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THE MAN WHO FED INDIA - GREEN REVOLUTION

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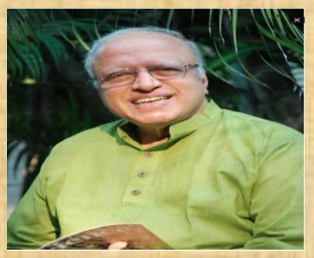

ABSTRACT: -

The Green Revolution transformed India from a food-deficient nation into a food-secure one, and at its centre stood Dr. M. S. Swaminathan. By introducing high-yielding wheat and rice varieties, improving irrigation, and promoting modern farming practices, he helped to prevent famine and ensured national self-sufficiency in the 1960s. This article highlights his scientific breakthroughs, global collaborations, and the long-term ecological challenges that followed. It also reflects on his call for an "Evergreen Revolution," aimed at boosting productivity while protecting soil, water, and biodiversity. Dr. Swaminathan's legacy continues to shape the future of sustainable agriculture.

Introduction:

Mankombu Sambasivan Swaminathan, widely regarded as the **"Father of the Indian Green Revolution,"** played a pivotal role in transforming India's agricultural landscape during the mid-20th century. He is credited with saving millions of people from starvation through his landmark work on enhancing productivity and production of wheat and rice crops during the 1960s-70s. This article explores Swaminathan's groundbreaking contributions to agricultural science, particularly his work in introducing high-yielding varieties of wheat and rice, which

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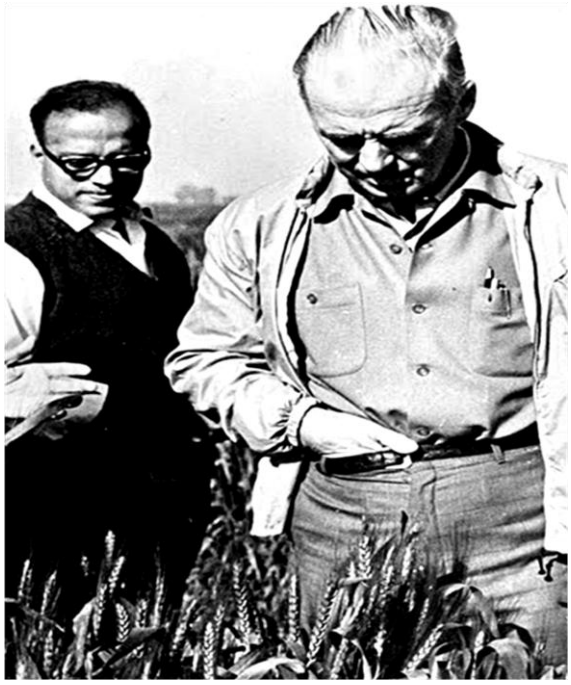
significantly enhanced food security in India and other developing nations.

SIR SWAMINATHAN EXAMINING THE WHEAT CROP

M.S. Swaminathan: father of India's Green Revolution - The Hindu - https://www.thehindu.com/shorts/ms-swaminathan-father-of-indias-green-revolution/article67361260.ece



GREEN REVOLUTION: SHORT-TERM GRAINS AND LONG-TERM ECOLOGICAL HARM

A SEED SOWN – THE FOUNDATION

Prof. Swaminathan was born on August 7, 1925, in Kumbakonam, Tamil Nadu, India. He was born into a Tamil Brahmin family with a strong background in agriculture and academics. His father, Dr. M. K. Sambasivan, was a surgeon, and his mother, Smt. Parvati Thangammal Sambasivan came from a family deeply rooted in farming. Growing up, Swaminathan's family values and background greatly influenced his interest in agriculture and science. Swaminathan began by studying for a BA degree in zoology and intended to follow his father into Medicine, but upon witnessing and experiencing the horror of the Bengal famine that killed an estimated four million people, he decided, somewhat to the consternation of his family, that he would study agriculture.

LANDMARK CONTRIBUTION

Prof. Swaminathan returned to India in 1954 from the USA, and worked at the Central Rice Research Institute, Cuttack, Odisha, and further at the IARI, New Delhi. He was concerned about India's food security with a 'ship to mouth' existence and India's image as a 'begging bowl'. He was interested in increasing agricultural productivity and production, especially of our staple food grains, wheat and rice. For this, he envisioned that the plant type should be tailored to be functionally responsive to the external application of fertilizers. The height of plants should be reduced without reducing the length of the grain-bearing panicle. This is what he strived to achieve by pursuing interspecific hybridization, induced radiation, and chemical mutagenesis, as well as the use of plant growth regulators.

