M.S. SWAMINATHAN

One Man's Quest for
a Hunger-Free World

Gita Gopalkrishnan

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Preface

Early this year I was asked by the organizers of the Youth Employment Summit to write the story of M. S. Swaminathan. It was to be a short inspirational biography to enthuse the youth of today. The focus was to be on Swaminathan's youth as well as the people, places, and events that influenced his perceptions and brought him to achieve distinction as an adult. His work and accomplishments in later life were to be traced back to his younger days in order to demonstrate the power and value of youth.

I have written this book for the nearly 2000 delegates attending the Youth Employment Summit in Alexandria, Egypt, in September 2002, primarily from countries where not much is known about India. But Swaminathan's story will surely inspire and encourage a much wider audience, not the least in his own (and my) country.

This has been one of my most enjoyable and fulfilling assignments. I would like to gratefully acknowledge the help I received from various people. José Ruiz-Salas and Poonam Ahluwalia, of the Youth Employment Summit, have been particularly helpful with their comments. Professor Swaminathan generously gave me his time and also guided me in sourcing material. I have learnt a lot in the course of my interaction with him. Apart from providing valuable insights into her husband's personality, Mina Swaminathan went through my manuscript carefully and gave me some very helpful suggestions. Swaminathan's brother, M. S. Krishnamurthi, his

sister, Lakshmi Sivaraman, and his cousins, Thangam Aiyadurai and Mahalakshmi Suryanandan, told me about their shared childhood. At the M. S. Swaminathan Research Foundation, R.V. Bhavani, M. Geetha Rani, and N. Anil Kumar talked to me about their work. R. Malathy, V. Sridevi, and N. Parasuraman helped a lot in sorting out various issues. My husband, Gopi, read all my drafts with a critical eye. And, my teenage grandchildren, Aparna and Govind, looked at the biography from a youthful perspective.

Gita Gopalkrishnan

Foreword

It was my lucky day when I met Dr. M.S. Swaminathan eight years ago. I remember the day very clearly. I had only read about him up until then, about how he had engineered India's greatest triumph over poverty and hunger. The awe I felt when I was first introduced to him could be compared to an astronomer's excitement at finding a new star. Here I was in front of the man who had changed the face of India. The world is a different place now because of him. I want to share the awe I have of this person with today's youth — who now wake up to and approach the world differently because of him, his commitment, his resolve. My wish is that this biography will serve to bring new hope and inspire change among youth.

Dr. Swaminathan's work has made an impact, not only in my beloved India, but also around the world. His deep understanding of food security and sustainable development has ensured a real change in the lives of millions. In the mid-1960s, he planted the seeds of hope, but it was only the first step, and perhaps the easiest. What came next was a revolution in India, then Asia, and expanded to encompass many other parts of the world. Countries in only after a couple of years of sowing Dr. Swaminathan's seeds and implementing his farming techniques became self-sufficient in food production. As a scientist and as a policymaker, he has led the charge in improving the sustainability of agricultural practices, and he continues to promote improvements in production and

productivity in order to meet the demands of future populations.

Throughout his career, Dr. Swaminathan has in various ways been able to positively impact the lives of youth. This comes from the interconnectedness of his life's mission of freeing the world from hunger with the issue of youth employment. The agricultural sector will continue to employ many youth in developing countries, even with the advent of new technologies, and not in spite of. As Dr. Swaminathan argues, production and productivity need to improve, and this will happen because of advances in communication and information systems, and here is where new jobs for youth lie. The infrastructure to support improvements in production, and particularly jobs that complement farm production, will depend on technological advancements. Given that hunger is not always a problem of availability, but a matter of access (in other words, purchasing it), the need to provide employment opportunities to youth in order to better their condition is critical, if they are going to be healthy and productive members of society.

In the relatively short time I have known Dr. Swaminathan I have learned many things. The most important one is his response to all my requests, which has always been "Why not?" With those two words he makes everything possible. He made it possible for me to discover that I too have a role to play in breaking the cycle of hunger and poverty in the world. I have chosen the Youth Employment Summit as a means to that end, and I thank Dr. Swaminathan for that inspiration. I appreciate every minute that he has taken to show me the bigger picture, to counsel me — not only on how to do things better, but how to do better things — and to

recognize my accomplishments however big or small, which serves to drive me further.

I would like to thank the Global Environment Facility and the World Bank for their commitment and financial support of this biography, and for recognizing the impact that youth can make in environmental sustainability. I would also like to acknowledge the support of Janet Whitla, President, Education Development Center (EDC), Inc., the organizational sponsor of the Youth Employment Summit.

Finally, but certainly not least, I would like to recognize Gita Gopalkrishnan for all her hard work and dedication to this biography. From the bottom of my heart, thank you, Gita, for making my dream come true.

Poonam Ahluwalia
Executive Director
Youth Employment Summit

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Introducing Swaminathan

M.S. SWAMINATHAN... TIME Magazine has called him "one of the twenty most influential Asians of the 20th century." The Indian Government has honored him with its prestigious national decorations and he has been the recipient of numerous awards and prizes and medals from all over the world. He has been named Commandeur of the Order of the Golden Ark of the Netherlands, and has received the Magsaysay Award for Community Leadership, the Ordre du Merite Agricole of France, and the Golden Heart Presidential Award of the Philippines. He has been awarded the Charles Darwin International Science and Environment Medal, the Volvo Environment Prize, the UNESCO Gandhi Gold Medal, the Franklin Delano Roosevelt Four Freedoms Medal, and the Indira Gandhi Prize for Peace, Disarmament and Development — to name just a few. In 1987, he was the first recipient of the World Food Prize, considered equal to a Nobel in the field of agriculture.

At current tally, Swaminathan has 28 national and 24 international awards to his name. He has honorary doctorates from 43 universities around the world, including one from the oldest university in the western world, the University of Bologna in Italy. He is a Fellow of the Royal Society of the UK and of the National Academy of Sciences of the US, among the 30 other scientific academies and societies he belongs to. He has chaired 28 Indian committees and has held positions in 33 international ones. Among his current responsibilities is leading the Pugwash Conferences on Science and World Affairs and holding the UNESCO-Cousteau Chair in Ecotechnology. Testifying to his diverse interests, he is also the president of a non-profit institution that services the health needs of the poor, and the chairman of an organization that seeks to provide a forum for discussion and application of developments in information technology. A recent survey of his writings and speeches goes into almost 50 pages. He seems to be a man in a rush to accomplish in one lifetime what would need several.

Who is M.S. Swaminathan? He is an agricultural scientist, a plant geneticist. But he is much more than just that. He is an environmentalist, an ecologist, an administrator, an educator, an advisor to governments around the world, a social worker, a philosopher, and a visionary whose dream is to rid the world of hunger and poverty.

I wanted to know more about him and went to seek him out at the M.S. Swaminathan Research Foundation in Chennai, India. It was an impressive white building with a red tiled roof. I walked in through a short corridor and saw on either side

greenhouses full of plants. I found myself in a hexagonal-shaped area surrounding a courtyard with a garden. There was something unusual about the garden. It was not the normal landscaped one with a lawn and flowerbeds. As I looked at it again, from the depths of my memory came the terms describing the five ecological zones mentioned in classical Tamil literature: mountains, forests, pastoral lands, coastal plains, and arid deserts. I now realized this central garden had been planted with horticultural species typical of each of these regions. There was not much wood used in the structure of the building, I presumed, to save the fast depleting forest wealth in the country. The water brought down by the fury of the monsoon rains was collected and stored and used for the gardens and other purposes. There were solar panels on the roof; the computers ran on solar energy. This building was clearly designed on a sound environmental foundation.

An international seminar was on that day. Delegates were arriving, they represented several nationalities. The whole place was buzzing with activity. An affable gentleman in his seventies was greeting everyone coming in. He looked calm and collected in the middle of all the excited goings-on around him. I was told he was the man I had come to meet — M.S. Swaminathan, the founder of this research organization.

It was getting on to 10 a.m. when the seminar was scheduled to start. But, the chief guest, an important member of the government, hadn't arrived. Time is flexible in India. Punctuality is not one of our virtues. And government ministers have to be given some latitude. However, M.S. Swaminathan seemed to be of a different mold. The delegates were all ushered in and they took their seats. He made a brief announcement: "Our chief guest has been delayed, he is on his way. We will

not wait, he will join in when he comes." The proceedings started.

Monkombu Sambasivan Swaminathan. A long name, but that is the way it is with many south Indian names. The first word is the name of your village or town, the second is your father's given name. The last, the one you are known by, is your given name. There are no surnames. Traditionally, the first son is called after his father's father and the second son, after his mother's father. Obviously, to cut short the long name, the first two words are initialized.

I spent several weeks getting to know Swaminathan and his philosophy of work and living. He is a couple of years over 75 and has the energy and enthusiasm of a 25-year-old. He is forever on the move. One day I was told he was away in Manila; the next week he had gone to Budapest. Two days he was in Delhi, back to his base in Chennai for just an evening, and off to New York. He travels to out-of-the-way locations in India — to a small town called Kottakal in the southwestern state of Kerala to inaugurate a tissue-culture laboratory of rare medicinal plants and, a thousand miles away, to the rice-growing Jeypore Tract in the eastern state of Orissa to look at some research work his Foundation is involved in there. He never shows any signs of fatigue. I asked him how he manages it. "Well," he said with a smile, "if you are committed, and excited by what you are doing, tiredness never sets in."

And excited and committed he is to his cherished cause. Swaminathan strongly believes that the peace our world is sadly so much in need of today can be achieved only by ridding it of hunger and poverty. It is obvious that hunger arises out of

poverty, and the most important cause of poverty is unemployment. It is a sad state of affairs that when we have progressed on so many fronts, when man has conquered the skies and the oceans, there are so many people in the world without jobs. Swaminathan puts this down to lack of imaginative thinking and lack of enterprise on the part of governments. New and creative ways can, and must, be found for the unskilled, the illiterate, the landless, and the excluded — particularly youth and women of all ages — to be able to earn their living.

The activities of the M.S. Swaminathan Research Foundation (MSSRF) are directed towards pro-nature, pro-poor, pro-women, pro-employment programs. Its headquarters in Chennai is staffed by young and enthused scientists, ecologists, economists, specialists in gender studies, sociologists — of both sexes. MSSRF runs a series of projects in several states of India, working closely with rural and tribal peoples.

'Sustainable development' is the catchphrase. It means that growth and progress can be shown to be reliable and dependable and can be maintained at an even and steady pace. Swaminathan insists that sustainable development must be firmly rooted in the principles of ecology, social and gender equity, employment generation, and economic potential. In farming, Swaminathan defines sustainable development as producing high yields *in perpetuity*, without associated social or ecological harm.

What were the influences that have shaped Swaminathan's life and work? Are there pointers in his upbringing, education, research work, his personality and ethical principles, his philosophy of living, which the youth of today can relate to? In exploring all these aspects, I had opportunities to talk to members of his family and to his colleagues at MSSRF. And in

the midst of his very busy schedule, Swaminathan gave me quality time.

India is a land of great diversity. Geographically, the highest mountain system in the world — the Himalayas ('abode of snow' in the Sanskrit language) — stands between the sub-continent and central Asia and China. Rivers that rise from these mountain ranges flow through the northern plains of India. The southern part of the country is a peninsula, surrounded by the Bay of Bengal to the east, the Indian Ocean in the south, and the Arabian Sea to the west. Central India is a plateau, with more rivers criss-crossing it.

India is a very ancient country, with a history going back thousands of years. The earliest people had a distinct artistic and literary culture. Invasions from central Asia through the mountain passes changed the face of north India, in particular, from the 13th to the 17th centuries. Then came the European powers — the Dutch, the Portuguese, the French, and the English. Stories of India's great wealth of gems and spices and textiles brought these Europeans initially as traders. They stayed on and set about to colonize the country. Except for a few small pockets here and there, the others were in no way as successful as the English. India was a British colony for almost three centuries, till she got her independence in 1947: an independence that was achieved not by bloodshed but through *ahimsa* or non-violence.

The peoples of India speak many different languages, eat a variety of foods distinct to each part of the vast country, their physical features vary from the north to the south. They are also of many different religious beliefs: most are Hindus with

a good proportion of Christians and Muslims and smaller numbers of Buddhists and people of other religious faiths. What unites them is a distinctive set of values — tolerance, a spirit of sharing, respect and affection for older members of the family, commitment to children, among other ideals. Another uniting factor is the English language, a legacy of the British. The national language is Hindi, but English is understood in every corner of the country.

India today is a modern nation, with bustling cities connected by road and rail and air and posts and telecommunications. She has made rapid progress in harnessing nuclear power and in space, information, and bio-technologies. Yet, she is a poor developing country, by the economic standards of the world. According to recent estimates, there are over a billion Indians. Over 70 percent of them live in the rural areas, in villages dotting the country.

This is the country M.S. Swaminathan belongs to. He is rooted in her history and culture and religious philosophy, and yet very much a product of her modern, scientific temperament. He has made it his mission in life to bring together tradition and modernity to foster a movement of hope and peace by eradicating hunger and poverty, for mankind to live in harmony with nature.

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Those were the days...

It was an idyllic childhood. Monkombu, in the 1930s when Swaminathan was a young child, was a small village in the state of Kerala in southwestern India. It was a natural island in the middle of the river Pamba, with many canals of the river running through. In fact, it was referred to as the 'Venice' of Kerala. The inhabitants moved around in country boats. Rice fields dominated the landscape, interspersed with groves of coconut palms and mango trees.

The name of the village is actually derived from the mango. Legend has it that a trader was once transporting logs of mango wood on the river when one got stuck on the sandy bank. Try as he might, he could not dislodge it. In a dream, he was told that the spirit of the goddess Bhagavati was in that log and that she wished that a temple be built in her honor on that spot. The trader did accordingly and called the place 'Mavin Kombu' (meaning 'log of the mango tree' in the local Malayalam language). This word has since been corrupted to Monkombu.

Swaminathan's family was among the most important in the village. Generations before, the rajah of Ambalapuzha had traveled to the neighboring region of Tamil Nadu. He had been very impressed by the scholars at the Thanjavur court and requested that one such scholar be sent to his province. Enji Venkatachella Iyer, Swaminathan's ancestor, was chosen to move to Ambalapuzha. The rajah was so delighted and struck by Venkatachella Iyer's knowledge of the scriptures that he gifted him acres of land comprising the village of Monkombu. The family came to be called the Kottaram family ('kottaram' means palace).

Swaminathan's grandfather, Krishna Iyer, had six sons. It was a large joint family, very common in India of those times, equally sharing the assets and contributing to the work in farming the land. They grew rice and mangoes and coconuts, the natural produce of that region. Swaminathan's father, Monkombu Krishna Sambasivan, the fifth among the brothers, wanted to become a doctor. His family encouraged him and he was sent off to study medicine at the medical college at Madras. He specialized in surgery and decided to set up practice in the town of Kumbakonam, some 400 miles away to the east, in Tamil Nadu.

School holidays brought the family together. Wherever they were, the children came home to Monkombu for the long and hot summer vacation. Thangam, one of Swaminathan's cousins, describes the wonderful get-togethers at Monkombu. "We looked forward greatly to the time school would close and some 25 of us children in the family would gather at our village home. It was a big property. There were separate buildings housing the bedrooms, the kitchen and dining area and the *puja* room where the gods were worshipped, and the rooms where the

vegetables and fruit were stored and paddy was threshed. To beat the heat of the summer, thatched structures were put up between these buildings. We were always running from one to the other. We played all sorts of games out in the gardens. Since we were so close to the river, the ground was quite moist. So, fine white pebbles were spread all over. We would sit under the mango trees on pieces of matting or even sheets of newspaper and play board games all day long. There was no piped water. Next to the kitchen area, there was a square structure that held water from a spring. This was used only for cooking. All of us had to go to the river or to the ponds in the estate for our baths. It was great fun and even the youngest baby learnt to swim. The river would flood every two or three years, when the monsoon rains had been exceptionally heavy. Then there was water everywhere and we could not make out which was land and which was the river. The younger children were kept indoors and the older ones would borrow the big wooden tubs from the work area and paddle around happily.

"Ambi [Swaminathan's nickname] and I were great friends, he was only two years younger than I. He loved to go to the sheds and look at the many cows we had. All our food came from our own sources — milk from our cows, rice from our fields, fruit and vegetables from our garden. The food was cooked in huge vessels, to feed the big family and all the household help. Our grandmother looked into all the domestic arrangements. My mother and my aunts did all the cooking. The best part of the day was at the end, when tired and hungry after all our fun and games, we would gather under a big tree. We would sit in a circle around our eldest aunt who would dole out spoonfuls of delicious rice-and-yogurt on to our outstretched palms, all the while telling us exciting stories from

Indian mythology and history. And we would nod off, probably dreaming of kings and queens."

The holidays he spent at Monkombu left a lasting impression on young Swaminathan. There was no discrimination in the family between boys and girls and he grew up without any sense of inequality between the genders. The temple to goddess Bhagavati was at the heart of the village. No one could worship at the temple without having had a bath. Physical cleanliness was insisted upon. Everyone had the right to worship. Inside the temple, there was no difference between rich and poor, young and old, men and women. It was an egalitarian space.

Swaminathan's grandmother was an ardent devotee of Bhagavati and visited the temple every single day. Often, her grandchildren would accompany her. She taught them that faith in the divine included a strong ethical value system. Later in life, as a scientist, Swaminathan was always deeply conscious that all technological push must be matched by an ethical pull.

The paddy fields in Monkombu kindled Swaminathan's early interest in agriculture. Monkombu was in Kuttanad, popularly described as the 'rice bowl' of Kerala. Saline water used to flood the fields and had to be pumped out into the river before the monsoon crop of rice was sown. Like in Holland, dykes had to be constructed to keep the saline water out. Swaminathan greatly looked forward to the nighttime excursions to keep vigil against the breaching of the dykes.

He was also fascinated by the graceful, rhythmic movements of the village women planting the saplings, all in absolutely straight lines. On one holiday, he wanted to try his hand at the planting. It looked very simple! His uncle warned him that it would be backbreaking work. But the ten-year-old was not to be deterred. He started off with great enthusiasm but,

within a few minutes, his back did begin to ache. He had to give up, much to the amusement of the women. "How can you work like this for hours at a stretch? Don't you get tired?" Swaminathan asked them. "Well, that's our livelihood. We get paid by the number of saplings we put into the ground," they answered. Swaminathan thought it over and went to his uncle again. He asked him if there wasn't an easy way to do the job. Maybe a machine could plant the saplings? "If we used machines, Ambi, how will these workers earn their bread? You know in India we have too many people to feed and they need jobs to be able to get money to buy food," his uncle explained patiently. That was Swaminathan's first introduction to the truism that people could not have access to food if they did not have jobs. Six decades later, it still holds true. But, today, Swaminathan is convinced that modern technology can be used to create jobs, not eliminate them. And his respect and admiration for farm women has only increased many times. The concept that job destruction and job creation must be concurrent events underlined his approach while designing strategies for reducing drudgery in women's work.

