

# Indian Agriculture for Achieving Sustainable Development Goals



**Dr R.S. Paroda**

Former Secretary, DARE & Director General, ICAR and Chairman, TAAS



*Progress Through Science*

**Trust for Advancement of Agricultural Sciences (TAAS)**

Avenue-II, IARI, Pusa Campus, New Delhi-110012

E-mail: [taasiari@gmail.com](mailto:taasiari@gmail.com); Tel.: +91-11-65437870; Website: [info@taas.in](mailto:info@taas.in)



## Trust for Advancement of Agricultural Sciences (TAAS)

### GOAL

An accelerated movement for harnessing agricultural science for the welfare of people.

### MISSION

To promote growth and advancement of agriculture through scientific interactions and partnerships with stakeholders.

### OBJECTIVES

- To act as think tank on key policy issues relating to agricultural research for development (AR4D).
- Organizing seminars and special lectures on emerging issues and new developments in agriculture.
- To institute national awards for the outstanding contributions to Indian agriculture by the scientists of Indian and other origin abroad.
- Facilitating partnerships with non-resident agricultural scientists visiting India for short period.

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# **Indian Agriculture for Achieving Sustainable Development Goals**

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## **The Context**

Globally, poverty and hunger are still twin challenges before human civilization despite specific temporal and spatial efforts. Though extreme poverty has been reduced by more than half since 1992, yet more than 800 million people live on less than \$1 a day. And roughly, half of the world's population lives below \$ 2.50 a day. Besides, 1 in 9 people are undernourished. Poor nutrition results in nearly half (45%) of the deaths among children under the age of five years; nearly 3.0 million children per year. Unfortunately, every 3.5 seconds a child dies from poverty. Therefore, it is necessary to produce affordable, nutritive, safe and healthy food more efficiently and sustainably. On the contrary, agriculture is facing bigger threat now than ever before on account of degradation of natural resources, especially land and water, besides the adverse impact of global climate change. Hence, combating climate change, reducing emission and conserving natural resources, without compromising economic development especially on food front would require new set of policies, institutional reforms and additional investments in agriculture sector.

Modern agriculture has achieved much over the past century. While the global population has grown from less than three billion people in 1950 to more than seven billion people today, the levels of hunger have not followed this trend. Of the estimated 805 million people experiencing chronic hunger globally, around three quarters live in rural areas and are overwhelmingly dependent on agriculture for their food and livelihood. 526 million people

in Asia and the Pacific (65% of total) are impacted by hunger, being highest in the world. Most of them live in South Asia. Tackling hunger is not only about increasing food production; it's also about increasing incomes and strengthening markets so that people have ready access to food. Fortunately, the Food and Agriculture Organisation of the United Nations has predicted that hunger levels are likely to decrease considerably by 2030.

## **Revisiting MDGs**

To address these concerns, global leaders revisited the Millennium Development Goals (MDGs) to have a new action plan. It was a unique effort by the national leaders to combat poverty, hunger, under-nourishment and other issues of global concern. Earlier, MDGs were the world's time bound and quantified targets for addressing extreme poverty in its many dimensions. In all, there were eight MDGs. The first MDG was to eradicate extreme hunger and poverty, the second one was to achieve universal primary education, third to promote gender equality and empower women, fourth to reduce child mortality, fifth to improve maternal health, sixth to combat HIV/AIDS, malaria and other diseases, seventh to ensure environmental sustainability and eighth to develop a global partnership for development. It is a matter of great satisfaction that most of the developing countries made good progress in achieving these goals, especially the poverty. Most of the countries achieved the goal of reducing poverty by half between 1992 and 2010. Between 1990 and 2002 average overall income increased by over 21 per cent. The number of people living in extreme poverty declined by estimated 130 million. The child mortality rates fell from 103 deaths per thousand live births a year to 88. Life expectancy rose from 63.03 years (2001) to 68.78 years (2017). An additional 8 per cent of the developing world's people received access to water and an additional 15 per cent acquired access to improved sanitation services. The world did make significant progress in achieving main goal of reducing poverty. Across countries, though the decline in poverty was uneven. In Asia, there were about 740 million poor people in 1990-92, which declined to 565 million in 2010-12. In this

context, China did remarkably well, where poverty declined from above 60 per cent in two decades to around 10 per cent by 2008. Other East-Asian and Pacific countries also did quite well. A lot still needs to be done, compared to South Asia, where maximum poverty still resides, despite Green, White and Blue Revolutions.

## **Adopting SDGs**

After 20 years of collective efforts globally, the world leaders again met and reviewed the efforts towards Millennium Development Goals and decided collectively to lay yet greater focus on sustainability. Poverty eradication, promoting sustainable patterns of consumption-production and protecting and managing the natural resource base for economic and social development were considered as the overarching objectives for sustainable development. Accordingly, on 25th September, 2015, the UN adopted a set of goals to end poverty, protect the planet and ensure prosperity for all as a part of new Sustainable Development Goals (SDGs) to be achieved by 2030. India also was one of the 193 United Nations member states to adopt the SDGs and committed herself to meet the SDGs in the given timeframe. At the United Nations Summit for Adoption of Post-2015 Development Agenda, PM Narendra Modi reaffirmed India's commitment, saying that: "Today much of India's development agenda is mirrored in the SDGs". The resolution adopted by the United Nations (UN) has much broader intergovernmental agreement which, while acting as the Post-2015 Development Agenda, builds on the Resolution, popularly known as "The Future We Want". In all, the SDGs are 17 in number with 169 targets covering a broad range of sustainable development issues. Over half of the SDGs relate to global food security and nutrition and four are directly related to hunger. These four are : 'no poverty', 'zero hunger', 'climate action' and 'life on land'. At present, there is a projection of producing 70 per cent more food needed to feed 9.7 billion people by 2050. Thus, the global food systems have to be reshaped if we have to achieve the SDG's, in general, and those related to agriculture, in particular. Similarly, agriculture's demand for water could

rise by over 30 per cent as availability shrinks. Additionally, per capita arable land is also expected to decrease by 50 per cent by 2050 and about 30 per cent of food is wasted every year.

In this context, Indian scenario is no different. While we have achieved considerable progress in reducing poverty, hunger and malnutrition, yet millions of people go to bed hungry. Similarly, malnutrition is another aspect of the hunger which leads to many type of diseases especially among the children thus affecting the economy of the country. As stated earlier, within Asia, South Asia has the largest concentration of poor (nearly 304 million). As high as 71 per cent of the poor and food insecure population of South Asia live in India. Like other countries, India also met most of the MDGs well before 2015, but the pace had been much slower compared to China and other countries in southeast Asia. Also, the progress for some of the development goals had been rather inconsistent. The official estimates do reveal that while India achieved the poverty reduction target, it fell short of reducing hunger mainly on account of economic access to food and not because of shortage of foodgrains availability.