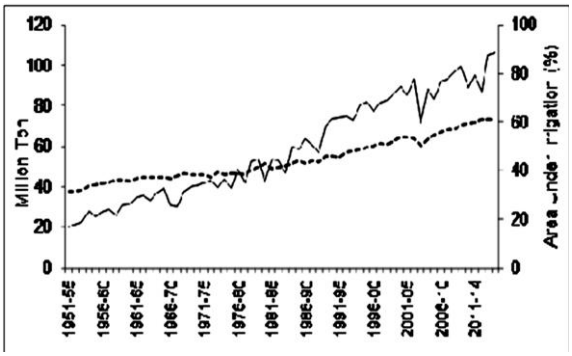
His ability helped him trace the **'Norin-10'** dwarfing genes from Japan and '**Dee-Geo-woo-Gen'** dwarfing Mutants from China in **rice**. His initial contact with Prof. Orville Vogel of Washington State University (Pullman, USA) led him to Prof. Norman E. Borlaug, Director of the International Maize and Wheat Improvement Centre (CIMMYT), Mexico. As a result, Prof. Swaminathan and **Prof. Borlaug** collaborated, with Borlaug touring India and sending supplies for a range of Mexican dwarf varieties of wheat ('Lerma Rojo' and 'Sonora-64') from Mexico, which were to be bred with Japanese varieties. Initial testing in an experimental plot showed promising results. The crop was high-yielding, good quality, and disease-free. The hesitation by farmers to adopt the new variety with high yield. More modifications were made to the grain in the laboratory to suit Indian conditions better. The new wheat varieties (Kalyan Sona, Sonalika) were sown, and in 1968, production went to 17 million tonnes, 5 million tonnes more than the last harvest.

PRODUCTION DETAILS OF RICE AND WHEAT DURING 1960-1970

Source : (Heitzman, James; Worden, Robert L., eds. (1996). "Food-Crop Production". India: a country study (5th Ed.). Washington, D.C.: Federal Research Division, Library of Congress.)

CROP	YEAR	PRODUCTION
WHEAT	1965	12 MILLION TONS
	1970	20 MILLION TONS
RICE	1960	34.58 MILLION TONS
	1970	40.43 MILLION TONS

Decadal changes in rice and wheat production in India



Source: Gurditta, H., & Singh, G. (2016). Climate Change, Food and Nutritional Security: Issues and Concerns in India. *Journal of Climate Change*, *2*(1), 79-89. https://doi.org/10.3233/JCC-160009 (Original work published 2016).

SERIES OF EVENTS-GREEN REVOLUTION

- **Phase I (1965-66 to 1980):** India's first phase of the Green Revolution was driven by an urgent need for food security. The country was heavily dependent on food imports, and the threat of famine was high. The real game-changer was the High-Yielding Varieties (HYV) program introduced in 1965-66. By 1980, food grain production had reached around 100

million tonnes, up from just 33 MT in 1965 and 25 MT in 1950.

- **Phase II (1980-1991):** With wheat production stable, attention turned to rice production during the 6th and 7th Five-Year Plans. With introduction of HYVs, there's heavy usage of fertilizers and all other resources because the HYVs are high demanders of them.
- **Phase III (1991-2003):** By the 1990s, the revolution aimed to reach India's semi-arid and dryland regions. Crops like cotton, oilseeds, pulses, and millets were targeted under the 8th and 9th Five-Year Plans. Efforts like the Integrated Watershed Management Programme tried to improve water usage in dry areas.

From the Green revolution to the Evergreen revolution

The dwarf and semi-dwarf wheat and rice varieties had the capacity to take up as much chemical nutrients and water from the soil, CO2 and sunlight from the atmosphere, and produce a large number of grains. Application of mineral fertilizers and chemical pesticides, besides copious irrigation, constitutes external inputs. In 1967, Professor M.S. Swaminathan had noted that farmers in the northwestern India tended to apply excessive chemical fertilizers and several repeated applications of chemical pesticides. He also noted that the chemical pesticides led to the premature elimination of natural enemies of pests. Hence, in his Presidential Address to the Agricultural Sciences Section of the Indian Science Congress held at Varanasi on 4th January 1968, (several months before William Gaud coined the term "Green Revolution" and the government of India commemorated the Wheat Yield Revolution in India by releasing a special stamp in June 1968).

