

Strategy Paper

**Reorienting the Agriculture
Research for Development
(AR4D) Agenda for Sustainable
Livelihood Security of
Smallholder Farmers**

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**Chairman, TAAS & Former Secretary (DARE) &
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Progress Through Science

Trust for Advancement of Agricultural Sciences (TAAS)



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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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by

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Agriculture has remained an integral part of the socio-economic fabric of rural India since time immemorial and also occupies centre stage in Indian economy as it sustains livelihood of over 70 per cent of the rural households and provides employment to over 60% of the population. Despite wide variations in growth performance during last six decades after independence, which is primarily due to the subsistence nature of farming in India and the sector's heavy dependence on monsoon, the country has witnessed several innovations in agriculture. One of the most evident - "Green Revolution" was brought out by a science-led synergistic extension approach capitalizing genetic potential, irrigation, fertilizer, appropriate policies and farmers' hard work. This innovation accelerated the growth in agriculture sector and led to an unprecedented transformation in the development of our country. The increased agricultural productivity, rapid industrial growth and expansion of the non-formal rural economy resulted in higher per capita GDP, ensuring food security of the nation. However, continuing to secure such gains is becoming a major challenge especially in the context of growing population which is touching 1.3 billion, declining factor productivity, deteriorating natural resources, impact of global climate change and above all a fatigue in the existing research and extension system that largely operates in the public sector.

A. The Challenges Ahead

(i) Food Demand vs Small Farm Holdings:

Both research and development and innovations by farmers had enabled India harvest record foodgrain production of 265 million tonnes in 2014, which later got declined to around 252 million tonnes in 2016 due to two consecutive droughts. By 2030, we would need to produce 70 per cent more food grains than what we are producing today, that too while facing multiple challenges like depleting water resources, diversion of human capital from agriculture, shrinking farm size, soil degradation, indiscriminate and imbalanced use of chemical inputs and overarching effects of changing climate. A consistently low investment over last two decades in agricultural research for development (0.3% of agricultural GDP) further complicates the problem. Therefore, ensuring the availability of and economic access to food, in both quantity and quality (nutrition), for the poorest of the poor in the country remains a daunting challenge. In this direction, the 'GCARD Road Map' developed through interaction of diverse stakeholders from around the world in Global Conference on Agricultural Research for Development held in Montpellier, France in 2010 highlighted an urgent need for reorienting Agricultural Research for Development (AR4D) globally, especially to address the needs of resource-poor smallholder farmers and consumers. It also envisages a major paradigm shift towards farming system's research with greater thrust on "Innovations for greater impacts on small holder farmers" requiring partnerships among stakeholders and their capacity building.

(ii) Natural Resource Degradation and Climate Change:

The ever increasing population growth is interlinked with fast declining and degrading land, water, biodiversity, environment and other natural resources which are around 3-5 times more stressed due to population, economic and political pressures in India compared to the rest of the world. The country has already reached the limits of land available for agriculture and hence very limited scope exists for horizontal expansion. Inefficient use

and mismanagement of production resources, especially land, water, energy and agro-chemicals, has vastly reduced fertility and damaged our soil health. In Indo-Gangetic Plains, the food bowl of India, soil organic carbon is invariably less than 0.5% which is just not sustainable. Today, soils are both hungry and thirsty. To a greater extent, lack of political will and appeasement policies to provide free or relatively cheap inputs like seeds, fertilisers, water, energy etc. have further exacerbated the problem.

B. Opportunities to Harness

(i) Innovations in Natural Resource Management:

One of the main causes of slow growth in agriculture is relatively poor dissemination of emerging technologies relevant to the needs of smallholder farmers. Innovations in agriculture are needed to meet the major challenge of increasing resource scarcity and bring in structural transformation in the socioeconomic context, so as to reduce cost on inputs on one hand, and improve the livelihood of resource poor smallholder farmers on the other. Therefore, in order to liberate the nation from hunger and poverty, while sustaining existing natural resources, the policy makers will have to have a renewed thrust and commitment for additional funding (almost three fold -1.0% of agricultural GDP) for agricultural research for development (AR4D). Without this, the task of achieving inclusive growth and development will remain quite elusive.

