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GUEST EDITORIAL

Achieving the sustainable development goals

Recently, the Member States of the United Nations approved a set of 17 Sustainable Development Goals (SDGs) to be implemented through 169 specific targets. These will take the place of the UN Millennium Development Goals which had a target date of 2015 for fulfilment. India has been able to achieve the target of reducing poverty by half by 2015, but the goal of reducing hunger by half is yet to be achieved. The SDGs are based on the concept that our social and economic development objectives must be rooted in the principles of environmental, social and economic sustainability. It is therefore important that we develop multi-disciplinary approaches with community participation for developing an effective implementation strategy.

We would like to illustrate the action needed for a few of the SDGs to indicate the next steps at the national level. Goal 2 deals with 'End hunger, achieve food security and improved nutrition and promote sustainable agriculture'. Sustainable agriculture is the foundation for achieving the other goals of food and nutrition security. Fifty years ago our country was leading 'a ship to mouth' existence, since we had to depend upon the arrival of wheat from USA under its PL480 programme for operating the public distribution system. In 2013, our Parliament approved a National Food Security Act which confers the right to food to all those who need social protection against hunger. This transition from 'ship to mouth' to 'right to food' with home grown food is a historic transition, since no other country has at the moment legislative provision for making access to food a legal right. Access to food as a basic human right has, however, been advocated from the days of the Roman philosopher Seneca, who pointed out 'a hungry person listens neither to reason nor religion, nor is bent by any prayer, he needs food today'. To sustain the Right to Food Act, we need to ensure that human numbers and human capacity to produce food are in balance.

Hunger has three major dimensions, viz. deficiency of calories, inadequate protein consumption, and lack of adequate quantities of micronutrients like iron, zinc, iodine, vitamin A, vitamin B12, etc. in the diet. We can produce enough food for the present and future populations if we adopt the evergreen revolution pathway of increasing crop production (Kesavan, P. C. and Swaminathan, M. S., *Curr. Sci.*, 2006, **90**(2), 145–146). This pathway is based upon integrating ecological principles in technology development and dissemination. An evergreen revolution involves increase in productivity in perpetuity without ecological harm. The evergreen revolution pathway helps overcome some of the environmental problems often associated with the green revolution technologies like groundwater pollution and depletion, soil erosion and genetic homogeneity leading to genetic vulnerability to pests and diseases. Eco-agriculture will help produce the quantity of food we need to feed the public distribution system according to the commitments under the Food Security Act, since we still have a large untapped production reservoir.

The problems of protein and hidden hunger will still remain. Protein hunger is becoming more widespread because of the high cost of pulses, resulting from an adverse demand–supply situation.

A study by Assocham Chamber has indicated that India may have to import 10 million tonnes of pulses to meet its needs. This reminds us of the situation in 1966 when we had to import 10 million tonnes of wheat largely under the PL480 programme of USA. Internationally we were then described as a 'ship to mouth nation'. We were determined to change this situation and before the end of the 60s, the country witnessed the wheat revolution and the more general green revolution. Such a change in our food situation came about through a combination of scientific skill, political action and farmers' enthusiasm.

The same symphony approach could bring about similar results in the case of pulses. In all our major pulse crops, namely chickpea, pigeon pea, lentils, urad and moong bean, our average yield is less than one tonne per hectare. The average yield can be easily doubled with technologies on the shelf through efficient extension and public policy support in the areas of pricing and procurement. There is need for greater attention to improving soil health, good quality seed production and supply, appropriate mechanization, improved post-harvest technology, community management of plant health, assured and remunerative marketing, and farmer-friendly import–export policies. There are also opportunities for expanding the area under pulses in rice fallows and through inter- and multiple cropping.

2016 is the International Year of Pulses. We should try to make this year (2016) a significant landmark in our

efforts to achieve self-sufficiency in pulse production, just as we did in the case of wheat in 1966. The M.S. Swaminathan Research Foundation (MSSRF), Chennai has initiated a programme of promoting the concept of 'Pulse Panchayats', where all the farmers in a Panchayat cooperate in areas like rainwater harvesting and efficient use, crop health management and safe storage, and value addition to primary products. The first such Panchayat is in the Edaiyappatti village, Tamil Nadu. Such Panchayats will result in the origin and growth of pulse revolution symphonies, just as Seed Villages and National Demonstration did in the case of wheat 50 years ago.

