

## Need to Revitalize and Transform the National Agricultural Research System

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I am pleased to have an opportunity to write this Editorial for *Agricultural Research*, the official journal of the National Academy of Agricultural Sciences, India. I congratulate the Academy for having taken this initiative to publish original research papers, critical reviews and opinion articles addressing issues related to agricultural research for development. It is a very timely initiative, as the world faces enormous challenges in ensuring food-and-nutrition security of the fast-growing population. These challenges can only be met by cutting-edge science and fast application of emerging technologies for sustainable agricultural growth and development. I wish the new journal great success in promoting high quality scientific research in various disciplines of agricultural sciences, and formulation of policies for agrarian prosperity.

India has always recognized that a prosperous, productive and sustainable farm economy is the cornerstone of equitable and inclusive growth. The Indian *economy* is based in part on *planning* through its five-year plans, with emphasis on agrarian economy. The first Five Year Plan, introduced by the first Prime Minister of India, Jawaharlal Nehru, addressed mainly the agrarian sector, including investments in dams and irrigation. During the last seven years, the country has pursued policies to revitalize agrarian economy, and adopted a multi-pronged strategy to improve returns to farming sector and step up investment in augmenting the rural infrastructure [1]. These policies have begun to pay off. The country has achieved a new plateau in food-grain production, exceeding 250 million tonnes during 2011–2012, an all-time record for the country. The

production of grain-legumes, which are the main source of proteins in Indian diet, has touched 18 million tonnes, crossing the barrier of 15 million tonnes. The country is producing today more milk, more fruits, more vegetables, more sugarcane, more oilseeds and more cotton than ever before. The agricultural growth is expected to be about 3.5 % per annum during the current 11th Five Year Plan (2007–2012). This is commendable, but we must improve upon it in the 12th Five Year Plan to achieve a minimum growth of 4 % or even higher. This calls for a very determined effort in many areas including investment in irrigation, investment in watershed management, provision of credit, provision of marketing support, etc. One of the key elements in that effort must be the contribution of agricultural research, and I take this opportunity to focus on this area.

I am aware that at any given time there is bound to be a gap between the yields obtained under the field conditions and the yields that can be achieved under ideal farming conditions. That difference is quite substantial at present, and it represents the failure of the system. In the short run, it is the job of the administration to close this gap, and our agricultural strategy must give high priority to this effort. This is not the job of research scientists, but it does require close collaboration between the scientists, technologists and the administration on the ground. We must do better in this area than we have done thus far. One of our major concerns is that our extension services system is no longer sufficiently robust. The First Green Revolution was achieved with the support of an effective rural extension and research infrastructure. At that time, *panchayats* (village self-governance), rural agricultural staff, agricultural scientists and district level officials actively collaborated to create a robust extension services system. We need now to revitalize the extension services system. The Krishi Vigyan

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Kendras (Agricultural Science Centres), which now cover virtually the entire length and breadth of the country, and Agricultural Technology Management Agencies (ATMA) have to play a major role in this process of revitalization and transformation of the extension network.

Looking beyond the application of known technology, our farm economy needs a far greater injection of science and a knowledge-based approach to increasing incomes and productivity [1]. Both land and water are limited resources. It is vital that we develop technologies to raise land productivity and accomplish a significant reduction in water use per unit of agricultural output. To achieve this objective, we need to develop varieties which can ensure high yield while economizing on water and are also capable of withstanding water stress. Equally important is the need to develop improved breeds of livestock which can flourish in our diverse agro-climatic conditions and do not require high value inputs. We owe a great deal to our scientists for what we have achieved in the past. We were able to overcome various constraints, thanks mainly to the dedicated work of our agricultural scientists, under the guidance of Professor M.S. Swaminathan, the father of the Green Revolution in our country. But we should not rest on our laurels. We have still a long way to go.

The National Agricultural Research System needs to be further strengthened to meet the challenges of the years ahead. Our Government is committed to raising the R&D spending as a whole to at least 2 % of the GDP by the end of the 12th Five Year Plan from the current level of about 1 %. Given the importance of the role that agriculture plays in achieving our national goals, we have to ensure that a significant proportion of increased R&D spending is directed to agriculture research and related activities. While the public sector needs to take the lead, we also need much greater support through private sector investment and involvement in agriculture, particularly in R&D. Indeed, it is unlikely that the goal of 2 % of GDP in research can be achieved unless a significant part of this is financed by the private sector.

Resources are only one part of the solution. I also feel our agricultural research system needs to look forward to keep abreast with the developments globally. I am particularly keen to ensure that research funding is based on clearly defined research goals which are linked to achieving productivity increases in the field. This calls for a system which not only focuses on basic research at one end but also encourages a spectrum of activity translating basic research to the development of varieties that meet the needs of our farmers, given the not-so-favourable circumstances in which they have to operate and their resource constraints.

We need to promote structured public–private partnerships, to foster better synergy among institutions and

disciplines. Further, we must never forget that linkage with farming communities is vital to enhance the efficiency and productivity of our agricultural research system. This would help in achieving a blend of modern science with traditional knowledge and making the system more responsive to the long-felt needs of our farmers. Special attention needs to be paid to the role of women in the farm sector. Women have historically been the source of vast traditional knowledge. Thus, special efforts have to be made to make the entire R&D chain more gender sensitive and give priority to technological options that reduce the drudgery of women working on the farm.

As we go forward, we have to keep in mind not only the increase in demand for food but also the changing composition of that demand. It is estimated that we would need at least an addition of nearly 50 million tonnes of food grains in the next 10 years to meet the ever-rising domestic demand. Increased production of food grains is certainly important for food security and sustaining our efforts to rid the country of the scourge of malnutrition. However, proper nutrition also requires a balanced diet. We would need to produce more fruits and vegetables and protein-rich products such as milk, eggs, fish and meat. The demand for these products is expected to grow substantially with rising incomes and changing dietary habits and preferences. Therefore, we have to pursue a multi-pronged strategy which seeks to boost productivity and production through product-specific interventions.

In the coming decades, we will have to also deal with the threat of climate change [2]. Climate change and the rising demand for commercial energy are expected to have a significant impact on agriculture in India. Rise in energy demand and continued dependence on fossil fuel-based energy will lead to higher costs of cultivation and also lead to an unwanted increase in carbon emission. The present generation faces even bigger challenges. Earlier we achieved higher agricultural productivity through means that used water very intensively and relied heavily on chemical inputs. And we did not have a looming concern on climate change. Fortunately, our economy is now much stronger, and we certainly have the intellectual and institutional capacity to overcome all challenges. I have no doubt that the country's R&D efforts will make a major contribution to creating the new green revolution in the years that lie ahead.

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