(ii) Strengthening Collaboration and Partnerships:

It is well known that Green Revolution was an outcome of partnership between National Agricultural Research System (NARS), International Research Centres like CIMMYT and IRRI, and extension system including progressive farmers. Regional and global networks and partnerships for knowledge sharing and enhanced capacity development of different stakeholders is a must for outscaling innovations in similar ecologies. It has been increasingly realized that under the changing scenario of production to consumption, the linear approach in technology development and deployment will not serve the purpose to

address the new Sustainable Development Goals (SDGs). Therefore, for inclusive growth in agriculture through large scale uptake of new technologies, a major paradigm shift is needed from R&D to AR4D, involving greater participation of all stakeholders. The past experiences from the regional organizations/programs like Asia-Pacific Association of Agricultural Research Institutions (APAARI), SAARC, ASEAN, Rice Wheat Consortium (RWC), Cereal Systems Initiative for South Asia (CSISA), etc. have revealed that regional partnerships are very important to catalyse faster adoption of new technologies mainly through sharing of success stories around good agronomic practices (GAP).

(iii) Linking Research with Extension:

In the present context, the agriculture sector has to be more scientific oriented and technology driven. Our research should be sensitive to local needs and meet the aspirations of both farmers and consumers. There should be closer working relationship between research and extension organizations. The scientists involved in basic, strategic, applied and adaptive research, together with subject matter specialists, extension workers and farmers, should be seen as an integral component of knowledge dissemination and agricultural advisory system. The interface between research and technology transfer is indeed very critical for converting outputs into outcomes. In fact, we need to link “land-to-lab” and “villages to institutions”. This would require a paradigm shift from “top down” to “bottom up” approach for technology generation, refinement and adoption.

Furthermore, research agenda of the institutions should be better organized for technology development and its dissemination. For agricultural research to make an impact, there must be strong linkages among researchers, extension agencies, farmers and other stakeholders. In all the institutions, the technology transfer programs need to be an integral part of technology development in order to empower farmers with proper knowledge. Accordingly, the farmer participatory research has to be given major focus henceforth.

(iv) Empowering Women for Inclusive Growth:

It is well recognised that women empowerment is quite important for both agricultural growth and household nutrition security. Globally, about 43 per cent women are engaged in agriculture. In India, 60 per cent of farming operations are performed by women. Therefore, agriculture can be a primary driver for the empowerment of women. Innovations improve their work efficiency but would also ensure overall household development and nutrition security. However, women in agriculture are invariably deprived of access to agricultural knowledge, credit, technology to overcome their drudgery and market related services. Often, they are deprived of their rights to land and resources. All these adversely impact their performance. The State of Food and Agriculture Report of 2010-11 by FAO has already indicated that reducing the gender gap between male and female farmers could raise yields on farms by almost 20-30 per cent. As a consequence, it is expected that engendering agriculture would lead to reduction of undernourished people globally by 12-17 per cent. This in turn would translate into 100-150 million fewer hungry people. Hence, technology generation relevant to women farmers and its adoption should become an important agenda for future agricultural growth as was recommended by the first Global Conference for Women in Agriculture (GCWA) held in New Delhi from March 13-15, 2012.

(iv) Retaining Youth in Agriculture:

The ageing population of farmers and declining interest among rural youth to take up agriculture as a profession are challenges for agricultural sustainability not only in India but also in other countries of the world. A large section of youth invariably prefers to migrate to cities to seek employment, especially the Government jobs. Hence, a major challenge today is how to retain youth in agriculture, which certainly cannot be left unaddressed. The declining interest of rural youth in agriculture is directly related to existing poor physical amenities, socioeconomic conditions and lack of enabling environment. Economic factors such as low paid employment, inadequate credit facilities, low profit margins, and lack of insurance against crop failure are also

discouraging youth to get engaged in agriculture. Social factors include public perception about farming, especially the parental desire that their children should opt out of agriculture are also the reasons for choosing occupation other than agriculture. Environmental issues include poor soil health, non-availability of water for irrigation and climate change. Concerted efforts are thus needed to stimulate their interest further by expanding their horizon and understanding of secondary and speciality agriculture for enhanced income and avoidance of risk factor in agriculture. Proper incentives for their involvement in agricultural education, research and extension and by linking them to the expanding markets will, therefore, have positive effects in attracting youth in agriculture.

