# Combating Hunger and Achieving Food Security

Food security can be achieved only through concurrent attention to food availability, access and absorption. It needs synergy between food and non-food factors: clean drinking water, sanitation, primary healthcare and purchasing power. The future of food security will depend on a combination of the ecological prudence of the past and the technological advances of today and tomorrow. The issues that need to be addressed in combating hunger and achieving food security are highlighted in this book by a great Indian geneticist. The genesis and growth of the yield revolution in wheat is traced at the beginning in order to give readers, particularly the younger generation, an understanding of the efforts that ushered in the Green Revolution of the 1960s.

The book also discusses major causes of chronic and hidden hunger and emphasizes on the need to redesign the farming system to increase food production. The role of an effective monsoon management programme to maximise its benefits is examined. There are sections that analyse the importance of biodiversity conservation and enhancement and farmer skill development. Important issues for increasing agricultural production including investment by financial institutions in agriculture and rural development, women's role in agriculture, and youth employment in rural livelihoods are discussed in great detail in the text. The book concludes that there must be synergy between scientific knowledge, political will and farmers' active participation to achieve the goal of overcoming chronic and hidden hunger in the populations of developing countries.

**M. S. Swaminathan** is the founder chairman of MS Swaminathan Research Foundation, Chennai, India. He studied at the Plant Breeding Institute of the University of Cambridge and earned a PhD in 1952. Professor Swaminathan has contributed significantly in the areas of agricultural science, food and nutrition. He has been described by the United Nations Environment Program as the 'Father of Economic Ecology'. Swaminathan is the recipient of many prestigious awards which include the Ramon Magsaysay Award for Community Leadership (1971), the Albert Einstein World Science Award (1986), and the first World Food Prize (1987). He is Fellow of the Royal Society of London, the U.S. National Academy of Sciences, the Russian Academy of Sciences, the Chinese Academy of Sciences, and the Italian Academy of Sciences.

"There are some staggering facts to consider. We know that the world's current food production is enough to feed its entire population one and half times. And yet, according to the UN's Food and Agriculture Organization, one in eight people suffer from chronic malnutrition. Meanwhile, more food is wasted per year in the developed world than is produced in the whole of sub-Saharan Africa in the same period. As many of the essays in this collection demonstrate, the main issue is not scarcity, but poverty and equality. And the answer does not lie in the increasing yields, but in improving them."

— **Sir LeszekBorysiewicz**, Vice-Chancellor,
University of Cambridge

"The policy recommendations presented in the book are based on solid empirical evidence produced and acquired by Dr Swaminathan over many years. He not only knows the history; he played a major role making it ... The book provides a knowledge-based tour-de-force of food, agricultural and related environmental policy issues."

— **Per Pinstrup-Andersen**, Chairman,
High Level Panel of Experts to the UN Committee on Food Security

"... should be read by anyone who wants to understand what it takes to wage a 'frontal attack' on hunger and malnutrition in a developing country. Professor Swaminathan makes clear that this fight will require a combination of scientific know-how, political will, and farmers' toil. His gift for explaining complex concepts in terms everyone can understand means the book will be valuable for policy-makers and lay readers alike. Swaminathan not only describes what was behind past progress in India, but also talks about the National Food Security Act and sketches what it will take to overcome chronic and hidden hunger ..."

— **Shenggen Fan**, Director General,
International Food Policy Research Institute

"… only M. S. Swaminathan has the breadth of experience, intellect and depth of insight to comprehensively describe the past, the present and the preferred future directions for development of India's vast agriculture sector … The must-read basic primer into India's approaches and ways of thinking about human welfare, environment and agriculture from the intellectual giant who played a central role in the research and legislation behind the new technologies, services and policies addressing these challenges."

— **Thomas A. Lumpkin**, Director General,
International Maize and Wheat Improvement Centre

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M. S. Swaminathan

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# Foreword

It is no accident that the 'eradication of extreme poverty and hunger' was first on the list of the United Nations' Millennium Development Goals. Access to food and proper nutrition has a direct impact on our capacity to reduce child mortality, to enhance maternal health and even to boost primary school attendance – all of which were announced in the year 2000 as development priorities. Crucially, the ways in which we grow food are profoundly linked to our ability to ensure environmental sustainability – another Millennium Development Goal.

Few people have understood the urgency of tackling the complex challenge of global food security better than Professor M. S. Swaminathan. Few have advocated so effectively for the need to bring scientists, non-governmental organisations, global policymakers and local communities together to achieve the objective of a hunger-free world.

There are some staggering facts to consider. We know that the world's current food production is enough to feed its entire population one and half times. And yet, according to the UN's Food and Agriculture Organization, one in eight people suffer from chronic malnutrition. Meanwhile, more food is wasted per year in the developed world than is produced in the whole of sub-Saharan Africa in the same period. As many of the essays in this collection demonstrate, the main issue is not scarcity, but poverty and equality. And the answer does not lie in the increasing yields, but in improving them.