The Kottaram family expanded its agricultural activities to include rubber and coffee. These were called plantation or cash crops, because they were grown essentially for the market. These plantations were not in Monkombu. Rubber was grown in the south, near Trivandrum. Coffee was grown in Wayanad, a hilly area to the north. Pepper was also cultivated here, the creepers twining around the silver oak trees planted to give shade amongst the coffee. Swaminathan never failed to be moved by the sight of these acres of crops. They also gave him his early lessons on the complex web of

relationships in agriculture. He noticed that his uncles were worried when prices for rubber or coffee or pepper fluctuated wildly in the international markets. There was the risk of monsoons failing or of pests and diseases too, as when the oranges grown in Wayanad were almost totally wiped out by the *citrus dieback* affliction. This was when he also realized that the risks in agriculture could be faced by measures like mixed and multiple cropping. Non-farm livelihoods were very necessary too, something which he actively advocates today.

Swaminathan and his siblings spent other vacations with their cousins on their mother's side of the family. His mother, Thangammal, was very close to her older sister, Visalakshi. The latter lived in Madras (now called Chennai). Her husband, also a Swaminathan — Krishnaswami Swaminathan (known familiarly as KS)— taught English at Madras University. He was a very learned man, in English literature as well as in his mother tongue, Tamil, and in Sanskrit, the classical Indian language that has given rise to most other Indian languages. Visalakshi and Swaminathan and their three daughters always made Swaminathan's family most welcome.

Swaminathan's cousin on his mother's side, Mahalakshmi, just a couple of months younger than him, talks of her aunt and uncle with great affection. Sambasivan always brought them gifts — goodies to eat like fruits and nuts and Indian sweets, and games like jigsaw puzzles and board games, and stationery stuff like pens and pencils and coloring crayons. He was a very genial man, full of fun.

Mahalakshmi remembers that on one of their holidays in Kodaikanal, a hill resort in south India, they were having a picnic at a waterfall. There were a couple of local urchins

tormenting a rock lizard. They were aiming stones with catapults at the poor, frightened creature. They would not heed the elders in the party who shouted at them to stop their cruel game. "Ambi, who was then about 10 years old, suddenly got up and walked over to those boys. We were all worried that they would turn on him, and watched anxiously. He said something to them in his usual quiet and gentle voice, and, to our great surprise, the boys walked away shamefacedly," says Mahalakshmi. Unconsciously, he seems to have been putting into practice Gandhi's words: "When you are in the right you can afford to keep your temper, and when you are in the wrong, you cannot afford to lose it." To this day, Swaminathan manages to get difficult things accomplished and untangles knotty situations without having to raise his voice.

Mahalakshmi recounts that Swaminathan loved reading, even as a young child. He was very observant and had a good memory, so his vocabulary and knowledge of the English language were extraordinary. Sambasivan once got the cousins to engage in a spelling competition. They were about 7 or 8 years old then. She is still rueful about it: "I could spell most of the words, but was stumped by 'ecclesiastical'. Ambi rattled off the correct spelling, much to my discomfiture that I, whose father was a professor of English, lost out to the son of a doctor!"

The second child in a family of four, Swaminathan was born on 7 August 1925 and brought up in the temple town of Kumbakonam, an ancient settlement going back to very old times. In Hindu mythology, the story goes that after the great flood when the entire universe was destroyed, the gods brought

up ambrosia, the elixir of life, out of the oceans. It was stored in a pot. As the floodwaters receded, the god Siva pierced the pot with an arrow to release the ambrosia. One of the pieces of the pot fell on the spot where the settlement was founded. The soil of Kumbakonam is very fertile and it is one of the important rice growing areas of the country. It seems appropriate that this was the land where the finest agricultural scientist of the millenium should have been born.

Swaminathan's father, Sambasivan, having qualified as a surgeon, chose to settle down in Kumbakonam. His younger brother, Narayanaswami, who set up as a specialist in X-rays, joined him. The Monkombu Kottaram family thus spread itself, moving from agriculture to medicine.

Sambasivan was a general surgeon and a family doctor, much respected for his skills as well as for his compassion. Patients from all over, rich and poor alike, thronged his clinic. He gave each one his undivided attention and spent long hours at his work. He waived his fees for poor patients. He was often summoned, at odd hours, to go into remote villages in the area. Never once did he refuse, even at the expense of his personal comforts.

Filaria, a highly communicable disease spread by a particular species of mosquito, was rampant in Kumbakonam. Everywhere you could see people with swollen legs, a manifestation of the disease that has given it the popular name, elephantiasis. Sambasivan had been elected as Chairman of the town's Municipal Corporation, with one of his campaign promises being that he would free the town of its dreaded mosquito menace. It was a mammoth task, but he was determined to make good his word. Sambasivan was a great believer in what he called 'people's power.' He was sure that

great things could be achieved if people worked together through education, social mobilization, and community action.

He got all the citizens involved in the job. Schoolchildren were asked to identify the breeding grounds of mosquitoes in their neighborhoods. Men, women, and children filled up the stagnant pools of filthy water with sand. Garbage was removed to landfills far outside the town. Sewers and open drains were doused with the disinfectant supplied by the Municipal Corporation. The whole affair turned into an enthusiastic competition between the various localities in Kumbakonam. Never had the town been so clean. And filaria was gone forever. Swaminathan would remember this crusade more than 30 years later, when he enlisted the support of farmers to prove that new hybrids of seeds could transform the food situation in India.

Sambasivan was also a staunch nationalist, actively participating in India's struggle for independence. Mohandas Gandhi (called *Mahatma*, or 'great soul') was the leader of the Congress party in the forefront of the movement. Gandhi's chief weapon against the British was *ahimsa* or non-violence. It was a philosophy based on the great religions of the world — Hinduism, Christianity, and Islam. The British could deal with militants using the conventional weapons of warfare. This was the first time they came across antagonists who just sat still and refused to fight back or co-operate. Gandhi and his trusted lieutenants — Jawaharlal Nehru, Vallabhai Patel, C. Rajagopalachari — soon took the country by storm. Men and women from all walks of life joined the Congress party and the struggle for independence.

Sambasivan threw himself wholeheartedly into the freedom struggle. Other members of the family, like his brother-in-law KS in Madras, were also ardent nationalists. They heeded

Gandhi's call to wear only handspun cloth and boycotted all British-made goods. Even the soap they used was the hard, red, carbolic one made locally, when the market was flooded with lovely scented English soaps like Yardley, remembers one of Sambasivan's nieces!

Swaminathan and his brothers had their early school education at the Native High School and later at the Little Flower High School in Kumbakonam. The Little Flower High School was run by Catholic missionaries. Moral education and discipline were stressed. The teachers were good, particularly in subjects like English and Mathematics. However, in those days, the emphasis was on getting the text by heart and repeating it in class. Though it did not foster original thinking, this approach helped to improve one's memory. Most of the time arithmetic was done mentally, since there were no calculators or computers or other artificial aids then. This certainly sharpened the student's mind.

The headmaster was a strict disciplinarian and would not hesitate to resort to caning if he thought the misdemeanor merited it. The combination of very good teaching and discipline led to many students who came from the deprived sections of society doing very well in school and obtaining scholarships to go on to university. As Swaminathan has pointed out on more than one occasion, underprivileged youth almost always make the most of the right opportunities to better their prospects.

The school had a large playground. "Football was the most popular sport, but Ambi and I used to play cricket too with other boys in the neighborhood. Ambi was the bowler of the team and did a good job of it," recalls Swaminathan's brother. Cricket is one of the legacies Britain left to her colonies. Even

today, it is a keenly contested game among the former colonial countries.

Swaminathan relives an unforgettable incident in his early life, an act of recklessness when he was about six years of age. Kumbakonam is on the river Cauvery which is usually completely dry from about February to May each year. In June, water is released from the barrages upstream. The people flock to see the river flowing fast after the dry months. Swaminathan had learnt to swim in Monkombu and was rather proud of his prowess. One morning, he jumped into the river and was immediately dragged several meters by the strong current and was nearly drowned. His mother went in after him, but she was also caught in the current. Fortunately, some men who were standing on the banks rescued both of them. Swaminathan was unconscious for a few hours, but prompt medical attention saved his life. The first thing his parents told him when he came to was that he should always make the distinction between foolhardiness and bravery. He impressed this on his daughter, Madhura, when she went mountain climbing in the Himalayas.

Tragedy struck this happy family when Sambasivan suddenly passed away in 1936. He was only 36 years old and at the height of his career. Swaminathan was a child of 11. They had just returned to Kumbakonam after a trip to the French territory of Karaikal. Sambasivan complained of abdominal pain. There was only one other surgeon in Kumbakonam those days, Colonel Kelly at the Government Hospital. He couldn't do anything and advised that the patient be taken immediately to Madras, 200 miles away. Sambasivan took the night train to Madras, accompanied by his wife. Jawaharlal Nehru, the charismatic Congress leader (later to become independent

India's first Prime Minister), was to visit Kumbakonam in the next few days. Even as he boarded the train, Sambasivan gave instructions for Nehru's reception and said he would be back in time for the event.

In Madras, Sambasivan was immediately operated upon by the leading surgeon of the city. It was a rare pancreatic complication. He did not make it and died the next day, 12 October 1936. That day has been etched in Swaminathan's memory. He was very close to his father, and was quite inconsolable at this sudden loss. He was not yet in his teens and his father had been a major influence on him. Till today, he has never forgotten that his father would insist that there was nothing that was impossible. For every problem there is a solution, the glass is not half-empty but half-full. "It exists only in your mind," Sambasivan would exhort his children, "there is no such word as 'impossible'." That appears to be the maxim that rules Swaminathan's life. He has achieved what was thought to be 'impossible', making his country self-sufficient in food production. And he is going on to tackle other 'impossible' things like eradicating hunger and poverty and bringing about a peaceful revolution in the world.

The extended family swung into action. Thangammal and her four children continued to live in the spacious house in Kumbakonam that they were already sharing with Sambasivan's brother and his family. Monkombu Krishna Narayanaswami brought up his brother's children together with his own four on an income that was much reduced, as Sambasivan, as a medical practitioner, had been the main earning member. But he did this bravely, denying himself and his family privileges we now take for granted, like holidays, the latest fashions in clothing, and frequent visits to the cinema

and other places of entertainment. Swaminathan's sister remembers that all of them had only four sets of clothes, that too of handspun cotton, every year. The only diversions (those were the pre-TV times) were classical music concerts and mythological plays at the local temple, open to all. Once in a rare while, they were taken to the cinema. And, she says, "when a love scene was being shown, our uncle would make us children shut our eyes!" The one thing on which money was spent without a second thought was food. They were vegetarians, and there was always an abundance of vegetables and fruit and milk and cereals like rice.

Narayanaswami and his wife showed no difference in their love as well as strict upbringing of all the children. They are well into their 90s now, and are as proud and jubilant about Swaminathan's achievements and world renown as his own parents would have been. And he, on his side, is ever conscious of the deep debt of love and gratitude he owes them.

The concept of sharing that Swaminathan lays great stress upon can be traced back to his having been part of a large extended circle of relatives in his formative years. Though they had tragically lost their young father, Sambasivan's children did not lack love or care. This kind of sharing and giving is very much part of the Indian ethos. Families are, no doubt, becoming nuclear, especially in urban areas. Yet, there is always a strong feeling of kinship, a gathering together of the clan so to say, in times of distress as well as happiness. The sense of security that children derive from such relationships is without measure, and lasts life long.

In his work as a scientist and researcher, Swaminathan has always believed in sharing information, sharing knowledge. Scientists cannot exist in watertight compartments, he insists.

Only through interaction with others in their field of work, only through learning from the next person, can they derive energy and enthusiasm for their own pursuits. Swaminathan is convinced that this is particularly applicable to agricultural scientists, who must build partnerships with other scientists, with students, with political systems, and most important of all, with farmers — rural and tribal men and women — who are the primary users of all agricultural knowledge.

Swaminathan's childhood was a happy and secure one. It molded much of his later thinking and activities. And this poem by Nobel Laureate Rabindranath Tagore, India's greatest poet, remains one of his favorites:

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 mud piles
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...

3

Going on...

Swaminathan was only 15 years old when he graduated from high school in 1940. Kumbakonam did not offer the best facilities for university education. Swaminathan and his older brother thus went to live in Trivandrum with another of their uncles, Monkombu Krishna Neelakantan, an important member of the civil services. At that time, Trivandrum was the capital city of the princely state of Travancore (part of what is now the state of Kerala). The maharajah of this state was a very enlightened person who greatly encouraged education. Travancore University was one of the best in the country.

Swaminathan studied for a Bachelor's degree in zoology. That was the period when India was in the grip of her struggle for freedom from British rule. Gandhi had issued his stirring call for'*swaraj* (literally 'self-rule'). Nearly every student was fired with patriotism and the songs of nationalist poets like Subrahmanya Bharati and Rabindranath Tagore were sung all

the time. Swaminathan recalls that in 1942, when Gandhi started the 'Quit India' campaign, the students in his college (Maharaja's College, Trivandrum) went on strike. The Principal, however, dealt with the situation in a very tactful manner. He told them, "I also want freedom, but we cannot get it by shouting and staying away from classes. However, by studying and by equipping ourselves with knowledge and capability in science, we can serve independent India better." Swaminathan and his contemporaries saw the logic of this and withdrew the strike and concentrated on learning new skills relevant to independent India.

Swaminathan's interest in studying for a degree in agriculture was slowly growing. As a child, both in Kumbakonam and Monkombu, he had loved to spend hours at the paddy fields. He would watch with fascination the beautiful ladybird beetles eating the hoppers and other pests of paddy. Chemical pesticides were not used those days and the farmers explained to the young boy that the beetles were, in fact, being of service in eliminating pests. He had learnt about biological control and the need for conserving biodiversity at the level of each field. He would remember this when, decades later, there was a crisis in rice production in Indonesia. Vast numbers of brown plant hoppers were destroying the rice crops. President Suharto appealed for advice to Swaminathan, who was then heading the International Rice Research Institute. The scientists at IRRI saw no way out but to ban the pesticides being used on the crops. Therefore, 57 pesticides were banned by the Indonesian government. There was a big hue and cry. Rice was the staple food of Indonesia and most people felt that if chemicals were not used to control the pests, the entire crop would be destroyed and there would be nothing to eat.

President Suharto, however, stood his ground. Time was given for nature to act. Two years later, the production of rice increased by 18 percent and pesticide consumption came down by 65 percent. The cost of cultivation fell and the environment became much safer. The common sense and perception of the Indian farmers had been conveyed to their Indonesian counterparts fifty years later.

The Second World War was having a devastating effect on the Indian economy. In 1943, there was a great famine in Bengal, in eastern India. The colonial government could not gauge the extent of the crisis in Bengal and failed miserably in sending supplies of foodgrains to alleviate the misery of the people. The newspapers were full of stories of how the poor in Bengal were literally dying on the streets. Swaminathan and his friends discussed these events endlessly. Swaminathan argued that the only way to counter such calamities was to build up a stock of foodgrains. India had sufficient natural resources, all that was needed was hard work and perseverance. "Man-made problems have to have man-made solutions," he quoted his father's words on the filarial mosquito menace in Kumbakonam.

There was acute shortage of rice all over the country. Burma had been occupied by Japan and supplies of Burmese rice coming into India had dwindled considerably. No more could people have two rice meals a day. Swaminathan's aunt had to turn to other sources of nourishment for her family. At least one meal, and often both, consisted mainly of tapioca (cassava). She was such a genius in producing very tasty dishes out of it that the children did not really miss rice! This again was a lesson that the would-be agricultural scientist learnt — a diversified food habit. In later life, one of his areas of study has been the

widening of the food basket by giving greater attention to underutilized crops like millets and tubers.

Seeing his passionate belief that good agricultural practices were the answers to the problems of the day, some of Swaminathan's friends advised him to take to farming. After all, his was an agricultural family. But Swaminathan had seen how his uncles worried about their crops. Too much rain, too little rain, market fluctuations, pests, everything had an effect. He didn't want to limit himself to such things. He wanted to be a scientist, an agricultural scientist. He wanted to study plant genetics so that he could help India become self-sufficient in food production. He wanted to help the average Indian farmer with a small holding to increase his yield. He wanted to develop new and improved varieties of seeds. He wanted to teach the farmers about better farming methods, about better soil and water management. He wanted to take the best of science and technology to the mostly illiterate rural masses who depended on agriculture not only for food but also for employment and income.

Once he had made up his mind, the next step was to implement his plans. After getting his degree in zoology, he joined the well-known agricultural college in Coimbatore, in Tamil Nadu. This was affiliated to the University of Madras, one of the oldest universities in the country. Swaminathan got another Bachelor's in Science degree here, topping his class in academics. He remembers that when he appeared for the interview for admission to the college, the Principal asked him why he chose to study agriculture when with his excellent academic record he could have got into dream courses like

medicine or engineering. That was the social prestige of agriculture then. No wonder the growth rate in food production in pre-independent India was less than 0.1 percent between 1900 and 1947.

For the first time, Swaminathan was living away from home. But this was perhaps compensated by the fact that he shared a room in the students' dorm with the son of the owner of Coimbatore's leading confectionery house! He was soon totally into his studies, but he also found time to play cricket and field hockey. The professor of agronomy, C. Ramaswami, had played cricket for India and was very enthusiastic about coaching promising players. Swaminathan had to be in the cricket ground as soon as classes were over. Ramaswami taught his young wards how to concentrate as well as relax both in the classroom and in the playing fields. Swaminathan was also a keen debater, honing his skills for later life in putting across his points of view to a wider world audience.

In his second year at the agricultural college, the eminent Congress leader Rajagopalachari had become the Chief Minister of Tamil Nadu, under an arrangement of partial freedom negotiated by Gandhi with the British Government. One of the first steps he took in 1946 was to introduce prohibition. Gandhi had rightly identified prohibition as a very important means for women's emancipation and their household food security. There used to be liquor shops just outside the college farm, and Swaminathan had noticed how the farm workers would go there straight after they got their wages. They would reel home drunk, and with no money in their pockets for their families. In the year when he saw prohibition in action in Coimbatore, the health of both men and women laborers dramatically improved. Instances of

quarrels and murders came down steeply, so did the frequency of women being battered. Thus, prohibition brought striking social change and improved the well being of the family. It is unfortunate, feels Swaminathan, that this important step which was conceived by Gandhi not so much on moral grounds but as fostering better household economics and gender justice has been given up for the sake of revenue through duties on liquor.

On one of their field trips, the students were taken to a farm belonging to a prominent local farmer, who had a large breed of pedigree cattle known as the Kangeyam breed. It was a remarkable collection of awesome animals, maintained with great love and care. However, later, because of lack of funds, the breed had to be sold in small lots to various people. It is now difficult to get pedigreed animals not only of this breed, but also of most other Indian breeds of cattle. In fact, it was his admiration for the maintenance of native breeds of cattle for public good that led Swaminathan to establish a National Bureau of Animal Genetic Resources when he became Director General of the Indian Council of Agricultural Research.

An important lesson he learnt during his years at Coimbatore was to trust the judgement of farmers. For them, one ounce of practice is worth tons of theory. Because of the serious shortage of rice due to Burma having been occupied by Japan, the government decided to distribute fertilizer free to rice farmers in order to rapidly increase productivity and production. This was to be done in the months of May and June, before the onset of the heavy monsoon rains. This was vacation time for students and therefore they were all mobilized to distribute fertilizer among farmers and also educate them on fertilizer use. This was their first experience in applying chemical fertilizer to paddy. On the very first day in the village

where Swaminathan was sent, farmers told him that it was foolish to apply chemical fertilizer before the rains as it would be washed away by the downpours. Nevertheless, he distributed the fertilizer among rice growers in the village. They also dutifully applied it in his presence. Soon the monsoon broke and there were torrential rains. Later the harvest proved that there had not been much benefit from the fertilizer application. Swaminathan insists that the man in the field knows his job more thoroughly than the scientific expert. Farmers are quick to take to new technologies if they are sure they will be benefited.

