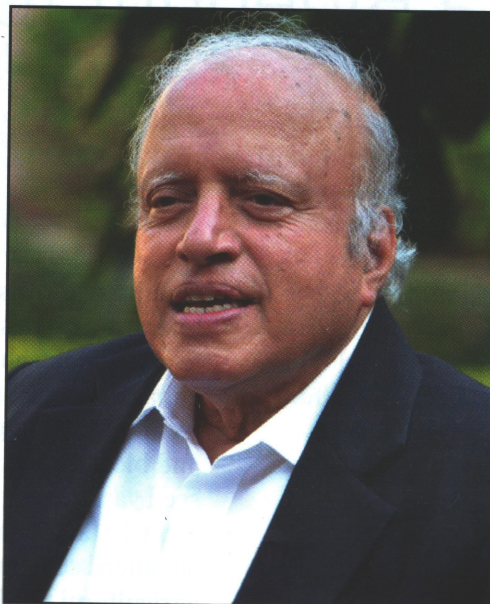


# Celebrating Dr M S Swaminathan's Peerless Contribution to Agriculture

India has lost the main architect and global leader of the green revolution, Dr Monkombu Sambasivan Swaminathan. A visionary who played a key role in introducing and further developing high-yielding varieties of wheat and rice and strived to deliver innovations in agriculture. Dr Swaminathan's collaborative scientific efforts with American agronomist Dr Norman Borlaug, spearheading a mass movement with farmers and other scientists, backed by public policies, saved India from certain famine-like conditions in the 1960s.



Swaminathan's work, as a PhD and post-doctoral researcher at Cambridge and Wisconsin, was primarily in potato genetics and breeding. Yet, he was undoubtedly the master strategist and charioteer of Indian agriculture. His ability to keep abreast of global agricultural breakthroughs, tracing the Norin-10 dwarfing genes in wheat from Japan and locating Orville Vogel and Borlaug, who had developed varieties incorporating these in the US and Mexico respectively.

In 1963, Dr Borlaug developed a high-yielding wheat variety. However, there was a catch. The variety of wheat which he developed was not suitable for making chapati. Dr Swaminathan and his team overcame this issue by developing another variety of wheat by crossing Dr Borlaug's wheat variety with Indian varieties. In 1963, India harvested 96 million tonnes of wheat from 100 million hectares which was considered a miracle in Indian agriculture and the country's first step towards self-sufficiency in agricultural production.

India's Green Revolution became a reality because of his relentless efforts to create high-yielding wheat cultivars that helped India achieve the goal of high production levels of both wheat and rice. He was the driving force behind the creation of the "evergreen revolution" with the M S Swaminathan Research Foundation.

Swaminathan wore many hats. He was an

agronomist, agricultural scientist, plant geneticist, administrator, educator and an institution builder. He established the Nuclear Research Laboratory at IARI and played a role in setting up the International Crop Research Institute for the Semi-Arid Tropics in India; the International Board for Plant Genetic Resources (now known as Bioversity International) in Italy and the International Council for Research in Agroforestry in Kenya. He helped build and develop a number of institutions and

provided research support in China, Vietnam, Myanmar, Thailand, Sri Lanka, Pakistan, Iran, and Cambodia.

Dr Swaminathan was honoured with India's highest awards, including the prestigious Padma Shri, the Padma Bhushan, and the Padma Vibhushan, along with various international honours, including the Ramon Magsaysay Award (1971) and the Albert Einstein World Science Award (1986). He is also the recipient of the H K Firodia Award, the Lal Bahadur Shastri National Award, the Mahatma Gandhi Prize of UNESCO (2000), the Indira Gandhi Prize and the Franklin D Roosevelt Four Freedoms Medal. He was named the first World Food Prize Laureate in 1987 for developing and spearheading the introduction of high-yielding wheat and rice varieties into India during the 1960s when the country faced the prospect of widespread famine. Wheat production doubled in just a few years, making the country self-sufficient, saving millions from extreme food deprivation.

