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Area of Thrust: Agriculture R&D and T/T Leading to Self Sufficiency, Part 2.

1. In part 1, we had seen how our farmers are truly making us proud and in this stupendous task, how we are witnessing how a number of entrepreneurial innovators steadily emerging in our otherwise far below the levels performance of their industrial counterparts including the much glorified services sector! And yet, why "do farmers go marching"? Fortunately enough, the otherwise neglected sector has started occupying columns also in major national dailies. One such recent one by a reputed analyst Aarati Krishnan is quoted in full below.

Why do farmers go marching? Aarati Krishnan, The Hindu March 25, 2018.

March month: Farmers from across the State had marched into the city earlier this month, demanding that the government fulfill their demands. Farmers, distress is increasingly being triggered by excess output and falling prices, but policy fixes are yet to address this

Why are Indian farmers perpetually in revolt? The question has been raised by many after the recent farmers' march to Mumbai and simmering rebellions across the States in recent years.

No doubt, agriculture is one segment of the economy on which vote-conscious governments haven't skimped on outlays. Over the years, Central governments have allocated ever-rising sums towards procurement, input subsidies and rural employment schemes, while States have periodically announced loan waivers.

But that farmer protests have persisted, and even intensified, perhaps shows that many of these schemes aren't addressing the right set of problems. The reasons for agricultural distress have changed quite dramatically in recent years.

From shortage to plenty

A few years ago, farmers seeking to register their protest used to do so beside wilted crops and parched farmlands.

But in the last couple of years, farmers from Mandsaur to Salem have given vent to their angst by dumping vast quantities of unsold produce — tomatoes, grapes, onions and milk — on lakebeds and national highways.

Historically, agricultural distress in India has been linked to truant monsoons, input shortages and lacklustre yields which frequently put growers on the road to penury.

In recent years though, it is surplus output and unremunerative prices that have decimated farm incomes more often.

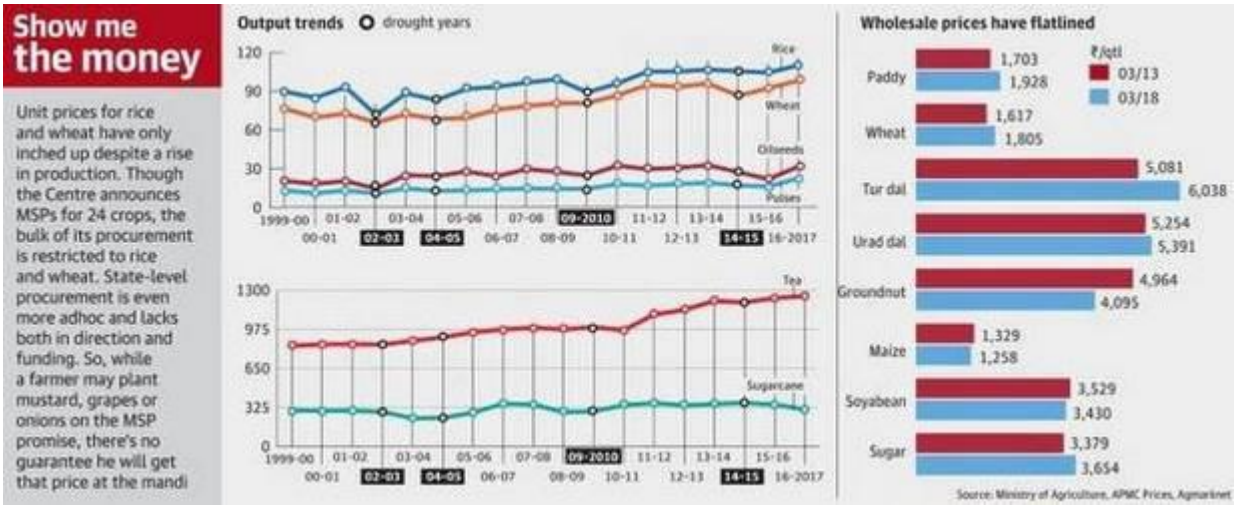
Trends in India's agricultural output over the last twenty years present an eye-opener to this problem of plenty.