In 1947, the year India became independent, he moved to the Indian Agricultural Research Institute (IARI) in New Delhi as a post-graduate student in genetics and plant breeding. This is the premier research institute devoted to the scientific study of agriculture, a major aspect of Indian life. Agriculture has employed, employs, and will have to continue to employ around 70 percent of India's population. IARI started life in 1905 in the village of Pusa in the state of Bihar in north India, thanks to the munificence of Henry Phipps, an American philanthropist. Pioneering research work was done in agriculture and cattle breeding, chemistry, economic botany, entomology, and mycology. In 1936, the Institute was relocated to New Delhi. IARI's Pusa campus (called in memory of its origins) extends over 1250 acres. Its research activities have expanded into 17 divisions, and it is an autonomous university offering both graduate and post-graduate degrees.

Swaminathan did his post-graduate research at IARI on non-tuber bearing *Solanum* (the family to which the potato belongs).

He was deeply interested in potato because of its significance to human food security, its fascinating genetic traits, and its cultural history. The potato plant belongs to the nightshade family, which includes tomato and tobacco too. It is originally from Ecuador, Peru, and Chile in South America and is said to have been brought to Europe in the early 16th century by the Spanish conquistadors. Today, several varieties of potato are grown all over the world and it is one of the staples in our diet. It is full of starch, which makes up the carbohydrates we need for energy. And the *Solanum* plant today is very different from its South American ancestor. The ancestral plant can be compared to a tiny neolithic pony with a modern variety being akin to a pedigreed racehorse. Scientists like Swaminathan have worked on the plant's genetics and brought about changes through breeding and methods of cultivation. Potato farmers look for high yields per acre, good flavor and color, resistance to diseases, and good keeping qualities in their crops.

Early in 1948, when Swaminathan was studying at IARI, Jawaharlal Nehru visited the institution to invite suggestions from the scientists there on increasing the country's food production. Nehru told them that the gap between demand and supply was only 10 to 15 percent and, therefore, it should not be difficult for India to achieve self-reliance in food. Swaminathan was very interested in what his professors told Nehru, and took notes on the discussion. The plant breeder said his variety would increase yield by 10 to 15 percent. The entomologist maintained that by following his method of pest control, 20 percent more yield could be obtained. The fertilizer expert claimed 15 to 20 percent additional yield could be derived through the use of fertilizers. The rat control expert said that by killing rats, 30 percent more production could easily

be achieved. Nehru wondered why these scientists were not taking their knowledge to the farmers. Achieving self-sufficiency seemed to be so easy! Sadly, Jawaharlal Nehru did not live to see his country achieve the desired agricultural progress. It took 20 years, till 1968, for that to happen.

To digress a bit here...When, in 1954, Swaminathan came back to IARI as a member of its teaching and research faculty, his mind went back to Nehru's visit to the Institute when he had been a student there. He recalled that there had been no synergy among the various packages of practices recommended. Scientists of different disciplines were working in isolation. They also had little contact with farmers. This understanding helped him, in 1960, to both design and implement an integrated program of production as well as national demonstrations in the fields of poor farmers. Later he described this program as 'lab-to-land and land-to-lab', a two-way learning process. It is this contact with the farmers and the participatory demonstration and testing programs that led to the subsequent revolution in agriculture. Swaminathan never forgot Nehru's exhortation: "Everything else can wait, but not agriculture."

Having obtained his post-graduate degree with high distinction in cytogenetics, the study of inheritance with reference to cells, from IARI in 1949, Swaminathan was again at the crossroads. India had just got her independence and there were a lot of opportunities in the administrative services. His mother and his uncle believed that government service would be the best for him. Agricultural science was still in its infancy in the country. What could it offer a bright boy like him? On the other hand, if he took the all-India competitive examinations for jobs in the civil services, he would be assured of life-long employment in the service of his country. Swaminathan was

persuaded to sit for the examinations, though his heart was still with agricultural research. He was selected to the Indian Police Service.

However, fate or destiny, whatever you may call it, played its hand. Swaminathan was informed that he was the recipient of an UNESCO Fellowship to study genetics in the Netherlands. There was no question in his mind now. Swaminathan's brother attributes his decision to reject the safe job and plunge into the unknown to his interaction right from childhood with farmers and cultivators. The conditions of poverty suffered by marginal farmers and women, he feels, must have goaded Swaminathan to work for their upliftment through science.

The UNESCO Fellowship was to work for nine months at the Wageningen Agricultural University in the Netherlands. Swaminathan was to continue his research on potato at the University's Department of Genetics. Accordingly, he set sail for England, from where he would go to Holland. He was 24 years old and this was the first time he was going overseas. He was worried as to what Europe just after the Second World War would be like and what the future would hold for him. But, he was very sure of one thing — his decision to continue as an agricultural scientist was the right one.

Instead of taking one of the large British liners that plied between India and the UK, Swaminathan chose to travel in a small Indian one named *Jal Azad* (meaning 'freedom of the seas'). India had gained her independence just two years before and the experience was still very new. The commitment to *swadeshi* (literally, 'of one's own country') was still very strong. As the ship sailed out of the Bombay harbor, a wave of

homesickness swept over Swaminathan. He kept looking back at the Gateway of India till it went out of sight. Funnily enough, this impressive archway was one of the foremost symbols of British rule in India that nationalists like his father and uncle, led by Gandhi, had fought against. It had been erected at the mouth of Bombay's port in 1927, to commemorate the visit of the Prince of Wales (later to become George V of England) and his wife to India in 1911.

The voyage took eighteen days. The ship halted at Port Said in Egypt for a day. It was a welcome break, and the passengers got off to see the pyramids. On arrival at Liverpool, Swaminathan had to take a train to London, then on to Holland by another boat, and another train to Wageningen. England was then limping back to normalcy after the War. Swaminathan remembers how he put a coin into a vending machine at Liverpool station for some chocolate. Nothing came out! An elderly Englishman who was watching him asked if he was new to the country and told him that chocolate as well as butter and other food items could be obtained only against ration cards. Swaminathan stayed in London for two days with G. Parthasarathy, who represented the news agency, the Press Trust of India, in the UK. The highlight of his brief stay was a visit to Fleet Street, which was then the heart of the media world. The veteran journalist that he was, Parthasarathy impressed upon the young scientist what a powerful and important tool a free and independent media could be. That was a lesson he learnt well, for today Swaminathan is a great believer in using the media to educate the people on issues like food security, poverty alleviation, and sustainable development.

Swaminathan arrived at Ede-Wageningen, the railway station for the Agricultural University, on a cold December day

in 1949 and was the only passenger to get off the train there. He was quite lost and bewildered. Suddenly, an elderly gentleman appeared, greeted him, and took charge of his large suitcase. He thought the old gentleman was a porter and worried as to how much to pay him. He was led to a car and after stowing away the suitcase, the gentleman introduced himself as Professor Dorst, Head of the Plant Breeding Institute as well as the Rector-Magnificus of the Agricultural University. Swaminathan felt very ashamed for having let him carry his bag. However, it was another lesson learnt, this time on the dignity of human labor, a point often stressed by Gandhi.

Wageningen lies in the center of the Netherlands. The cities of Amsterdam, Rotterdam and The Hague are only an hour away. Swaminathan found the surroundings of Wageningen delightful. It was a typically, water-rich, Dutch landscape, with the Veluwe, the largest nature reserve in the Netherlands, to the north and to the south the river Rhine. It was a most conducive setting for an agricultural university.

At the University, scientists firmly believed that their work was to ensure reliable supplies of safe, high quality food, while maintaining the biodiversity of natural habitats and conserving natural resources, if the earth has to be maintained as a habitable planet. The mission statement of the University thus reads: "Wageningen University wishes to develop and disseminate the scientific knowledge needed to sustainably supply society's demand for sufficient, healthy food and a good environment for humans, animals and plants." This was the foundation Swaminathan built upon for his later scientific work in improving India's food stocks.

Swaminathan learnt that potato had been the mainstay of the people in Europe during World War II and that the need

for producing as much potato as possible led to the abandoning of traditional crop rotations. This had given rise to a parasitic worm problem, the golden nematode, which became serious in the lands reclaimed from the sea. He worked on developing techniques for transferring genes that would provide resistance to the golden nematode and to frost damage. Working in the Genetics Institute, Swaminathan succeeded in standardizing procedures for transferring genes from a wide range of wild species of *Solanum* to the cultivated potato, *Solanum tuberosum*.

Deliberately choosing to stay as a paying guest with a family that did not speak English, Swaminathan lived with the Maarseveens. He wanted to learn Dutch and thought this way he would have no choice but to do so! It was a valiant effort, as he does not have a ear for languages. His room was up in the attic. Since he was a vegetarian, he could eat only eat vegetables, fruit, cheese, milk, and bread. After a couple of weeks with them, his hostess started giving him delicious vegetarian dishes. Unhappy that he had no variety in his diet, she had gone to the trouble of taking lessons at a cookery school. Swaminathan has never forgotten this kindness of an unknown lady in an unknown land.

During these months at Wageningen, Swaminathan made a short trip to Germany to meet one Professor Stelzner, who was also doing research on potato. The train journey to Frankfurt was very depressing, with the coaches all in bad state with no proper seats. Most of the passengers were wounded soldiers returning from the Russian front after the War. Swaminathan was shocked at the sight of badly damaged buildings in Frankfurt. He had to go to the Max Planck Institute for Plant Breeding located in an old castle at Volkdagsen, near Hamelin of the Pied Piper and the rats fame. Germany was

economically ruined, yet the spirit of the people impressed Swaminathan. Ten years later, when he had to go again to the Max Planck Institute (which had since moved to Koln), he was dumbstruck at the transformation in Germany. It had been completely rebuilt, rising from the ashes as it were. Swaminathan was most impressed that a totally devastated country had reconstructed itself into a nation with vigor and vitality and with a new democratic vision. No doubt the monetary assistance Germany received after the War had been important, but the spirit of her people, their courage, determination, and striving for excellence was the real explanation. What the new Germany taught him was that so long as a country neglects and undervalues its human resources, and overvalues material resources, that country will remain poor and backward.

After a year in the Netherlands, Swaminathan moved to England in 1950, to work at the Plant Breeding Institute of Cambridge University's School of Agriculture in Trumpington. Here, he earned his Ph.D degree in 1952, working under the supervision of Dr. H.W. Howard, for his thesis entitled, 'Species Differentiation, and the Nature of Polyploidy in certain species of the genus *Solanum*–section *Tuberarium*'. It presented an entirely fresh concept of the species relationships within the tuber-bearing *Solanums.*

As a scientist, he found the programs of the Plant Breeding Institute (PBI) very interesting. There was a good mixture of basic and applied research. The Institute was extraordinarily successful at both ends of the spectrum, namely, advancing the frontiers of knowledge as well as of production. Years later,

Margaret Thatcher's government separated the institute into two parts — one dealing with basic research and the other with applied research, and the latter was sold to Unilever in 1985. Delivering the 75th Anniversary Address of PBI just before it was sold, Swaminathan was rather unhappy at this, as he firmly believes that we need diversity in the organization of research and that research for public good should continue to receive support from public funds. With progress in biotechnology has come an increasing emphasis on profits and a trend to patent every advance. Swaminathan urged private companies and researchers to keep in mind the public good in deciding how to use their discoveries. "Where there is enormous power there is also enormous responsibility," Swaminathan said. "The ultimate aim is sustainable human happiness." Also, PBI trained a large number of young scholars, a task that a commercial company will not be able to undertake.

Soon after he joined Cambridge University, Swaminathan received a letter from the British Council offering to place him as a guest with an English family for Christmas. That was a very nice gesture. He thus spent the Christmas of 1950 with the family of a retired British administrator from Burma in their lovely cottage in Kent. It was a wonderful experience to feel the spirit of Christmas — the atmosphere of peace and goodwill and of caring and sharing. He still remembers the excitement of the young children, putting up their stockings for Santa Claus to fill. When they found their gifts next morning, they thought that Swaminathan was Santa Claus and his popularity soared! What we need today is the revival of this spirit not just for one week in December, but at all times.

The next Christmas Swaminathan spent with F.L. Brayne, a retired member of the Indian Civil Service who had been very

active in rural reconstruction and organic farming in the Punjab. He has written books like *Socrates in an Indian Village*, the contents of which are as relevant today as nearly 80 years ago when it was published. Brayne was an extraordinary person, full of knowledge based on experience in the field. Although he did not use the term 'sustainable agriculture', his methodology was the very foundation for sustainable advances in farm productivity. He had a beautiful orchard, and he took his young guest around and explained how he managed it and the kind of yield he was able to get. The week's stay with Brayne all those years ago has had a far-reaching impact on Swaminathan's work. The concept of sustainable agriculture, one aspect of the sustainable development towards which Swaminathan is an ardent crusader, owes a lot to Brayne's thinking and advice. This is agriculture based on ecological awareness, in which synergy, harmony, and economy are the basic principles, and of which recycling is a tool. These are essentially the doctrines on which Gandhi developed most of his ideas of rural reconstruction. Today, when the world is reeling under the pressures of overexploitation of all its assets like land and water and the environment, Swaminathan is of the firm opinion that Gandhian agriculture is the only system that will work effectively.

In his early days at Cambridge in the winter of 1950, parliamentary elections were held in Britain, and Swaminathan received a card that authorized him to vote. Leaders of the Labour and Conservative parties came to Cambridge to campaign. He listened to both Churchill and Atlee and decided to vote for Labour since it was clear that a Labour government would strive to work for greater equity in society. As expected, the government introduced the National Health Service that

ensured good quality health care for all. The other important step taken by the Labour government was to break the monopoly of the more affluent sections of British society in getting their children admitted to Cambridge and Oxford. Many fellowships were provided, so that children of more disadvantaged families could also enter these prestigious institutions, thus enlarging the diversity in the campus and enriching society as a whole.

Swaminathan noticed that several of his contemporaries at Cambridge were preparing themselves for political careers. They took active part in the Cambridge Debating Society and in the activities of the Cambridge Union. The Cambridge Union presidents often became members of Parliament and Ministers. Developing countries that have adopted a democratic system of governance should learn a lesson from this. Politics should also be considered as a profession that requires in-depth knowledge and expertise. One should prepare oneself for a political career, as one would do in the fields of medicine, engineering, agriculture, or teaching. Swaminathan feels that such groundwork would raise the standards of politics in countries where leaders often get elected because of family or monetary influence.

Based on his scientific papers published when he was at Cambridge, Swaminathan was offered a post-doctoral research associateship to work at the Department of Genetics in the University of Wisconsin at Madison and to set up a Potato Research Station at Sturgeon Bay. He set sail for the US straight from England and spent around 15 months there. The Genetics Department was a beehive of activities, day and night. There

were many distinguished scientists on the faculty, including Professor Joshua Lederburg who got a Nobel Prize later. Then there was Professor Shakelford who was working on mink genetics. He had obtained some new mutants in mink, which became very popular with women. Many others were working in frontier areas of science. Swaminathan shared a room with Professor James Crow, a very eminent human geneticist. This was the period in American history when Senator McCarthy was engaged in witch-hunting those he thought were communists. Professor Crow led a campaign against McCarthy. This crusade for human rights left a deep impression on Swaminathan. Gandhi's concern for all members of society, especially the poor and downtrodden, had already touched the young scientist. The American events served to further reinforce his belief that his chosen field of work — agriculture — had to be so designed that marginal farmers would be the greatest beneficiaries of the latest technologies and processes.

There were other lessons he learnt in the US. One day, Swaminathan noticed a long queue at the hospital adjacent to the Genetics Department. He wondered whether some very important person had died since this is the only occasion when crowds gather outside a hospital in India. However, early that morning, the community radio broadcast had asked for volunteers having a rare blood group since this was urgently needed for a patient. And people with that blood group were queuing up to donate blood. This again had a lasting effect on his mind, since it showed that human beings do respond generously to the needs of others.

Swaminathan's association with the University of Wisconsin was extremely pleasant both personally and professionally. He therefore felt privileged when the University conferred an

honorary doctorate on him in 1983. In fact, he had been offered a regular faculty position after the period of his associateship had ended in December 1953. He, however, declined since the whole purpose of his foreign education was to equip himself for serving the cause of Indian agriculture. The President of the University was kind enough to renew his offer when he learnt in March 1954 that, even two months after his return to India, Swaminathan had no job and was just applying against possible vacancies. Again, the patriot was determined to stick it out and was sure the chance would come his way to use his education to change things in his own country.

Over the years, Swaminathan's links with academic institutions in the US have grown. What impresses him most is the great dynamism and a continuous search for new ideas everywhere. The other important aspect is academic freedom and absence of a hierarchical relationship within universities, whether one is a student or a faculty member.

4

The Green Revolution...

Early in 1954, Swaminathan returned to India. If he had stayed on at the Department of Genetics at Wisconsin, he could have looked forward to a fulfilling research career. But, as he said, "I asked myself, why did I study genetics? It was to produce enough food in India. So I came back."

There was no job for him in India. Agricultural research was a very new field in the country. He applied for various government positions. For three months he was just sitting at home. Then, one day, quite by chance he met his former professor, N. Parthasarathy. This gentleman was with the Central Rice Research Institute in Cuttack. He offered Swaminathan a temporary job as Assistant Botanist with responsibility for transferring genes for fertilizer response from *japonica* varieties of rice grown in Japan to the *indica*s grown in India and other countries in South and South East Asia. He took it, and six months later one of his applications bore fruit

and he was selected for the post of Assistant Cytogeneticist at the Botany Division of the Indian Agricultural Research Institute (IARI) in New Delhi.

That was in October 1954, and he has stayed with agriculture since. Only, he has not stayed still. He has expanded agriculture to include nutrition security, environmental concerns, ecological safety, human development, natural resource management, all the way to " a new development agenda for human well-being and peace" — peace for individuals, for communities, for nations.

The first, and it became the most revolutionary, thing Swaminathan did when he joined IARI was to look into wheat production in India. Wheat had been cultivated in the sub-continent for more than 4000 years. Wheat kernels have been found in the ruins of Mohenjo Daro, the chief city of the Indus valley civilization dating back to around 2000 B.C. Over all these centuries, the local grain varieties developed through natural selection, adapting to survival under deteriorating water and soil conditions. The production, when India became independent in 1947, was only around 7 million tonnes (1 tonne equals 1000 kg), with an average yield of 700 kg per hectare.

On the other hand, India's population was growing without control. There were dire predictions that the country would be plunged into famine after famine. Some Western economists even went as far as to say that only an atom bomb could solve the problem. In 1965–66, there was widespread drought in north India. Famine conditions were developing. Foodgrains had to be imported either at great expense or under the concessional aid program of the US.

Swaminathan was determined to change this 'ship-to-mouth' situation. As he said in an interview years later,

"Importing food was like importing unemployment. Seventy percent of our people were employed in agriculture. We were supporting farmers in other countries." He was convinced that wheat production would improve if dwarf varieties were introduced. Indian wheats had tall stalks and the addition of fertilizers simply increased the height. The plants grew more pods and then collapsed under their own weight. Swaminathan reasoned that with short, strong stalks, the plants would not fall, and nutrients would encourage more grain production. This may sound odd, but it works because the dwarf varieties have been bred to allocate more of their photosynthate (the carbon that they fix via photosynthesis) to grain, and relatively less of it to their stems and leaves. For example, old wheat varieties allocated about 20 percent of their photosynthate to grain, while the dwarf varieties allocate 50 to 55 percent of their fixed carbon to grain.

