

India's preparedness for *zero hunger*

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While the geo-political progression is underway, the prime challenge with the humankind is to ensure food for all. And rightfully, the World Food Day 2018 has called for increased action to achieve Zero Hunger by the year 2030. It is time that the world leaders and key global players declare their commitment to eradicate hunger from this planet. The target is alarming that still 821 million people in the world suffer from chronic hunger and almost five million children, under the age of five, die of malnutrition-related causes every day. It is also a great cause of concern that one-third of all the food produced in the world is lost or wasted, while roughly 1,900 million people are overweight, and 672 million of these are obese and 3.4 million die due to obesity or overweight every year, narrating a storyline that the world produces enough food to feed every human. Meanwhile, the World Food Program of the United Nations has envisaged the expected outcome of the zero hunger to be as below:

- Saving the lives of 3.1 million children a year.
- Enabling well-nourished mothers have healthier babies to have stronger immune systems.
- Ending child undernutrition could increase a developing country's GDP by 16.5%.
- A dollar invested in hunger prevention could return between \$15 and \$139 in benefits.
- Proper nutrition early in life could mean 46% more in life time earnings.
- Eliminating iron deficiency in a population could boost workplace productivity by 20%.

- Ending nutrition-related child mortality could increase a workforce by 9.4%.

Over all, the Zero Hunger programme can help build a safer and more prosperous world for everyone to be healthy.

This implies that the global food security, while it remains a challenge, is also a great deal of concern to make our food nutritious. In this direction, it is important to develop a framework for R&D for linking food security with nutritional security issues. This would only be possible with global networking for local level actions. In this regard, India has transformed its food shortage level in the early 1970s to a self-sustaining nation as far as foodgrain production is concerned, raising the bar for a largely populated country to have enacted the National Food Security Act by 2013.

Right to Food

India is aware of this truth that 1 of every 6 people on the planet lives in India, and between the 2001 and 2011 census, the country grew by 17.6%, adding 181.5 million people

and country's population has doubled in size in just 40 years. Therefore, the Government of India launched a Centrally Sponsored Scheme 'National Food Security Mission' in October 2007 to increase the production of rice by 10 million tonnes, wheat by 8 million tonnes and pulses by 2 million tonnes in five years' time. The systematic interventions together with appropriate investments made the Government to achieve and go beyond the revolutionary targets. This success enabled the Government to introduce Right to Food Bill in the Parliament in 2012 and finally the act got passed in 2013.

Recognizing our share of world hunger, the National Food Security Act (NFSA) guarantees 5 kg of foodgrains per person per month at subsidized prices of ` 3/2/1 per kg for rice/wheat/coarse grains through public distribution system in order to enhance food access to about two-thirds of our population (roughly 800 million people as of 2015). Yet another scheme of the Government of India, 'Antyodaya Anna Yojana' has also provisions of food access to the poorest of the poor in the society, who can receive 35 kg of foodgrains per household per month through targeted public distribution system. Of late, the NFSA has a few added features in the present day context to also enable nutritional security linked to this Right to Food platform. Accordingly, research and development efforts have been activated to have robust bio-fortified varieties of principal crops that could be finally made available to the general public through the existing public distribution system and also retail market network.

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Towards Food and Nutritional Security

The production of rice, wheat, pulses, nutri/coarse cereals and total foodgrains in India which was about 93 million tonnes, 76 million tonnes, 14 million tonnes, 34 million tonnes and 217 million tonnes, respectively in 2006-07, the base year for NFSM, has enhanced to roughly 113 million tonnes, 100 million tonnes, 25 million tonnes, 47 million tonnes and 285 million tonnes, respectively, in 2017-18. Thus, in just over a decade, the production of rice, wheat, pulses, nutri/coarse cereals and total foodgrains in India enhanced by 20 million tonnes, 24 million tonnes, 11 million tonnes, 13 million tonnes, and 68 million tonnes, and their per hectare productivity enhanced by 439 kg, 647 kg, 247 kg, 778 kg and 487 kg, respectively.