Earlier, seed, pesticide, fertilizer and farm machinery were the only potential sectors to employ agricultural graduates/rural youth. Now new opportunities are emerging in IT linked agri - extension, seed technology, biotechnology, food processing, cold storage, packaging, supply chain management, insurance and farm credit. Private sector and NGOs are also engaging now the rural youth. In this context, greater thrust on vocational training of youth (including female) is urgently needed for relevant skill acquisition, greater confidence building and to serve as 'Technology Agents' to provide efficient knowledge/service on custom hire basis. It is high time that all out efforts are made at all levels to engage youth in multifarious activities around 'Plough to Plate' so as to make farming both attractive as well as lucrative profession. Knowledge based agriculture around secondary and speciality agriculture can obviously enhance opportunities for additional income for the youth. Peri-urban agriculture, contract farming, protected cultivation, establishment of self help groups or producer companies offer additional opportunities for youth to remain in agriculture.

C. Future Road Map: Need for a Paradigm Shift

The Success of Green Revolution was mainly due to holy alliance between researchers-extension specialists and farmers, backed by enabling policy environment. The technology

dissemination approach adopted in the past was top-down and centered around individual farmers. Faster adoption of technology was also on account of miracle seeds of wheat and rice, promoted largely by the public extension system which over the years has become relatively weak as well as complacent. On the contrary, new innovations around natural resource management require bottom-up approach, involving farmers participation, while ensuring confidence building among farming communities to take risk and make agriculture more scientific and resilient. In the process, sharing of knowledge on good agronomic practices (GAP), without dissemination loss, and incentives for critical inputs becomes highly crucial to achieve future successes. Also partnership among key stakeholders becomes essential to promote growth in agriculture. In the process, care is also needed to overcome complacency that has crept in the public extension/ advisory services. Also, a paradigm shift is needed from present national agricultural research institute (NARI) system to that of the national agricultural research and extension system (NARES). This would require active involvement of stakeholders such as farmers, NGOs, private sector, scientists and policy makers. Another paradigm shift has to be in the extension approach towards translational research in order to ensure outscaling of innovations for greater impact on both higher productivity and income. In this context, extension approach has now to be around farming communities rather than individual farmers. Also, Natural Resource Management (NRM) related innovations would require more lead time to assess the impact on farmers fields, unlike the impact of high yielding varieties on crop productivity. This obviously throws a new institutional challenge for needed reforms in our existing extension system, which is mostly dependent on public organizations. Role of private sector, especially through involvement of youth and gender in agriculture, becomes most relevant in the present situation. Hence, empowering youth (both men and women) through vocational training and building a cadre of 'Technology Agents' to provide technical backstopping as well as custom hire services to the smallholder farmers will go a long way in linking research with extension for accelerating agricultural growth. In other words, we need to link now 'land

with lab', the 'village with institute' and 'scientists with society' to ensure faster adoption of resource saving technologies that would benefit both producers and consumers. In the process, the Agriculture Technology Agents will become "job creators and not job seekers" and provide on farmers' door steps the best technologies as well as quality inputs. Another strategy could be to create 'Agri-clinics', where technology agents could join hands to ensure single window system of advisory services so that farmers need not run from pillar to post. In fact, a good farmer is more knowledge hungry and not so much dependent on government subsidy. Once convinced, the farmer is willing to take risk and invest in adopting new innovations.

D. The Way Forward

Agriculture in India must liberate the region from twin scourges of hunger and poverty and that of malnutrition of children and women. The nation must continue to feed the increasing population with adequate food supply. Accelerated science and innovation-led agricultural growth must be inclusive and should address the needs and aspirations of resource-poor smallholder farmers in the country. Under the growing challenges of resource degradation, escalating input crisis and costs with overarching effects of global climate change, the major gains in food production would largely depend in future on a paradigm shift from integrated germplasm improvement to that of integrated natural resource management. The future AR4D efforts by NARS must now be reoriented towards farming system's approach ensuring farmers' participation. Also, we need to employ more innovative ways for effective dissemination of knowledge and lay greater emphasis on outscaling innovations for needed impact on livelihood of small holder farmers. Henceforth, 'Farmer First' be our goal so as to bridge the income divide between farmers and non-farmers and benefit equally the producers and consumers. To ensure this, the developing countries like India must enhance their investments (almost triple) in AR4D in order to address effectively the emerging challenges and ensure food, nutrition and environmental security.