For an extended period from 1998-99 to 2009-10, India's rice output stayed stuck at 85 million tonnes to 95 million tonnes, with drought years such as 2002 and 2004 seeing sharp downward blips.

As consumption hovered at 80 to 90 million tonnes in this period, shortages were more frequent than surpluses.

But after climbing to 105 million tonnes in 2011-12, India's rice production has stayed well above the 100 million-tonne mark for the last six years, even scaling110 million tonnes in 2016-17. With offtake still stuck at about 90 million tonnes, there's been persisting excess stock in the market. As a result,

in the last five years, wholesale prices of paddy have crept up at a 2.4% annual rate.



The wheat story is similar. From a yearly average of about 75 million tonnes in the decade to 2010-11, wheat output leapfrogged to average 94 million tonnes in the last six years. Output, now at 97-98 million tonnes, is now neck-and-neck with domestic demand (about 100 million tonnes) and it may only be a matter of time before it overshoots it. With rising supplies, wholesale wheat prices have inched up at a 2% yearly rate in the last five years.

Not too long ago, India was facing a severe shortage of pulses, with output struggling to keep up with the rising protein intake of the masses. But farmers have dramatically ramped up pulses production too. From an annual average of 14 million tonnes in the decade to 2010-11, it has averaged 18

lakh tonnes in the last six years. India harvested a record pulses crop of 23 million tonnes in 2017, matching the official demand estimate, thus dampening once-high market prices for a range of dals. This script of galloping surpluses dampening prices has played out in commercial crops such as sugarcane and tea too.

If unremunerative prices have dogged other crops, fruit and vegetable farmers have been up against the high perishability of their produce. In the last fifteen years, India has doubled its potato output, trebled its tomato harvest and managed a fourfold increase in onion output. But poor storage facilities and State laws that keep farmers bound to their local mandis, have exposed farmers to wild swings in prices.

Driving the output

It is noteworthy that agricultural output has held up at relatively high levels in recent years, despite erratic monsoons. This could be because the droughts in 2014 and 2015 have been far less severe than those in 2009 or 2002.

In 2014, a drought year, the country still harvested 105 million tonnes of rice, 86 million tonnes of wheat and 17 million tonnes of pulses. Hefty hikes in the Centre's Minimum Support Prices (MSPs) have also had a big role to play in farmers ratcheting up output. In the last ten years, the support prices for wheat and paddy have risen 73% and 108%

and those on pulses have trebled. In recent years, State governments have also competed furiously with the Centre, announcing bonuses and their own support prices for crops such as onions, tomatoes, potatoes and even green chillies.

Illusory profits

It is early days yet to say if recent improvements in India's farm output are here to stay. But after responding enthusiastically to signals from MSPs for many years, farmers have lately found the mechanism failing them. Market prices for many crops have tended to plunge and stay below their official MSPs for extended periods.

For one, though the Centre announces MSPs for 24 crops, the bulk of its procurement operations (via FCI) are restricted to just two — rice and wheat, with NAFED chipping in on pulses.

State-level procurement operations are even more adhoc, lacking both direction and funding. Therefore, while a farmer may plant mustard, grapes or onions in any given year based on the MSP promise, there's really no guarantee that he will get that price when he visits the mandi.

Two, even in crops where the Centre or State agencies are active, their market interventions tend to be too selective and sporadic to make any real difference to a majority of farmers. Despite the Centre doubling down on procurement in 2017-

18, it will mop up only about a third of India's rice and wheat output and a tenth of the pulses harvest. So, if good monsoons result in more crops moving into surplus zone, market forces will continue to prevail over MSPs.

Three, given that the Centre's market interventions on rice and wheat have proved so ineffectual despite large spends, it is unclear how the Centre or copycat States will fund MSPs in a host of other crops.

New fixes

To be fair, the NDA has been trying out new policy fixes to address such problems. It is piloting 'price deficiency payments' in place of MSPs to compensate farmers for price-related losses.