Dr Swaminathan has made a stellar contribution to the agricultural renaissance of India. The International Association of Women and Development conferred on him the first international award for significant contributions to promoting the knowledge, skill, and technological empowerment of women in agriculture. **AS**



# Dr M S SWAMINATHAN

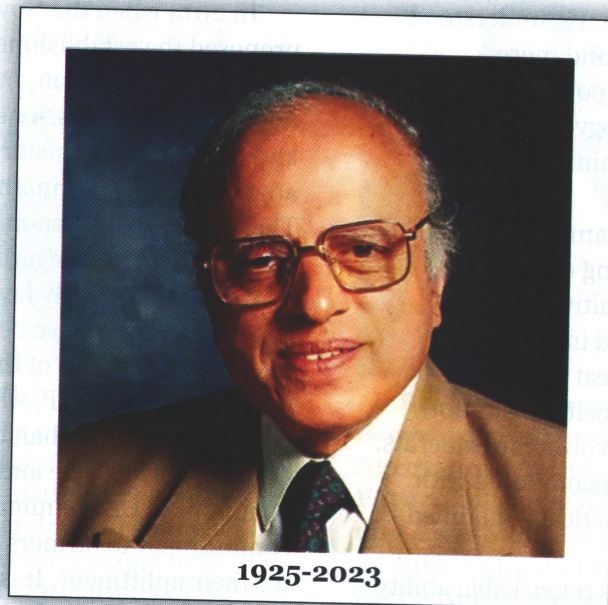
## FROM "SHIP TO MOUTH" TO "SHIP TO THE WORLD"

September 28 is a significant date in history, marked by the demise of Rao Tularam Singh, one of the leaders of the Indian rebellion of 1857 against British rule in India. Now, September 28, 2023, will also be etched in memory as a day of profound loss, with the passing of Dr MS Swaminathan, one of the legendary fighters for the cause of farmers. It is a somber day for Indian agriculture as it bid

farewell to Dr Swaminathan, its most beloved son, who passed away in Chennai at the age of 98.

In a tribute to Dr Swaminathan, Prime Minister Narendra Modi, fittingly described him as a "Farmers' Scientist". Another stalwart of Indian agriculture, Dr RS Paroda, paid his respects in an obituary by highlighting Dr Swaminathan's pivotal role in leading the green revolution that paved the way for India's self-sufficiency in grain production during the 1960s, after years of heavy dependence on grain imports. As Dr Swaminathan's influence extended far beyond India, touching the lives of farmers worldwide, a wave of condolences has been pouring in from across the globe.

Much like Dr Verghese Kurien's transformative impact on the dairy industry with the white revolution, Dr Swaminathan was the chief architect of India's green revolution. In the 1960s, when India imported a substantial 10.5 million tonnes of food grains from the USA under Public Law (PL 480) to alleviate food shortages, few could have predicted the remarkable turnaround that would unfold in the history of Indian agriculture. In recent times, India achieved record-breaking wheat production of 110 million tonnes, more than double of what the USA produces. India's wheat yield, at 3.32 tonnes per hectare, outshines many nations, including the USA, which stands at 3.30 tonnes per hectare.



1925-2023

It's worth noting that while HM Dalaya, the inventor of the first spray-dryer for producing powdered buffalo milk, remains relatively unknown to the general public, Dr Verghese Kurien is celebrated as the individual who brought this technology to the masses through Amul, significantly improving the financial well-being of dairy farmers and earning him the title of the "father of the white revolution." In drawing a parallel for the "father of

green revolution," one must consider Dr Norman Borlaug's inaugural visit to the Pusa Institute in New Delhi in 1963. At that time, Dr Swaminathan was at the helm of the Division of Genetics and Plant Breeding. A lesser-known fact is that Dr Borlaug developed the first semi-dwarf wheat varieties at the International Institute in Mexico using the Rht-B1b and Rht-D1b genes derived from Norin-10, a semi-dwarf wheat variety originally bred in Japan and released in 1935. Dr Borlaug employed Norin-10 in hybridisation with the US variety Brevor, ultimately creating a range of high-yielding, non-lodging, nutrient-responsive and rust-resistant wheat varieties such as Sonora 63, Sonora 64, Mayo 64, and Lerma Rojo.

