SCOPE FOR SECOND GREEN REVOLUTION

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Rice production can be raised in eastern parts of Uttar Pradesh by leveraging fertile soil of the Indo-Gangatic plains. With sustained focus in states like Assam and Jharkhand, the eastern region has the potential to share more than half of the country's annual rice production. The eastern India shares about 53 percent of the country's rice area and produces around 47 percent of the nation's rice output. The external dependence on edible oil and pulses for imports costs the exchequer in terms of huge import bills. The strategy to reclaim fallow lands for cultivation of soyabean, sunflower, mustard and pulses will reduce the burden of imports to meet growing domestic demand.

India witnessed the first Green Revolution in the late sixties and early seventies, making the nation self-sufficient in grain production in subsequent years. Now, the nation gears up for a Second Green Revolution in agricultural production, after over five decades since the first revolution. This revolution is the need of the hour to ensure higher level of income in the countryside in days ahead.

Indian economy is at a crossroads after sixty eight years of independence. The country's economy has to grow at a sustainable way by ensuring a balanced regional growth. The farm sector is the backbone of the national economy as majority of the population is still dependent on the primary sector, directly or indirectly. Farming continues to be the main source of livelihood for an overwhelming majority.

Prime Minister Narendra Modi has put high priority to usher in a Second Green Revolution, involving eastern Uttar Pradesh, Bihar, West Bengal, Jharkhand, Odisha and Assam. This revolution, based on a balanced and comprehensive integrated plan, will be able to change lives of farmers by ensuring stability in income against the erratic monsoon season, marked by frequent drought and flood, if the rains turn deficient or surplus.

The next revolution will raise productivity of the Indian farmers who still lag behind in terms of availability of good quality seeds, adequate water, power, right price and market for their produce. **The second Green Revolution ought to take place in eastern India where water, sunlight, fertile soil are in abundance.**

The first Green Revolution aimed at promoting mass production, while the Second Green Revolution is required to create sustainable livelihood security for the poor and eradication of poverty by generating gainful employment avenues. This focus ensures Mahatma Gandhi's philosophy of empowering the poor for an equitable distribution of the nation's prosperity, which the Prime Minister repeatedly highlights.

India's First Green Revolution refers to a series of research and development and technology transfer initiatives during the sixties in the northwest region under the leadership of Norman Borlaug, an American biologist. The first revolution in the farm sector saved Indian masses from starvation by raising production of grains through development of high-yielding varieties, expansion of irrigation infrastructure, adoption of modern farm management techniques, and distribution of hybrid seeds, synthetic fertilisers and pesticides to farmers' doorsteps. In 1970, Borlaug was awarded the Nobel Peace Prize for his contribution to promotion of world peace by ensuring food supply in Mexico and Indian sub-continent.

The Indian government selected Punjab to be the first site to try the new crops because of its reliable water supply and a history of agricultural success. India began its own Green Revolution programme of plant breeding, irrigation development, and financing of agrochemicals in the sixties.

The first farm sector revolutionised production scenarios. In the sixties, India's rice yields were about

Area (million ha) under Rice Cultivation eastern states

STATE	YEAR				
	2008-09	2009-10	2010-11	2011-12	2012-13
Assam	2.48	2.50	2.57	2.54	2.49
Bihar	3.50	3.21	2.83	3.32	3.30
Chhattisgarh	3.73	3.67	3.70	3.77	3.78
Jharkhand	1.68	1.00	0.72	1.47	1.41
Odisha	4.45	4.37	4.23	4.00	4.02
West Bengal	5.94	5.63	4.94	5.43	5.44
Eastern UP	3.16	2.99	3.13	3.13	3.16
Total	**24.94**	**23.37**	**22.12**	**23.66**	**23.6**
India	**45.54**	**41.92**	**42.86**	**44.01**	**42.75**

two tonnes per hectare; by the mid-nineties, yields rose to six tonnes per hectare. In the seventies, rice cost about $550 a tonne; in 2001, it cost under $200 per tonne. India became one of the world's most successful rice producers, and even turned a major exporter of the grain, shipping nearly 4.5 million tons in 2006.

But the almost stagnated agricultural production during last couple of decades has to grow again to ensure supplies to feed and sustain the increasing population in the world's second most populous country.

Initiated measures like 'Soil Health Card' scheme and government's theme of 'per drop, more crop' will be aggressively put into action at the farmer's field under the scheme of operations for the next revolution in the farm sector.

Under the scheme of plan to usher the next revolution, the government plans to put thrust on raising productivity of crops like rice, wheat, coarse cereals, pulses and oilseeds in the eastern region. Through applications of improved technology interventions like use of high yielding seed varieties, efficient use of water resources, timely dose of fertilisers and micro nutrients, the production of food crops such as rice and wheat can be raised substantially.