The dwarf plant holds its leaves more vertically, which minimizes self-shading and allows rows to be planted more closely. Thus, more plants can be packed into a given area, which results in increased yield on a per area, rather than on a per plant, basis. We all know that most plants flower in response to changing day lengths. But, these varieties are relatively insensitive to day length. This means that they can be planted widely across latitudes, and also can be planted more than once per year if the climatic conditions are appropriate.

Swaminathan found a crossbred wheat seed, part Japanese and part Mexican. Dr. Norman Borlaug had developed this variety in Mexico based on the dwarf genes of the Norin wheat discovered in Hokkaido, Japan, in 1961. Swaminathan wrote to Borlaug, who agreed to supply material suited to Indian conditions after observing the wheat-growing areas in India. He

came in March 1963 and traveled extensively with Swaminathan. Based on his observations, he sent a consignment of a wide range of the Mexican dwarf materials to IARI.

A plot of two hectares, almost 5 acres, was cleared of sugarcane in IARI's experimental fields to sow wheat. The short-strawed Mexican wheats responded vigorously to high doses of fertilizer and irrigation. The crop yielded over 5 tonnes per hectare, more than two to three times that of the native varieties. The grain was of uniform quality, free from diseases and pests. The harvest was kept for further sowing.

This was a major breakthrough. More testing, at more locations, confirmed the superiority of the Mexican dwarfs. But there was a lot more work to be done. Farmers were not used to such quantum jumps in yields and were dubious. Swaminathan knew he had to move quickly. In 1964, he pleaded with the Ministry of Agriculture to finance demonstrations in one-hectare plots in the fields of hundreds of small farmers. He wanted government to bear the cost of seeds and essential inputs. He needed government help specifically to import 18,000 tonnes of Mexican seeds. Luckily for him, the Agriculture Minister was a very sensible man. Against the advice of his bureaucrats who raised all sorts of objections, he said: "After all, he is asking for a small outlay, Rs.500 (around $10 in today's money) for a demonstration plot of one hectare, and 150 demonstrations in wheat. We will approve it immediately." The sanction came well in time for sowing and the results were dramatic, to say the least. Farmers were jubilant and India was on her march towards agricultural transformation.

However, the Mexican wheats had to be modified to suit local needs. Indians prefer the grain to be amber colored for their *rotis* (unleavened thin round breads, a staple item of food),

while the new wheat was red. Under Swaminathan's direction, scientists at IARI used gamma rays and ultraviolet light to change the red color to amber. The high-yielding, rust-resistant qualities were not affected. Hybrids were made of native Indian lines with the Mexican varieties, and the resulting new wheats were superior to both parents.

Believing that the ultimate aim of all agricultural research must be to bring the results within the reach of the cultivators, Swaminathan made sure that the new varieties were sown in the fields of the poorest farmers. This showed the ordinary farmer what the new grains could achieve.

In 1968, Indian wheat production went up from 12 million to 17 million tonnes. This was clearly a *revolutionary* jump, not an *evolutionary* one. To bring this new turn in India's agricultural destiny to the attention of the public at large, Swaminathan got the Government of India to release a special stamp on the Wheat Revolution.

The high-yielding varieties spread to other developing countries. By the mid-1980s, more than half the wheat sown in such countries were these hybrid ones. The nutritional status of people improved throughout the area, and mainly due to this, life expectancy in lesser-developed countries increased by 10 years in two decades. Thus, while farmers all over Asia tend their fields just like their ancestors did, the one vital difference is in the seeds they plant. William Gaud of the US coined the term ***Green Revolution*** to describe this unprecedented quantum jump in food production.

Swaminathan had proved his conviction that by 1968 these high-yielding varieties of wheat would turn the tide in India's

agricultural situation. In 1966, a TV crew from BBC, London, had come to India to film famine conditions. On the last day of their work, the director of this documentary film unit was keen on interviewing Swaminathan. He had heard of this scientist who was full of optimism in the midst of all the gloomy and doomsday forecasts. "Don't you know that predictions have been made that your people will starve to death in another 10 years?" he asked Swaminathan. Requesting the crew to take pictures of the new varieties of wheat, Swaminathan explained the dual strategy of national demonstrations in the fields of poor farmers and the import of seeds from Mexico. These steps would help to kindle farmers' enthusiasm on the one hand, and adequate availability of seeds on the other. He assured the filmmaker that "the wheat harvest of 1968 (in two years time) will change India's agricultural destiny. We will see in that year the beginning of a wheat revolution which will become an affirming flame in the midst of the sea of despair we see around us." Though the documentary maker probably had his doubts, he ended the film with Swaminathan's words of hope and cheer.

There is this charming story told about Indian Prime Minister Indira Gandhi's visit in 1967 to wheat fields near Delhi. There was a big crowd of farmers and their families waiting to greet the distinguished guests. They broke into song when they saw the visitors. Indira Gandhi's initial look of puzzlement changed to one of amused delight when she realized that the farmers were not singing in her honor. The lyric of praise was all for the bashful man standing next to her — M.S. Swaminathan!

Norman Borlaug was given the Nobel Peace Prize in 1970 in appreciation of his spearheading the Green Revolution that

completely changed the food insecurity status of much of the developing world. It was the first time that an agricultural scientist had been selected for this most prestigious prize. It fulfilled the condition that the Peace Prize shall be made to the person " who, during the preceding year, shall have contributed the greatest benefit to humankind." Borlaug was very conscious of the contribution of his associates towards this end. He expressed his feelings in a letter he wrote Swaminathan on the eve of his receiving the Nobel Prize: "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 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."

In 1971, India officially declared herself as self-sufficient in food production. Today, though her population has continued to grow, the country produces more than enough for her needs. The problem now is one of distribution and economic access to food. Swaminathan has been working on these issues and connected ones for some years now. And, as he did with the innovative idea of introducing hybrid seeds to increase wheat production, his solutions are creative. We shall look at them later on in this saga of his life and work.

Swaminathan's work at IARI was not restricted just to wheat production. In 1966, in just 12 years, he rose to become Director of the Institute. Education is a main function of IARI, which has excellent research, teaching, and laboratory facilities. It has

over 22,000 insect specimens and around 27,000 specimens of fungi. Its agricultural library is the best in Asia.

As an educator, Swaminathan refined IARI's goals to include relevance and excellence. "Choose a problem that is *relevant* to the needs of the country and put in *excellent* and thorough efforts to get meaningful results," he would say to his students. He wanted agricultural students to go to farmers' fields and work alongside them. Such experience would be vital for students to study problems at first-hand and come up with viable solutions. It would also teach youth to gain the experience and self-confidence to be self-employed.

Swaminathan was an excellent teacher and research guide. One of his students remembers: "Those were exciting days in the IARI experimental fields, when Swaminathan would come on his 'Robinhood' bicycle with a cane basket hanging in front of the handlebar, weighed down with books and notes meant for the morning 8.15 class. After the field visit, he would be in the classroom by 7.45 a.m., in rain, shine or winter of Delhi, and would fill up all available space on the blackboard with tables, charts, references, and figures meant for the morning lecture on the Cytogenetics-I Core Course. He would cover so much ground in one lecture that it would take us days to assimilate all that voluminous data...IARI Botany Division's Room 19 buzzed with the research activities of a large number of scientific staff and post-graduate students, each eager to show something new to the Professor. There used to be a powerful Leitz binocular research microscope, fitted with camera attachments, kept in a glass-fronted case right behind Dr. Swaminathan's seat. Students and researchers would eagerly wait their turn to show their botanical preparations revealing various kinds of alterations or aberrations in the cells

of the organisms. Swaminathan had a wide canvas of research programmes in both fundamental and applied genetics and cytology, and his method of teaching was 'learning by doing' till you succeed...Often, when he sat with a student to examine his slides, if he found the microscope dirty, he would take out his own handkerchief and start cleaning it himself with a smile. Invariably, the ashamed and surprised student got the message, and the instrument would be clean the next time!"

A fair number of India's agricultural scientists have passed through Swaminathan's hands as post-graduate students. There have been foreign students too at IARI. In fact, Bui Ba Bong, currently Vice-Minister for Agriculture in Vietnam, was one of Swaminathan's Ph.D. students. Swaminathan has also been responsible for starting agricultural universities in many Indian states. Even today, in the midst of all the various activities that take up a good part of his time, he continues with his scientific work and teaching, he still guides Ph.D. students. He has always believed in the old Chinese proverb, which says: "If you are thinking one year ahead, you plant rice. If you are thinking ten years ahead, you plant trees. If you are thinking hundred years ahead, you educate the people."

Farmers also had to be educated, Swaminathan believed then — and continues to do so now. With communications technology so widespread, farmers must be given the inputs to make their own decisions. They must not be either coerced or coddled. Given the right kind of information and provided with seeds, fertilizers, implements, and so on that they have paid for, even though it may be on credit, farmers will produce better results. His emphasis on remunerative and assured marketing opportunities as the major stimulus for small

farmers to take to new technologies has paid rich dividends. Swaminathan sincerely believes that "within each of us 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."

Swaminathan's attitude towards farmers has been one of deep respect for their hard work and courage. He has always had a lot of admiration and faith in their ability to take good harvests and bad ones in their stride. He insists passionately that scientists, administrators, and politicians, amongst others, must work with farmers — particularly poor farmers — in an atmosphere of genuine partnership, not one of patronage. In this context, he says he has experienced the wisdom of Gandhi's words: "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." We are the farmers' beneficiaries, Swaminathan maintains, it is not the other way around.

When, in 1987, Swaminathan was named the first recipient of the World Food Prize, he said he would have liked to have seen 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 did the next best thing with the money the prize brought. He used it as seed money for the Research Foundation he established the

following year in Chennai, whose purpose is to bring new technologies like space and nuclear and information sciences to the aid of poor farm men and women in increasing their yields and, thus, their income.

The revolution in wheat production was extended to crops like rice, another staple diet of countries around the world. India herself produces and consumes almost twice as much rice as she does wheat. Rice yields had changed very little, though new trends in agricultural science had been spreading. There was talk of international co-operation in agricultural research. After all, the basic sciences like physics, chemistry, and biology as well as the problems of agriculture, like pests and diseases, are common to all nations. Recognizing this, the Rockefeller Foundation and the Ford Foundation of the US decided to take advantage of the facilities generously offered by the Philippines government and, in 1962, set up the International Rice Research Institute (IRRI) in Los Banos. The objective was to improve rice production. Already there had been hope that a short-strawed variety of Taiwanese rice had potential to increase yields. A new variety of rice, called *IR8*, was bred, crossing this with existing plants. *IR8* lived up to its promise, doubling the yield of the traditional rice plant. More varieties were developed, with better grain quality, better resistance to pests and diseases, and adaptable to varied locations.

Swaminathan was aware that grain quality influences prices in the Indian market. Thus, as early as 1965, he initiated a breeding program involving the transfer of dwarfing genes to a *basmati* (scented, slender, long-grain rice that fetches a premium price in the market) variety from northwest India.

Fifteen years later, this cross led to the release of *Pusa basmati*, the first high-yielding *basmati* variety in the world.

Meanwhile, Swaminathan had gone on to hold important jobs in the Indian government. He was made the Director-General of the Indian Council of Agricultural Research (ICAR) in 1972. One of the first things he did here was to introduce the concept of what he called 'techniracy' — technical literacy — to impart training in the latest technical skills entirely through work experience. Formal literacy is not necessary for youth to learn basic skills like fixing agricultural implements, including even tractors, tilling machinery, and irrigation pumps. A chain of Farm Science Centers and later Forestry Science Centers was established all over India for this purpose. Swaminathan strongly believed that "if we can make the jump from the pre-literate to the post-literate world, without passing through the intermediate phase, we can save enormous resources and time." Techniracy stands out as an illustration of Swaminathan's creative thinking on generating employment facilities for disadvantaged members of our society.

In 1979, Swaminathan was designated Principal Secretary to the Government of India, Ministry of Agriculture and Irrigation. He was perhaps the only scientist to hold this high rank in government. Till then, senior bureaucrats from the civil services could alone serve in such important positions. During this time, there was an unprecedented drought in India. Swaminathan developed a comprehensive climate management strategy, which would help the country to minimize the adverse impact of bad weather and to maximize the benefits of good monsoons. This subsequently

led to the formation of 'crop-weather-watch' groups in the different districts of the country and to a whole life-cycle approach to insulating the poor from malnutrition. His scheme now serves as the foundation for a science-based and community-centered management strategy to combat natural disasters.

In March 1980, Prime Minister Indira Gandhi asked Swaminathan to move to the Planning Commission, since she felt that *doers* and not merely *thinkers* should be involved in India's planning process. In the two years that he spent there, Swaminathan typically introduced new features in the ongoing Plan document. He put in, for the first time in the planning history of India, chapters on women and development, and environment and development, and added a sub-chapter on a 'New Deal for the Self-employed' under the chapter on employment.

In 1982, the International Rice Research Institute was searching for a committed person to succeed its retiring Director General. The choice fell on Swaminathan, the first Asian to be offered this prestigious position. He was interested in going back to rice, particularly as it was a crop of great importance to India and also because he wanted to work with India's Asian neighbors. The wheat revolution was well on its way and he was ready for a new challenge. Perhaps he was also getting tired of planning, and opportunities in research were enticing.

He, therefore, went to Indira Gandhi to seek permission to leave her government and accept this position. She, expectedly, was not keen on seeing him go. Swaminathan recalls the occasion: "After hearing me out patiently on IRRI and the offer

of its top job, she said, 'I fully appreciate your desire to get back to a research institute in agriculture, but you are indispensable.' My response was, 'Madam, after hearing what you said, I feel it is time for me to go.' She looked surprised and asked, 'Why? Have I hurt you in any way? I sincerely feel you *are* indispensable', to which I replied, 'I feel one must leave when one is wanted, and this is why I feel that this is the right time to help you and our country in a different capacity.' The Prime Minister paused for a while, and reflected: '*You must leave when you are wanted, and not when people want you to leave*. These are profound words, and you have my best wishes.'"

In the six years he spent at IRRI, apart from his scientific additions to the development of rice and his substantial contributions to the research, training, and technology transfer programs of IRRI, Swaminathan helped establish a chain of national rice research institutions in different countries — the Philippines, China, Korea, Vietnam, Cambodia (Kampuchea), Thailand, Burma (Myanmar), Egypt, Tanzania, Sri Lanka, Iran, Madagascar, Nigeria, and Pakistan.

Two other issues assumed importance in his work at IRRI. Swaminathan's deep interest in recognizing the role of women in all spheres of human development was evident in his designing a project called Women in Rice Farming Systems. The contribution of women to rice production, marketing, and consumption needed recognition. And it is women who can, and do, take the responsibility of the health and welfare of their families.

In 1985, the Association for Women in Development (AWID), USA, chose to give their first award for "outstanding contributions to the integration of women in development" to Swaminathan. While presenting the award, the President of

AWID remarked that it was her seeing Swaminathan in action during the 1983 international conference on Women in Rice Farming Systems at IRRI, attended by around 100 women from rice producing countries worldwide, that had prompted her to nominate him for this award. She went on to say: "I heard his opening address and expected this would be the last we would see of him at the week-long conference. Instead, ...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 women in development."

The other endeavor Swaminathan worked on was to improve the economic well-being of rice farming families by assisting them to add value to every part of the rice plant. There is a saying in Asia that paddy and poverty go together, since the rice crop does not support any industry other than rice mills. Also, landless labor families tend to be high in proportion in rice deltas. Swaminathan wanted to prove that there was much more to rice production. Therefore, he designed a program titled 'Paddy and Prosperity', and organized training workshops to assist rice farming families to produce value-added products from rice straw, husk, and bran. Rice farmers learnt of the many possibilities to utilize rice biomass. Rice straw can be used as manure, as a substrate for oyster mushroom cultivation, as balanced animal feed, as raw material for paper manufacture, and as a source for biogas generation. Rice bran can be employed to extract edible oil and in soap

manufacture; de-oiled rice bran cake can be used as poultry feed and fortified to improve animal nutrition. Rice hull or husk can be used as a source of energy for grain drying and charcoal production, for hollow cement blocks from hull ash, and for extraction of solar grade silicon for use in photovoltaic cells. Creating avenues to stave off hunger and poverty has always been one of Swaminathan's deeply-felt causes.

The highlight of his tenure at IRRI was his being awarded the first World Food Prize in 1987. This was great honor indeed. One of the purposes of this prize is "to recognize, encourage, and reward outstanding individual achievement in improving and increasing the world food supply." Another is "to attract talented, creative, and dedicated young people to careers in the complex and challenging systems of food and agriculture."

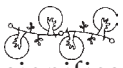
In his acceptance speech, Swaminathan focused on the irony of hunger in the midst of plenty. "In no other area of human need and endeavor is there so much global interdependence as in agriculture. Yet, the urban public seldom recognizes that we live in this world as guests of green plants and of the farmers who cultivate them...Globally speaking, reserves of foodgrains are growing daily. Simultaneously, the number of children, women, and men who go to bed hungry is also increasing.... Why?...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.'...a fear of having to share power and resources. We...need to show that helping the weak to become strong solidifies the whole community....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."

The M.S. Swaminathan Research Foundation was started with the cash award of $200,000 that went with the World Food Prize.

5

Carrying it forward

Swaminathan's genius for organization has found its richest realization in his own M.S. Swaminathan Research Foundation.  This unique logo, chosen to portray its pursuits, signifies the "open-ended, many-sided, and continuous evolution of humankind-nature interaction." This is evident in every aspect of MSSRF, right from the design of the building and its surroundings, to the fields selected for investigation.

MSSRF is a beehive of activity. Every second day there are training programs, workshops, seminars, symposiums, consultations taking place on a vast variety of topics. Indian and foreign visitors are often amazed at the output of work produced at the Foundation. The story of its genesis and growth is absorbing.

C.V. Raman was a great Indian physicist. He won the Nobel Prize for Physics in 1930 for his work on spectroscopy. In 1934,

he founded the Indian Institute of Science in Bangalore, in southern India. M.S. Swaminathan had tremendous respect and admiration for Raman. The older man, too, recognized Swaminathan's potential and encouraged him. In 1970, just before he passed away, Raman stayed with Swaminathan for a couple of days and urged him to start an autonomous center devoted to research. When he returned to India in 1988, after his stint at the International Rice Research Institute, Swaminathan did just that.

This was a time when the world started facing serious problems — ecological as well as social. There was growing damage to the basic life support systems like land, water, forests, biodiversity, and atmosphere. Poverty was increasing; inequalities in gender and social classes were also rising. There was rapid growth in human population. Newer and newer technologies were being developed, almost by the day. Economies were growing, but so was unemployment.

"Be the change you want to bring about." These words of Gandhi rang in Swaminathan's ears. He decided that his research foundation would concentrate on fostering sustainable development, with particular emphasis on protecting the environment and the needs of the poor and of women and youth. Appropriate blends of traditional and what he calls 'frontier' technologies — the new sciences of space, information, communications, genetics, biotechnology, renewable energy — he believed, would effect the much needed transformation in agriculture.

The M.S. Swaminathan Research Foundation has operated for more than a decade now on the principle of partnerships. Swaminathan describes it as an institution that reaches out to take in anyone who can contribute to its ideals. Consciously,

MSSRF has chosen not to have its own experimental farm. Its young staff members work with farming families in their fields. The rural and tribal women and men are considered partners and are credited with innovations in the field. Real life experience is thus married to academic training, and all knowledge, whether that of an illiterate or semi-literate farm worker or that of a scientific researcher, is equally respected. That is MSSRF's real and abiding strength.