For decades Professor Swaminathan has campaigned for the introduction of enriched food crops, for a greater emphasis on nutrition-sensitive agriculture, for a more balanced integration

of the world's food and energy security strategies, and for better communication between scientists and the public. In India, he is rightly acknowledged as the man behind the country's 'Green Revolution', which propelled the country to self-sufficiency in grain production in the 1960s. A more recent achievement is his influential role in the enactment of India's National Food Security Act (2013), which makes provision of nourishment for the country's poorest a legal entitlement.

But his continued and ever-developing thoughts on the questions surrounding food security, and his promotion of an 'evergreen revolution', point to the global scale of the challenge. While the effects of biodiversity loss and climate change are felt locally, the task of managing them has to be international, and concerted.

Professor Swaminathan is one of University of Cambridge's most distinguished alumni. He arrived in the early 1950s to do a PhD in Botany at Fitzwilliam College. Who could have imagined then that his ground-breaking research on the humble potato would soon have such tremendous implications for other staple crops across the world, including rice and wheat? In October 2014, in recognition of his contribution to the science and policy of sustainable food security, Fitzwilliam College made him an Honorary Fellow.

The University of Cambridge took a leaf out of Professor Swaninathan's book when, in 2011, it designated Global Food Security among its Strategic Research Initiatives. Its purpose in doing so was to integrate the wide range of research activity carried out across the university, and to develop sustainable, socially equitable and ecologically successful solutions to the food security challenge.

Today, Cambridge engineers, geographers, biologists and mathematicians are collaboratively developing tools to predict future demands for energy, land and water. Researchers in the

humanities and social sciences analyse the political economy of food supply, and evaluate the role of political structures in the production and distribution of food. Others study the regulatory frameworks of land ownership, or the economics of changes in land-use.

Through its Strategic Initiative in Global Food Security, the University of Cambridge aspires to make a significant contribution to the task of ensuring affordable access to sufficient, safe and nutritious food for all. This is in line with our mission statement: 'to contribute to society through the pursuit of education, learning, and research at the highest international levels of excellence'.

The Millennium Development Goals announced in 2000 have only been partly met as we enter 2015, their original target year. With governments, academics, NGOs and local communities now working closely with each other to fulfill their pledge to the UN's Zero Hunger Challenge – to eliminate hunger by 2025 – we are fortunate to have Professor Swaminathan's thoughts to suggest some of the ways in which this might be achieved.

Professor Sir Leszek Borysiewicz
Vice-Chancellor, University of Cambridge

# Preface

At the close of the 2012 London Olympics, the United Kingdom announced a programme designed to rescue 25 million children worldwide from malnutrition by the time of the next Olympics in Brazil. In May 2012, the World Health Assembly agreed to a target of reducing the number of stunted children by 40 per cent (a reduction of about 70 million children) by 2025. To meet these targets and nourish the 870 million hungry people in the world, the world's leaders will need to prioritize an innovative science-based marriage of nutrition and agriculture.

The problem of hunger is not simply a lack of sufficient quantities of food. The chronic hunger caused by protein and calorie under-nutrition is exacerbated by malnutrition (the 'hidden' hunger caused by the deficiency of micronutrients, which include iron, iodine, zinc, vitamin A and vitamin $B_{12}$), and sometimes by human diseases that disable the body's ability to absorb the micronutrients it receives. To address such intertwined problems, there must be synergy among national programmes dealing with the availability, access to, and absorption of food. These nutrition security programmes should be based on a life-cycle approach that starts with the 'first 1000 days' from pregnancy to two year old, the critical period when stunting can cause irreversible damage.

The United Nations (UN) Committee on World Food Security has released a comprehensive report on *Social Protection for Food Security* with recommendations for combating chronic childhood hunger. One of its recommendations – the concept of a 'food security floor' – is particularly worthy of mention. The food security floor recognizes the fact that freedom from hunger is a fundamental human right, defining the minimal steps needed for

hunger elimination. These include nutrition literacy, clean drinking water, sanitation and primary health care.

In some 'hunger hotspots' of the world where agriculture is the backbone of survival, as in sub-Saharan Africa and South Asia, mainstreaming nutrition in agriculture programmes is the most effective and low-cost method of eliminating malnutrition. This requires greater attention to the net income of smallholder farmers, whose women food producers have particular needs that require specific policies and support. As an example, the M. S. Swaminathan Research Foundation in Chennai, India, has designed a Farming System for nutrition initiative, comprising specific steps. They include carrying out a nutritional survey of the area and identifying the major causes of chronic and hidden hunger, and redesigning the farming system so that specific agricultural remedies are introduced for each nutritional malady, such as the cultivation of bio-fortified crops and crop-livestock integration. Thanks to the work carried out since 2004 under the Harvest Plus programme of the Consultative Group on International Agricultural Research (CGIAR), micronutrient-enriched varieties are becoming available in several crops, such as iron- and zinc-rich rice, iron-rich beans and pearl millet, zinc-rich wheat, and vitamin A–rich cassava, sweet potato and maize.