We all know that food security is influenced by a number of factors, including those that determine food availability-domestic food production and the capacity to import food as well as determinants of food access, including the distribution of food among various segments of the population. The estimated financial requirement for India to meet its costs for food security is around Rs 46 lakh crores (USD 729 billion) from the year 2015 to 2024. This cost includes the financial requirements for providing access to safe and nutritious food for all and also investments in irrigation, soil and water conservation, wasteland regeneration and rainfed farming. Continuous shrinking of land for agriculture due to land demand for industries, infrastructure and cities may increase the costs of food production. Climate change may also influence the productivity of crops in agriculture. It is now clear that almost 5-10 per cent losses in foodgrains have already been reported.

India is currently faced with high population pressure on land and other resources to meet its food and development needs.

The natural resource base of land, water and biodiversity is under severe pressure. Food demand challenges ahead are also formidable considering the non-availability of favourable factors of growth, fast declining factor productivity in major cropping systems and rapidly shrinking resource base. On the contrary, sustainable agriculture deals with conserving and sustainable use of land, water, plant and animal genetic resources, in ways that are environmentally non-degrading, technically appropriate, economically viable and socially acceptable. The process of sustainable agriculture must, therefore, meet the following criteria:

- to ensure that the basic nutritional requirements of present and future generations, qualitatively and quantitatively, are met while providing a number of other agricultural products.
- to provide durable employment, sufficient income, and decent living and working conditions for all those engaged in agriculture.
- to maintain and, where possible, enhance the productive capacity of the natural resource base as a whole, and the regenerative capacity of renewable resources, without disrupting the functioning of basic ecological cycles and natural balances, without destroying the socio-cultural attributes of rural communities, or without causing contamination of the environment.
- to reduce the vulnerability of the agricultural sector to adverse natural and socio-economic factors and other risks, and strengthen self-reliance.

### **Aiming SDGs in India**

India has, since adoption of SDGs in September 2015, directed its development pathway to meet specific priorities of employment, economic growth, food, water and energy security, disaster resilience and poverty alleviation. India has also aimed to restore its natural resources and adopt transparent and robust governance along democratic lines. However, emerging challenges of climate change impacts, increasing inequities, and lagging human

development indices are well recognised by both the people and the government. The post 2015 UN Sustainable Development Agenda framework thus provides an opportunity to renew and integrate efforts in order to meet, to a considerable extent the national and global aspirations in a defined time frame (i.e., up to 2030).

The pressing need for India, therefore, is to effectively execute the new agenda through much needed partnership among key stakeholders. This involves the participation of the public sector/ Government, corporate entities who are skilful in managing and multiplying resources, non-governmental organizations, social enterprises, and other development actors who are acquainted with implementing, evaluating and scaling up social development projects. The National Institution for Transforming India (NITI Aayog) is the national body primarily responsible for implementing the SDGs in India. Hence NITI Aayog must have an implementation plan drawn, which is well monitored and executed. In the process, the Government could tap regional and local partnerships and build stakeholder capacities to gather and measurable track data as indicators of change. Achieving the SDGs in a country, as diverse as India, will definitely be a herculean task, yet not unachievable. We need to clearly identify priorities, have locally relevant and people-centric development policies, and build strong partnerships. The government also needs to have a focused plan for tracking and evaluating impact and scaling up successful interventions. The SDGs are thus a direction and a vision for India to ensure prosperity and growth-both social and economic. It is quite clear that for meeting SDGs, India is in the centre stage globally and would demand concerted efforts to achieve all 17 goals, failing which, the UN targets would never be met considering the current levels of both poverty and hunger existing in India.

## **Meeting SDG Targets**

In order to meet the SDG targets, India will have to: 1) double its agricultural income of small-scale food producers, particularly women, family farmers, pastoralists and fishermen and women

through secure and equal access to land, other productive resources, inputs, knowledge, financial services, markets and opportunities for value addition as well as the non-farm employment by 2030, 2) by 2020, it has to maintain available genetic diversity of seeds, cultivated plants and domesticated animals and their related wild species, and promote access to and fair and equitable sharing of benefits arising from their use, 3) increase investments in rural infrastructure, agricultural research, technology development and extension services, 4) correct trade restrictions and distortions in world agricultural markets, including possible elimination of agricultural subsidies, and 5) adopt measures to ensure proper functioning of food commodity markets and their derivatives and facilitate timely access to market information, including on food reserves, in order to help limit extreme food price volatility. The goal of SDG 1 relates to elimination of poverty and SDG 2 calls specifically 'to end hunger, achieve food security and improved nutrition through sustainable agriculture'. Sustainability means using fewer natural resources to produce food and reducing food waste and loss. Improved nutrition means reducing both hunger and obesity through improved education, and access and availability of good quality foods.

Tackling hunger is not only about increasing food production. It is also about increasing incomes and strengthening markets so that people have access to food even when climate change prevents them from growing enough themselves. In fact, SDGs 1 and 2 resonate strongly with the Indian development agenda since elimination of poverty and hunger continue to be our major goals in future. Fortunately, our database for poverty indicators is robust and India has adopted some of the elements of a social protection network, like Food Security Act, although the measures adopted in terms of their coverage impacts is less assured. As regards hunger, India is justly proud of its success at the food front. However, this has not taken care of existing hunger because access to quality food would largely depend on income and prevalence of prices. If India succeeds in its goal of poverty reduction, it will also contribute substantially to the elimination of hunger. Indian policy, however, has placed too much emphasis

on hunger measured in terms of low dietary energy intake. Over the last two decades, we have come to understand now that India faces a serious problem of poor nutrition. Many of our children are stunted and weigh less than children in many other impoverished countries in the region. This could partly be due to the young age marriages of women and their poor nutritional status. The Government policy has not evolved as a robust response to this problem. This is a principal challenge today and if we can address this, it would take us a long way in meeting the SDGs. Interestingly, SDG concerning hunger, decline in poverty as well as average per capita calorie intake and an increase in the extent of calorie deprivation in recent years for India areas follows. For the country as a whole rural poverty declined from 45.61 per cent in 1983 to 28.30 per cent and urban poverty declined from 42.15 to 25.70 per cent between 1983 and 2004-05. During the intervening period, the average calorie intake per capita declined from 2221 to 2047 and from 2089 to 2020 kcal in the rural and urban sectors, respectively. In fact, as regards calorie deprivation, its extent has increased from 69 to 85 per cent in rural India and from 60 to 65 per cent in urban India.

