

Improving agriculture productivity and profitability through new technological innovation

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Thousands of farmers had recently assembled in Delhi to express their concern relating to the economic viability of farming. It is unfortunate that farmers have come to the conclusion that only agitation will attract attention. Among the top of their demand is waiving of loans, so that they can get back to farming by taking another loan. The second universal demand is the implementation of my report on the Minimum Support Price (MSP) which will make farming economically viable and attractive. The demand for loan waiver comes from the present unremunerative nature of farming and is indicative of the fact their economic viability is as important to farmers as to industrialists. Unfortunately, the then government did not take action on the National Policy for Farmers (NCF) when the report was presented in 2007. Farming is both a way of life and means to livelihood for nearly 60% of our population, a majority of whom are women and youth. I only feel sorry that in the election politics solutions like loan waiver are given importance. The basic difficulties of farmers can be overcome only if integrated attention is given to pricing, procurement and public distribution. Compounding the difficulties of today, farmers are facing serious problems from climate change. The most unfavourable impact of climate change will be high temperature, wide variation in precipitation and rise in sea level. While looking at the problems of farmers there should be equal attention to the families living and cultivating in the following ecosystems: Arid zone; semi-arid dry farming areas, irrigated areas, groundwater farming and plantation crops in hilly areas. The support extended to farmers should be according to the requirements of those cultivating in above mentioned ecosystems.

Farmers have now understood that while the problems of the other sections of the community receive continuous attention, their own problems tend to be neglected unless they agitate. The *Kisan Mukti March* has rightly called for a special session of Parliament to discuss the problems confronting those who keep us alive. It is sad that farmers who are life givers are forced to take their own life due to economic reasons. I sincerely hope that the recently held *Kisan Mukti March* will be a turning point in the history of public policy formulation in the field of agriculture. The reports of the NCF give a clear sense of direction to shaping the future of agriculture based on farmers' welfare. The government of India has already changed on the recommendation of NCF, the name of the agriculture ministry to Ministry of Agriculture and Farmers' Welfare. This change in name should get reflected in action designed to promote farmers' well being as the main purpose of agriculture ministry's at the centre and states.

The progress made by our farmers in improving production and productivity is illustrated by the fact that wheat production in India has gone up from 7 million tonnes in 1947 to over 100 million tonnes in 2018. Such an impressive progress has been rendered possible

due to interaction between technology and public policy. Technology has been mainly in the field of designing new plant architecture characterized by resistance to lodging and ability to transfer more of the photosynthesis to grain formation.

Ever since the publication of Mendel's Laws of inheritance in 1865, many innovations have taken place in the effective use of genetic knowledge for improving productivity and profitability of crops. Among the innovations introduced by plant breeders, mention may be made of induced mutation, chromosome doubling through colchicine and genetic medication through the application of the new knowledge in molecular biology. Genetic modification has made it possible to transfer genes across sexual barriers. More recently, gene editing technologies have become available which can help to achieve directed mutagenesis.

Breeding helps to develop strains with a higher yield potential. However for achieving the higher yield, we need interaction between technology and public policy. New scientific innovations, farmer friendly economic policies and farmers own enthusiasm to take to new technologies are all important for achieving the desired goal of a quantum jump in production.

In more recent years, progress in technological innovation has become more rapid. What is however important is to understand the risks and benefits associated with new technologies. As early in 1962, Rachel Carson in her classic book titled *Silent Spring* pointed out that pesticides including DDT can result in long-term harm because of their long residual toxicity. This is why before taking the new technology, to the field it is important that their assist for their positive as well as potentially negative effects.

New innovations are essential to overcome new challenges like those arising from climate change. More anticipatory research will be needed to ensure that our farmers are able to increase production under conditions of rising temperature and frequent floods.

The uncommon opportunities now available for improving agriculture should be mastered. The future belongs to nations which give importance to grains rather than guns. Let me quote from a recent article by Prof P C Kesavan and me published in *Current Science* :

Genetic engineering technology has opened up new avenues of molecular breeding. However, their potential undesirable impacts will have to be kept in view. What is important is not to condemn or praise any technology, but choose the one which can take us to the desired goal sustainably, safely and economically.

The National Commission on Farmers (NCF) which I chaired made the following goals for ensuring sustainable agriculture and food security.

- To improve the economic viability of farming by ensuring that farmers earn a "minimum net income", and ensure that agricultural progress is measured, by the advance made in improving that income.

