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Agriculture: Best of Cultures

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Tribute

I am privileged to be here at the kind invitation of the Dr. Amitabh Chowdhury Memorial Trust to deliver the Fourteenth Dr. Amitabh Chowdhury Annual Memory Lecture. I am grateful to Sri Justice Dhiresh Narayan Chowdhury and Ms. Barnali Chowdhury, who for almost an year now, have been in touch with me, for their affection. I am humbled to stand before you to speak in the memory of Late Dr. Amitabh Chowdhury, whom I have known through the publications of the previous memorial lectures. The personality of Dr. Chowdhury was glowing before me, even without seeing him in the physical frame, for the extraordinary achievements he made in just about three decades. Further, his dedication and feelings for others are unparallel.

Swami Vivekananda said, and I quote, 'This life is short, the vanities of life are transient, but they alone live who live for others, the rest are more dead than alive'. Dr. Amitabh Chowdhury, the noble soul, for whom we have assembled today, was truly the one who was in that mould and left indelible footprints on the sands of time. I pay my heartfelt tributes to Dr. Amitabh Chowdhury and thank the Chowdhury's for this noble act of establishing this Trust, to perpetuate his memory, who would be a model for generations to come.

Coming from an agricultural background, I chose this title for today's lecture, as there can be no culture without agriculture. Every sphere of life has recognized food to be paramount and sacrosanct, and we, the farmers and scientists, feel proud to belong to the segment of food production that keeps the country alive and the wheels of progress moving.

Introduction

Agriculture is the single largest employer in the world, providing livelihoods for 40% of global population, 500 m small hold farmers worldwide, mostly rainfed, providing up to 80% of food in the developing world. India being one of the largest agriculture economy, has now achieved the highest ever foodgrain production of over 275 million tonnes, 280 mt of horticulture produce, 165 mt of milk, 6 mt meat, 90 billion eggs, 10 mt fish and so on. Indian agriculture is a saga of millions of farmers in most diverse agro-ecological conditions, sustaining a billion plus human and half a billion livestock

population. Food demand estimates by 2050 indicate the need for doubling the food production to meet the requirements for the projected population of 1.7 billion. A paradigm shift from starch to protein, including the additional demands of pulses and oilseeds, as also from primary to secondary agriculture to enhance the farm income is imminent.

India, accounting for 17% of world's population and over 30% of world's smallholder farmers (over 85% of Indian farmers being small and marginal), and hardly 2.5% of the world's land and 4% of world's water resources, greatly impacts and gets impacted by the state of global food, agriculture and natural resource system. At the same time, agriculture in India employs 52% of the labour force and is the main source of livelihood for 80% of the rural poor, contributing 14% to GDP and 10% to total exports. Women constitute about 60% of the economically active population in agriculture and animal husbandry.

Key issues

With globalization in place, Indian agriculture is developing day by day. However, the overarching concerns some of which are natural while others are manmade. Some of these include small and fragmented land holdings, climate change, nutritional and livelihood security, poverty alleviation, profitability, gender equity, ecology and environment, and competitiveness in terms of cost and quality will continue to be major issues. Priority issues that call for attention include availability of water and its quality, soil health, genetic resource conservation, insulating farm production against increasing biotic and abiotic stresses, managing climate change, diversification, post-harvest management, enhancing input-use efficiency, energy management, increasing preparedness to match rapidly evolving trade regime, reducing knowledge lag, and congenial policy environment. Social dimensions of farming in the context of developing economies pertain to youth moving away from villages or the 'rurban' migration, that is impacting on the skill and energy inputs into farming.

The Green Revolution, with investment in new seeds, production technologies, cultivation methods and irrigation practices, and further efforts made India food-secure. However, the emerging challenges of climate change, natural resources degradation, pests and diseases, harvest and post harvest losses on one hand, and the persistent malnutrition and hunger in different forms on the other, point to the urgency of achieving greater agricultural productivity, value addition and resilience. Agriculture has to be linked to food, nutrition, health, employment and environment, for societal appreciation and investment. 'New Agriculture', with new sciences, knowledge and skills from 'seed to market' is the need for a sustainable, efficient and remumerative agriculture. Aspects of efficiency, precision, clustering, integration, diversification, mechanisation, value addition, market intelligence are being emphasised towards 'smart farming for small farmers'.

