

Food and nutritional security

I have read with interest the Guest Editorial entitled 'Food for all in anthropocene era' by M. S. Swaminathan (MSS) and P. C. Kesavan (PCK)¹. MSS is known to many of us as a world leader in the field of agriculture, and we have always admired him and derived inspiration from the way he provided this leadership. Therefore, it was rather spontaneous for me (like many others) to read the editorial with great interest. It addresses an important issue involving food and nutritional security at the global level. Several new concepts that have been covered in this editorial include the following: farming system for nutrition (FSN), naturally biofortified plants, gardens of biofortified crops, agri-horticultural remedies for nutritional maladies, training of Community Hunger Fighters, etc. A reference has also been made to the concept of 'evergreen revolution' earlier proposed and regularly advocated by MSS during the last 20 years; this concept as mentioned in the editorial was adequately covered in the book entitled *From Green to Evergreen Revolution* that was edited by MSS and published in 2010. On almost the same subject, PCK and MSS authored another book entitled *Evergreen Revolution in Agriculture: Pathway to Green Economy* that was published in 2012, and reviewed by me for *Current Science*². In this book, the authors also outline the wrongs done to the environment by the green revolution, which otherwise saved millions of people, who would have become a part of an epidemic for hunger and thus faced starvation during 1960s and 1970s.

The concepts of 'FSN' and 'gardens of fortified crops', proposed earlier by MSS³ and reiterated again in the editorial are both novel and appealing. The editorial also suggests implementation of eco-agriculture to provide agri-horticultural remedies for nutritional maladies. It has also been emphasized that there is a need of greater nutrition literacy on the part of the consumer, where 'Community Hunger Fighters' could be trained, who could then suggest agricultural solutions for the major nutritional deficiencies in targeted human populations.

The editorial also calls for reducing the use of chemical inputs, which adversely impact the earth's cycles and also contribute to greenhouse gases. With the

help of published literature, it has emphasized that farming without excessive use of chemical fertilizers may not have any yield penalty; instead it may stabilize and bring about further improvement in yields. In this connection, integrated nutrient supply and integrated pest management have been advocated as parts of the evergreen revolution methodology.

The editorial, however, evokes several questions. For instance, although the ideas and the need for the implementation of the above concepts are most appealing, one wonders about the feasibility and methods which a country like India or the plant breeding community at the global level should follow for the implementation of these concepts. One would like to know how can the Government of India or institutions like the Indian Council of Agricultural Research (ICAR) may implement these concepts. We need a feasible work plan for implementation of the proposed concepts at the grass-roots level. No such plan has been proposed either in the editorial or in the book, published in 2012, and no reference has been made to any literature that could help in the implementation of the proposed concepts. One also wonders, that having tremendous influence on the national agriculture system in our country, why has it not been possible for MSS to get these concepts implemented, or future plan prepared for this purpose.

Several possibilities for implementation of the concepts discussed in the editorial can be visualized. For instance, extension activity at a large scale could be undertaken, where the farmers (or even the households having land for kitchen gardens) are educated about the utility of this system, including the financial gains or gains in terms of nutritional security, which at present is not available to two billion people across the globe. This extension activity will also require a work plan at the national level that may be implemented through the national agriculture research system (NARS), including ICAR. Such a major plan and programme may or may not be possible in the present scenario in a country like India, and even elsewhere.

2. Gupta, P. K., *Curr. Sci.*, 2014, **106**, 104–105.
3. Swaminathan, M. S., *Curr. Sci.*, 2016, **111**, 965.

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Response:

In the first part of the letter, Gupta has rightly brought out several of my earlier publications to transform the green revolution into an evergreen revolution, largely to remove the environmental and social harm caused by the former. The evergreen revolution integrating eco-agriculture and on-farm and non-farm eco-enterprises is designed to fight both the famines of food and rural livelihoods. It is known that the green revolution was not kind to the alluvial soils of Punjab, rich agrobiodiversity and also it did not ensure food security at the household level of resource-poor millions of women and men due to lack of access. Paradox of 'mountains of grains on one hand, and millions of hungry people on the other' described the scenario. The systems-based approach of evergreen revolution provides enhanced opportunities for rural livelihoods and income generation to access to food.

The threat to global agricultural production is not only because of environmental degradation and burgeoning human population. The earth has entered a new human-made geological epoch called 'Anthropocene'. This is not merely a climate change risk, and it encompasses the entire planetary functions. It also refers to the vitiation of nitrogen cycle, carbon cycle, hydrological cycle, phosphorus cycle, etc. All these would have direct impact on agriculture as also the sea-level rise, increase in night temperature, etc. These cannot be tackled with a 'business as usual' approach. Instead, they require a radical systems-based approach using technologies that have a proven track record as being eco-friendly

1. Swaminathan, M. S. and Kesavan, P. C., *Curr. Sci.*, 2016, **111**, 1435–1436.

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and socially inclusive. In this context, whatever I have published so far as editorials in *Science*, *Current Science* and other scientific articles in journals are based on my concepts, some of which have also been put into practice in the M. S. Swaminathan Research Foundation (MSSRF) sites in Tamil Nadu, Puducherry, Kerala, Maharashtra, Odisha, Andhra Pradesh, etc. MSSRF also conducts training and capacity-building programme for the resource-poor small and marginal farmers in these places. Many such farmers as well as marginal fishers and landless labourers in several villages have economically profited by the same. However, as a research foundation MSSRF can implement the new concepts only in a few villages and its highly limited resources do not permit the extension of these various strategies to all over India.

Gupta is absolutely right in his concern to implement them at the national level. In fact, some of these ideas and strategies have already been included in the Farmers' Commission Report submitted to the Government of India in 2006. It is known that implementation of various programmes needs political support as well.

The implementation of concepts such as FSN at the national level (possibly involving more than 600,000 villages of India) is the need of the hour. The editorials in scientific publications put the new scientific ideas and concepts for wider dissemination and also critical evaluation by several distinguished scientists like Gupta. To that extent, these publications have served the purpose.

Under these circumstances, it is hoped that science-based strategies and models to sustain agricultural productivity in

anthropocene would be favourably considered by ICAR, the Ministry of Agriculture and planning bodies. The implantation should not be difficult in view of the fact that there are over 60 agricultural universities and several hundreds of Krishi Vigyan Kendras and many Home Science Colleges to implement training, and capacity building the resource-poor farmers to transform their subsistence farms into vibrant FSNs. Details of the training, capacity building as well as the resources required for these need to be discussed in different fora and not in scientific journals.

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