Urbanisation comes with challenges to agriculture and nutrition. Higher urban incomes are associated with a dietary transition to more fruits and vegetables, animal-sourced food, fats and oil, refined grains, and fruits and vegetables, which require more intensive use of natural resources. Urban lifestyles/effluents tend to increase consumption of processed foods and the urban poor are often limited to cheap unhealthy foods. At the same time, as urban population grows, hunger and under-nutrition will also increase. In addition to access to healthy and nutritious foods, access to clean water, toilets and sanitation will also be the challenges to hunger and malnutrition. Yet, rapid urbanisation brings opportunities, as the rise in urban food demand from rapid urbanisation for increased and diversified food production in rural areas can contribute to improved farmers' livelihoods. To take advantage of these opportunities, strong rural-urban linkages are needed. Rural-urban linkages are the physical, economic, social and political connections that link remote areas to large cities through smaller towns and cities in between.

Where links are strong, rural farmers can sell larger shares of produce in urban markets, labourers can migrate or commute to nearby towns for seasonal work and have better options of livelihood.

Agriculture in India plays an important role for the livelihood of poor, especially in the rural areas. However, agriculture sector is currently facing numerous challenges such as: decline in the size of land holdings, natural resources (especially soil and water), adverse impact of climate change, factor productivity decline, costly inputs, fluctuating markets, decline in income etc. These all are making agriculture more riskier. In the country, there is a huge gap between the actual yields and the potential yields and this yield gap is more in case of pulses, oilseeds and other neglected crops. At the same time, we have to look into the Public Distribution System by plugging the leakages and the diversions. Huge amount of food grains meant for the poor are diverted to fill the coffers of the rich. There are various factors for low yields of crops in the country as compared to most of the developed countries. Actually the farmers still use mostly the local varieties. Hence, with the passage of time, there is decline in yield and mostly these varieties become susceptible to diseases and pests. There is also a low Seed Replacement Ratio (SRR) in the country mostly in case of pulses and oilseeds. As such, emphasis is needed on increasing seed replacement rate using high yielding varieties and hybrids. The main question obviously before us now is:

- How can agriculture contribute towards achieving SDGs?
- What should be the strategy to promote agriculture for achieving SDGs?
- What lessons other developing countries, especially in South Asia, can learn from India or vice-versa?

In this regard, we have to achieve the SDGs with limited and shrinking resources, the climate change effect on agriculture which has led to yield reduction already, especially in rainfed regions. At the same time, under chemical fertilizers and insecticide/fungicide based intensive agriculture, we have

already harmed our agro-ecology to a great extent. We have lost considerable diversity of our flora and fauna, many insect and weed species have become resistant to various antibiotics, many new weed species have emerged, many new diseases are taking their toll and soil have become sick and degraded. Thus, to achieve SDGs, we have to mainly to focus now on climate smart agriculture, like zero or no till cultivation, rain water harvesting, practices that make best possible use of available resources with minimum loss of natural resources and above all the loss of agrobiodiversity. Role of improved varieties/hybrids and management practices have immense potential in achieving SDGs. It is encouraging that National Agricultural Research System (NARS) has developed several technologies that promise to increase income, reduce production cost, conserve natural resources, improve food quality and nutrition and minimize various kinds of risks. The need now is to create an enabling environment to scale out useful and efficient innovations like conservation agriculture (CA) for greater adoption and large scale impact on higher income of our smallholder farmers. Farm mechanisation also saves a lot of energy and labour and also results in input use efficiency. Also as most of the farmers in the country are marginal and small landholders, our policies and institutions should support them to adopt farm mechanization. The financial institutions must provide better credit at lower interest rates. Similarly, more and more farmers and more and more crops should be brought under insurance cover. Mobilization of farmers by organising them into farmer's cooperatives, producer companies or commodity interest groups should now be the major aim of all developmental institutions. These groups could then be linked to the markets to increase their income substantially.

The Indian Council of Agricultural Research (ICAR) coordinates research and education conducted by 107 specialised institutes/ research centres and 67 agricultural universities across the country. Technological innovations are the backbone of productive and resilient farms, fisheries and livestock operations and a safe, wholesome food supply. They contribute to improvements in the quality of seeds, animal stock and inputs,

labour saving devices, effective production and conservation practices, reduction of post harvest losses, efficient price discovery mechanisms and control of pests, diseases and contamination. Access to these innovations will be essential if farmers and producers along the value chain and are able to meet the rising global demands in the face of climate change. Climate change, resource constraints, storage and distribution of food are some concerns that threaten India's food security. With increasing population and socio-economic development needs, access and availability of resources for food production, can be seen as a critical constraint to ensuring food security. Agriculture is undeniably a resource intensive sector and this fact comes along with a need for efficient and effective management of finite resources, in order to ensure long term sustainability of agriculture and thus food security for all.

## **Recent Government Initiatives**

Indian government is giving high priority to agriculture sector to make it more efficient, competitive, sustainable and resilient. Doubling farmers' income by 2022 is a recent policy initiative of the Government. In this context, there are several programs which aim to increase farmers' income, conserve soil and water resources, improve resilience and reduce climatic risks. These programs include: Prime Minister Irrigation Program, Prime Minister Agricultural Insurance Scheme, National Food Security Mission, National Horticulture Mission, National Mission on Sustainable Agriculture, National Agricultural Development Plans, National Livestock Mission, Mid Day Meal Scheme and Anganwadi Centres contribute to tackling food and nutrition insecurity etc. To strengthen value chains of agricultural commodities and improve market efficiency, a provision has been made to develop e-NAM (One Nation-One Market). However, to establish efficient and inclusive rural-urban value chains, institutional arrangements that support the participation of marginal and smallholder farmers, who often have little marketable surplus, are further needed. Production in urban and peri-urban areas is shifting towards resource-intensive foods such as vegetables, dairy, meat and poultry to meet the

rapidly growing demands. To veer production to rural areas—thereby reducing pressure on increasingly scarce urban and peri-urban lands—rural agri-infrastructure such as cold chains, cold storage and processing facilities are necessary. Leveraging towns and intermediate cities to facilitate economic and social connections between rural and urban areas, and improving rural infrastructure is, therefore, crucial. All these efforts demonstrate India’s commitment to accomplish the SDGs that relate to agriculture. There is, however, an urgent need to ensure reorientation of on-going efforts towards higher efficiency and effectiveness of on-going initiatives by developing a Road Map by which we are able to achieve the goals well before 2030. To end hunger and malnutrition in India and beyond, we must find solutions that historic, ongoing trends of rapid urbanisation. Doing so is key in India, where despite progress, 20 per cent are still hungry and around 39 per cent children are stunted. Improving links between rural and urban areas would thus be a critical start.