In order to increase the production of food crops in India, the Indian Council of Agricultural Research (ICAR) led the National Agricultural Research System (NARS) in developing location-specific new high yielding varieties/hybrids and their matching production and protection technologies of food crops. As a way forward to take the new varieties to the farmers' fields, the ICAR also shoulder the responsibility to produce breeder seeds that the developmental agencies multiply and mass produce for the farmers. But for such an institutional arrangement towards enhancement of productivity, the country could not have achieved thumping production for food security. For instance, 541 high yielding climate-resilient varieties/hybrids were developed and notified for commercial cultivation. Likewise, about 415 thousand quintal breeder seeds of food crops were also produced and distributed to different states during the last five years.

Furthering research in agricultural sciences has been focusing on employing molecular tools in breeding techniques to insulate high yielding varieties/hybrids against major biotic (diseases and pests) and abiotic stresses (heat, drought, cold/frost, salinity/alkalinity, acidity, etc.) of food crops with a great success. As one of the first products of this

effort, a bacterial leaf blight resistant variety of rice namely Improved PusaBasmati 1 was developed by successfully employing marker-assisted selection (MAS) through pyramiding of xa13 and Xa21 genes from the source variety IRBB 55 in the genetic background of Pusa Basmati 1. As of now, over 26 varieties/hybrids of different field crops have been developed using MAS technique and released for cultivation comprising 20 of rice, one each of wheat and pearl millet, and four of maize.

Drought tolerant varieties of rice (Sahabhazi Dhan, DRR Dhan 42, CRR Dhan 200 series) and wheat

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(PBW 527, HI 1500, HI 1531, HD 2888, etc.) to overcome the drought effect and increase production of these crops in adverse climatic conditions have been notified for commercial cultivation. For water-logged conditions, Swarna sub1 and IR 64 sub1 are the two rice varieties that can give reasonable yield even in submerged conditions. For promoting diversification in irrigated rice-wheat cropping system and also for crop intensification in other cropping systems, short duration climate resilient varieties of pulses namely JG 14, JG 11, JAKI 9218 and Phule G 8517 of chickpea and IPM 205-7 (Virat), IPM 02-3, IPM 2-14, HUM 16, and TMB 37 varieties of mungbean have helped in introducing the pulses, creating new niche and cropping systems.

In an effort to address the issues of malnutrition in the country, the ICAR

instituted a research platform on bio-fortification, and developed bio-fortified varieties/hybrids of food crops possessing higher nutritional quality like high zinc varieties of rice (DRR Dhan 45 and Chhattisgarh Zinc Rice 1), high protein variety of rice (CR Dhan 310); high zinc and iron varieties of wheat (WB-2 and HPBW-01); high quality protein varieties of maize (Pusa Nutri Q Makka 1, Pusa Nutri Q Makka 2, Pusa Nutri Q Makka 3 and Pusa Nutri Q Makka 4); high zinc and iron varieties of pearl millet (AHB 1200, Pusa 1201, Pusa Composite 443 and HHB 299); and high iron containing variety of lentil (Pusa Ageti Masoor). So far, 17 bio-fortified varieties have been developed and released. Similarly, we have bio-fortified varieties in vegetable crops such as cauliflower and sweet potato. In fruits, an iron-rich pomegranate variety Bhagwa is being promoted across the country.

Another major step towards addressing malnutrition is promotion of traditional crops, particularly millets that are known as nutri-cereals. Adapted to harsh environment of the semi-arid tropics, the millets are the backbone for dryland agriculture, as they can withstand high temperatures and grow on nutrient poor soils with little or no external inputs. The millets are nutritionally superior to wheat and rice owing to their higher levels of protein with more balanced amino profile, crude fiber and minerals such as iron, zinc, and phosphorous and can also help tackle health challenges such as obesity, diabetes and lifestyle problems as they are gluten free, have a low glycemic index and are high in dietary fibre and antioxidants. The Government of India, on 18 July, 2017, decided to start distributing millets under Public Distribution System (PDS) to improve nutritional security and subsequently, on the basis of the recommendations of NITI Aayog, the NFSM-Coarse Cereals has been divided into two components: NFSM (Makka and Jau) and Sub Mission on Nutri-Cereals covering Sorghum, Pearl Millet (Bajra), Finger Millet Little millet, Kodo millet,

Barnyard millet, Foxtail millet and Proso millet in 202 districts of 14 states of the country. As a contingent plan, the cultivation of millets is very suitable for small and marginal farmers. Further, procurement through profitable MSP and inclusion in the mid-day meal schemes in schools shall strengthen millet-based nutritional support system in the country.