It plans to replace input subsidies with direct cash transfers. It has kick-started a national electronic market for produce and is nudging States to repeal their APMC Acts, which prevent farmers from selling in markets of their choice.

But its aggressive inflation-fighting efforts and on-off trade policies still work to the detriment of farmers. In the last couple of years, despite supply gluts, the Centre has continued with sizeable imports of wheat and pulses at low tariffs.

Handling of spikes

Seasonal spikes in prices of sugar, atta or rice are often met with export taxes, minimum export prices or even outright export bans.

States, on their part, continue to be quite adamant about levying high taxes and hanging on to the draconian mandis, which force farmers to rely heavily on middlemen.

This puts the Indian farmer in a 'Heads I win, tails you lose' situation. If market prices of crops hit rock-bottom, the government is helpless to rescue them. But if prices soar, the government prevents them from making hay by clamping down.

All this makes it clear why Indian farmers are seething. It's for the same reason that salaried employees are often unhappy. Who would like being rewarded peanuts, after being highly productive?"

A very lucid and yet brilliant summary of the contemporary status of Indian agriculture indeed!

3. Obviously one would like to ask: who is the leading of the architect and leading light of this great Agricultural Revolution in India? Undoubtedly he is none other than MS Swaminathan, the living legend who continues to be passionate of his field even at the age of 92! Given below is a

fitting tribute to him when he completed 90 years a couple of years ago.

A living legend: Swaminathan@90

When National Commission on Farmers that he headed in 2004-06 recommended that MSP for crops be at least 50 per cent more than the weighted average cost of production, it caught on like wild fire.

Written by **Harish Damodaran** | Published: August 13, 2015, Indian Express. 2:17 am

MS Swaminathan with Norman Borlaug inspecting a wheat field in India.

-  the field

On August 7, Monkombu Sambasivan Swaminathan turned 90. For those who know him, it came as no surprise to see the scientific face of India's Green Revolution spend that Friday delivering a lecture on '65 years of Adventure in Agricultural Research & Development' in the morning, followed by a quiet evening with family members. Nor did it surprise that he spoke with perfect clarity, non-stop for almost an hour, while reflecting on "the excitement of doing science, particularly in the field of agriculture".

Many harvests have passed between now and the first two decades of Independence when Swaminathan made the stellar scientific contributions, both on- and off-field, that led to the country's transformation from a 'basket case' to achieving foodgrain self-sufficiency. In the early 1960s, India's wheat and rice production were languishing at 10-12 million tonnes (mt) and 35-36 mt, respectively, forcing massive grain imports that crossed 10 mt in 1966-67. In 2013-14, domestic wheat output was estimated at 95.85 mt, while at 106.65 mt for rice.

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- **t is true that the people who did the actual breeding or selection of the blockbuster varieties in wheat (Kalyan Sona, Sonalika, Arjun, Janak, HD-2285 and HD-2329) and rice (IR-8, Jaya and Padma) that farmers planted in a big way aren't as well known in popular imagination — the likes of VS Mathur, SP Kohli, DS Athwal and, of course, the legendary G.S. Khush. But there isn't any doubt that the basic strategic vision underpinning the Green Revolution in India — introducing a new genetic strain or 'plant type' responsive to increased fertiliser and water application — came from Swaminathan.**

The traditional wheat and rice cultivars were tall and slender. These 'lodged' – fell flat on the ground — when they grew and their earheads were heavy with well-filled grains produced in response to high fertiliser doses.

In 1954, while at the Central Rice Research Institute at Cuttack after doing a PhD from Cambridge University and a post-doctoral research associateship at the University of Wisconsin, Swaminathan worked on a programme for transferring genes from the relatively non-lodging and fertiliser-responsive 'Japonica' rice varieties to indigenous 'Indica'

races. This approach of breeding for enhanced fertiliser response he extended to wheat after joining the Indian Agriculture Research Institute (IARI) at New Delhi later that year. Swaminathan essentially sought a reduction in plant height making it less lodging-prone. His strategy of developing semi-dwarf wheat varieties using mutagenesis — exposing plants to chemicals or radiation to introduce desirable modifications in their DNA — did not, however, work: The lowering of plant heights led to a simultaneous reduction in the size of the grain-bearing panicles or earheads!