## **Indicators of Achieving SDGs**

Major dimensions of hunger include calorie deprivation and protein hunger (including hidden hunger). Some specific policies in achieving sustainability include more focus on hunger (including hidden hunger) and malnutrition than before, take zero hunger challenge by 2025, links between agriculture and nutrition, increase in investment, raising productivity of small farmers, assessing climate change and thereby improving productivity and resilience in agriculture, and also gender sensitive policies in agriculture and health. A time has come to focus on small farmers, rainfed agriculture, plight of women farmers and youth and also on biofortified crops for nutritional security. It has also been observed that there is intense desertification through warming of cold desert area and land degradation in eastern region since 1975 to 2006. Due to this, agriculture is becoming distressful due to crop failures. Also in southern region, coconut based farming system has become uneconomical. Due to land degradation, there is increase in arsenic and fluoride contamination, shift in

rivers, shift in sundarban delta, increase aridity and incidence of drought, floods and cyclones which aggravate the situation further. There is a need to develop a site-specific information through Land Resource Inventory (LRI) on 1:10000 scale along with use of balanced fertilizer, boosting rainfed agriculture, land management in hills, land use plans for plateaus, drought hit area of central India, coastal region, flood plains, and developing potential area for carbon sequestration and geoportal and mobile apps.

Impact of climate change is clearly visible across the globe and more vulnerable for tropical country like India. In the last 15 years, 8 times drought were affected and recently in 2014 and 2015, the country has observed simultaneous occurrence of drought and floods affecting agriculture, food and nutrition, livelihood and sustainability of smallholder farmers. Setting up Integrated Farming Systems (IFS) models for household, use of community participation, zero tillage, stop burning crop residues, and expanding climate resilient villages in India could be a major solution for climate risk reduction. Contingency plans are required to be in place, such as water saving cultivars, crop diversification, rain water harvesting and conservation, building large farm ponds, sustained vegetables and horticulture systems, increase in production of pulses and fodder so as to increase household farm income.

## **New Technologies and Innovations Needed**

There is a need to accelerate the breeding of self-pollinated crops with wider gene pool, develop and deploy high yielding nutrient-rich hybrids in both field and horticulture especially vegetable crops, promotion of biofortified crops, use of genome engineering/ gene-editing for modifying crops to have more yield and also to resist drought and disease more effectively, crop intensification, rainwater harvesting, recycling of wastewater, and managing blue water etc. Also, farmers need mechanisation across agricultural. value chain / crop cycle (from tillage & seed-bed preparation to post harvesting) to enhance crop productivity. Scaling up farm mechanization by promoting

both pre- and post- harvest machineries brings efficiency in food value chain by improving cropping intensity, reducing cost of production and drudgery of agricultural workers, enhancing farm power supply, and maintaining a socially desirable mix of human labour, animal power and mechanical power. IT based skill development programme for extension workers, decision support system, developing appropriate technologies for mechanizing horticulture crops especially in hilly areas, and emphasising on precision and cloud data with cost effective technologies like smart tractors, unmanned aerial vehicles and wireless technology are some encouraging areas that need attention. Also, pluralistic extension approach needs to be promoted and empower models like commodity group, farmer's organization, and producer's companies to strengthen market linkages. Programme delivery mechanism in the disadvantaged areas needs to be streamlined with due emphasis on socio-economic mapping. Extension services in allied sectors like horticulture, animal husbandry, fisheries, poultry, sericulture, etc. are required to be adequately strengthened. Competencies of extension agencies especially youth as 'Technology Agents' need to be improved by systematic training and capacity building programs enabling them to respond to emerging issues like climate change adaptation, use of ICT, input use efficiency, INM and IPM technologies, etc. Agricultural extension planning at block or cluster level is required to be adequately addressed jointly by ATMAs, KVKs, and other stakeholders like NGOs, private sector, etc at micro level keeping in view the specific requirements to meet SDGs.

Further, India must again strengthen conventional plant breeding (including pre-breeding) and emphasise on adoption of GM technology both in field and horticultural crops for which policy support is badly needed. Availability of good quality seed, including hybrids and planting material, is the need of the hour. Work on pre- and post harvest losses are also to be strengthened. Besides characterisation of bio-resources, multi-disciplinary / multi-functional approach will have to be followed in natural resource management in a way that farmers and

scientist work in unison on long term basis. In livestock sector, India may expand successful model like Amul Dairy with yet better efficiency and assess the reasons for not scaling this model in certain other states. Also, there is a need to reduce the number of non-productive animals, conserve and improve indigenous breeds, reduce methane emission by better housing and feeding of large animals, promote backyard poultry and to enhance feed resources that can be produced locally.

## **Roles of Public Policies**

Changing goals and approaches frequently have invariably led to the failure of policies in reducing poverty and inequality. Many a times, administrative incapacity, uncoordinated and duplicated efforts have resulted in not achieving the targets. There is a need to bring in socio-economic reforms to insulate the poor from adverse shocks. Strengthening of institutions for effective implementation of policies is needed. Also needed change in mind-set is necessary for setting the targets commensurate with right policies. We know that agricultural spending is still low in India (0.4% to be raised to minimum 1% of AgGDP). Also, more capital investment in agriculture related activities is extremely necessary in high income states (HIS), middle income states (MIS) and low income states (LIS). HIS need investment in agricultural R&D, health and education with greater focus on non-farm employment opportunities, whereas rural infrastructure development is required in LIS. Rationalisation of subsidies/reduction in input subsidy, technology intervention are also required to improve efficiency of public spending. To meet the target of doubling farmer's income by 2022, an innovative strategy is required for increasing the livelihood of the resource poor marginal farmers by diversification towards sub-sectors of agriculture, like livestock, horticulture and fishery and to move towards secondary and specialty agriculture with needed focus on marketing reforms including price management. Also, there is a need to have in place right policies to promote low volume high value crops, requiring market linkages and right policies/incentives for exports and value addition.

## **Policies for Climate Action**

India faces many challenges with regard to climate change, such as serious droughts in one region and dangerous floods in another. Why is India particularly vulnerable to the diverse effects of climate change? The reason India is so vulnerable is because it is a large country with many living in poverty, inadequate infrastructure, and a lack of government planning to deal with complex weather systems. Recently, a World Bank report emphasized how India will be subject to irregular monsoons, flooding, rising sea levels, and higher temperatures. The monsoon season is vital to the Indian economy because many Indians are agrarian. What happens to India's monsoons will drastically affect the fate of the agricultural sector and the people dependent on it. Climate change is going to continue to create erratic extremes throughout the monsoon season. Preparation for weather irregularities brought by climate change is thus essential to protect the lives of the Indian people and the growth of the Indian economy.