Dr Swaminathan's most significant contribution was his role in facilitating Dr Borlaug's visit and his astute recognition of the potential offered by the Mexican dwarf wheat varieties. This led to a series of field trials conducted in India, during which he encouraged wheat breeders to develop location-specific wheat varieties. Collaborating with scientists from Punjab, Haryana, Pant Nagar Universities, and the Pusa Institute, Dr Swaminathan effectively brought Dr Borlaug's varieties to farmers' fields. He showcased the yield potential of these new varieties through National Demonstrations, an innovative concept at the time. The credit for transferring this technology to



benefit farmers goes to Dr Swaminathan.

Dr Swaminathan's visionary concept of bridging the gap between technology generation and its practical implementation in farmers' fields, known as 'Lab to Land,' significantly impacted agricultural scientists worldwide. He understood that research should extend beyond mere publication, emphasising the importance of the continuum of research, technology development and its adoption by farmers within the realm of Agricultural Sciences.

It is worth noting that Dr Swaminathan faced opposition when conducting experiments with foreign-originated wheat cultivars directly in farmers' fields, which involved importing a substantial 18,250 tonnes of wheat seed from two Mexican varieties. This opposition was not limited to politicians but also involved bureaucrats, mirroring the resistance often encountered with new technologies, including genetically modified tools in the current century.

However, Dr Swaminathan's remarkable ability to persuade planners and politicians demonstrated his exceptional leadership, paving the way for the inception of India's first green revolution. This ability may be attributed, in part, to his background as a distinguished teacher at the Pusa Institute. I remember how many of us, unable to officially register for his Genetics course, would attend his classes, standing by the windows. His teaching style was nothing short of mesmerising, characterised by his exceptional ability to convey complex concepts with remarkable clarity- such as the laws of genetics, genetic code, and DNA replication. His words flowed effortlessly, like honey dripping from the comb, as those who attended his lectures outside the classroom can attest.

Today we deeply miss Dr Swaminathan for his invaluable guidance on a plethora of problems facing Indian agriculture. Dr Swaminathan's profound impact on agriculture is not confined to the past. His visionary approach emphasised the optimisation of farm inputs, including water, nutrients and chemicals. He cautioned against the unrestrained use of these resources, a message that resonates more than ever today. He emphasised that nature would not pardon our excessive usage, and thus, he always advocated the concept of the 'evergreen revolution'. Sadly, we are already witnessing the consequences of disregarding his advice: degraded soils, dwindling water resources, critically low

groundwater levels, looming environmental pollution, and the uncontrollable reality of climate change becoming a reality. His advice to live in harmony with nature and with each other is lost in the hurry to progress.

In 2014 when the Government of India proposed the establishment of the first National Farmers' Commission, I vividly recall, as the Agriculture Commissioner, that the then Food and Agriculture Minister Sharad Pawar promptly appointed Dr Swaminathan as its Chairman. The commission's reports, particularly on the recommendations regarding the minimum support price (MSP), strongly favoured farmers. Across the country, farmers have been fervently demanding the implementation of the formula he advocated for determining MSP, which involved fixing it at 50 per cent higher than the cost of cultivation plus C2, showing his love and dedication to the farming community. Dr Swaminathan's unwavering commitment to farmers exemplified his deep love for their upliftment. It is this passion that led the Prime Minister to refer to him as a true "Kisan Vaigyanik." While we will undoubtedly miss his guidance, the spirit of empowerment that he instilled in the agricultural scientific community will continue to thrive in times of crisis. It is a rare sight to witness millions of farmers offering their heartfelt tributes and shradhanjali to this great visionary, often with tears in their eyes. This moving display of respect became evident during our travels through villages.

As we follow the path laid out by him, taking small but significant steps in transferring technologies to farmers' fields, we are aware that Indian agriculture has become both more modern and more complex. Farmers no longer require mere advice; they need comprehensive support. The journey ahead is long, but the foundations laid by the late Dr Swaminathan are sturdy enough to help us achieve the sustainable future of Indian agriculture that he envisioned. While in India we have several Swamis to preach the path of salvation, in agriculture there is only one Swami, to show us the path of agrarian emancipation, and that is Dr Swaminathan. In a world marked by disorder, his words continue to echo: "We can buy peace with grains, not with guns." **AS**

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