2014 has been designated the International Year of Family Farming by the UN, and every effort should be made by developing countries to make each family farm a bio-fortified farm. On my suggestion, a sum of ₹ 200 crores has been provided in the Union Budget for 2013–14, to organize 'nutri-farms' – where nutritional considerations are mainstreamed in the design of the farming system – in the high malnutrition burden areas. If synergy can be created among scientific know-how, political do-how, and farmers' participation, it should be possible to achieve the goal of overcoming chronic and hidden hunger in

large sections of the population of developing countries during this decade.

This book is a collection of papers written and transcripts of speeches made by me between 2012 and 2014. India's recently enacted National Food Security Act has provided the backdrop for many of my observations. I have felt strongly about certain issues that need to be addressed in combating hunger and have reiterated those concerns in various forums. If we focus with determination on the ways and means to achieve food security that I have discussed, I am confident that with the support of government and the fortitude of the farming community, we will be able to prove the prophets of doom wrong and eradicate hunger to a large extent in our country.

I have traced the genesis and growth of the yield revolution in wheat right at the beginning of this book in order to give readers, particularly the younger generation, an understanding of the efforts that ushered in the Green Revolution of the 1960s. Repetitions of ideas and interests and suggestions have been edited to the extent possible, but they are likely to crop up, given my strong convictions and my lifelong quest for a hunger-free world.

# Acknowledgements

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# Abbreviations

| | |
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| BMI | Body Mass Index |
| CADFWF | Central Agricultural Development Fund for Women Farmers |
| CBD | Convention on Biological Diversity |
| CEDAW | Convention on the Elimination of All Forms of Discrimination against Women |
| CFS | Committee on World Food Security |
| CGIAR | Consultative Group on International Agricultural Research |
| CHF | Community Hunger Fighters |
| CRRI | Central Rice Research Institute |
| CSR | Corporate Social Responsibility |
| DBT | Department of Biotechnology |
| DFID | Department for International Development, UK |
| DRDO | Defence Research and Development Organisation |
| FAO | Food and Agriculture Organization |
| FSN | Farming System for Nutrition |
| FSR | Farming Systems Research |
| GIAHS | Globally Important Agricultural Heritage Systems |
| GMO | Genetically Modified Organisms |
| HLPE | High Level Panel of Experts |
| IADP | Intensive Agricultural District Programme |
| IARI | Indian Agricultural Research Institute |

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| ICAR | Indian Council of Agricultural Research |
| ICDS | Integrated Child Development Service |
| ICRISAT | International Crops Research Institute for the Semi-Arid Tropics |
| ICT | Information and Communication Technology |
| IFAD | International Fund for Agricultural Development |
| IFFCO | Indian Farmers Fertiliser Cooperative Ltd. |
| IFPRI | International Food Policy Research Institute |
| IMD | India Meteorological Department |
| IPBES | Inter-governmental Platform on Biodiversity and Ecosystems Services |
| IRDP | Integrated Rural Development Programme |
| KVK | Krishi Vigyan Kendra |
| LANSA | Leveraging Agriculture for Nutrition in South Asia |
| LBW | Low Birth Weight |
| MDG | Millennium Development Goal |
| MGNREGA | Mahatma Gandhi National Rural Employment Guarantee Act |
| MSP | Minimum Support Price |
| MSSRF | M. S. Swaminathan Research Foundation |
| NBA | National Biodiversity Authority |
| NCF | National Commission on Farmers |
| NGO | Non-Governmental Organisation |
| PDS | Public Distribution System |
| PPV&FRA | Protection of Plant Varieties & Farmers' Rights Authority |

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|---|---|
| QLM | Quality Literacy Movement |
| QPM | Quality Protein Maize |
| RSR | Rural Systems Research |
| SFAC | Small Farmers Agri-Business Consortium |
| SHG | Self-Help Group |
| SPS | Sanitary and Phytosanitary |
| STI | Science, Technology and Innovation |
| TAC | Technical Advisory Committee |
| TNAU | Tamil Nadu Agriculture University |
| UN | United Nations |
| UNDP | United Nations Development Programme |
| UNICEF | United Nations Children's Fund |
| USDA | US Department of Agriculture |
| VKC | Village Knowledge Centre |
| VRC | Village Resource Centre |
| WAR | Winning, Augmentation and Renovation of Water Resources |
| WFP | World Food Programme |
| WRAP | Waste and Resources Action Programme |
| WTO | World Trade Organization |