Climate change can have a dramatic impact on our natural resources, economic activities, food security, health and physical infrastructure. India is one of the countries most affected by climate change. The threat is especially severe in places where people's livelihoods depend on natural resources. In such areas climate adaptation measures take on a special significance for safeguarding rural livelihoods and ensuring sustainable development. The Indian Government launched the country's first National Action Plan on Climate Change (NAPCC) in 2008. Main themes of this plan was to : 1) further expansion of solar power generation, 2) further increases in energy efficiency, 3) measures to sustain India's environmental and water assets, 4) further expansion of forests for carbon sink purposes, 5) sustainable agriculture, and 6) developing a knowledge base for dealing with climate change issues. India's NAPCC recommends that the country generate 10 per cent of its power from renewable sources by 2015, and 15 per cent by 2020. In India, there are three main areas of policy activity that are focused on targeting, mitigating, and adapting to climate change. First of all, energy access is a priority for the Indian government.

Providing energy to 400 million people who do not have access to modern electricity is a necessity, making off-grid solutions such as solar energy key to reaching these populations and providing sustainable clean energy sources. Secondly, India has adopted a national action plan on climate change, and many of its smaller states are developing state action plans that include components regarding climate change adaptation. Many of the policies are already being implemented as part of the centralised economic plan drawn up by India's Planning Commission (now NITI Aayog). India is concerned to further develop its economy and continue its policies aimed towards poverty alleviation and appears determined to pursue these goals in addition to any policies aimed at reducing its GHG emissions.

Under Paris Convention, countries responsible for more than 80 per cent of global greenhouse gas emissions made specific commitments to reduce their emissions by 2020. The Paris agreement includes commitments that go beyond 2020, reflecting a greater level of ambition than in the previous commitments. Countries' emissions reduction commitments reflect their different levels of development and capabilities. Internationally, the Indian Government has voluntarily agreed to reduce the emissions intensity of its gross domestic product (GDP) by 20–25 per cent from 2005 levels by 2020. It also ensures that its GHG emissions from one unit of GDP in 2030 is at least one third lesser than what it used to be in 2005. India intends to produce about 40 per cent of its electricity in 2030 from 'non-fossil fuel based sources' like solar, wind or hydropower. These promises, and a few more, have been made in an action plan that India submitted to the UN climate body, UNFCCC, outlining the kind of steps it wants to take until 2030 to contribute in the global fight against climate change. India sought international help of at least USD 2.5 trillion at current prices to implement all these plans till 2030.

India is key nation towards in the efforts of the international community to shift to a sustainable, low-carbon path that will confront climate change, improve human health, and foster prosperity for all. In India, climate action seems to be most

successful since it is integrated with efforts to tackle existing challenges in energy access, water security, agricultural productivity, disaster resilience, and broader economic development goals. For example, distributed or on-site generation of renewable energy, such as rooftop solar panels, can play a significant role in providing access, especially in rural areas. With an advanced institutional landscape, India is now better prepared to deal with the multi-faceted nature of climate change. Many institutions have already developed relevant expertise. However, the current challenge is to develop a cross-sectoral, integrated Approach. In common with other developing countries India considers that the solution to the world's climate change problems is primarily the responsibility of the developed industrialised world. It has resisted efforts for a limit to be placed on its own GHG emissions. India is concerned to further develop its economy and continue its policies aimed towards poverty alleviation and appears determined to persevere these goals in addition to any policies aimed at reducing its GHG emissions. India is now the world's fourth largest emitter of GHG gases.

Addressing effectively the climate change will be the key to achieving SDGs. Many investments in mitigation and adaptation-such as a low-carbon energy plant or climate-resilient infrastructure are operationally indistinguishable from investments in 'development' and must be structured and executed together. Some of the policy action points that are related to climate risk management are: to invest in climate-smart technologies and capacity building with synergy between food security and an integrated/scientific land-use policy. Also there is a need to review the state action plans for climate change. Emphasis is also required on proper analysis and effective adoption of Soil Health Cards (SHC), facility of Soil Test Laboratory (STL) at least at the Block level, in enhancing risk coping ability of the resource poor farmers against weather and market linked fluctuations, capacity building, adoption of efficient irrigation systems like drip and sprinkler irrigation to reduce excess use of water and to increase productivity. Rationale for climate-smart agriculture (CSA) has to be appreciated by the decision makers and scaled to benefit small holder farmers.

## **Towards ‘No Poverty’ and ‘No Hunger’**

Income inequalities continue to grow and poverty remains largely a socio-economic problem. Approximately three-quarters of the world’s poor live in the rural areas, with the share even higher in low-income countries. In addition, certain groups are disproportionately represented among the poor like: women, people with disability, children, and people in tribal areas. The degradation of the productive assets of the poor, exacerbated by lack of access to modern infrastructure and amenities creates a poverty trap that reinforces the loop of further degradation and worsening of poverty. While its extreme manifestations are in low-income countries, developed countries also need to address problems of poverty and malnutrition. Reducing by half the number of poor people, as nationally defined, and ending all forms of malnutrition require especially developing countries like India to initiate focused actions including those addressing the structural causes of poverty, hunger and malnutrition. Feeding the growing world population, expected to exceed 9 billion by 2050, will require increased food production by 70 percent, at a time when agriculture is already facing unprecedented pressure of degraded natural resource base coupled with the adverse effects of climate change. On the contrary, the investment gaps in agriculture and social sector protection are indeed substantial.

‘The Future We Want’ has set out sustainable developments goals (SDGs) to end poverty in all its forms everywhere, end hunger, achieve food security and improved nutrition, and promote sustainable agriculture, ensure healthy lives and promote well-being for all at all ages, ensure sustainable consumption and production patterns and take urgent action to combat climate change and its impacts. Hence, alleviation of poverty and hunger is of utmost importance. Hunger can be removed only when households have continuous flow of income. For this, there is an urgent need for agricultural diversification. Skill development of youth can help in getting jobs and provide regular income. Hence, emphasis on vocational training and entrepreneurship is

urgently needed. India needs young entrepreneurs who are job creators and innovative rather than job seekers.

Indian Government has notified the National Food Security Act, 2013 (also known as Right to Food Act) on 10th September, 2013 with the objective to provide for food and nutritional security in human life cycle approach, by ensuring access to adequate quantity of quality food at affordable prices to people to live a life with dignity. The Act provides for coverage of upto 75 per cent of the rural population and up to 50 per cent of the urban population for receiving subsidized foodgrains under Targeted Public Distribution System (TPDS), thus covering about two-thirds of the population. The eligible persons will be entitled to receive 5 kgs of foodgrains per person per month at subsidised prices of Rs. 3/2/1 per kg for rice/wheat/coarse grains. The existing Antyodaya Anna Yojana (AAY) households, which constitute the poorest of the poor, will continue to receive 35 kgs of foodgrains per household per month. The Act also has a special focus on the nutritional support to women and children. Besides meal to pregnant women and lactating mothers during pregnancy and six months after the child birth, such women will also be entitled to receive maternity benefit of not less than Rs. 6,000. Children up to 14 years of age will be entitled to nutritious meals as per the prescribed nutritional standards. In case of non-supply of entitled foodgrains or meals, the beneficiaries will receive food security allowance. The Act also contains provisions for setting up of grievance redressal mechanism at the District and State levels. Separate provisions have also been made in the Act for ensuring transparency and accountability. Thirty-two (32) states/UTs, namely Andhra Pradesh, Assam, Bihar, Chandigarh, Chhattisgarh, Daman & Diu, Delhi, Goa, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Lakshadweep, Madhya Pradesh, Maharashtra, Odisha, Puducherry, Punjab, Rajasthan, Sikkim, Telangana, Tripura, Uttarakhand, West Bengal, Uttar Pradesh, Meghalaya, Jammu & Kashmir, Andaman & Nicobar Islands, Mizoram, Dadra & Nagar Haveli, Gujarat and Arunachal Pradesh are implementing the Act at present.