It has been found that in a state like Bihar, rice production can be doubled with the use of combination of factors like use of improved seed varieties, timely irrigation and fertiliser shots, adoption of modern farm practices.

Rice production can be also raised in [illegible]ern parts of Uttar Pradesh by leveraging ferti[illegible] soil of the Indo-Gangatic plains. With sustained foc[illegible]s in states like Assam and Jharkhand, the eastern region has the potential to share more than half of the country's annual rice production. The eastern India shares about 53 percent of the country's rice area and produces around 47 percent of the nation's

Production (mt) of milled rice in eastern states

STATE	2008-09	2009-10	2010-11	2011-12	2012-13
Assam	4.01	4.34	4.74	4.52	5.13
Bihar	5.59	3.60	3.10	7.16	7.53
Chhattisgarh	4.39	4.11	6.16	6.03	6.61
Jharkhand	3.42	1.54	1.11	3.13	3.16
Odisha	6.81	6.92	6.83	5.81	7.30
West Bengal	15.04	14.34	13.05	14.61	15.02
Eastern UP	6.99	5.84	6.73	7.32	7.59
Total	**46.25**	**40.69**	**41.72**	**48.58**	**52.34**
India	**99.18**	**89.09**	**95.98**	**105.31**	**105.24**

Area, production and yield of Wheat in eastern states

State	2010-11			2011-12			2012-13			2013-14		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y
Assam	40	50	1179	53	60	1147	34	44	1304	31	40	1290
Bihar	2100	4100	1948	2142	4725	2206	2208	5357	2427	2009	4738	2358
Chhattisgarh	107	1225	1144	109	133	1227	101	141	1396	103	134	1301
Jharkhand	100	160	1642	159	303	1908	164	319	1944	174	370	2126
Odisha	1.4	2.04	1458	1.46	2.4	1644	1	2	1894	1	1	1000
Uttar Pradesh	9640	30000	3113	9731	30293	3113	9734	30302	3113	9839	29891	3038
West Bengal	320	870	2760	316	873	2765	322	896	2786	332	928	2795

Area in 000 ha, Production in 000 tonnes and yield in kg/ha

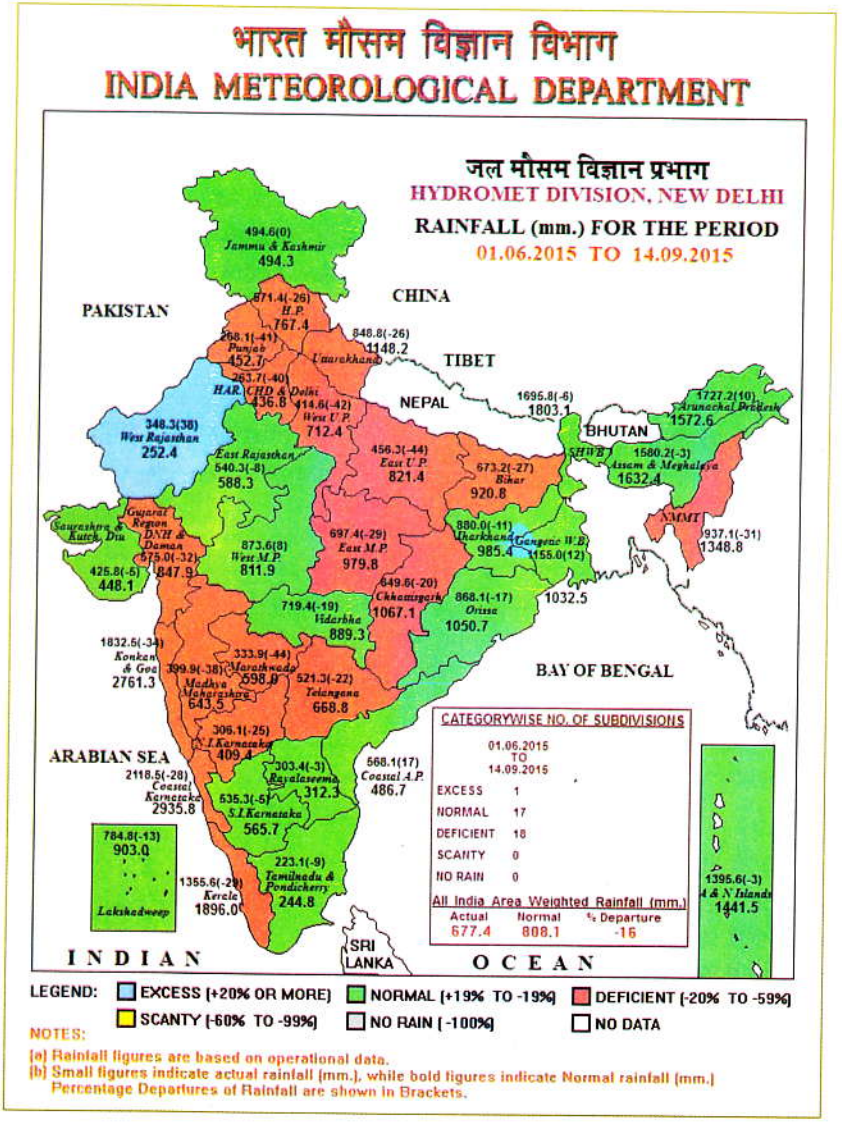
rice output. The government aims at popularising adoption of stress tolerant rice varieties, both for drought and flood in the eastern belt.