Realizing pulses as a cheaper protein source, the Government felt the need for promoting pulses and also set targets for brining self-sufficiency in the country. In this effort, to augment the availability of quality seeds of newly developed high-yielding varieties of pulses in the major pulses growing districts of the country, the Union Agriculture Ministry launched a project for establishment of 150 Seed-Hubs on Pulses at 97 KVKs and 53 ICAR Institutes/SAU-AICRP Centres across 24 states with budget outlay of over ₹22,500 lakh for 3 years since Kharif 2016. These Seed-Hubs on Pulses produced 52,422 quintal seed in 2016-17 and 1,11,801 quintal in 2017-18. Further, as a measure to strengthen the existing seed chain of pulses with newly notified high yielding varieties, the Ministry also launched another project in kharif 2016 for development of seed infrastructure with a budget outlay of 2,039 lakh and produced additional 6005 quintal breeder seed of pulses during 2016-17 and 4,862 quintal in 2017-18. Along with the NFSM-pulses scheme, which is being implemented in 638 districts of all the 29 states of the country since 2016 kharif, and strong policy support in terms of remunerative MSP, price stabilization, procurement, buffer stock and area expansion of pulses in rice fallows, these two interventions of ICAR on the seed front have eventually resulted in an unprecedented enhancement of 54.3% in pulses production in just two years, raising the production of pulses from 16.35 million tonnes during 2015-16 to 25.23 million tonnes during 2017-18.

Food Loss Management

The farm mechanization in

agriculture is advocated for enhancing the efficiency of food production processes as it enhances crop productivity by 15-20%, cropping intensity by 5-22%, and gross income to the farmers by 20-30% by potentially reducing the cost of production by ca. 20-25%. At the same time, huge post-harvest losses are reported in the country. A very comprehensive survey for assessment of harvest and post-harvest losses for 45 crops and livestock produce has been carried out in 107 districts of India covering 14 agro-climatic

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zones. The report revealed that the range of harvest and post-harvest losses was up to 6% for cereals, 8% for pulses, 10% for oilseeds, 18% for fruits, 13% for vegetables, 9% for plantation crops and spices, and 11% for livestock produce. In this endeavor too, the ICAR is handholding establishment of 150 agro-processing centres at the district level for processing and value addition of agro-produce available locally, as sponsored by the Union Ministry of Food Processing Industries. As an effort towards doubling of farmers' income, establishing value chains for various agricultural commodities are being worked out and shared with the line departments for promotion.

Trans-boundary plant pests and diseases are a threat to food security. Locusts, wheat rust, wheat blast, armyworm, fruit flies, banana diseases, cassava diseases are among the most destructive trans-boundary plant pests and diseases. This calls for workable biosecurity measures and

stringent regulations to ensure safe agriculture in this country. Over the years, a total of 64 pests including 5 fungi, 17 viruses, 24 insects/ mites, and 16 weeds of quarantine significance for India have been intercepted in exotic germplasm imported into the country. If any of these pests were not intercepted, they could have been introduced into the country and established. If introduced, they would have caused an annual yield loss of 0.1%, as estimated in a study of ICAR. Possible yield losses have been calculated for maize, wheat and soybean based on their production and their minimum support price (MSP). A loss of revenue of ₹1,315.9 million for maize (during the year 2013-14); ₹263.25 million for soybean (during the year 2014-15) and ₹11,224 million for wheat (during 2015-16) was estimated due to trans-boundary pests and diseases, had they not been intercepted by the Indian agencies.

Conclusion

India has addressed the legislative and administrative, agricultural R&D, targeted public distribution system, trade policies and all other issues to ensure food and nutritional security of its over 1.3 billion people and doing its bid whole-heartedly and is also ready to respond very earnestly to FAO's call for Zero Hunger by 2030. To achieve this impeccable target, it is time we necessitate new strategies to reduce malnutrition by bringing changes in food systems. Novel ideas such as nutri-gardens, nutri-farms and nutri-smart village concepts should be piloted for upscaling and outscaling apart from achieving climate resilience and sustainability in food production through diversified agriculture per se. Further, policy re-alignments and convergence of government programs shall fortify better efficacy of program outputs, and be linked to the One Health Program of the Government of India.

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