To achieve 'No hunger' by 2030, Government must build on those approaches that have proven to be effective. These combine following three important elements:

- **Providing immediate access:** Promote immediate access to food and nutrition-related services to the hungry people through social protection net.
- **Increasing opportunities:** Create opportunities for the poor and hungry to improve their livelihoods by promoting decent labour conditions, increasing investments to improve farm productivity, rural infrastructure and better market access.
- **Ensuring sustainability and improved nutrition:** Increase the sustainability of food production and consumption systems by conserving natural resources, adopting sustainable agricultural practices, reducing food losses, diversify dietary preferences, reduce levels of food waste in consumption, reduce emissions of greenhouse gases from agriculture and other sectors so as to slow the pace of climate change and ensure better food security for our future generations.

Investing in agriculture is the best a way to increase the productivity of agricultural labour and the land. Productivity increases enable better remuneration, thus, contributing to raising the living conditions of food insecure people while helping to reduce pressure on scarce natural resources. Public investment in institution building, productivity-enhancing research, rural transport, markets, health, education and social protection is needed to ensure food security, nutrition and inclusive growth as well as sustainable development.

## **Role of Institutions**

There is a need to empower farmers with right information enabling them to improve agricultural productivity as well as efficiency. Input providers should be competitive from top to the bottom. The Government should make higher investments in agricultural research for development (AR4D) and in

strengthening of rural institutions and farm services, integrated approach for germplasm improvement, capacity building for knowledge integration and dissemination, competitiveness of technology-based input markets for access of small farmers to improved technology and reforms in land, market and trade to realize desired outcomes. There is a need to :

- strengthen ICAR as an apex organization by tripling its budget,
- more autonomy to State Agricultural Universities (SAUs),
- IVLP through farmers participatory approach and
- vocational training/ informal education

Role of agri-market is essential to increase income of farmers through price realisation and help in crop diversification. A policy should be there to de-notifying fruit and vegetable crops from APMC act, promote perishable produce markets, focus on soil health and water management and to develop more direct linkages with farmers. Institutions need to be more vigilant in the process of implementation of policies through effective monitoring and oversight for needed coordination and convergence of on-going programs and activities.

## **Promoting Private Sector**

Some of the key points on the role of private sector should be to start focusing on R&D for delivering better services and products and to involve themselves right from the beginning in the research development and policy planning as robust entity. Enabling policy environment to involve private sector for agricultural growth is somehow lacking in Indian system and there should be some legal leverage by government for private sector to help enhance the farmer's income and private sector should have futuristic focus on the product development and may act pro-active role in providing real time information which may impact farmers' decision making on cropping pattern, diversification and sale of their produce etc.

The dominant sector in India is Agriculture which consists of agriculture proper and other allied activities such as dairying,

animal husbandry, poultry etc. This sector which is completely managed by private enterprise contributes nearly 32 per cent of the domestic GNP and provides employment to nearly 67 per cent of the working population. From this point of view, it may be thought that the private sector is dominant in the case of agriculture and allied occupations. But, in practice, agriculture is not run on a commercial basis and much of it is in the hands of small and marginal farmers. Indian agriculture has witnessed significant transformation over the past few decades. The changes range from new entrants into the sector to new and improved technologies, to farming becoming more mechanised, to weather, soil and environmental changes, to new markets and demand, and most importantly to agriculture evolving from just a way of life to a full-fledged business agribusiness. These changes have unfortunately not been accompanied by changes on the institutional and policy front. Over the years, public sector has played the key role in agriculture in India from setting up guiding policies to providing goods and services such as fertilizers, extension and marketing. But in an expanding and diversifying economy like India, private players hold potential to mobilise additional investments in infrastructure and R&D as well bring in the desired efficiencies in the agricultural value chain through superior service delivery. The National Agricultural Policy 2000 also envisages promoting private participation in agriculture through contract farming, land leasing arrangements, direct marketing and setting up of private markets to allow accelerated technology transfer, capital inflow and assured market for crop production. Private sector can offer their services in multitudes of ways throughout the agricultural value chain. Conducting research, introducing improved technologies, provision of credit through cooperatives and self-help groups, creating infrastructure (for seeds, fertilizers & pesticides, transportation and processing), helping with extension services, passing on accurate and timely information, and diffusing crop insurance are key areas where private sector can improve their engagement further.

Private sector has already begun engaging in contract farming with farmers. Establishing this farm-firm linkage could help

provide credit, assured market, remunerative prices, quality check and extension services, particularly to small landholders. It becomes important to identify the actual cultivator of the land to offer them the benefits of inputs and government schemes such that they could transition from subsistence farming to commercial agriculture. Absence of or weak land tenancy laws in India has resulted in minimal land transfer, thus leaving the already fragmented land fallow on most occasions. A transparent leasing law is essential to push consolidation of land holdings.

## **Public Private Partnership**

India is now one of the fastest growing emerging economies of the world, with a targeted annual growth rate of over 8 per cent. For the economy to grow at this pace, there is a strong need to upgrade the country's infrastructure services. Public Private Partnerships (PPPs) have been recognized as one of the most effective mechanisms to achieve this. There is a scope to leverage PPPs as a relevant vehicle in the agriculture sector as well. Enhanced yield and productivity is a crucial need, with India still battling food insecurity and poverty. Technology, better inputs and improved farming practices can make this possible. Over the past 65 years, Indian agriculture has recorded an average growth rate of 2.7 per cent per year, making it the slowest growing sector. The failure to consistently touch 4 per cent growth as targeted in the Five-Year Plans indicates the challenges we face in agriculture. Thus agriculture is a key sector for research, investment and development. There is an urgent need to work together to bring innovations via partnerships between the private and public sector, farmers and government to meet India's agriculture needs through new technology and intervention models. Several partnerships have already been developed between the public and private sectors with the objective of achieving these goals. Monsanto India Limited (MIL) is an important stakeholder in the agriculture PPP space, through its multiple partnerships with State Governments. We have reached out to more than 9 lakh farmers through PPPs alone and have helped improve yields and rural incomes significantly in the geographies these partnerships have been implemented.

