

INNOVATIONS AND NEW TECHNOLOGIES NEEDED TO ACCELERATE AGRICULTURE GROWTH

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Agriculture needs continuous infusion of innovation and technology in ensuring global food security, poverty reduction and environmental sustainability. Socio- Economic and Caste Census (SECC) 2011, released in 2015 also indicates that out of 24.39 crore households in the country, 17.91 crore lived in villages and among these, 10.69 crore were considered as deprived households. Agriculture is still the backbone of rural India as the data of SECC indicates that 31.26 per cent of the total rural households are still broadly identified as poor where the main earner has an insecure and uncertain source of income. Increasing urbanization, globalization and demand for high-value products have dramatically changed the global context for agriculture. Agriculture is critical for those who live below the poverty line, as there is an uncertainty from the harvesting point of view.

According to the World Bank, gross domestic product (GDP) growth originating in agriculture raises the incomes of the poorest households by at least 2.5 times as much as growth in other sectors does. Over the years, one of the issues in Indian agriculture is the declining profitability of most of the agricultural crops and enterprises which is the main

cause of alienation of the people from this crucial sector. There are number of factors responsible for the gloom on the faces of the farming community. The real prices of agricultural commodities are not increasing in tune with the increasing costs of critical inputs such as labour, fertilizers etc. that have been mainly responsible for the declining profitability in agriculture. The next challenge is the shortage of quality seeds to achieve the yield potential in different crops. In India, average national yields of most agricultural commodities are about 40 to 50 per cent of the corresponding world averages. The yield gaps in different crops should be seen as an opportunity for future growth and simultaneously our approach should be consistent with agro-ecological, environmental, socio-economic, political and technological settings in the major production regimes.

On an average, rice and wheat yields will need to be enhanced by about 40 percent and pulses, oilseeds, maize, millets, sorghum and horticultural commodities yields by about 50 to 100 percent. The other challenges are inefficiency in irrigation, lack of mechanization, soil erosion, degradation in soil



health, post-harvest losses in crops, and inefficiency in agricultural marketing system among others. The problem of technology fatigue in agriculture is further compounded due to lack of timely information about market prices, crop varieties, production techniques, seasonal risk and disease control strategies. This highlights the importance of effective application of information and communication technologies (ICTs) in agriculture to mitigate the technology gap.

Efficient Use of Water Resources for Irrigation

Irrigation is the most important element in agricultural process. And judicious use of available water resources is the need of the hour. As per official data, around 46.34 per cent of India's net sown area of around 140.80 million hectares was under irrigation till 2011-12. In crops such as oilseeds, pulses and coarse cereals, only 26 per cent, 16.2 per cent and 14.4 per cent, respectively, is under irrigation out of the total area under cultivation. In food grain such as wheat and rice, it is slightly better and of the total area under cultivation around 48 per cent is irrigated. To achieve the target of total irrigation, a massive fund infusion would be needed. Experts estimate it to be in excess of Rs 50,000 crore. The NDA Government has allocated about Rs 5,300 crore for the programme in the Union Budget 2015-16, while in the previous year Rs 1,000 crore was allocated. The state-run National Bank for Agriculture and Rural Development (Nabard) has set a target of providing Rs 30,000 crore as credit to farmers for irrigation over the next three years. Water use efficiency is presently estimated to be only 38 to 40 per cent for canal irrigation and about 60 per cent for ground water irrigation schemes. It is estimated that with 10 per cent increase in the present level of water use efficiency in irrigation projects, an additional 14 million hectare area can be brought under irrigation from the existing irrigation capacities. Efforts are needed in this direction as it would involve a very moderate investment as compared to the investment that would be required for creating equivalent potential through new schemes. In addition, there is need to revive the traditional water reservoirs. There are about 12, 85,000 tanks with varying sizes in the country with a storage capacity of 50 million cubic meters. The tanks are deteriorating, resulting in poor performance. Restoring these traditional water bodies and promoting water harvesting should receive major developmental support.

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The Central Water Commission (CWC) estimates that the ultimate irrigation potential that can be created through major, medium and minor projects would be about 75.9 million hectare irrigation potential making use of ground water has now been assessed as 64 million hectare. Thus the total irrigation potential from surface and ground water sources would be about 139.9 million hectare. The annual replenishable ground water resource for the entire country is 433 billion cubic metre (bcm). The ground water assessed is the dynamic resource which is replenished each year dominantly with the rainfall received in different parts of the country.