The ‘Agricultural imperative’ has been appreciated globally, wherein food production needs to be doubled by 2050, to feed the projected 9 billion population, with lower resources and reduced carbon footprints. India has moved from an era of chronic food shortages during 1960s to food self-sufficiency and even food exports. However, the hidden hunger and child malnutrition have become a constant concern in the Indian subcontinent. This calls for a strategy for sustainable agriculture and a continuum paradigm of agriculture-food-nutrition-health-environment-employment and synergy between different players in the food sector.

New Agriculture

With concerns regarding eroding biodiversity, degrading land and water resources, climate change, small farm holding to the tune of 85%, as also increasing human population, the challenge is to produce more with less for more. With stress agriculture becoming a common phenomenon, remunerative agriculture has to consider both speciality agriculture and secondary agriculture in the coming times. Emphasis from Starch to protein, One Health from Soil-Plant-Animal-Man concept, Skill & Youth in agriculture need to be incorporated in new agriculture. Enhancing input use efficiency, effective soil-water management, integrated pest management, mechanization of farming, proper handling and storage of the produce to reducepost harvest losses to the tune of 6-18% worth over Rs. 95,000 crore every year, are the aspects to be considered from ‘seed to market’ in order to bring about efficient agriculture. In this direction, new technologies are being developed and incorporated in farming to make it smart.

Water being the key input in farming and given its status today with regard to competing demands from different sectors, water productivity, i.e. the quantity of produce from a unit volume of water and the budgeting for different crops has received high attention of the planners and researchers. Water footprints have become a measure of efficient crop production. Similar is the approach with regard to energy and nutrients, for demand-driven applications, leading towards precision farming. Innovations in water management and devices such as drips and sprinklers have enabled ‘more crop-per drop’ in different farming practices.

In an endeavour to enhance per unit productivity, the most important intervention has been developing varieties and hybrids as required in crops and breeds in animals. With over 10% of global biodiversity, its conservation and utilisation in agriculture has been given high priority. Both approaches of *in situ* and *ex situ* conservation are being employed, with the country having genebanks for the agricultural biodiversity, as well as India becoming a global partner by depositing the seeds for future in the Svelbardgenebank in the Arctics.

Efforts in horticulture have paid, with high growth rates, enabling diversification, livelihoods, export earnings as well as a win-win situation for both farmers and the consumers. Vegetable farming, floriculture, fruit trees suitable for different agro-climatic zones in the country are assuming commercial dimensions. Agri-forestry is an emerging area with high potentials of wood, fruits as well as ecosystem services.

With over 500 million of cattle, buffalo, goats, sheep and poultry in the country, the opportunities for farm diversification are very many, with different agro-climatic conditions and culinary preferences. Conservation of indigenous bovine breeds as also small ruminants, improvement with new technical interventions, feed and health management, are receiving attention, for the integrated farming approach across the country.

Aquatic resources in terms of over 8,000 km of coastline, rivers, lakes, reservoirs, ponds and tanks, the potential for food production from the waters is high and technologies have enabled high fish production levels, along with diversification in the aquatic produce in terms of shrimp and molluscans. New methods of cultivation such as cage farming with due seed and feed support have resulted in multi-fold increments in productivity levels.

Farm mechanisation needs to be promoted in greater measures to realise the full potentials of agriculture and reduce drudgery in operations. While several prototypes of machinery and implements are available, their scale-up and application in smallholder farming are the challenges to be addressed. Deployment of sensors, drones and robots in different operations is being discussed and attempted in some places.

Secondary Agriculture

While the emphasis for decades was on production agriculture in order to meet the food demands, secondary agriculture in terms of primary processing, value addition, composites, by products and high value products, food safety & quality assurance and the concept of ‘wealth from waste’ are assuming significance in the context of reducing post-harvest losses, ensuring higher income to farmers as well as environmental upkeep is assuming importance. New skills need to be developed in this regard from ICTs to machineries, to rekindle the interest for agriculture among the youth, who otherwise are moving to cities in search of greener pastures. Nothing can be more greener than farming!