Continuity and change — the DNA model of growth — is the basic principle of the Foundation. Environmental, economic, social, and inter-generational sustainability is one of the purposes. To achieve this, replicability, the ability to generate a self-propelling momentum, is an important method. MSSRF works both at the grassroots level as well at public policy and action endeavors.

MSSRF operates in five major program areas — Coastal Systems Research, Biodiversity and Biotechnology, Ecotechnology and Food Security, Gender and Development, and Informatics. The work culture is neither a corporate nor a government one — it is distinctive to the Foundation. It is a culture that considers that science and education should serve a human and social purpose. Over 200 persons from a variety of disciplines work here, in a calm and cordial atmosphere. Most of them are young, with the energy and enthusiasms of youth.

Geetha Rani is the manager of MSSRF's Gene Bank. She has a Master's degree in botany and has been with the Foundation for around a decade now. The Gene Bank, unique in nature and the first of its kind, is a walk-in cold storage where important seed material (called germplasm) of cereals, pulses, and medicinal, rare and endangered plants are housed. For hundreds of years, tribal and rural farm families living in

remote areas of India have been cultivating traditional varieties. With shifts in conventional agricultural patterns and stresses due to natural calamities and man-made destruction, these are now on the verge of extinction. MSSRF scientists collect and document this germplasm from selected 'hot spots' of biodiversity rich areas in the country. The significance of such a gene bank is that farmers can access the stored material at any time to revive traditional varieties in the field. The documentation would help identify a farmer or a community to be suitably recognized and rewarded. Geetha Rani is completely involved in her work. Through her field visits, she has interacted with many farming communities and feels "highly enriched by the experience." She has been so enthused that she is now working towards her doctorate under Professor Swaminathan on the 'Conservation and Enhancement of Traditional Agro-biodiversity in Tamil Nadu'.

Bhavani is a post-graduate in economics, her special field being planning and development. She worked for some years in a premier commercial bank in the country before switching track a year and a half ago to work in the development sector. She felt she was wasting away in the bank when there was so much to be done elsewhere. It was a conscious decision and looking back, she says, "joining MSSRF is perhaps one of the beautiful things to have happened in my life. It has opened new horizons and every day is proving to be a learning experience." In MSSRF, she works in the area of food security. She is currently co-ordinating a project on community food banks — looking at how decentralized storage and management of food and working with ongoing government food relief programs can lead to the effective food security of vulnerable populations. She has to liaise with different state

governments to get their concurrence and support for the implementation of pilot projects.

MSSRF's Community Agrobiodiversity Centre at Wayanad in Kerala has been set up to strengthen community biodiversity conservation systems. With a doctorate in botany, Anil Kumar is Principal Scientist at this Centre. He has been engaged for more than ten years in the collection and categorization of rare and endangered plants in the area. Working with grassroots institutions, communities, and individuals, he has been instrumental in building up various formal and informal partnerships in the conservation and sustainable use of biodiversity. Thus, he has strengthened MSSRF's goal through education, training, capacity building, and networking. He has motivated a number of families, especially the youth and women, to revitalize and continue their conservation traditions. Anil Kumar finds it a very rewarding experience to work under Swaminathan. He describes him as an unusually effective leader who keeps everyone focused on the institutional objectives while at the same time encouraging personal growth and team development.

Such young professionals will earn much more if they work for a commercial organization or even for the government. Their willingness to be part of MSSRF shows that they believe in its goal of "serving public good with maximum economy, efficiency, accountability, and transparency." It is a caring organization committed to its staff and scholars, while insisting that integrity is an absolute must. And Swaminathan's ability to ignite the enthusiasm of youth to work for the less privileged members of society cannot be denied.

Let us investigate some of the exciting projects that MSSRF is involved in.

Swaminathan has long been of the view that we should not remain silent spectators of impending disasters. At the World Climate Conference held in Geneva in 1989, he proposed an anticipatory research program to meet the potential adverse effect of rise in sea level as a result of global warming. He suggested an integrated package of avoidance and mitigation measures. He did not remain content with recommending to others what they should do. In 1990, a Genetic Resource Center for adaptation to sea level rise was established at MSSRF to carry out an innovative scientific program designed to conserve mangrove wetlands in coastal areas, and more importantly, to transfer genes for sea water tolerance to rice, mustard, legumes, etc. Visitors to MSSRF can now see rice plants with genes for salt tolerance transferred from mangrove trees.

The Convention on Biological Diversity (CBD), adopted in Rio de Janeiro in 1992, and since ratified by nearly 170 countries, defines biological diversity as follows: "Variability among living organisms from all sources including, among others, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems." To put it in simple language, biological diversity is the term used to talk of the many and different kinds of living organisms that inhabit land and water. The Global Biodiversity Assessment published by the United Nations Environment Program in 1996 has adopted a working estimate of 13.6 million for the total number of species occurring on earth. Out of this, less than 2 million are currently known to science.

Biological diversity is a priceless heritage, the wealth of life comprising millions of plants, animals, and micro-organisms, the genes they contain, and the intricate ecosystems they help build into the living environment. This diversity of forms has evolved right from the moment life began on earth and has been responsible for sustaining our evolution and continued growth.

All over the world there are indigenous and local communities who depend greatly on biological resources. They respect, preserve, and maintain the knowledge of biological diversity through the practices of their traditional lifestyles. CBD recognizes "the desirability of sharing equitably benefits arising from the use of traditional knowledge, innovations, and practices relevant to the conservation of biological diversity and the sustainable use of its components."

MSSRF has established a Technical Resource Center, the first of its kind in the world, for the implementation of the equity provisions of CBD. This Center supports MSSRF's community biodiversity program. Collecting primary data in several states of India, it chronicles the contributions of rural and tribal families to the conservation and enhancement of agro-biodiversity. Young tribal men and women are organized into an Agro-biodiversity Conservation Corps. Since such people have a social stake in living in their villages, they are trained to undertake jobs like compiling local biodiversity inventories and revitalizing the conservation traditions of their communities. The Technical Resource Center has developed multimedia databases documenting the contributions of the indigenous population so that they can claim their entitlements from national and global community gene funds. A Community Gene Bank and Herbarium have been established for use as

reference centers. And, finally, the MSSRF Center puts together traditional conservers (those who gather and store seeds and plants) and industry, to cultivate plants of commercial value by tribal and rural families under contract.

In 1991, MSSRF set up the biovillage program in Pondicherry. A former French territory, Pondicherry is a hundred miles south of Chennai on the southeastern coast of India. Nineteen villages were christened 'biovillages' to stress that the basic approach to development must be human-centered. The rural poor were introduced to new opportunities — small enterprises that included mushroom production, floriculture, growing vegetables, aquaculture, poultry keeping, and goat rearing. Even in the design stage, issues like the long-term sustainability of the program and its potential for self-replication were emphasized. It is only too well known that any externally funded program would collapse when financial and technical inputs are withdrawn. Swaminathan was determined this should not happen to the biovillages. Credit programs were supported by training and knowledge and skill empowerment. Infrastructure was established to supply inputs and market outputs. The Farmers' Field School conducts training courses and disseminates information on agricultural practices.

Over the last decade or so, the biovillage program has had many success stories. New leaders, especially women, have emerged who are taking the movement forward. Rani Rasu, an illiterate village woman, has four children, of whom two are handicapped. She and her husband could barely make ends meet as agricultural laborers. She was advised to go in for dairy farming. She took a loan to purchase her first cow. Now she

owns 3 cows and a calf, and sells around 10 liters of milk a day to the co-operative society. In five years, her earnings grew more than three-fold. The family is comfortably off, according to the village standards. Rani Rasu has plans for the future as well. She wants to get into fodder (cattle feed) cultivation. She and nine of her friends have organized themselves into a group to learn more about dairying techniques and to interact with other dairy farmers and experts. Eventually, her dream is to have a dairy farm of her own with the best technology.

Sarasu's is another story. Burdened with an alcoholic husband and the care of three young, school-going children, she was always very short of money even for basic necessities. The introduction to floriculture through the MSSRF project seemed a good way to improve her life. She was so enthusiastic that she dug the plot of land given to her, ploughed it, and planted crossandra (*kanakambaram* in Tamil), all on her own. Crossandra flowers, yellow and orange in color, are strung together and worn on their long hair by women all over south India. Sarasu now earns enough to provide for her children's education and cope with her good-for-nothing husband.

There are so many of them. Valarmathi, who is physically disabled, and Selvi, who walked out of an unhappy marriage, both cultivate oyster mushroom. Devi is into fodder cultivation and, because of her earning power, has more say in family matters. Childless Vijaya was in a state of depression all the time, till she joined the MSSRF beneficiary group and started to make ropes out of coir. Now she employs 8 people and operates a powered loom. She is so busy she has no time for self-pity.

The men are not to be left behind. A wayward boy, Kumaran was the despair of his parents. But his behavior and attitude

changed dramatically when, at the age of 18, he joined the MSSRF program. Today, he is one of the best producers of mushroom and his production unit is the Foundation's star exhibit. He attends training programs, and gives lectures and demonstrations. Now he wants to study for a graduate degree.

Ponnambalam is an innovative farmer who grows sugarcane, paddy, peanut, millets, and cotton in rotation. Interaction with MSSRF exposed him to various ideas about the possibilities of bettering his yields through integrated crop management and eco-friendly devices. He is very active in the Farmers' Field School, sharing his experience with others.

Such semi-literate village folk show extraordinary leadership qualities. They are the true apostles of sustainable development. They prove Swaminathan's oft-repeated point that poverty and lack of formal education are not barriers to the learning of new skills when their application and benefits are clearly demonstrated.

In 1998, MSSRF added value to the biovillages by introducing what it calls 'village knowledge centers'. This is a wholly unbelievable project. When all over the world the information technology boom is about commerce, entertainment, and the frills of the Internet, Swaminathan's experiment in these villages shows that technology has a human side too. And, as with all his other thinking, the *antyodaya* or bottom-up approach, starting with the poorest, has been used. Tiny villages are connected through a two-way wireless system that allows simultaneous data and voice transmission. People can stay in touch through computers and telephones round the clock. MSSRF in Chennai also can reach the villages through this network.

In each village that is part of the project, the community has to provide space to house a computer and pay workers to run the center. In return, the village receives the needed hardware and maintenance for the communication system, specially designed web sites in the local language — Tamil in these villages — that provide information on a wide variety of subjects, and training for the volunteers. People can access facts on women's health issues, advice on growing local crops and protecting them from diseases, daily market prices for these crops, local weather forecasts, details of entitlements through major government schemes for the poor and pensioners, availability of bank loans and interest rates, as well as bus schedules, emergency telephone numbers, names and addresses of doctors and hospitals, daily news...the list goes on.

The volunteers are trained for 2 weeks on MS-Exchange and MS-Word with Tamil fonts. They are mainly women, underscoring Swaminathan's and MSSRF's determination to change gender inequity wherever it is encountered. " If the information centers 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 favor women bring about improvements for the family as a whole," explains Swaminathan.

These knowledge centers prove the fact that information technology can help millions of people. Farmers have gained more control on their local markets as current prices for their produce are readily available. They get the right seeds when

they want them. In turn, they have contributed information on over 350 types of herbs that can be cultivated in their area.

Fishermen now don't look at the skies and try to decide what the weather would be like. Loudspeakers along the seashore blare out weather conditions in their area as well as wave heights and wind directions, downloaded from the US Navy's web site. Satellite images also show where the fish banks are likely off the Pondicherry coast. They can set out in their small catamarans (logs of wood lashed together, from the Tamil word *kattinamaram* meaning 'tied wood') knowing which patch of sea to fish in and when to return home before the weather breaks.

No longer are computers the learning tools of urban children in India who have access to them in their city schools. Children in these villages come to the knowledge centers and learn MS-Word. They are adept at PowerPoint presentations too, but what they like best is the paint program. Their imaginations just soar in all the colors possible.

The biodiversity conservation program, the biovillages, and the village knowledge centers are only some examples of how Swaminathan and the people at his Foundation are using innovative, ingenious, imaginative, and resourceful methods to change the lives of ordinary rural folk. Sir Francis Bacon, the seventeenth century English philosopher, said two things that sum up Swaminathan's efforts more than three centuries later. First, "Humanity brings change into the world through information, agriculture, and industry." Second, "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."

6

The man...

Let me try and describe M.S. Swaminathan. He is 77 years old, of medium height, bald with a wispy white fringe, with a broad forehead, moves about quickly, has a friendly smile and a firm handshake. He prefers vegetarian food, is a non-smoker, and abstains from drinking alcohol. His lifestyle is very simple, no ostentatious frills. He drives around in a small Indian-made car, the Maruti. When he is in Chennai, he is at work by 8 a.m. His door is always open to anyone in his Foundation who wants to share some information or clear a doubt. He has a very paternal attitude towards his people. He has a phenomenal memory and remembers to ask them about some minor personal problems they may have told him about. The atmosphere is a very democratic one. When it is time for a cup of tea, 'the professor' as he is addressed at MSSRF, invites his visitor to accompany him to the cafeteria where he pays at the counter. In India, where government and corporate culture see to it that big bosses are waited upon, this is not common.

He is full of energy — attending meetings, seminars, consultations; delivering addresses at universities, at public forums, at scientific congresses. He networks with so many people all over the world that he has good friends on every continent. Every other week there is an article by him in the print media on topical matters, like the situation in Afghanistan or the senseless sectarian violence in India, always connecting such issues to his hopes for peace and sustainable development in the world. He is in correspondence with a great many people on a great many subjects — he never fails to answer any letter, whether it is official or personal, whether it is from a renowned scientist or from a 10-year-old schoolboy. His wife, Mina, says he has long had the habit of carrying letter paper and postal stationery with him and dashing off his missives, waiting at airports, during flights, and from hotel rooms. Not for him the laptop, he writes longhand when he is on the move and dictates to his secretaries when he is back at base. He catches up with his reading and his thinking on long international flights. Jet lag doesn't seem to worry him at all. He arrives home in the wee hours — flights from the west reach Chennai at unearthly times — and by mid-morning is at his desk. It is his ability to catnap, snatch some minutes of sleep whenever and wherever he can, which refreshes him.

He always stays calm and unruffled. Mina talks of her husband being totally free of tension and stress. It is not hard work that saps a man's energy as much as pressures and anxiety do. He has his work cut out and he is fully engrossed in it. Nothing else matters: not criticism, not praise. One cannot have achieved the status Swaminathan has without collecting detractors and

defamers on the way. He takes them in his stride. He learnt from Norman Borlaug, he says, to just ignore them. He has never tried to stifle criticism, nor has he tried to take any vindictive action against the perpetrators of slander. His philosophy has always been "to your own self be true, you will then not be false to others." Similarly, praise and adulation do not go to his head. He has evolved a good technique to keep his ego in check. When he hears or reads something greatly complimentary about himself, he says he assumes it is about someone else!

It is his immense faith in, and goodwill towards, the ordinary human being that give Swaminathan the strength of action, the energy and enthusiasm for all his work, Mina asserts. More than anything else, people matter to him. He never forgets names and faces, even those of students of long ago or of a fleeting recent acquaintance. He is at his best when he is interacting with others, whatever age or status, whatever gender, whatever profession or nationality. He is always thinking of ways and means to help people help themselves. He builds up their confidence, makes them believe in their own potential. He never stints the hours he spends talking to a young student or guiding a research worker or listening to someone's problems or success story, even at the expense of time for himself or his family. There are so many men and women today in top positions in India and overseas who owe their successful careers to the help and encouragement he has given them. Swaminathan trusts people implicitly and believes that is the only way to bring out the best in them. And when he has been let down, as has happened, he shrugs it off and goes on. He treats everyone with the same courtesy and never fails to acknowledge the smallest kindness he has received. I was told by his cousin of a family gathering

where he was the only one to have gone into the kitchen and thanked the cook for the delicious fare she had provided.

Mina Swaminathan has a picturesque way of describing her husband. She compares him to the river Ganga, the greatest of India's rivers. The river flows down from the Himalayas across the northern plains, oblivious to how people treat her. Some use a tremendous amount of her water, some carry away small potfulls. Others just splash a few drops on their faces while yet others pollute her waters. The Ganga continues to flow, serene and unperturbed.

Perhaps not surprising in a person who has spent a good part of his childhood in Kerala, with its beautiful landscape of sea and beaches and rivers and hills and fields of paddy and groves of coconut palms, Swaminathan has a great love for nature. One of his favorite pieces of verse is this by Joyce Kilmore:

I think I shall never see
A poem as lovely as a tree
A tree whose hungry mouth is prest
Against the earth's sweet flowing breast
A tree that looks at God all day
And lifts her leafy arms to pray

A tree that may in summer bear
A nest of robins in her hair
Upon whose bosom snow has lain
Who infinitely lives with rain
Poems are made by fools like me
But only God can make a tree.

Trees and plants have always been close to his heart. He recollects an old Amerindian proverb he was told about in Guyana: "The sky is held up by trees. If the forest disappears, the sky — the roof of the world — collapses and nature and man perish together." He believes that the attitude towards trees and plants is a down-to-earth measure of a civilization, since centers of civilization and centers of origin of economic plants often overlap. To a person who is interested in the secrets of the past, a tree narrates in which years it experienced the stress of drought and when it was nourished with abundant water. In Swaminathan's hometown of Chennai, there is a great banyan (Indian fig) tree. Believed to be over 500 years old, this tree occupies a space of 40,000 square feet, with over 100 aerial roots descending vertically from the massive horizontal branches. It is an ecosystem in its own right, harboring a variety of birds, rodents, reptiles, and insects. It is reported that on one occasion nearly 3000 people sat under its canopy.

Says Swaminathan, "At the heart of agriculture, there is a simple truth that in the growing of green plants, we can capture the energy of the sun, our most precious asset, and turn it into food, fuel, fodder, and other products. Hence, wherever man plants trees, grows vegetables in small plots, covers a tiny patch with grass or flowers, or covers the roofs of mud huts or brick buildings with vines, he is playing a role in our agricultural development. When Charaka, the venerable physician of ancient India, was asked by his teacher to bring plants which were quite useless, he returned empty-handed, remarking that there was no such plant. When we all understand this, agriculture in our country will have come of age."

"Agriculture is what you call applied ecology. Ecology means remaining in harmony with nature, and agriculture means using natural resources in a sound and scientific way. Therefore, anybody who is interested in agriculture, not only today but also for the future, has to think of the conservation of nature and natural resources, " he once explained. In 1984, Swaminathan was named the president of the International Union for the Conservation of Nature and Natural Resources and vice-president of the World Wildlife Fund. Two others who have held such high positions in these prestigious international organizations are Prince Philip, the Duke of Edinburgh, of England and Prince Bernhard of the Netherlands.

An example of his deep concern for environmental protection is the issue of Silent Valley, the only surviving tropical rain forest in peninsular India. The flora and fauna of this area are quite unique. Twenty-three mammalian species, including 3 endangered ones — tiger, lion-tailed macaque, and Nilgiri langur — have been recorded. There are unique herbal and medicinal plants. This whole region has also been found to be a reservoir of useful genes in rice, conferring resistance to some major pests.