Recent TAAS Publications

- Stakeholder Interface on GM Food Crops - Recommendations, May 19, 2011.
- TAAS Foundation Day Lecture on “Harnessing Knowledge for India’s Agricultural Development” by Dr. Uma Lele, August 12, 2011.
- Farmer’ Led-Innovation - Proceedings and Recommendations, December 23-24, 2011.
- Implementing the International Treaty to Address Current Concerns about Managing our Plant Genetics Resources - Strategy Paper by Dr. R.S. Paroda, January 23, 2012
- The Sixth Dr. M.S. Swaminathan Award Lecture for “Challenges and Opportunities for Food Legume Research and Development” by Dr. M.C. Saxena, January 25, 2012.
- 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.



DR. R.S. PARODA

Dr. Rajendra S. Paroda is an accomplished plant breeder and geneticist by profession and an able research administrator. He has made significant contributions in the field of crop science research. He is known for modernization and strengthening the national agricultural research system (NARS) in India as well as in Central Asia and the Caucasus. He was instrumental in establishing the Asia-Pacific Association of Agricultural Research Institutions (APAARI) and the Asia-Pacific Seed Association (APSA), while serving with FAO in early nineties. Since, 1992, he is continuing as Executive Secretary of APAARI.

He was elected as the first Chairman of the Global Forum on Agricultural Research (GFAR) and served from 1998-2001. Dr. Paroda was also the Director General, Indian Council of Agricultural Research (ICAR) & Secretary, Department of Agricultural Research and Education (DARE), Government of India during 1994-2001. He has the unique distinction of being the main architect of one of the world's largest and most modern National Gene Bank at NBPGR, New Delhi. He is Fellow of almost all the prestigious Science Academies in India and the Agricultural Academies of Russia, Georgia, Armenia and Tajikistan, besides that of Third World Academy of Sciences (TWAS), Italy. He had been the President of the National Academy of Agricultural Sciences (India) from 1996-2001 and was elected as General President of the prestigious Indian Science Congress Association for the year 2000-2001. In addition, he served as President of more than a dozen agricultural scientific societies in India. In recognition of his meritorious contributions to agricultural research, the President of India conferred on him the prestigious PADMA BHUSHAN in 1998. He also received several prestigious awards, namely, ICAR Team Research Award (1983-84), Rafi Ahmed Kidwai Memorial Prize (1982-83), Federation of Indian Chamber of Commerce and Industry (FICCI) Award (1988), Om Prakash Bhasin Award (1992), Asia-Pacific Seed Association Special Award (1995), Dr. Harbhajan Singh Memorial Award (2001), Dr. B.P. Pal Memorial Award (2003), Borlaug Award (2006) and Agriculture Leadership Award (2008), 1st Dr. A.B. Joshi Memorial Award (2012), Prof. Kannaiyan Memorial Award (2012), Medal from Govt. of Vietnam (2012), Krishi Siromani Samman by Mahindra (2013) and Vaigyanik Drishhikon Society (VDS) Samman (2013). In all, 15 Universities including Ohio State University, Indian Agricultural Research Institute, Scientific Council of Agricultural Academy, Agricultural Universities of Pantnagar, Kanpur, Jorhat, Coimbatore, Hyderabad, Udaipur, Varanasi, Srinagar, Meerut, Bhubneshwar, Punjab and Dharwad have conferred honary D.Sc. (Honoris Causa) degrees on him. Dr. Paroda has also served as a member of many international organizations such as Australian Center for International Agricultural Research (ACIAR), Commonwealth Agriculture Bureau International (CABI), Finance Committee of the Consultative Group on International Agricultural Research (CGIAR), Global Biotech Advisory Council of Monsanto, Board of Trustees of IRRI, Chairman of ICRISAT Board of Trustees and Chairman, Program Committee of GFAR. In view of his outstanding achievements, both American Society of Agronomy and the Crop Science Society of America had awarded Dr. Paroda with their prestigious Honorary Membership in 2001. ICRISAT and Kazakhstan have named their Gene Banks after him. He also served as a member of the World Meteorological Organization (WMO) High Level Taskforce for preparing a Global Framework for Climate Services. As Chairman of the Organizing Committee of Global Forum on Agricultural Research for Development (GCARD), he provided leadership at global level to organize successfully GCARD2 in October, 2012 in Uruguay. His passion, as Chairman, Trust for Advancement of Agricultural Sciences (TAAS), is to link science to society through needed policy reorientation and to work for the overall progress of the resource poor farmers. Since 2010, he has been serving as Chairman of the Farmers' Commission of Haryana State and as member of the Rajasthan State Planning Board. Currently, he is a member of the ICAR Society as well as its Governing Body.

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