The government aims to bring around seven million hectares of fallow land under cultivation in the eastern region. These fallow lands can be used for the cultivation of pulses and oilseeds, promising high returns to small and marginal farmers in these regions where land holdings are small and scattered.

The first green revolution brought in food security in grains production but did not result in self-sufficiency in oilseeds and pulses production. The next revolution aims at reducing import dependency for edible oil and pulses through promotion of domestic production.

India is the world's top edible oil importer as supply falls far short of demand. The country is also one of the world's leading importers of pulses. The external dependence on edible oil and pulses for imports costs the exchequer in terms of huge import bills. The strategy to reclaim fallow lands for cultivation of soyabean, sunflower, mustard and pulses will reduce the burden of imports to meet growing domestic demand.

Another strategy to raise production from a piece of farmland is to promote second cropping technique. The strategy relates to promoting sowing of wheat crop just after the harvest of



Constraints for low productivity of crops in Eastern India

- Low spread of hybrid and high yielding varieties
- less adoption of improved agronomic practice
- Imbalance use of fertilizers
- Salinity in coastal areas and acidic soil in lateritic belt
- Low level of farm mechanization
- Small and fragmented land holdings
- Lack of infrastructure for seed production, certification and seed storage
- Large area is under rainfed conditions
- Occurrence of natural calamities (frequent floods and droughts).
- Lack of marketing & transport infrastructure, primary processing and storage

Source: Agriculture Ministry, GoI.

paddy wherever the field is under assured irrigation facilities. Intercropping of horticulture crops will also be encouraged for extra income.

Strategies for the Second Green Revolution also include creating irrigation structures like farm ponds, lift irrigation point to improve irrigation potential and cut excessive dependence on monsoon rainfall.

Every year, the monsoon retreat from the western region from September after remaining active for four months from June. The country witnessed two successive deficient monsoon since 2014. But the resilience of the Indian farm sector was demonstrated when the monsoon rainfalls were deficient by 12 percent last year, but the grain production dropped only by 4.7 percent in the crop year to June, 2015.

In 2015, the June to September monsoon season also set to be deficient though a healthy distribution over main crop growing areas had helped evade a widespread drought.

The summer rains are the lifeline of the rural economy as the agriculture sector shares around 14 percent towards the national economy. The success of the monsoon is critical for consumer demands in rural areas for goods like cycles, refrigerators. If the monsoon fails in a year, then that year usually witnesses distress in rural areas, reflected in terms of slide in income, rise in unemployment and in extreme case resulting in farmers' suicides. The excessive dependence on the monsoon rains has to be minimised by raising productivity in rainfed areas through technology intervention by using drought or flood resistant seed varieties.

Farmers will also be encouraged to adopt farm machineries and implements that are suitable for small land holdings. The strategies also include creating infrastructure such as warehouse, procurement centre, marketing infrastructure. Farmers in the eastern region will be provided with global research experience at their fields with tailor made advisories from Central Rice Research Institute (CRRI), State Agricultural Universities (SAUs) and Indian Council of Agricultural Research (ICAR) affiliated institutions.

Prime Minister Narendra Modi has already set an agenda for making India a developed nation in near future. This agenda for growth is based on balanced and equitable regional growth. On several occasions, he has highlighted the need to have a higher growth in the eastern region for ensuring the balanced growth of the nation. It is necessary to ensure a higher growth in the farm sector to sustain a double digit growth for the entire economy.

A Second Green Revolution will ensure higher production of grains by realising higher productivity for rice, wheat, maize, oilseeds in the eastern region. Another revolution in the farm sector is unlikely to take place in the north-western grain bowl region of Punjab and Haryana where production and productivity for most of the food crops have been saturated with not much room left for increasing overall output.

The next green revolution has the mandate to ensure food security for the world's sizeable population that live in the South Asian country where children suffer from malnutrition and hunger.

The second revolution is vital for ensuring green a balanced regional growth in the country, an agenda dear to the Prime Minister. In fact, the next agricultural revolution is a necessity for India to feed growing number of mouths. This should happen at the earliest to give a cushion against any spurt in food prices due to supply shortage that may even lead to social unrests. Everything can wait, but not the next green revolution.

(The author is a Delhi based senior freelancer. He has worked with Reuters, PTI & Dow Jones)