Professor M.S. Swaminathan stated: "Exploitative agriculture offers great dangers if performed with only an immediate profit or production motive. The emerging exploitive farming community in India should become aware of this. Intensive cultivation of land without conservation of soil fertility and soil structure would lead, ultimately, to the springing up of deserts. Therefore, the initiation of exploitive agriculture without a proper understanding of the various consequences of every one of the changes introduced into traditional agriculture, and without first building up a proper scientific and training base to sustain it, may only lead us, in the long run, into an era of agricultural disaster rather than one of agricultural prosperity".

Unfortunately, these precautionary principles suggested by Professor M.S. Swaminathan, Father of India's green revolution, were set aside as the focus was on immediate profit. Subsidized electricity to

pump out groundwater, as well as subsidies for chemical fertilizers and pesticides, led to the transformation of the "green" into a "greed" revolution. As expected, the ecological devastation to soil health, fresh water, and biodiversity became noticeable in the late 1980s. Yield gains associated with the green revolution started showing signs of fatigue.

Such a solution was conceived of by Swaminathan (1996), who played a crucial role in ushering in the green revolution in the 1960s. He called it the "evergreen revolution" and its designed goal is to "achieve productivity in perpetuity without causing ecological harm. Evergreen revolution involves a paradigm shift from a commodity centric to a "systems approach". It involves in sustainable management of natural resources and progressive enhancement of soil quality, biodiversity and productivity. The term "evergreen revolution" denotes sustainable advances in crop productivity per unit of land, water, and time, without associated ecological harm.

While on the one hand, the evergreen revolution seeks to develop eco-friendly agricultural practices, and on the other hand, it strives to ensure food security at the individual level. In contrast, the Green Revolution brought about food security at the national and, not at the individual level. The evergreen revolution is, therefore, more holistic in ensuring food security at the individual level than the Green Revolution.

TIME LINE (1925-2013):

August 7, 1925: Mankombu Sambasivan Swaminathan was born.

1940s: He completed his schooling and higher education, a Bachelor of Science degree in Agricultural Science from the University of Madras in 1944.

1947-1949: Having witnessed the Bengal famine of 1943, Swaminathan dedicated his life to improving India's farming methods to battle food shortage. After Independence, Swaminathan joined the Indian Agricultural Research Institute (IARI) in New Delhi to focus on plant genetics and breeding.

1954: As an IARI scientist, he learnt of Dr. Norman Borlaug's newly developed Mexican dwarf wheat variety, which could produce higher levels of grain and develop stronger stalk structures to support the increased biomass.

1965-70: Continuing his research with Dr. Borlaug on wheat varieties, Dr. Swaminathan modified grains in the laboratories to better suit the Indian soil, giving higher yield and free of infestation. He then convinced farmers mainly in India's rural northern belt **1979-1982**: Appointed as the director-general of the **Indian Council of Agricultural Research** (ICAR), Dr. Swaminathan worked to educate farmers on

weather and crop patterns by setting up thousands of ICAR centres across India. His research at CRRI resulted in the development of several rice varieties, including ADT27 and RASI, which were cultivated widely in Tamil Nadu

In 1982: He became Director General of the **International Rice Research Institute** in the Philippines – the first Asian to hold the post – and worked to promote participation of women farmers in rice cultivation. During his tenure as Director General of the IRRI, research on the C4 rice plant was started to improve photosynthesis.

1987-2000: For his contributions, he was awarded the first World Food Prize in 1987. Using the award money, he set up the M.S. Swaminathan Research Foundation in Chennai in 1988 to provide a collaborative platform for global leaders, rural farmers to coordinate research on issues such as micro-level farming, eco-technology.

2002: He was elected as President of the Nobel Peace Prize-winning Pugwash Conferences on science and world affairs – another first for a citizen from a developing nation.

2004: Back at home, in 2004, during the United Progressive Alliance (UPA) government's tenure, he was made chair of the National Commission on Farmers, which was constituted to address rising farmer suicides in India

2005: Joined the United Nations Millennium Project's Hunger Task Force.

2007-13: After being nominated by then-President Dr. APJ Abdul Kalam to the Rajya Sabha in 2007, he presented the Women Farmers' Entitlements Bill 2011 to increase women's role in farming due to the gradual migration of male farmers to cities in search of employment

CONCLUSION

Dr. M. S. Swaminathan's Green Revolution turned India from hunger to self-sufficiency. His legacy reminds us that the true tribute lies in shaping agriculture that is not just high-yielding, but also sustainable and farmer-friendly for the future. **"From seeds of hope to fields of plenty, his legacy still grows."**

"If agriculture fails, everything else will fail."

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