## **Corporate Social Responsibility**

India is the first country in the world to make corporate social responsibility (CSR) mandatory, following an amendment to The Company Act, 2013 in April 2014. Businesses can invest their profits in areas such as education, poverty, gender equality, and hunger. The Act advocates that those companies with a net worth of Rs 4.96 billion or more, or an annual turnover of Rs 9.92 billion or more, or a net profit of Rs 50 million or more during a financial year, shall earmark 2 per cent of average net profits of three years towards CSR. Agriculture sector can take benefit of CSR a great deal.

## **Way Forward**

The SDGs do present a unique opportunity for the entire agricultural sector to get aligned for achieving a better tomorrow for the world. Currently, India has the largest number of undernourished and poor people in the world. Hence, if India can accelerate the pace to achieve SDGs, then globally we could soon eliminate hunger, achieve food security and improve household nutritional security. At the same time, it is imperative that policy makers accord high priority to agricultural research for development (AR4D) and ensure enhanced allocations (a minimum of 1% of agricultural GDP) to NARS and strengthen the food systems for physical and economic access to resource poor people residing in rural and urban areas. In fact, agriculture sector be seen as an important sector to achieve faster the goals of eliminating both poverty and hunger as well as ensure nutrition and environmental security and protection of fast degrading natural resources. However, the success of achieving SDG would require a Mission-Mode approach to implement and effectively monitor the progress on defined goals. Strategies to accomplish SDGs must, therefore, address the following recommendations on priority:

- Despite witnessing Green, White and Blue Revolutions, having attained impressive food production of 275.68 million tonnes, milk production of 155 million tonnes and both inland and marine fish production of 7.0 million tonnes, on

GHI, India ranks 100 among 113 countries and prevalence of poverty is around 24 per cent. Despite physical access, our major aim should now be to provide economic access to available food through effective implementation of national food security act and other safety net initiatives, especially in the regions/states where maximum poverty and hunger still resides.

- Ensuring meaningful engagement of all stakeholders in the formulation of national strategies, implementation plans and monitoring of the progress towards achieving SDGs, using baseline data for defined goals to be a national priority.
- The functioning of National Agricultural Research System (NARS), involving ICAR Institutes and the State Agricultural Universities (SAUs), must involve other stakeholders such as NGOs, FPOs, private sector institutions, farmers and agribusiness entrepreneurs.
- Continuous prioritization as well as re-prioritization is needed for development research portfolio in tune with the fast-changing global, regional and national needs. The ‘top-down’ approach adopted in the past will have to be changed to make it a ‘bottom-up’ approach. A shift from project to program mode and also from commodity/crop to farming system’s mode is urgently warranted. In this context, focus on crop diversification, hybrid seeds/high value crops, biotechnology, ICT, GIS and good agronomic practices (GAP) would help in doubling farmers’ income and attain resilience in agriculture with efficient input (water, fertilizers, chemicals for pesticides) use.
- Adopting eco-friendly and climate resilient technologies, with emphasis on efficient farming systems in different eco-regions and strengthening of activities for improving soil health through organic matter recycling, conservation agriculture, efficient and need based use of nutrients, using decision support systems and soil test results, improved water use efficiency using micro-irrigation techniques etc. would help resilience in agriculture.

- Make best use of available knowledge and technologies through: i) defining recommendation domains (technology targeting); ii) increased investments (almost double) in managing efficiently land and water resources; and iii) strengthening input delivery as well as market linkage mechanisms.
- National Livestock Mission should focus particularly on quality feed and fodder, improved risk coverage including animal insurance, conservation and improvement of indigenous breeds; higher productivity and production; value addition; enhanced livelihood opportunities; increased awareness; and better availability of quality animal products to the consumers at affordable price.
- Need for developing new agri-food systems for pre- and post-production management through processing and value addition and by ensuring no wastage of food both during storage, transportation and consumption.
- Knowledge updation of farmers on new technologies, practices and recent advancements is a must as against providing subsidies. Building multilateral and multi-sectoral technology transfer mechanisms for linking science to society with greater emphasis on attracting and retaining youth in agriculture, especially through diversification, secondary and specialty agriculture are to be strengthened to empower farmers.
- Dissemination of available high- value technologies; market linkages through e-NAM, revision of APMC; provision of pledged storage; developing and providing need-based technologies for immediate use and also for anticipatory long-term needs of farmers/industries/consumers is now needed. We need to remain competitive in order to take full advantage of globalization of agriculture and have an advance preparedness for emerging new WTO regime.
- India must increase substantially its capital investments for creating much needed infra-structure, available by involving

both public and private sectors, especially in the eastern and north-eastern regions so as to capitalise on rich natural resources that have great potential for faster agricultural growth and evergreen revolution.

- SDGs have several interconnected goals and, thus, require an effective coordination and convergence mechanism at all levels through an inter-disciplinary and inter-institutional/departmental approach to draw collective strength for desired impact. Such coordination mechanism has to be top down for effective monitoring and evaluation.
- Widening the policy space with much needed faith in agricultural science and new technologies without fear and with human face, is very much needed for accelerating growth. Therefore, an aggressive approach on policy advocacy and reforms is urgently warranted for scaling innovations for achieving SDGs in the given time frame, i.e., 2030.