But around this time, Swaminathan — who kept abreast of the latest crop research — had learnt of 'Norin-10', a semi-dwarf wheat with large panicles originally bred in Japan and collected by Samuel Cecil Salmon, an agronomist with the post-World War II American occupation administration under General Douglas MacArthur. This variety was used by Orville Vogel at Washington State University to breed a winter wheat, 'Gaines', containing the Norin-10 dwarfing genes and giving very high yields. Swaminathan, in 1960, wrote to Vogel, requesting for the seeds of Gaines. Vogel readily obliged, while also warning that, being a winter wheat, it may not flower in India. He further advised Swaminathan to approach Norman Borlaug, who had incorporated the same dwarfing genes through Vogel's lines into his spring wheat varieties in Mexico that were better suited for India. This was precisely what Swaminathan was looking at: A new plant type that was short and yet with normal spikes, which could use more fertiliser and water to give higher grain yields per acre.

In April 1962, Swaminathan sent a detailed proposal to the then IARI Director, B.P. Pal, seeking to invite Borlaug to India and initiate a wheat breeding programme with dwarf spring wheat material from

Mexico. The rest is history. Borlaug visited IARI in March 1963 and later on sent the seeds from the best of his semi-dwarf Mexican wheat strains, Sonora 64 and Lerma Rojo 64. The selections and varieties developed from those launched the Green Revolution. By the end of the decade, India's wheat production had crossed 20 mt. The catalyst here was clearly Swaminathan. As Borlaug put it, he deserved "a great deal of the credit … for first recognising the potential value of the Mexican wheat dwarfs. Had this not occurred, it is quite possible that there would not have been a Green Revolution in Asia". The same strategy of changing plant architecture to confer lodging-resistance and enable higher fertiliser application was followed for rice — in this case, using Taichung Native 1, an Indica variety developed in Taiwan carrying the semi-dwarf 'Dee-Gee-Woo-Gen' genes.

Swaminathan, all through this, wasn't ignorant of the side effects of the Green Revolution. As early as January 1968, addressing Indian Science Congress at Varanasi, he spoke of the dangers of "the rapid replacement of numerous locally adapted varieties with one or two high yielding strains in large contiguous areas", "intensive cultivation of land without conservation of soil fertility (that could) … lead ultimately to the springing up of deserts", "indiscriminate use of pesticides, fungicides and herbicides", and "unscientific tapping of underground water". Could anyone have been more prophetic and still clear that there was no alternative to raising yields? It was the prelude to his subsequent focus on converting the Green Revolution into an 'evergreen revolution' — "improvement of productivity in perpetuity without ecological harm", as he reiterated in his Friday address.

That same passion and genuine concern has extended to championing the cause of crop producers. When National Commission on Farmers that he headed in 2004-06 recommended that MSP for crops be at least 50 per cent more than the weighted average cost of production, it caught on like wild fire. Even Narendra Modi made this part of his poll campaign; his promise to fix MSPs by adding 50 per cent profits to farmers' input costs won many votes, though it is waiting to be implemented.

"Someday, I am sure the formula of cost-plus-50 per cent will be adopted. There is no other way", believes Swaminathan, who radiates the same youthful optimism even at 90".

Last but not the least, I very fondly remember even today my meeting him in the wheat field itself maintained by the Directorate of wheat research in Panipet. I had accompanied my son a few years ago. When enquired in the office of the then Director Dr Natarajan, we were told that he was with MS Swaminathan in the fields even at 12 noon. There we saw him with a cap on his head, inspecting the latest wheat plant varieties. We went near them. When he met me, straightaway he said to me, "DR Damodaran, This is where Green Revolution was born". I told him, "Sir, I am twice blessed!" He just smiled and wished me and we had subsequently visited the place in detail for my son to write his piece in Business Line. He was truly a modern Maharshi for India itself, worrying about the sad plight of his farmers even at the age of 92! Will any of the Governments in Centre and State fulfill one day this dream, one wonders!

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