In the 1970s, the Silent Valley Hydro-electric Project (SVHP) had been mooted to augment the energy requirements of Kerala. Water from this project was expected to provide irrigation for raising an additional crop in 10,000 hectares. Also, the implementation of the project over a period of 6 to 7 years would boost the economy and employment prospects for the local people in one of the underdeveloped parts of Kerala. SVHP was expected to be implemented over about 845 hectares, of which 830 would be submerged under the reservoir, with forest land comprising 530 hectares.

Environmentalists all over the world were up in arms. The natural evolutionary processes extending over a period of 50 million years which resulted in this unique biological wealth would be lost, if human interference on the scale proposed for implementing SVHP was allowed. Swaminathan was asked by the Indian government to study the problem and give his recommendations. His report was typically very balanced and at the same time constructive in finding plausible solutions, keeping in view all the conflicting forces, vested interests, political and bureaucratic pressures bearing on the issue. In conclusion, he said: "If steps are not taken to satisfy the legitimate socio-economic aspirations of people of this area, mere talk about ecology and environment will be met with cynicism and with the question, 'Who is more important — man or monkey?' If we proceed with the implementation of SVHP without taking advantage of alternative methods of providing energy, employment, and irrigation, will future generations forgive us for destroying a 50-million year old genetic heritage, at a time when the solar energy option is no longer an illusion? Alternative pathways available for providing power, irrigation, and jobs at no ecological risk will, in my view, help to achieve the desired social goals more speedily and economically. It should not be beyond our political, intellectual, or financial capabilities to find solutions which can enable the present-day human population of this area to experience a better quality of life without destroying a priceless biological endowment." The Silent Valley project has not been carried out.

Perhaps he was remembering this verse from the Atharva Veda, one of India's ancient philosophical treatises:

What, O Earth, I dig out of thee
quickly shall that grow again
May I not, O pure one,
pierce thy vital spot
or thy heart.

Swaminathan has great concern for children. He is very fond of quoting Condorcet, the eighteenth century French philosopher: "People have a duty towards those who are not yet born; that duty is not to merely give them existence but to give them happiness." One of the major handicaps that children in several developing countries face is that of low birth weights, giving rise to physical and mental stunting. This has more far-reaching repercussions than one can imagine. Delivering the Keynote Address at the World Conference on Science, Budapest, in 1999, Swaminathan called on the UN agencies like the World Food Program (WFP), FAO, UNICEF, WHO, and UNDP to address this issue with urgency. He wanted them to launch, in collaboration with interested national governments, a global program to fight maternal and fetal undernutrition, thereby helping to minimize the numbers of low birth-weight children. He suggested that this program be called the Global Movement for Children for Happiness.

The educational needs of children, particularly in a country like India where agriculture is the major activity, is another issue Swaminathan has been interested in. He believes that an awareness of its biological surroundings must be created in a child right from its infanthood. In primary school, the emphasis should be on learning about nature through direct observation, and on using nature to develop scientific skills, aptitudes, and

habits of thought. He deplores the belief that education is something that must take place within a building, in barren and bare classrooms.

In rural India, mainly due to economic necessity, there are a large number of school dropouts in the older age group, almost as many as those in school. Most of these children are already working. Swaminathan has this innovative idea of carrying educative experience out to their workplaces in their fields. This is not just having open-air classes or teaching arithmetic in terms of bags of manure or hectares sown. They can be taught the latest technologies and developments in agriculture by progressive farmers who can give them work experience for part or most of the day.

Extending this concept to the urban underprivileged, such children can be placed for regular work in industrial establishments for a couple of days in the week. This will give them real work experience and preliminary training for future careers. Similarly, urban children can also be sent to live in villages with farming families for some weeks to learn more about agriculture and farm operations through direct observation and participation.

Swaminathan insists that this kind of work experience should be given academic recognition. A boy or girl who can run a simple project such as a small poultry unit or a kitchen garden, would have learnt responsibility, independence, and initiative as well as arithmetic, science, and economics and the conventional skills of reading and writing.

Women's empowerment is another of his crusades. 'It's a man's world' is indeed very true, for women are regarded as the

weaker sex all over the world — not just physically. Getting the top job is almost impossible for a woman, whether she is a scientist or a corporate executive or a university professor. As a geneticist, Swaminathan says he "really can't see why there should be such a difference just because X and Y chromosomes differ." Custom, tradition, ignorance, and prejudice have relegated women, especially poor and rural women, to the biological functions of child rearing and home making.

Swaminathan believes in the adage that "if we truly seek to help the poorest, we must serve women." Poor women run the family with virtually nothing by way of resources. If one member of the family has to starve, it appears to be taken for granted that it would be the mother. However, given the opportunity to fight against hunger and poverty, poor women use all the means at their command to do so. They have an intense desire to move up, they are hardworking, they are concerned about their human dignity, they are willing to make sacrifices for the good of their children.

Swaminathan advocates an integrated program of literacy and 'techniracy' as the most meaningful way of achieving the empowerment of rural women in agriculture. Many of the back-breaking jobs such as paddy transplanting are done by women, he points out, remembering the women workers at his family's fields at Monkombu. They have to break off in between to breast-feed their babies, cook for the family, and tackle numerous other chores.

In his Foundation, scientists and sociologists have been looking at issues like the impact of new technology and new skills to help underprivileged women earn more income per hour, yet reduce the number of hours they work. If a woman earns less than a dollar digging and hewing for eight hours,

she can earn four or five times that by producing hybrid seeds, working for fewer hours too. A team from the J.R.D. Tata Ecotechnology Center, a part of MSSRF, has started a scheme in a small village in south India. Called the seed village project, poor women are being taught to grow quality hybrid seeds of sunflower, cotton, okra, tomato, and eggplant. Appropriate market linkages have been provided. Traditional knowledge has been blended with modern science and it has been ensured that the project is ecologically viable and socially acceptable. The village community is committed to it. The enthusiasm and sense of achievement of the women must be seen to be believed. Actually, way back in 1964, Swaminathan had organized a similar project in the Jounti village near Delhi. The Jounti Seed Village helped to rapidly produce good quality seeds of high-yielding varieties of wheat, thereby hastening the onset of the wheat revolution in India.

Swaminathan has long recognized the gender component in biodiversity management. It is tribal and rural women who are responsible for sowing, hoeing, crop maintenance and harvesting, food processing and storage. They observe, select, and conserve plant seeds and species for future propagation. Research in one single village in Thailand revealed 230 different plant species, many of which had been rescued by local women from a nearby forest before it was cleared. Women are very knowledgeable about indigenous plants, trees, and animals. They are the ones who use forest wealth, like fuel and fodder and fibers. The 'medicinal plants' we talk about now have been grown and used for centuries all over the world by women. Swaminathan has been fighting for acknowledging and rewarding the conservation and enhancement of plant genetic resources by such marginalized folk.

Could it be that this sensitive man has so much empathy for children and women, because he lost his father when he was at a very vulnerable age and saw his young mother lead the limited life of a widow in the conservative India of more than six decades ago?

Honoring him with a Doctor of Science degree in June 2001, the University of Massachusetts, Boston, talked of "the magnificent inclusiveness of (your) concerns, by nation, socio-economic group, gender, inter-generational, and including both human and natural environments."

7

...And his family

Simple living, high thinking. This has been ingrained in Swaminathan right from birth. His family placed great emphasis on doing one's duty by the country and its people, the ordinary men and women of the land. His father, Sambasivan, died when Swaminathan was only 11, but such was his personality that he left a lasting influence on his young son. Sambasivan was a selfless worker in the cause of India's freedom struggle and a staunch follower of Gandhi and his ideals. Swaminathan has inherited his father's zeal and determination to see things through to their logical conclusion.

Thangammal, Swaminathan's mother, became a widow at a very young age. In the tradition-bound Hindu community of those days, widows had a hard time. They were relegated to the background and didn't have much say in family affairs. They spent their lives mostly within the confines of their homes, immersed in household tasks. Thangammal kept to most of

the conventions. However, the Gandhian values of the family she belonged to accorded her respect and regard. Her attitude to life was a source of immense comfort and encouragement to her four children. When their father died, she taught them to accept life as it came, that pleasure and pain go together. She also impressed upon them by her actions what Gandhi had said about his own mother: "I learnt from my illiterate mother that all rights in life only accrue from a duty well done." She worked for hours on the *charkha*, the wooden spinning wheel Gandhi made popular, producing yarn that would be woven into *khaddar*, the handspun material that nationalists like her and her family wore. Her children often sat down with her and worked the *charkha*, and learnt how the act of spinning brought about a sense of peace and calm meditation. Swaminathan attributes his professional qualities and his love and compassion for everyone, regardless of age, gender, caste, class and religion, to the inspiration of his mother. He recalls that his mother's influence on his life was "more through non-verbal communication rather than oral advice. She was the embodiment of all that is good and great in Indian womanhood — universal love, patience, hard work, and taking pain and pleasure with serenity."

After their father's death, Swaminathan and his siblings were cared for by their uncles, Narayanaswami and Neelakantan. They were strong proponents of family values and the children imbibed their principles just by the example of the way they lived. Narayanaswami looked after his brother's children as his own. He took tremendous pains to give them a secure base and a solid education. Neelakantan, a man of absolute uprightness, was in the forefront of the movement to throw open temples to the 'untouchables', the

lowest among India's caste system. These were the people Gandhi called *harijans* ('children of God'). The brahmanical order had kept them out of mainstream activities till Gandhi and his followers fought against such injustice and ushered in a more just and equitable society.

In 1955, Swaminathan married Mina Boothalingam. They had met in Cambridge, where she was also studying, in 1951. Mina opted for a career in teaching, and has been actively involved in the educational profession ever since. Well known in her field, Mina is a great advocate of women's and children's rights, and has contributed a lot to her husband's thinking on the subject. Paying rich tribute to his wife, Swaminathan says, "My wife has been my principal guide and source of inspiration. She has encouraged my work, at considerable sacrifice to her own professional and personal life. Mina 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 of children have provided much of the stimulus for my work. Her humanism and indifference to consumerist values have greatly strengthened my personal convictions and goals."

Theirs has been a close and mutually reinforcing marriage. Mina recalls with nostalgia the early days in the 1960s and '70s, when they were both working hard at their respective jobs. Their three daughters — Soumya, Madhura, and Nitya — were in school. Sunday was reserved for family activities. Swaminathan and Mina set aside their work and took the girls on picnics and other outings. Historical sites as well as spots of natural beauty surround Delhi, where they lived. The capital

city of India, it plays host to visiting dignitaries and cultural events from all over the world.

Often, Swaminathan would take his daughters to the experimental fields where the wheat revolution was taking place. Talking of the wheat revolution, Mina remembers how frustrated and distressed she sometimes was with her husband's total involvement with his work. When, in March 1963, she was expecting their third child and the baby was due any day, she wanted her husband with her. But, instead, he was traveling all over the countryside with Norman Borlaug. Fortunately, Swaminathan was back in Delhi in time for Nitya's arrival.

Mina also remembers the excitement when Swaminathan received his first major international award — the Ramon Magsaysay Award for Community Leadership — in 1971. She herself was away in London, attending a women's conference. Swaminathan got the call from Manila in the middle of the night. Those were the days when international calls where very rare. He was startled out of his sleep, to be told he had got this prestigious honor. He sent off a cable (remember, no faxes or e-mail then) to Mina asking her to return home immediately. He obviously wanted his wife beside him when he accepted the award, and she made it in time. Once the ceremony in Manila was over, Swaminathan had to return to India to attend to pressing work. But, with his typical concern and support for her professional interests, he insisted Mina stayed on for a few more days to visit schools and get an insight into the educational structure there. Little did either realize then that they would spend years at the International Rice Research Institute in the Philippines a decade later.

Swaminathan has been a very supportive father and has encouraged his daughters to strike out on their own. All three

are highly qualified professionals. Soumya is a pediatrician, Madhura is an economist, and Nitya works in gender and rural development. When the girls are asked, as they often have been, why none of them wanted to follow their father in agriculture, they say they wish to excel in different fields. Swaminathan talks of being indebted to his daughters "for providing a window into the thought processes and dispositions of the post-Independence generation. My daughters have helped me remain young in my thinking and helped me bridge the generation gap in terms of values and aspirations."

The Swaminathans spent close to twenty years in Delhi. However, the distance of over 1500 miles from the family in Kumbakonam and Monkombu did in no way affect the strong kinship ties. In India, the extended family is a very important institution. Whatever be individual differences in opinion, the solid underlying bonds of affection and trust remain unbroken. Every summer, on the very day school closed for the long vacation, Mina and the children would take the train south. It was a two-day long and hot and dusty journey to Madras, their first halt. As the train neared Madras, the girls would be all excited at the prospect of going to the beach. Madras boasts of the second longest beach in the world, next only to the Copacabana in Rio de Janeiro. After a couple of days, they would travel overnight to Kumbakonam. The next two months would be spent there in the family home, often broken by short trips to other places nearby. Swaminathan's pressure of work never allowed him a long break. But he would definitely join his family for at least a fortnight.

Various members of the extended family came to Delhi too. Children were regularly sent for holidays with the Swaminathans. The older members would spend a few days there on their way to pilgrimage centers further north, in the lower reaches of the

Himalayas. Tourist trips to places in and around Delhi were also a big attraction. In fact, Mina says she learnt so much of Delhi's history over the years, when she took her guests around, that she seriously considered becoming a tourist guide when she retired from teaching! Some came to study in Delhi and would spend all their weekends with the Swaminathans. Others would come for medical treatment. Mina and Swaminathan would provide physical and emotional support. There have been instances when they have indulged in 'match-making' and introduced young cousins to potential spouses!

One of Swaminathan's greatest pleasures is in buying food for his family, not surprising in a man who dreams all the time of agricultural productivity. Mina describes how, when she and the children returned to Delhi after their summer in Kumbakonam, their fridge would be bursting with all manner of goodies — fruit and vegetables, chocolates and ice-cream. That was Swaminathan's way of telling his family how much he missed them and how happy he was in having them back. Even today, he finds time on his travels abroad to shop at supermarkets for exotic cheeses and chocolates and other such stuff. He is a very indulgent grandfather and sweeps his five grandchildren off to eat ice-cream whenever possible. In this aspect of his personality, he is perhaps subconsciously following his mother. Indian women of her generation expressed their love and affection for their children not by hugging and kissing them but by showering them with their favorite food.

Swaminathan has been molded by all these influences and values. He has, in turn, passed them on to his children, and to numerous others who have come in contact with him.

8

The guiding truths

Yet, two great masters have guided and continue to guide Swaminathan's life and work — Gandhi and Ramana. They were to be significant milestones in his progress towards sustainable development. Their teachings were exemplified in the life of his uncle, KS, who had married Thangammal's sister. KS had taught English Literature at one of the premier colleges in Madras. His intellectual capacity was matched only by his compassion and sense of fairness. KS moved to Delhi in 1960 when he was appointed the chief editor of the *Collected Works of Mahatma Gandhi*. This was a mammoth undertaking, as Gandhi had been a prolific writer and correspondent. KS brought out the *Collected Works* in 100 volumes and wrote the prefaces for all of them. Gandhian to the core that he was, KS was also a follower of Ramana, one of India's greatest saint-philosophers. All this has a bearing on Swaminathan's work, because he was much influenced by KS's thinking. The older man was the role model for the young scientist.

Gandhi, Swaminathan already knew. In fact, one of his earliest memories is of Gandhi's stay in their house in Kumbakonam when his father had been alive. He remembers his mother giving away gold jewelry to Gandhi who routinely went on a door-to-door campaign to collect all the excess gold ornaments, to be used for the welfare of the poorest and downtrodden people of India. "Whatever is surplus to one's requirements, one must give for better causes," has been one of the tenets Swaminathan has lived by. He started by donating the cash that came with one of his earliest awards, the Ramon Magsaysay Award for Community Leadership, towards educational facilities for the children of migrant workers in Delhi. When he left the International Rice Research Institute at the end of his very successful and highly admired tenure as its Director General, all the people working there contributed towards a farewell gift for him. Swaminathan asked that the handsome sum of money that had been collected be used to dig wells for the communities in that area where water was scarce. And, with the World Food Prize as the beginning, the monies from the numerous international prizes he has received over the years have been the main sources of funding for the research, educational, and networking activities of MSSRF. He was, of course, following an example set by his uncles. Of the 2000 acres of plantation land, mainly coffee, which they had in Wayanad in north Kerala, they contributed one-third to the *bhoodan* (literally, 'donate land') program of Vinoba Bhave. One of the chief workers in Gandhi's movement, Vinoba traveled by foot all over India, asking rich landlords to give away surplus acres to the landless poor.

Gandhi's whole title to greatness consists in the lesson he taught by example and precept, that an ordinary man can do much by pursuing in practice the values that all men hold dear

in their inmost heart. In all the work that he has done and is continuing to do for bettering the lives of poor farmers, of tribal cultivators, of women, of the hungry and the jobless, Swaminathan has been motivated by the principles Gandhi stood for. *Sarvodaya*, the advance of all at all levels, and *antyodaya*, a bottom-up approach starting with the lowliest and the poorest, have governed his approach. He is totally convinced that we can foster a new political, social, and scientific commitment to end the irony of the widespread human misery and deprivation of the 'have nots' in the midst of the conspicuous consumption and unsustainable lifestyles of the 'haves'. We **can** do it, he says, provided everyone of the privileged class keeps in mind, in their day-to-day life and work, Gandhi's advice: "Recall the face of the poorest and the weakest man whom you have seen, and ask yourself if the steps you contemplate are going to be of any use to him. Will he gain anything by it? Will it restore to him control over his own life and destiny?" Gandhi also said, "Self-realization is impossible without service of, and identification with, the poorest." What he meant by 'service' was not relief or charity, but radical restructuring of the present exploitative system.

"*Swadeshi* is that spirit in us which restricts us to the use and service of our immediate surroundings to the exclusion of the more remote. Thus, as for religion, I must restrict myself to my ancestral religion, i.e., the use of my immediate religious surroundings." These words of Gandhi's are echoed by Swaminathan. He was born a Hindu, so he is a Hindu. The fact of the matter is that for Gandhi as for all the Indian people — Hindus or Muslims or Christians — religion is not a set of doctrines but a way of life, a philosophy of being. One learns one's mother-religion as one learns one's mother tongue, by practicing it at home.

Swaminathan talks of Hinduism being a very scientific religion. The ten *avatar*s or incarnations of Vishnu in Hindu mythology interpret the theory of evolution. The first is the form of a fish, the next a tortoise, the third a boar, the fourth a man-lion (half animal-half human), the fifth a dwarf, and the remaining five are fully evolved humans. The origin of life in the ocean is particularly significant, since modern science has established that life arose in the ocean. Evolution and reverence for both living and non-living beings are common concepts in Hindu philosophy.

The theory of *karma* is a very important one, maintains Swaminathan, since it provides an opportunity for self-correction and self-development. To put it simply, you reap as you sow, over several birth cycles. We are the result of a complex set of causes and conditions, a mixture of actions that are sometimes excellent and positive and sometimes unwholesome and negative. Little by little, these causes ripen into results. *Karma* is a highly misunderstood concept in the Western world, since it is associated in Western thought with fatalism. The truth is far from it, it is a beautiful concept for achieving the height of human perfection and maturity, Swaminathan asserts. If we understand that negative actions lead to suffering, for ourselves and others, and that positive actions lead to happiness, it is up to us to act now in such a manner that we build our future by "sowing good seeds."