- To mainstream the human and gender dimension in all farm policies and programmes and give explicit attention to sustainable rural livelihoods.
- To complete the unfinished agenda in land reforms and to initiate comprehensive asset and aquarian reforms.
- To develop and introduce a social security system and support services for farmers.
- To protect and improve the land, water, biodiversity and climate resources essential for sustained advances in the productivity, profitability and stability of major farming systems by creating an economic stake in conservation.
- To foster community-centred food, water and energy security systems in rural India and to ensure nutrition security at the level of every child, woman and man.
- To introduce measures which can help to attract and retain youth in farming by making it both intellectually stimulating and economically rewarding, by conferring the power and economy of scale to small and marginal farmers both in the production and post-harvest phases of farming.
- To strengthen the biosecurity of crops, farm animals, fish and forest trees for safeguarding both the work and income security of farmer families, and the health and trade security of the nation.
- To restructure agricultural curriculum and pedagogic methodologies for enabling every farm and home science graduate to become an entrepreneur and to make agricultural education gender sensitive.
- To make India a global outsourcing hub in the production and supply of the inputs needed for sustainable agriculture, and products and processes developed through biotechnology and Information and Communication Technology.

The NCF report was submitted in 2006 and very little action was taken until the time the present government headed by the Prime Minister Shri Narendra Modi took office. During the last four years, several significant decisions have been taken to improve the status and income of farmers. Some of them are :

- Designating the Ministry of Agriculture as Ministry of Agriculture and Farmers Welfare to stress the importance of keeping farmers welfare as the measure of agriculture progress.
- Issue of Soil Health Cards (SHC) to all farmers to promote the adoption of balanced nutrition. Soil health is basic to plant health and plant health is basic to human health. Hence the Universal Soil Health Card scheme is a very important one.
- Allocation of both budgetary and non-budgetary resources for promoting micro-irrigation through the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY).
- Conservation and sustainable use of indigenous breeds of cattle through a Rashtriya Gokul Mission. The Prime Minister also inaugurated the First International Congress on Agro-biodiversity.

- Promoting online trade through electronic national agriculture market which helps to bring together different agriculture market. The creation of Gramin Agriculture Markets (GrAMs) will provide scope for direct sales to consumers in both retail and bulk form.
- Introduction of Agricultural Produce and Livestock Marketing Act, 2017 and Agricultural Produce and Livestock Contract Farming Services Act, 2018 supported by electronic Negotiable Warehouse Receipt (eNWR) system for increased institutional credit to the farm sector
- Determination of Minimum Support Price (MSP) based on the recommendation of the NCF. Assured procurement at MSP of more crops.
- Integration of protein rich pulses and nutri-rich millets into welfare programmes including Public Distribution System (PDS), mid-day meals, ICDS, etc.
- Increase in the income of farmers through activities like apiculture, mushroom cultivation, bamboo production, agro-forestry, vermi-compost and agro-processing for generating additional jobs and income for farm families. Prime Minister has also suggested that we should develop methods by which farmers income can be doubled within the next five years.
- Setting-up several corpus funds to complete on-going irrigation productions, modernised he infrastructure in dairy cooperatives and strengthen the adoption of inland and marine aquaculture.
- Above all, the recent announcement of remunerative price based essentially on the recommendation of NCF is a very important step to ensure the economic viability and attractiveness of farming.
- "While the Government has ensured in its notification that from Kharif 2018 onwards, the MSP of the notified crops would be minimum of 150% of the cost of production, it is noteworthy that it ranges from 150 to even upto 200% for coarse cereals which will provide an incentive to the farmers in achieving our objective of improving the nutritional intake of our population".

Anticipatory research in an era of climate change

There are several reports in the media about the bioshield function of mangrove forests along coastal areas. Mangroves have helped to save both lives and livelihoods particularly of fisher and coastal communities. The beneficial impact of mangroves has been observed by local community on several occasions including the recent Gaja in Tamil Nadu. Earlier, the damage caused by Tsunami as well as the super cyclone in Odisha were also considerably less in mangrove rich areas. It is in recognition of the critical role of mangroves in the conservation of coastal ecosystems that the famous temple at Chidamabaram chose a mangrove plant (*Excoecaria agallocha*) as a Temple Tree.

When MSSRF was started in 1989-90, the mangrove ecosystem at Pichavaram was taken up for priority attention. Both in the Philippines, where I lived for a few years and in India, the general appreciation of the role mangroves play in both ecological and livelihood security has been little. Mangrove areas were being converted into aquaculture farms and

tourists centres. This is why we started a genetic garden of mangroves at Pichavaram near Chidambaram with support from Department of Biotechnology. Considerable amount of work has been done to promote public understanding of the need for protecting the mangrove forests and extending them to all coastal areas. A **Charter for Mangroves** was prepared and with the help of the Government of Japan and IITO, an International Society for Mangrove Ecosystems (ISME) was formed in 1990. It is only when natural calamities of the kind induced by cyclones occur that there is more awareness of the need to protect and propagate them. I hope the calamity caused by Gaja can be converted into an opportunity for saving coastal wetlands and more particularly mangroves.

New technologies are the basic raw material for productivity improvement. There are adequate opportunities for anticipatory research involving new technologies. We should capitalize on them to ensure the wellbeing of farmers and farming.