## Recent TAAS Publications

- Global Conference on Women in Agriculture - Proceedings and Recommendations, March 13-15, 2015.
- The Seventh Foundation Day Lecture on “Ensuring Food and Nutrition Security in Asia: The Role of Agricultural Innovation” by Dr. Shenggen Fan, DG, IFPRI, January 11, 2013.
- Special Lecture delivered at Indian Seed Congress 2013 on “Indian Seed Sector : The Way Forward” by Dr. R.S. Paroda, February 8, 2013.
- Foresight and Future Pathways of Agricultural Research Through Youth - Proceedings & Recommendations, March 1-2, 2013.
- Managing Our Water Resource for Increased Efficiency - Strategy Paper by Dr. R.S. Paroda, May 28, 2013.
- A Brief Report on Seventh Dr. M.S. Swaminathan Award presented to Dr. William D. Dar, DG ICRISAT, Hyderabad, June 24, 2013.
- Brainstorming on Achieving Inclusive Growth by Linking Farmers to Markets - Proceedings and Recommendations, June 24, 2013.
- The Indian Oilseed Scenario : Challenges and Opportunities - Strategy Paper by Dr. R.S. Paroda, August 24, 2013.
- National Workshop on Outscaling Farm Innovation - Proceedings and Recommendations, September 3-5, 2013.
- Brainstorming Workshop on Soybean for Household Food and Nutritional Security - Proceedings and Recommendations, March 21-22, 2014.
- The Eight Foundation Day Lecture on “Sustainable Agricultural Development - IFAD’s Experiences” by Dr. Kanayo F. Nwanze, President, IFAD, August 5, 2014.
- Need for Linking Research with Extension for Accelerated Agricultural Growth in Asia - Strategy Paper by Dr. R.S. Paroda, September 25, 2014.
- Brainstorming Workshop on Upscaling Quality Protein Maize for Nutritional Security - Recommendations, May 21-22, 2015.
- The Ninth Foundation Day Lecture on “21st Century Challenges and Research Opportunity for Sustainable Maize and Wheat Production” by Dr. Thomas A. Lumpkin, Former DG, CIMMYT, September 28, 2015.
- National Dialogue on Efficient Management for Improving Soil Health - New Delhi Soil Health Declaration - 2015, September 28-29, 2015.
- Regional Consultation on Agroforestry: The Way Forward - New Delhi Action Plan on Agroforestry 2015, October 8-10, 2015.
- National Dialogue on Innovative Extension Systems for Farmers’ Empowerment and Welfare - Road Map for an Innovative Agricultural Extension System, December 17-19, 2015.
- Round Table Discussion on Promoting Biotech Innovations in Agriculture and Related Issues - Proceedings & Recommendations, August 4, 2016.
- Awareness cum Brainstorming Meeting on Access and Benefit Sharing – Striking the Right Balance – Proceedings, October 22, 2016.
- National Conference on Sustainable Development Goals: India’s Preparedness and Role of Agriculture, May 11-12, 2017.
- Regional Policy Dialogue on Scaling Conservation Agriculture for Sustainable Intensification, September 8-9, 2017.
- Policy Brief on Scaling Conservation Agriculture in South Asia.
- Retrospect and Prospect of Doubling Maize Production and Farmers’ Income – Strategy Paper by Dr. N.N Singh, September 10, 2017.
- Delhi Declaration on Agrobiodiversity Management – Outcome of International Agrobiodiversity Congress 2016, November 6-9, 2017.



## *Brief Resume*

Dr R.S. Paroda has made valuable contributions in the field of agriculture both as a researcher and an able administrator. He has made significant research contributions in the field of plant breeding and genetic resource management. During the period 1994-2001, Dr. Paroda spearheaded and modernized the national agricultural research system (NARS) as Director General, ICAR and Secretary, DARE, Government of India. During his leadership of ICAR, more than 20 new institutions were created in crops, horticulture, livestock, natural resource management, fishery, agricultural engineering and social science sectors. Dr. Paroda is

well known for initiating and strengthening many visionary programs at the national level. The prestigious National Agriculture Technology Project (NATP) of the World Bank was designed by him to reorient agricultural research, education and extension system to meet new challenges faced by the agricultural research system. Dr. Paroda is the main architect of one of the world's largest and most modern National Gene Banks housing more than 200,000 crops germplasm accessions. The impressive National Agricultural Science Centre (NASC) Complex, located at Pusa Campus, was built mainly at his initiative and direction. International Crop Research Institute for Semi Arid Tropics (ICRISAT), Patancheru and Agriculture Research Institute of Kazakhstan have named their Gene Banks after Dr Paroda in recognition of his notable contributions in the field of genetic resource management. Dr Paroda has received several national/international awards and recognitions, including the most prestigious PADMA BHUSHAN in 1998. Other awards conferred on him are: Rafi Ahmed Kidwai Memorial Prize (1982-83), ICAR Team Research Award (1983-84), FICCI Award (1988), Om Prakash Bhasin Award (1992), Asia-Pacific Seed Association Special Award (1995), CGIAR Award for Outstanding Partnership (2000), Life Time Award by Association of Agricultural Scientists in America (2001), Dr Harbhajan Singh Memorial Award (2001), Dr B.P. Pal Memorial Award (2003), Borlaug Award (2006), ISCA Gold Medal for Excellence in Science (2006), Gold Medals from Ministry of Agriculture of Armenia (2006) and Vietnam (2012), Life Time Achievement Award of 'Agriculture Today' (2008), Dr A.B. Joshi Memorial Award (2012), Prof. Kanniyam Memorial Award (2012), and Krishi Shriromani Samman by Mahindra and Mahindra Ltd. (2013). He has been conferred Fellowship of several National Science Academies like, INSA, NAAS, NASI and was elected as General President of the prestigious Indian Science Congress in 2000-2001. Among international recognitions, he was elected as Fellow of Agricultural Academies of Russia, Georgia, Armenia, Tajikistan and the Third World Academy of Sciences (TWAS). He had also been the President of more than a dozen Agricultural Scientific Societies. Both American Society of Agronomy and the Crop Science Society of America had awarded their prestigious Honorary Membership on Dr Paroda in 2001. Dr Paroda has been conferred honorary D.Sc. by 15 academic institutions including Ohio State University, Indian Agricultural Research Institute, Scientific Council of Agricultural Academy, Republic of Azerbaijan and State Agricultural Universities at Pantnagar, Kanpur, Jorhat, Coimbatore, Hyderabad, Udaipur, Varanasi, Srinagar, Meerut, Bhubneshwar, Ludhiana and Dharwad. Dr Paroda served as founder President of Global Forum on Agricultural Research (GFAR) from 1988-2001. He also served for more than two decades as Executive Secretary of Asia-Pacific Association of Agricultural Research Institutions (APAARI), a well known regional organization fostered by him to strengthen regional research collaboration. He had served as Chairman as well as Vice-Chairman of ICRISAT Board, member of Board of Trustees of IRRI, member of WMO High Level Task Force on Climate Services, member of Advisory Council of Australian Center for International Agricultural Research (ACIAR), member of Finance Committee of CGIAR and a member of the Governing Board of the Commonwealth Agriculture Bureau International (CABI). Dr. Paroda has spearheaded the organization of several international conferences and discussion sessions including, International Crop Science Congress (1996), Indian Science Congress (2001), Global Conference on Women in Agriculture (2012), Agricultural Science Congress (1997, 1999), Global Conference for Agricultural Research and Development (2012) and 1st International Agrobiodiversity Congress (2016), Till recently, Dr Paroda worked for the overall benefit of farmers as Chairman, Farmers Commission of Haryana, Chairman of Working Group on Agriculture and member of Rajasthan Planning Board. When State Agriculture Policies both in Haryana and Rajasthan were released. Currently, He is Member of Strategic Impact, Monitoring and Evaluation Committee (SIMEC) of CGIAR. Chairman of the Trust for Advancement of Agricultural Sciences (TAAS), his goal is to link science to the society.