Irrigation efficiency in agriculture can be improved by adoption of modern methods of irrigation to achieve the goal of more crop per drop of water. In our country, the area covered under micro irrigation is about 5 lakh hectares. The states which are leading on the micro-irrigation front are, Maharashtra, followed by Karnataka, Andhra Pradesh and Tamil Nadu. Micro irrigation is very popular in 30 different crops especially in wide spaced horticultural crops. Drip irrigation is an effective tool for conserving water resources and studies have revealed significant water saving ranging between 25 and 50 per cent by drip irrigation compared with surface irrigation, with yield increases as high as 100 per cent in some crops under specific locations. Union Government has approved spending of 500 billion rupees over five years to expand irrigation in rural areas to boost crop productivity. A total of 53 billion rupees has been allocated for the irrigation project in the current fiscal year ending on March 31, 2016.

Horticulture has become a key driver for economic development in many states in the country. It contributes 30.4 per cent to GDP of agriculture



More Emphasis Needed on Horticulture

from nearly 13% of the total cropped area and support nearly 20% of the agricultural labour force. India is the second largest producer of fruits (88.97 million metric tons) and vegetables (162.89 million metric tons) in the world after China during 2013-14. Horticulture production (268.9 million metric tons) surpassed food grain output (257 million metric tons) for the first time in 2012-13 which continued in 2013-14, with horticulture production of 277.4 million metric tons in comparison to foodgrain production of 265 million metric tonnes. During 2014-15, India exported fruits and vegetables worth Rs. 7474.14 crores. One heartening sign is that the percentage share of calorie intake from fruits and vegetables has increased from 6.9 per cent in 2004-05 to 7.0 per cent in 2009-10 in rural areas and 7.2 per cent to 8.0 per cent in urban areas during the corresponding period. Central Government has taken major initiatives in 10th and 11th Five Year Plans for accelerating the growth of horticulture in the country. A National Horticulture Mission was launched in 2005-06 as a Centrally Sponsored Scheme to promote holistic growth of the horticulture sector through an area based regionally differentiated strategies. It is during this period that three flagship schemes having impact on horticulture development namely, National Horticulture Mission, Horticulture Mission for NE and Hilly Areas and Rashtriya Krishi Vikas Yojana are being implemented simultaneously.

Protected cultivation is a high-tech cultivation which result in 5 to 12 times higher output than cultivation in the open field. Presently, there is nearly 623, 302 hectares of area under protected cultivation in the world. In India, protected cultivation under polyhouses is approximately 25, 000 hectares which is negligible in comparison to some of the leading countries in the field of protected cultivation. States like Andhra Pradesh, Gujarat, Maharashtra, Haryana, Punjab, Tamil Nadu and West Bengal have consistently expanded the area under protected cultivation. Maharashtra and Gujarat had a cumulative area

of 5,730.23 hectares and 4,720.72 hectares respectively. The major crops grown in the protected cultivation are tomato, capsicum, cucumber, melons, rose, gerbera, carnation and chrysanthemum. Floriculture is one such venture which needs high tech protected environment. On the other hand, there are some crops which can also be grown in the open field conditions. But, floriculture is also technology deficient as the farmers are not able to realize the complete potential of the acreage under floriculture. In India, we have about 232.74 thousand hectares area under cultivation in floriculture in 2012-13. Production of flowers is estimated to be 1.729 million tonnes loose flowers and 76.73 million tonnes cut flowers in during the period. The country has exported 22,947.23 MT of floriculture products to the world for the worth of Rs. 460.75 crores in 2014-15 and our main export destinations were United States, United Kingdom, Germany, Netherland and United Arab Emirates. However our yield potential is still lower in comparison to world leaders in protected cultivation. In Haryana, National Horticulture Mission (NHM) has joined hands with Israel to rope in farmers in protected cultivation in vegetable farming. Under this, Indo-Israel Centre for Excellence in Vegetables has been established at Gharaunda near Karnal and the project is spread over 15 acre and doing a business of Rs 55 lakh per annum. On an average, setting up a green house or poly house on one acre of land requires around Rs 40 lakh (Rs 900 per sq m) and in one year it gives a minimum return of around Rs 60 lakh.