The *Bhagavad Gita*, the most famous of Hinduism's philosophical works, carries an essential message: "Work alone art thou entitled to, and not to its fruit." This eternal truth, emphasized by Gandhi and exemplified by his actions, has formed the basis for all of Swaminathan's work. "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," he says.

Very different from Gandhi in his actions was Ramana. He was an enlightened person who lived in south India in the twentieth century. As a young boy in his teens, he had left home to discover the meaning of life. He spent several years in intense meditation, without much interest in food or drink or in his surroundings, on the slopes of the Arunachala hill in Tiruvannamalai, a town about 100 miles south of Chennai. In 1922, he settled down at the foot of the hill, where today an institution embodying his teachings, the *Ramanasramam,* stands. Ramana founded no organization, initiated no movement, and formulated no new truth. He took no part in politics, brought about no social reform, organized no social service. Ramana hardly ever spoke, but he conveyed profound truths through silence. "When one has learnt to be still, one is." And yet many came to him in doubt and distress and found clarity and comfort in his presence.

Ramana's philosophy was an age-old one and very simple. One had to delve deep into one's own consciousness and discover one's true self. The ancient Greeks offered the same doctrine: *Know thyself*. Who am I? I am not just a rarefied spiritual entity. I am my body, my thoughts, words, actions, my circumstances, my relations, and my responsibilities. Such self-inquiry will always inevitably lead to self-improvement at each level of thought, feeling, and action.

Ramana did not advise the abandonment of life in the world. Each one has to accept his personal responsibility to his own inner light. Each individual has to seek and find his true

identity, and then come back renewed to his own given external world. This fusion of awareness with daily action will harmonize in practice the two highest human values, freedom and responsibility. Ramana's main teaching was that liberation or freedom is our real, essential, and permanent nature, and that responsibility to our fellow beings is an exhilarating means of discovering it.

Swaminathan has been profoundly influenced by this thesis that liberation is not escape from earthly existence, but its transformation through involvement in life. Each person has a duty in his station, an obligation to identify with people in need of his service. Gandhi and Ramana had no gurus, neither did they seek disciples. They just did their appointed work.

KS brought about a fusion of the thoughts of Gandhi and Ramana. KS once wrote: "Gandhi exemplifies the tree's rootedness and Ramana embodies its openness to light. They both knew...that the earth that holds the tree that holds the branch that holds the leaf is in its turn held by the sun." This touched a chord in the agricultural scientist whose greatest happiness was in making things grow. KS imbued in Swaminathan a sense of responsibility and duty towards his fellowmen. Writing about him in 1995, Swaminathan said: "If there is one lesson to be learnt from the life and work of KS, it is that true happiness comes from giving and not acquiring, from caring and not from exploitation, and from self-transcendence and not self-gratification or self-glorification."

These have been the various influences that have endowed Swaminathan with the strength and capability to pursue his ideals of promoting the moral and the ethical dimensions of

hunger, poverty, development, and peace. History teaches us that economic progress and materialistic values are not the obvious recipes for sustainable development and peace. We have to understand, Swaminathan fervently believes, that all of us have a personal stake in eradicating hunger and alleviating poverty. There is a moral responsibility for every human being, particularly those vested with authority and influence, to ensure that suffering and deprivation are not legacies handed down to coming generations.

9

Feeding the hungry

Food is the most basic need of a person. Hunger — mild or severe, open or hidden, persisting or short term — makes for extreme hardship. The first thing essential for a productive and healthy life is obviously freedom from hunger. Yet, all over the world, and especially in the developing countries, there are millions of people who go hungry to bed every night. What can we do to correct this situation? This is the question that Swaminathan has been asking of himself and of everyone else concerned.

Accepting the Ramon Magsaysay Award for Community Leadership in 1971, Swaminathan quoted the Roman philosopher Seneca: "A hungry person listens neither to reason, nor to religion, nor is bent by any prayer." Throughout his career, Swaminathan has tried to link the right to food with peace and sustainable development, emphasizing that where hunger rules, peace cannot prevail. Hunger anywhere threatens

peace everywhere. It leads to social unrest, political instability, massive migrations, rebellions, civil war, crime, and violence. Lasting peace can be achieved only by overcoming the famines of both food and livelihoods. Swaminathan describes hunger as "the oldest and most persistent foe of humankind."

How many people starve each year across the globe on average? It is estimated that 40 million persons of all ages die each year from starvation and diseases related to malnutrition. Numbers like these are difficult to grasp. But they become more real if they are put in terms of something more familiar. This number is equivalent to 300 jumbo jets each carrying 400 people crashing every day! This is only the numbers who actually die. Estimates are that about 1 in 10 people are severely malnourished, and 1 in 6 are not fed well enough to be considered as having 'enough' food each day, which means they lack sufficient calories to satisfy their basic bodily requirements.

This brings us to the concept of food insecurity which can be essentially defined by the three components of food: **availability**, food **access**, and food **absorption** into the body. Let us take availability first. Very simply put, food will be available to everyone if enough is produced to meet the demand. The world *does* possess the capacity to feed everyone. Agricultural production has made rapid strides both in the industrialized nations and the developing ones. This has largely been due to important advances in science and technology, especially in the area of breeding new varieties and hybrids of food crops. The production and distribution of good seeds, fertilizers, and pesticides have also played their part. So have pricing and marketing policies as well as land reforms and development of rural communications and markets. Most

important, however, has been the hard work of farm men and women all over the world.

Yet, there is no room for complacency as this has not been the story throughout the developing world. The situation is very bad in Africa, particularly sub-Saharan Africa. South Asia will also have about 200 million malnourished people by 2010. Swaminathan warns that there should be no relaxation on the food production front. He argues that the present 'rosy' picture of surplus foodgrains should not be mistaken for over-production, but as an indication of inadequate consumption by the poor.

A near doubling of demand for food in developing countries is anticipated over the next 25 years, with population growth and also with urbanization and greater incomes. Increased incomes often are associated with changes in diet, with people eating more animal-derived products. Much grain must be fed to livestock, and thus diets richer in meat and dairy products require increased grain production for animal feed.

Therefore, it has to be remembered that in the coming years more agricultural products will have to be produced on less land and with less water for irrigation. Also, the importance of agriculture must not be downplayed. In countries like India, agriculture is not just an instrument for food production; it is the backbone of the rural livelihood and ecological security system. However industrialized a country may be, unless it has enough food for its population, its economic development will suffer. Avoiding undernourishment and hunger is a much more complex task than preventing famines.

The *availability* of food is dependent on not just adequate production. Prices play a major role. All over the world, governments support farmers by maintaining the prices of

foodgrains at a minimum standard. This adds to the cost of food to the consumers. In developing countries, the more the minimum support price, the less the numbers of people able to afford the food. More and more food may be produced, but it is not reaching the poor who really need it. Swaminathan argues that "we have reached a stage in our agricultural evolution when our production will increase only if we can improve consumption."

Even with all this growth in agricultural production, *access* to the food is more of a problem. You can't buy food if you don't have money, and you won't get money if you don't have employment. Possibly the most vexing issue facing the world today is job opportunities. We are in need of much innovative thinking on the problem of employment. It is often said that modern technological developments are responsible for eliminating jobs. This is not wholly true, for we can use technology to create jobs in areas not thought of before. On balance, technology may really lead to more jobs than it destroys.

Even if food is available and it reaches the people, it may not mean better health standards. *Absorption* of food is the ability to assimilate the food eaten to lead a healthy and productive life. It is a function of clean drinking water, primary health care, primary education, and environmental hygiene. These factors are sadly lacking in many developing countries, especially in the rural areas. Water sources are often polluted, industrial wastes being a major cause. Statistics show that children under the age of one are the most susceptible to diarrhea leading to death, because of contaminated water.

The health and nutritional status of the poor is much below standard. Vitamin and micronutrient deficiencies are very

common, giving rise to problems like stunting in children and chronic energy insufficiency in adults. For example, 25 to 50 percent of children born in several of the developing countries have low birth weight due to the malnutrition of mothers. Low birth weight has been reported to lead to poor development of the brain in early childhood. It may also give rise to frequent infections and chronic disease as the child grows into adolescence and adulthood. It has been estimated that by the year 2020 there will be about one billion children growing up with impaired physical and mental development. Is it not very cruel that such children are denied the opportunities for a fulfilling life even from birth?

Lack of basic education makes matters worse. Jobs and incomes depend on the level of education. Female literacy is a very important tool to fight hunger. The wife and mother is the one who is responsible for feeding the family and if she is educated in the necessary ingredients for healthy diets, the battle is almost won. In many countries of the Middle East, Africa, and Asia, girls are not sent to school. And, even if they do start schooling, they drop out within a few years. They are kept back at home to help in domestic chores or look after younger siblings. The empowerment of women through education and employment is an absolute must today. If women are given the fundamentals of education, they gain self-confidence, they are able to get better deals buying and selling produce, they can get jobs or start their own enterprises, they can fight oppression and injustice. Most important of all, their knowledge of environmental hygiene, nutrition, and healthcare improves, and they can look after their families better.

On Swaminathan's initiative, the Indian Government has launched several 'food-for-work' programs. These include

some resourceful ones like the program that provides 2 million tonnes of foodgrains for work on bio-environmental control of mosquitoes, rainwater harvesting, and recycling of solid and liquid wastes.

Food availability, food access, and food absorption overlap. Food production is linked to job access, food access, and food absorption. In turn, being employed influences the demand for food and encourages more production. Jobs also lead to better education, better living standards, better knowledge of nutrition and healthcare needs, and, therefore, overall health and happiness. The elimination of poverty-induced hunger will make rapid progress only when **every person is enabled to earn his or her daily bread** and maintain adequate health to do so.

10

Bringing hope...

It has been increasingly recognized that the problem of food is inextricably intertwined with the problems of employment, political and social stability, and finally, peace. No complete solution to one is possible without significant progress on the others. Employment is the key to progress and peace. High levels of unemployment will lead to frustration, polarization, instability, and violence.

Swaminathan has been greatly exercised by the urgent need to create millions of new jobs. Conventional development pathways are not enough. Too often they help those who can help themselves and sideline those who are helpless through no fault of their own. Even as economies grow, work forces shrink, leading to 'jobless growth'. This aggravates both economic and gender inequity. Swaminathan describes it as "economic, social, and technological apartheid."

Several international seminars and consultations have been organized in Swaminathan's Foundation to explore opportunities to stimulate productivity, competitiveness, and employment in the developing countries. These nations face enormous challenges in the field of employment, both to increase the quality and scale of livelihoods available today, and to lay the foundations for a substantially increased number of jobs to meet the needs of a growing population in future years. The focus has been on practical measures to attack poverty at its roots, to reduce illiteracy, and to increase employment and opportunities for the unskilled, the illiterate, the landless, and the excluded. Gandhi once declared that "the test of orderliness in a country is not the number of millionaires it owns, but the absence of starvation among its masses."

Predominantly agricultural countries in the developing world, Swaminathan insists, should realize that agricultural progress constitutes the best safety net against poverty and deprivation to rural women and men. Hence, they should not blindly imitate the pathway to economic growth chosen by industrialized countries. Agriculture not only produces food, it also produces a great many of the jobs needed by households to buy food. Since agriculture is the world's single largest employer, raising production and productivity in this field can immediately place additional purchasing power in the hands of the rural poor. They will buy more food, clothing, and other basic consumer goods that will create more jobs and higher incomes for many more people. The spiral of economic growth, with jobs at the bottom line, will begin.

Between 1952 and 1968, due to land reform, the number of cultivators in Taiwan increased fivefold. There were dramatic increases in output and productivity. A shift from foodgrains

to more value-added fruit and vegetable crops created more than 100,000 jobs in post-harvest and processing activities. Improved rural incomes and purchasing power led to growing demand for goods and services, including manufactured goods. Further growth in employment was the result.

A wide range of agriculture-based industries and services will stimulate the formation of new enterprises and create related livelihoods. A strategy that produces a large number of new jobs in the non-farm rural sector could lead to a substantial expansion of employment opportunities. The biovillage program of MSSRF that we have already talked about in an earlier chapter is based on this concept.

This program focuses on the rural poor, especially women. A mix of enterprises appropriate to the resources of the area is identified and the participants are enabled to translate these into income- and employment-generating activities. Ventures include production of oyster mushroom from paddy straw, vermicompost from used straw waste, fodder plantations on wastelands, goat rearing and dairying based on biomass from fodder, aquaculture in community ponds, and so on. Small farm households grow vegetables and flowers and hybrid vegetable seeds. Integrated resource management is fostered through flower-vegetable-fish culture and fodder-dairy-biogas enterprises.

Swaminathan is very enthused by the huge success of the biovillages. Begun in 19 villages, it is now being spread to over a hundred. He is confident that the transfer of *know-how* to *do-how* will completely change the landscape of the poorer countries. Rural people all over the world are extraordinarily receptive to new ideas that will be of benefit to them, he asserts, and all developing countries can become like America — a 'land of opportunity.'

"Women's empowerment and their full participation on the basis of equality in all spheres of society...are fundamental for the advancement of equality, development, and peace," Swaminathan quotes from the preamble to the 1995 Beijing Conference on Women. The experience gained from MSSRF's biovillages and other programs like the village knowledge centers mainly operated by poor rural women indicates that meaningful jobs that reduce the drudgery of their everyday lives and increase their incomes can take off with right technologies, choice of enterprises, and appropriate training. At the other end of the spectrum are highly qualified women scientists and technologists. Marriage and the process of raising a family have often taken precedence over putting their skills and knowledge to work. Swaminathan has thought of them too. In collaboration with the Government, MSSRF has set up a Women's Biotech Park near Chennai, where women professionals are provided opportunities to convert their academic accomplishments into entrepreneurial excellence. It could be the manufacture of herbal cosmetics or fertilizers from vermicompost or manufacturing bio-degradable bacterial products to improve waste treatment systems.

Attracting and retaining youth in farming is another of Swaminathan's considerations. He is hopeful that with the new technologies that include biotechnology and bio-organic farming technologies, farming can become both interesting and profitable. Young farm workers can undertake the organisation of agri-clinics and agri-business centres and provide facilities like pest proofing of crops, nutrition and health management of farm animals, and integrated crop-livestock-fish production systems. They can learn, and put to use, mechanical skills like running and maintaining agricultural machinery. Accounting

and marketing will also be sectors where employment opportunities can arise. If young people are encouraged and motivated to stay on in their villages and produce more food, there can be no better alternative to migration to already overcrowded cities. India has launched its first agricultural job portal dedicated to finding employment for young aspirants. Distance learning courses are also planned to bring the latest in technology to rural farmers.

Another area where Swaminathan has been very active is in fostering relationships between rural producers and urban consumers in a mutually beneficial manner. With MSSRF's active participation, a National Association for Agri-Business Development has been established. Systematic efforts have begun to get food industries and marketing co-operatives interested in tying up with rural farmers for a variety of crops. A start has been made with millets rich in vitamins and micronutrients, organically grown pineapple, and mushroom. There are many opportunities for remunerative occupation here.

In all the programs of MSSRF, emphasis is laid on employment generation. In the coastal systems research projects, for instance, villagers have been introduced to micro-enterprises like producing candy from palm sugar, making rope and mats from coir, thatching roofs, marketing of dry and fresh fish, kitchen gardens, bee keeping, and running small grocery stores. Small-scale credit facilities and community banking systems have been set up to encourage such entrepreneurial activities.

Food processing, water harvesting and watershed management, setting up special gardens for traditional medicinal plants and production of medicines, harnessing

energy from bio-gas — these are some of the avenues open for gainful employment in the rural sector. Community health care, education and vocational training, ecological mining that will include biological methods of rehabilitation of mined land, and eco-tourism are resourceful methods to create livelihoods. Information and communication technologies can provide opportunities for roles in forecasting weather, disseminating farm-based news and advice, and marketing of products and support services.

Policy and action in creating employment opportunities, Swaminathan says, must be based on partnerships and alliances of many and varied kinds: among government agencies, non-governmental organizations, business and trade interests, scientific and educational institutions, and, most importantly, urban and rural groups. A key element must be the empowerment of people at the community level to mobilize their creativity, potential, vision, and hope. The target communities must participate in every facet and exercise control as far as necessary.

Broad-based education should be promoted in all respects as the foundation of knowledge and skill, especially for women, all children, the unskilled, and the illiterate. Education can make a major contribution to increasing the economic output of the developing countries; but education alone, without the corresponding effort to create employment possibilities, can be self-defeating.

"The poor are poor," asserts Swaminathan, " because they have no productive assets—no land or livestock, no education, and no technical skills." The only resources they have are their time and labor. His strategy for fighting poverty is bringing about a transition from unskilled to skilled work through

improving the technical competence of the poor. If technology was an important factor in the rich-poor divide in the past, Swaminathan's approach is to enlist technologies like biotechnology and information technology as allies in the movement for gender and social equity.

Thus, there are now uncommon opportunities for a better present and future for humankind. There are concrete instances around the world where such opportunities have been created, generating a new optimism with reference to human destiny and well-being. What is now important is to convert such unique examples into a universal sustainable livelihood security movement.

11

...And sustaining it

As we enter the new millennium, we have much to celebrate. Man has stepped on the moon and is busy conquering space. The world has shrunk with respect to travel and communication. Sitting in India, I can call far out Boston, Massachusetts, in one second and can send an electronic text, even a book, in two. Television brings the world to your doorstep — you can watch international sports, art and cultural events, political rallies, whatever interests you, at the flick of a button. The human genome has been mapped. Medical care and technology are keeping us healthy and alive for longer years. Agriculture and industry have made such rapid strides that we eat a variety of foods and use an equal variety of goods in our daily lives. Politically, the Cold War has ended and more and more democratic systems of governance are being established in the nations of the world.

And yet...all is not right with the world. The rich are getting richer and the poor are getting poorer, the divide is widening.

There are "unsustainable lifestyles and unacceptable poverty" all around. There is growing damage to land, water, forests, biodiversity, oceans, and the atmosphere. Environmental degradation is the order of the day. Gender inequity is increasing. Economic growth is taking place at the expense of employment; even as economies grow, their work forces shrink. Population in the developing countries is swelling at an alarming rate, posing grave threats to the supporting ecosystems. And a most frightening development is the spread of ethnic and religious intolerance in every continent.

However, the silver lining to the cloud is the broad recognition that 'sustainable development' is the only way for our world to survive and thrive. It is clear that if we are to promote a sustainable civilization, we should create an environment where every man, woman, and child can have the opportunity to lead a healthy and productive life. Such an environment will have to be based on food security, livelihood security, and ecological security — one cannot exist without the others.

In the 1960s, the Green Revolution swept across the developing world, taking agriculture based on resources like land, water, and chemicals to new heights. Countries like India rapidly became self-sufficient in food production after decades of facing shortages. But population growth, land degradation, and increasing consumption capacity have led to what is called the 'fatigue' of the Green Revolution.

The visionary that he is, Swaminathan had expected this would happen. As far back as 1968, he urged the need to introduce environmentally sustainable strategies like organic nutrient supplies, integrated pest management with reduced

dependence on chemical pesticides, and scientific management of land and water assets. He hoped that his overall approach would diminish the risk that intensified agriculture could prove unsustainable because of overuse and overloading of soil, water, and other resources.

Experience of the past four decades or so shows how great his foresight has been, even though little attention was paid to it at that time. Precision farming methodologies in India and other Asian developing countries have demonstrated the value of his approach. He has helped Vietnam to become self-sufficient in food, even to become a food exporter; and he has laid the foundations for agricultural reconstruction in Cambodia. He has similar accomplishments to his credit in China, Indonesia, Myanmar, the Philippines, Bangladesh, and Sri Lanka, and countries even further away like Egypt, Tanzania, and Madagascar.