As regards micronutrient deficiencies, the biofortification pathway is both economical and effective. There are biofortified plants in nature such as moringa, sweet potato, and a wide range of vegetables and fruits. Many of them are rich in micronutrients like vitamin A, vitamin B12, iron, zinc, etc. We can also develop biofortified varieties of crops through Mendelian breeding. A good example is the iron-rich pearl millet developed by a breeding company in collaboration with ICRISAT in Hyderabad. The third method of biofortification is genetic modification. In 1992, Ingo Potrykus (Swiss Federal Institute of Technology, Zurich) and Peter Beyer (University of Freiburg, Baden-Württemberg, Germany) started a project to genetically engineer rice plants to produce beta-carotene in the endosperm. The food grains produced by genetic engineering, however, are not currently acceptable owing to biosafety considerations. Therefore, naturally occurring biofortified plants should be the crops of choice from the point of view of ending micronutrient malnutrition.

Obviously, the SDGs require an inter-disciplinary approach. At the request of the Indira Gandhi National Open University, we have designed a course on sustainability science. This course helps impart knowledge on the economic, environmental and social dimensions of sustainability. We suggest that all our universities should develop and introduce in the curriculum a multi-disciplinary course on sustainability science. This will help in accelerating progress in achieving the objectives of SDGs.

An important requirement for ensuring the sustainability of agricultural production is the effective implementation of SDG 13 and 14, viz. 'Take urgent action to combat climate change and its impacts'. Goal 14 states 'Conserve and sustainably use the oceans, seas and marine resources for sustainable development'. On 1 October 2015, the Government of India announced that it will take the following two actions to contribute to the mitigation of climate change:

- Reduce by 2030 the emission intensity of the GDP by 32–35% from the 2005 level.
- Generate about 40% of electric power installed capacity from non-fossil fuel-based energy resources by 2030 (i.e. nuclear, solar, wind, biomass and biogas).

In addition, we should try to enlarge the food basket by adding in the public distribution system, millets and other drought-tolerant but nutrition-rich crops. In the field of energy, every farm in the rural areas should have a biogas plant, a few fertilizer trees (i.e. those which fix atmospheric nitrogen) and a rainwater harvesting pond. Since we have a long coastline, there is a need to ensure that sea-level rise does not lead to the emergence of climate refugees and also cause damage to crops due to salinity. Ninety-seven per cent of the world's water is sea water. In this connection we should promote along the coast, biosaline farms where halophytes or salt-tolerant plants are cultivated. The technology developed by farmers in the Kuttanad area of Kerala for growing crops below sea level also needs to be perfected and promoted. The work of the Kuttanad farmers has been recognized by FAO by conferring the status of a Globally Important Agriculture Heritage Site to this farming area. Kuttanad farmers grow one crop of rice during the monsoon season and one crop of fish during the non-rainy season. Salinity management holds the key for successful agriculture and for this purpose, biobunds are being constructed. Unlike the concrete bunds, characteristic of the polder lands of the Netherlands, the bunds of Kuttanad are made of biological material like coconut fibre and clay. The Government of Kerala has recently decided to establish an International Centre for Research and Training in the field of below sea level farming in Kuttanad. Such an Institute will be helpful to countries threatened with the prospect of sea-level rise, such as Maldives, Sri Lanka and the Sunderbans area of Bangladesh and West Bengal, India. The world requires 50% more rice in 2030 than in 2004, with approximately 30% less arable land of today.

Following the tsunami of 26 December 2004, small-scale fishermen going out in small wooden boats are worried about wave heights at different distances from the shoreline. It is now possible to provide them on their mobile phones, information on wave heights at different distances from the shore. This is possible because of the data provided by the Indian National Centre for Ocean Information Services, Hyderabad. There is no time to relax in developing strategies for insulating our coastal communities from the impact of sea-level rise, since over 20% of our population lives near the seashore.

Climate change can be a mega catastrophe unless we take steps to convert the potential calamity into an opportunity for sustainable food security and economic development.

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