Agro-food processing is very important for creating value addition in our agricultural produce which will help in creating higher value for our agricultural produce and also create enormous job opportunities for the rural youth. The total valuation of the food processing industry is expected to reach US\$ 194 billion by 2015 from a value of US\$ 121 billion in 2012. The net export of processed food is expected to outreach its present value of US \$ 43 billion. This sector directly employs 13 million and 35 million

"Start-up India" and "Stand-up India" will be there for the future of the country. And for a bright future of the country "Stand-up India" and Start-up India shall be launched. There are 1.25 lakh banking units i.e. 1.25 lakh branches of banks in the country. Under the Start-up India programme more schemes will be formulated, but every branch must resolve and in the days to come resolve once again to disburse loans for start-ups to the tribals in the locality where there is any tribal habitation, and where there is no tribal habitation, the branch can provide loans to a Dalit or a tribal, give financial support to them and thus enable 1.25 lakh Dalit entrepreneurs to come up. Let there be tribal entrepreneurs in the tribal settlements of this country. These one lakh twenty five thousand branches should promote start-up of women entrepreneurs and help them financially.

people are indirectly involved. Food processing and value addition are other major grey areas which can create a boom in the employment. Our country has not utilized this huge untapped potential. Food processing can reduce the huge losses of Rs. 55, 000 crores in foodgrains, fruits and vegetables. Value addition can be done in foodgrains, fruits, vegetables, dairy products, meat, poultry, fish and medicinal and aromatic plants. Theoretically, one per cent post-harvest loss reduction of horticulture produce is expected to save Rs 230 crores annually. There are number of diversified ventures in agriculture which are suited to almost every region and economic strata of the population. Food Processing Industry is employment intensive. It has been estimated for India that for every Rs.10 million invested, it creates 18 jobs directly and 64 indirectly in the organized sector and 20 jobs in the unorganised sector across the supply chain. At present food processing sector employs about 13 million people directly and about 35 million people indirectly. For the projected growth in the Food Processing Industry, it is expected that the requirement of human resource would be about 17.8 million in 2022.

Need to Focus on Soil Health

Soil health is of paramount importance to realize the sustainable potential of productivity of cultivable crops. This can be achieved by efficient use of nutrients in the crops and with the right mix of inorganic and organic sources of nutrition. Generally, NPK consumption ratio of 4:2:1 is considered as desirable based on recommendation of 120:60:30 NPK kg/ha dose (4:2:1) for wheat/rice. There is a wide NPK use ratio in Northern Zone (13.5: 4.3:1),



Agro- Food Processing

while it is narrower in Southern Zone (2.9: 1.6: 1). It is 5.6: 3.3: 1 in Western Zone and 5.0: 2.4: 1 in the Eastern Zone. The NPK ratio also shows wide variations from State to State. While impressive strides in agricultural production have been made, consumption of NPK fertilizer has increased 28.10 million tons per year. It is assessed that in the country 10 million tons of plant nutrients are removed by various crops in excess to what is being applied in the form of fertilizers. There are about 12 crore farm holdings in the country, soil analyzing capacity of 4 crore samples is required annually to enable analysis of each holding once in three years. This requires a massive expansion in soil testing programme in all parts of the country. There were 1049 soil testing laboratories in 2010-11 with annual analyzing capacity of 1.07 crore samples. As a result, 0.74 crore soil health cards were issued to farmers during 2010-11. Keeping this in view, a centrally sponsored scheme "National Project on Management of Soil Health and Fertility (NPMSHF)" was launched in 2008-09. In addition, States are availing substantial resources for soil testing programme under the "Rashtriya Krishi Vikas Yojana (RKVY)" and "Macro Management of Agriculture (MMA)". The present Central Government plans to equip 14 crore farmers with the soil health cards in the next three years.