Technology partnership, Innovation and Agri-business platforms as well as incubators are being built up to empower farmers and their kin, to familiarise and show opportunities in agriculture, that are so varied in terms of inputs, production, processing, marketing and support systems. The components of agri-business are as varied as agri- and food input management, production and

warehousing, logistics and distribution, trading, processing, food and retail services. ICTs are already contributing to the weather-crop-market advisories, and could play a major role towards IoT in Agriculture.

Changing expectations in Agricultural Education

Science &Technology-led agriculture would encompass deployment of new tools of geospatial knowledge, genomics and proteomics, bio and nanotechnology; Precision farming and protected cultivation and so on.Higher education can be the engine for increasing agriculturalproductivity through better skilled technicians, innovative research and market-based extension linked to technologies and practices. Farming now faces additional new challenges, that need to be reflected in the national agricultural academic curricula and research priorities. In addition to freeing the country of endemic and stubbornly high undernutrition and poverty, India now has to rapidly become competitive in global markets. Agriculture has to not only contribute to India's growth, but support its shift to a climate-smart, bio-based, knowledge-intensive, green economy, with rapid innovations. Resilient agriculture is the present need with productivity enhancement by more than 4 per cent annually, from the shrinking available arable land and water resources. This is essential to meet the burgeoning food and nutritional needs and to maintain food sovereignty to impact upon poverty, especially in rural areas. Thus, agriculture has to be economically viable, globally competitive, socially equitable and environmentally sustainable, and these facts must be duly internalized in the education curricula.

The sector, undoubtedly one of the largest service sectors, has to engage in a new global social contract to serve the needs of society, improve the quality of life and environment, build leadership, increase collaboration and develop new approaches to new challenges and uncommon opportunities. It needs to evolve in tune with the fast changing national and international scenarios. The present situation demands a renewed thrust for enhanced quality and relevance for developing self-motivated professionals and entrepreneurs in view of the changing scenario of globalization of education, emergence of new areas of specialization such as biosensors, genomics, alternative sources of energy, nanotechnology, etc.

The graduates are required to possess professional capabilities to deal with the concerns of sustainable development in all its aspects. Further, there is need for agricultural graduates to possess knowledge, skills, including 'soft skills', and entrepreneurship qualities. Diverse skill sets are required to provide a range of services such as advisories on new innovations for corporate and contract farming, markets and so on.

As higher education is recognised as the launch platform for the entire career of the student, business unusual is called for achieving: (i) sustainable intensification and diversification of production and zero waste to meet demand

for nutrition and food quantity and quality; (ii) doubling of not only farm productivity, but also income levels; (iii) ecosystem services that improve water quality and quantity, soil health, carbon capture and biodiversity; and (iv) Agri-business with a sound knowledge of Intellectual Property Management and Trade issues. The graduates are expected to be fully aware of the developments in global agriculture both for locally adopting the success stories from across the world as well as for availing worldwide employment opportunities.

Way Forward

Food production systems, have now to have a focus on health & employment; water & energy; and youth & women. At the same time, doubling farmers' income levels is important, through integration, diversification, clustering small holdings, reducing costs of cultivation, enhancing input efficiencies, and value addition to the produce. Cluster Farming; Integration & Diversification; Input management (Quality Seed, Water, Power), Small farm mechanisation; Reducing Post harvest losses; Processing &Value addition, Storage & Market access; Infrastructure (Irrigation, Cold Chains); Access to information & knowledge; Credit & Crop Insurance; Non-Farm and Off-Farm Employment and Income; Capacity Building and Agri-Skills; and Gender mainstreaming & Retaining Youth in Agriculture are the important elements of new agriculture. In this direction, Innovations, Inputs, Incentives, Investments and Institutions would play a major role. With agriculture on a tripod of farmers, scientists and policy makers, it is imperative that emphasis is laid on the above, for inclusive agricultural growth leading to a resilient, globally competitive and profitable agriculture.

Through this Forum, I would like to also state that the farmers today, men and women, who toil in rain and sun, need profits as also prestige for the vocation. PPP in agriculture is Profit-Prestige 4 Peasants. I would like to thank you all for the kind attention for this presentation on farming, with the message, we have all come basically from the rural India, and it is now beckoning us to contribute our possible best. The Trust could start a few Agro-Medical activities connecting agriculture with health & nutrition of rural children, for which we could provide inputs. If agriculture succeeds, what else can fail? If agriculture fails, what else can succeed?

Thank you very much.