Swaminathan has coined the term 'ever-green revolution' to describe the pathway to continuous advancement in productivity, but without associated ecological harm. This is the fundamental basis of sustainable development. Two-time Pulitzer Prize winner Edward O. Wilson recognizes and affirms Swaminathan's concept of an ever-green revolution as the means of a sustainable end to hunger. In his recent book, *The Future of Life*, Wilson writes: "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...No one knows the exact solution to this dilemma. Most scientists and economists who have studied both sides of it agree that the benefits outweigh the risks. The benefits must come from *an ever-green revolution*. The aim of this new thrust is to lift food production well above the level attained by the Green Revolution of the 1960s, using

technology and regulatory policy more advanced and even safer than those now in existence."

The success of the ever-green revolution, Swaminathan insists, will lie with small-scale farmers and their traditional practices. He has always had the greatest respect for farmers' indigenous knowledge, for instance, in using green manure together with nitrogenous fertilizer. Another aspect that the ever-green revolution depends on is the financial capability of small farmers, which is meager in most communities. This places stress on poverty relief measures, with greater attention to women who are the main players in agriculture. They are also the majority of the poor, getting little credit for their contributions in cultivation and marketing.

The ever-green revolution should use ecotechnology to further its aims. Swaminathan defines ecotechnology as "the blending of the ecological prudence and technologies of the past with the best in frontier technologies, particularly biotechnology, information and digital technology, space technology, nuclear technology, and management technology." Without ecotechnological empowerment, Swaminathan is emphatic that farmers will not be able to produce more food and other agricultural commodities on an environmentally sustainable basis from less land, water, and energy sources.

Gandhi described as *sarvodaya* a society where there is high social agreement. In this, individual goals have to be made to coincide with social goals. And the individual whose welfare has to be identified with the social interest should be the poorest person. Swaminathan's dream is to see the emergence of a *sarvodaya* world of farming, where there is unity of purpose in spite of the diversity of methodologies, farming systems, climates, soils, and needs. More affluent members will have to

pay attention to those who are economically, socially, and ecologically handicapped. Ethics has to be married with economics and technology. Swaminathan repeats in every appropriate forum that the technological push must be matched by an ethical pull. Sustainable progress is just not possible if these two don't match.

12

He keeps on…

11 September 2001: that day witnessed a never imagined method by which innocent thousands were killed for the sake of ideologies. And the events of that day led to a country being devastated and more innocent people killed, in the name of different ideologies.

Akthar Mohammed of Kangori, a remote hamlet in the mountains of northern Afghanistan, had a large family and no food for them. He had a terrible choice to make. He was offered wheat in exchange for his sons, Sher and Baz, aged ten and five. He gave up his sons and heartbrokenly, but candidly, said, "I miss my sons, but there was nothing to eat." Unforgettable tragedies of this kind are taking place when the markets of both developed and developing nations are flooded with food.

Swaminathan's perceptiveness in turning such a calamity to use in the service of the poor and hungry is remarkable. He proposes the establishment of a global grid of Community Food

Banks (CFB), to begin with in the 'hunger hot spots' of the world such as Afghanistan, North Korea, and parts of Africa and India. A CFB could be initiated either with national resources or with the support of the international community through the World Food Program. Appropriately designed bins could store quantities of grain staple to the area to meet the needs of the local population for a year. A village or a hamlet with a population of 800 individuals should have a CFB with a storage capacity of 200 tonnes of grain, on the estimate that 1 tonne can support 4 persons for a year. The ecology and climate of the area as well as the kind of staples stored will determine the structure of the bin. Once established, the CFB could be self-sustaining, with the purchase of local grains and tubers and other life-saving crops of the region. Ideally, the CFB could become the medium for transferring to the local population their entitlements such as subsidized foodgrains and also to support the nutritional needs of old and infirm persons, pregnant and nursing mothers, and infants and pre-school children. Immediate relief operations following major natural catastrophies like droughts, floods, cyclones, and earthquakes, as also seasonal slides in livelihood opportunities, can also be catered to by CFBs. The launching of a global movement for community-managed nutrition security systems is an idea whose time has come, says Swaminathan. Extending the concept of a CFB, he advocates the setting up of an 'International Bank for Nutrition for All' to support the on-going UN World Food Program. In other words, those who have more should share their surplus wealth with the less fortunate members of the human family.

In the Indian context, Swaminathan's current crusade is for achieving a hunger-free India by 15 August 2007, which

marks the 60th anniversary of the country's attaining independence. The Prime Minister of India has embraced this goal. Swaminathan's two-pronged strategy consists of, first, linking all the on-going nutrition programs to ensure that the food security of every man, woman, and child is attended to, based on an entire lifecycle approach. Second, he has proposed the establishment of over 100,000 Community Food Banks, with priority being given to the hunger, biodiversity, and hydrologic 'hot spots' in the country. The CFBs could become the catalysts of a people's movement for ensuring *food for all and for ever*.

Swaminathan has also recommended the organization of a National Consortium for Sustainable Food Security. The aim is to bring together everyone concerned — business and industry, government agencies, non-government organizations, women's and consumer groups, professional experts, and the mass media — to act in unison to eliminate hunger.

Earlier, when in 2001 a massive earthquake struck the state of Gujarat in western India, Swaminathan had put into action his ability to turn disasters into opportunities for strengthening human security and well-being. Within a few days of this great human tragedy when thousands were left homeless, he drew up a scheme for the construction of a large number of low cost greenhouses. Swaminathan proposed that those moving into such greenhouses be trained in raising high value horticultural crops like vegetables and flowers, using modern water- and nutrient-saving technologies, as well as in hybrid seed production. Thus, the greenhouses became sources of secure

livelihoods, once more permanent shelters were constructed. And a new chapter in the agricultural history of this area, which is very short of water, was begun with such high value-low water use cultivation.

Very recently, Swaminathan has been elected to lead the Pugwash Conferences on Science and World Affairs, the influential group that strives to eliminate nuclear weapons and to bring about peace in the world. The Pugwash movement, so called because the first conference was held in 1957 in Pugwash in Nova Scotia, Canada, was launched by Bertrand Russell and Albert Einstein. After the horrors of the Second World War, they were of the strong opinion that eminent men of science had to come together to make a statement about the disasters arising from wars. The Russell – Einstein manifesto was signed by eleven distinguished scientists, most of them Nobel laureates. In part, the manifesto (in the beautiful language of Bertrand Russell, who won the Nobel Prize for Literature) read: "We are speaking on this occasion, not as members of this or that nation, continent or creed, but as human beings, members of the species Man, whose continued existence is in doubt...consider yourselves only as members of a biological species which has had a remarkable history, and whose disappearance none of us can desire...We have to learn to think in a new way...the question we have to ask of ourselves is: what steps can be taken to prevent a military contest of which the issue must be disastrous to all parties?...Shall we put an end to the human race or shall mankind renounce war?" It is most apt that Swaminathan, with his passionate

belief in peace, is to lead Pugwash now when violent uprisings seem to be the order of the day in many parts of the world.

In tune with his strong and long-held view that freedom from hunger and poverty would surely lead to sustainable development and peace, Swaminathan organized a Consultation on 'Peace, Freedom from Hunger, and Sustainable Development: The Ethical Dimensions' at his Foundation in Chennai, in collaboration with the UN World Food Program, the UN University of Peace, Costa Rica, and several other organizations. At this Consultation he brought together prominent and esteemed moral and spiritual leaders of the world. Through dialogue, advocacy, and concerted action, the leaders charted out a realistic pathway towards building a world environment where tolerance, mutual respect, human rights, and sustainable peace prevail.

This is the story of Monkombu Sambasivan Swaminathan. 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, employment, and the environment. Agriculture has been further broadened to include concepts of food security, basic human needs, and social equity. It is in this larger sense that Swaminathan is more than an agricultural pioneer. Indeed, he ranks as one of the world's finest exponents of human development in its most comprehensive sense. It isn't often that the life of an accomplished scientist is also one of enduring commitment to human causes. In Swaminathan, the two have found equal expression.

As Maria Rilke Ranier puts it:

Again and again in history
Some special people wake up
They have no ground in the crowd
They move to broader laws
They carry strange customs with them
And demand room for bold audacious actions
The future speaks ruthlessly through them
They change the world.

13

Recognitions

As you walk into Swaminathan's office in his Foundation, your eye is immediately drawn to the bookshelves. Among the many books are numerous trophies and plaques and mementoes. The walls are lined with citations. He is probably the only scientist who has been honored so much. It is quite impossible to fully cover the awards and recognitions he has received over the years. I have made an attempt to describe some of them in the following pages. Almost all the monies that have come with these prizes have been donated by him to further the causes he believes important to food security, sustainable development, and peace in the world.

The Government of India publishes an honors list on 26 January every year, to commemorate the founding of the Republic of India on that date in 1950. The *Padma* awards — *Padma Shri*,

Padma Bhushan, and *Padma Vibhushan* — are conferred on eminent Indians from all walks of life by the President of India. They are recognized for their contributions to arts, literature, science, sports, community work, and public service. Swaminathan was awarded the ***Padma Shri*** in 1967, the ***Padma Bhushan*** in 1972, and the ***Padma Vibhushan*** in 1989.

Ramon Magsaysay was president of the Philippines from 1953 until he died in a plane crash in 1957. Magsaysay won hearts and minds by focusing his energies on helping the poor. His accomplishments inspired two American philanthropists, John D. Rockefeller III and his brother Nelson, to establish an award "to be given annually to one or more persons in Asia whose demonstrated leadership is motivated by a concern for the welfare of people comparable to that which characterized the life of Ramon Magsaysay." Every year, since 1958, the Magsaysay Awards, often regarded as the Nobel Prizes of Asia, are presented in five categories: government service, public service, community leadership, international understanding, and journalism, literature, and creative communication arts. **The Ramon Magsaysay Award for Community Leadership** was given to Swaminathan in 1971, in recognition of outstanding contributions as "scientist, educator of both students and farmers, and administrator, towards generating a new confidence in India's agricultural capability."

The Borlaug Award was instituted by Coromandel Fertilizers, a prominent Indian company in the agricultural field, in 1971 in honour of Dr. Norman E. Borlaug for his pioneering work in wheat.

The award is given annually to an Indian scientist for making a significant contribution in any area relating to agriculture and food security, besides environmental awareness and its contribution to sustainable development. In 1979, it was awarded to "M.S. Swaminathan, 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 a 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." On the occasion of the presentation of the Borlaug Award, the Company also organizes the Coromandel Lecture, a prestigious annual event to express its concern for society and commitment to issues concerning agriculture and the environment.

The World Food Prize was conceived by Norman Borlaug, the 1970 Nobel Peace Prize laureate, as the equivalent of a Nobel Prize in the field of Food and Agriculture. It is financed by the General Foods Fund, Inc., a foundation supported by General Foods. The **first World Food Prize** was presented to Swaminathan in 1987. Some of the commendation letters received by him on the occasion speak of the regard he has been held in for decades:

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 you have helped to bring to the people you have served. (Ronald Reagan, President, United States 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)

The Golden Heart Presidential Award of the Philippines is the highest award that can be conferred on a non-Filipino. President Corazon Aquino of the Republic of the Philippines honored Swaminathan with this significant award in 1987, "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 Filipino farmers, and for having expanded considerably the International Rice Research Institute's capacity for upstream research to bring the fruits of

recent advances in science and technology to Asian rice farmers."

The Volvo Environment Prize was set up in 1988 with the aim that the environment — one of Volvo's core values — should be emphasized not just by the company meeting the very highest standards in terms of production and products, but also by recognizing the significance of inventions and discoveries that favor pro-environmental work through the provision of funds for an environment award. In keeping with its philosophy of awarding the prize for prominent natural science, socio-economic, or technical work of direct or indirect significance to the environment on a global or regional basis, the 1999 Volvo Environment Prize was awarded to 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."

Swaminathan received the **Indira Gandhi Prize for Peace, Disarmament and Development** in 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." This prestigious award honors those outstanding global citizens who have made a significant contribution to humanity's material and cultural progress. It commemorates

Indira Gandhi, former Prime Minister of India, who was herself an outstanding international personality of her time. Presenting this award on her birth anniversary is a fitting way to remember her spirited espousal of world peace, disarmament, and issues vital to the developing countries. Several worthy men and women have received this prize since it was instituted in 1985. Among them have been heads of State and Government, as also individuals and organizations that have championed many humanitarian causes, including those of democracy and development.

The Franklin D. Roosevelt Four Freedoms Medal, awarded by the Franklin and Eleanor Roosevelt Institute, USA, and the Roosevelt Stichting, the Netherlands, was created to honor individuals and institutions whose work has given special meaning to those freedoms President Roosevelt described in 1941:

> We look forward to a world founded upon four essential 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.

Swaminathan was chosen as the recipient of the Medal in 2000 because the Trustees believed he exemplified "those objectives which President Roosevelt described in urging Freedom from Want as an essential condition of human liberty. ...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 that 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, 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."

The Planet and Humanity Medal of the International Geographical Union was awarded in 2000 to M.S. Swaminathan, "a great scientist, a responsible and thoughtful caretaker of nature, and an outstanding humanist, in recognition of his unique success in outstanding scientific research and its application, leading to Asia's Green Revolution. His endeavors 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."

Swaminathan has received many more awards from various sources around the world and for various causes. Some of the more interesting ones are listed below:

- **Bennett Commonwealth Prize of the Royal Society of Arts**, for significant contributions to Household Nutrition Security (1984).

- First recipient of the**Award instituted by the Association for Women in Development**, Washington, D.C., USA, for "outstanding contributions to activities which foster development for women" (1985).
- Krishi Ratna **Award**, for "devotion to the cause of agro-science, and for being the benefactor of the farming community," instituted by the Bharat Krishak Samaj / World Agriculture Fair Memorial Trust Society, and presented by President Giani Zail Singh of India in 1986.
- **Commandeur of the Order of the Golden Ark** of the Netherlands, to honor special services rendered to the conservation of the flora and fauna in the world (1990).
- **Tyler Prize for Environmental Achievement**, "in recognition of life-long contributions to increasing biological productivity on an ecologically sustainable basis, and to promoting the conservation of biological diversity" (1991).
- **The Honda Prize** instituted by the Honda Foundation, Tokyo, for outstanding services to the development of eco-technologies in the field of agriculture (1991).
- **UNEP–Sasakawa Environment Prize**, "for outstanding global contribution to the management and protection of the environment, and to conservation and sustainable development" (1994).
- **Global Environmental Leadership Award**, conferred by the Climate Institute, Washington, D.C., "for encouraging village-level responses to environmental issues" (1995).

- China's **Award for International Co-operation on Environment and Development**, "for outstanding contributions to the lofty cause of environmental protection and development, and for signal accomplishments in the field of international co-operation" (1997).
- **Ordre du Merite Agricole** of France, created in 1883, to honor "persons having rendered services of the highest quality to the cause of agriculture and its development and amelioration" (1997).
- **Henry Shaw Medal** awarded by the Board of Trustees of the Missouri Botanical Garden, "in consideration of important service rendered to humanity through emphasis on sustainability in agriculture" (1998).
- **UNESCO Gandhi Gold Medal for Culture and Peace** for "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).

Afterword by M.S. Swaminathan

My youth, like that of most others in India of the 1930s, was a period of idealism and nationalism. Young and old shared the dream of a free and self-reliant India. *Purna swaraj* (total freedom) and *swadeshi* (self-reliance) were our goals, to be achieved through Mahatma Gandhi's unique belief in *ahimsa* or non-violence. It was indeed a great day in our history when we won our independence.

Unfortunately today, we find a growing violence in the human heart. Obviously, this is due to a sense of injustice and social exclusion — whether real or perceived. Young people often don't have jobs but they have access to guns. A World Summit on Sustainable Development was held at Johannesburg in August–September this year to foster what I hope will become **a new global ecological order**. A global ecological order involves harmony with nature. Harmony with nature will not be possible unless we achieve harmony with one another. How can we value and protect biological diversity if we do not nurture an understanding and love of human diversity in terms of gender, religion, language, ethnicity, and political belief? Gandhi asked long ago: "How can we be non-violent to nature, if we are going to be violent to each other?"

Many of my beliefs and experiences have been captured in this book by the author, Gita Gopalkrishnan. I shall hence not repeat them. However, I would like to share my thoughts on **the power of partnership**.

In my early plant breeding career in wheat and other crops, I used to select plants characterized by **individual excellence**, that is, plants possessing large panicles, bold grains, and so on. I found that varieties developed on the basis of this principle could yield about 10 to 15 percent more than the parental varieties. In the late 1950s, I shifted my attention to selecting plants for **collective or population performance**. This approach led to the breeding of varieties capable of yielding 200 to 300 percent more than the parent strains. Thus, the point that, whether in plants or animals or human beings, it is **collective excellence** that leads to revolutionary progress and not just individual brilliance was brought home. This would suggest that we must foster in human societies "**genes for co-operation**". If we do so, we can build a society committed to a global ecological order, based on principles of gender and social equity, sooner that most people would consider possible.

I am convinced that, if technology was a key factor in enlarging gender and economic inequity from the days of the Industrial Revolution in Europe, we now have an uncommon opportunity to enlist technology as an ally in the struggle for gender and social equity. "The real voyage of discovery does not consist in seeking new landscapes, but in having **new eyes,"** said Marcel Proust. The youth of the world should develop new eyes that can help to foster a sense of respect, love, and admiration for all the inhabitants of our planet, described by Buckminster Fuller as "spaceship earth" to stress its finite natural endowments.

I have found great happiness not just in the joy of scientific work nor in winning awards, but in caring for the socially and economically handicapped sections of society. What is needed in such work is the will to succeed and a conviction that for every problem there is a solution. For example, when we wanted to bridge the digital divide in rural India, we met with both sceptics and obstacles. I was warned that the supply of electricity would be erratic. Harnessing solar energy solved this. Then there was a problem of either absence or malfunctioning of the telephone system. This was taken care of by developing a hybrid wired and wireless system of communication.

Hunger is the extreme manifestation of poverty and hence I have concentrated on working for a hunger-free India and world. The inspiring and beautiful words of poet W.H. Auden bring out the urgent need for all of us to adopt such a goal:

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.

I hope that all the young men and women who read this book will strive to become affirming flames in the midst of the sea of despair and violence we see in our midst. Let the Youth Employment Summit convened by the Education Development Center, Boston, become the forum for the fusion of millions of affirming flames, which can extinguish darkness and despair from every home and hut in our planet.

M. S. Swaminathan

Suggested Readings

For those who may be interested in learning more about the influences that have shaped Swaminathan, here is a very short list. They are classics that have stood the test of time.

1. Jawaharlal Nehru. *The Discovery of India*. First published in 1946 by Signet Press, Calcutta. Reprint, Oxford University Press, 1985.

2. Louis Fischer. *The Life of Mahatma Gandhi*. First published in 1951 by Jonathan Cape. Reprint, Granada Publishing, 1982.

3. Paul Brunton. *A Search in Secret India*. First published in 1934. Reprint, B.I. Publications, Bombay, 1970. See Chapter IX, "The Hill of the Holy Beacon."

To know more about Swaminathan's work, the book to read is:

R.D. Iyer. *Scientist and Humanist : M.S. Swaminathan*. Bharatiya Vidya Bhavan, Mumbai, 2002.