Biotechnology

Use of biotechnological tools in agriculture could make food crops higher yielding and more robust to biotic and abiotic stresses. This could stabilize and increase food supplies, which is important against the background of increasing food demand, climate change, and land and water scarcity. In 2012, 170 million hectares (ha) by more than 17 million farmers in around 12 per cent of the global arable land were planted with genetically modified (GM) crops, such as soyabean, corn, cotton, and canola, but most of these crops were not grown primarily for direct food use. In India, genetically modified cotton- Bt cotton was first commercialized in India in 2002 and in 2012, over 7 million farmers had adopted this technology on 10.8 million ha area which is equivalent to 93 per cent of the country's total cotton area. Bt cotton has certainly increased the profitability of the farmers and simultaneously reduced the use of chemical pesticides in this crop drastically. Studies suggest that the introduction of Bt technology has reduced food insecurity by 15 – 20 per cent among Indian cotton growers. But, the use of genetically modified crops was restricted to cotton only due to concerns

echoed by various environmentalist groups. But, now the Central Government has allowed the trials of other GM crops also which will give a momentum for adoption of other GM crops.

Need to Streamline Marketing of Agriculture Produce

Our system of marketing also needs major technology and capital intervention to modernize and unify the marketing network in different parts of the country. Such interventions will help to raise the income of the farmers, reduce the post-harvest losses in the crops and will also help in moderate the prices of the different commodities. Our country incurs too much wastage of its farm produce due to inefficient and antiquated marketing practices. Markets in the agricultural products are regulated under the Agriculture Produce Market Committee Act enacted by state governments. There is need to unify the marketing system as different Agriculture Produce Market Committee have multiplicity of fees and taxes which had a cascading impact on the prices of a commodity when it passes through the supply chain. These charges could be as high as 14.5 per cent in Andhra Pradesh, excluding state value-added tax and close to 10 per cent in Odisha and Punjab.

There are 2,477 principal regulated markets based on geography, called agriculture produce market committee and 4,843 sub-market yards regulated by the respective APMCs in India. Central Government has allocated Rs. 200 crore to the newly created Agri-Tech Infrastructure Fund, which would support online integration of 585 Agricultural Produce Market Committee (APMC) marketing yards in the next three years. Further, Government has cleared last week with an outlay of Rs 5,000 crore for the next five years. Marketing system can be unified through online agri-trade in which Karnataka has done exemplary work. The state has integrated 55 mandis with trade to the tune of Rs 8,500 crore. The Centre's proposed Online National Agriculture Market (NAM) will adopt many of the best practices from this model but also look at similar reform initiatives in other states to incorporate the same into its design. The Central Government's proposed online agri-trade platform will initially integrate 585 marketing yards across the country. The software would be provided free of cost to the states and in addition grant of up to Rs 30 lakhs per mandi as a one time measure for related equipment and infrastructure.

Need to Modernize Technology Transfer Tools

Technology transfer in agriculture should focus

on key interventions at different stages of the crop starting from land preparation to sowing of the seed, crop protection, harvesting, post-harvest management and marketing. Technology transfer need effective interactive groups at grass root level in the villages. These groups should become tool of disseminating information about various government sponsored schemes and these entities will help in liaising with various Govt. departments for developmental activities. A comprehensive Kisan knowledge Management Systems (KKMS) should be developed to provide and disseminate information related to the modern technology, modern farm implements, best agricultural practices and post-harvest management including market information. Dissemination of crucial information related to weather data and agro climatic conditions, prices of agriculture produce is needed to the farmers at regular basis. There are various interventions like Village Knowledge Centres, Farm Schools, Farmer's Clubs, Kisan Call Centres, Radio and Television, Mobile Phones, Internet and dedicated Kisan Channel of Doordarshan which are making a good impact and their delivery system should be made more effective and target oriented. Community Radio Stations should be established in Agriculture Universities and institutes for the dedicated services of technology dissemination.

Beyond these key areas, there is need to revamp the research, teaching and extension network of the state agriculture universities. Most of the agriculture universities often face resource crunch in funding their different research, teaching and extension programmes. The funding to these institutions should be increased linked with time bound objectives and with a cap on need-based scientific and other manpower. The central government should also devise effective system in inter-linking the institutes of Indian Council of Agricultural Research and other institutes engaged in agriculture research with the state agriculture universities for pooling of the resources scientific expertise in achieving common objectives. We have the third largest pool of scientific and technical professionals. Hence, agriculture should continue to receive the first priority and best and dedicated efforts of everybody in the ladder of governance and decision making in the field.

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