

Agricultural R&D budgetary support

to potential areas in Indian Agriculture

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In the past, budgetary support to Indian agricultural R&D system has received less attention than it deserved. The Union government is expected to support agricultural R&D for financing of investment, inclusive growth for tapping potential of high value agriculture, availing opportunities for public-private partnership in sunrise sector, and energy use in agriculture. The essential elements of strategy for agricultural research and development is: (i) to make substantial investment for development of research capacity within the Indian Council of Agricultural Research (ICAR) and the State Agricultural Universities; (ii) to provide leadership, resources and environment for development of a pluralistic system; and (iii) to facilitate partnerships with the international organizations. The research and extension systems have undergone a continuous change. Advancements in Industry 4.0 technology have taken shape and research on high value agriculture including animals and horticultural crops has expanded. This expansion has created space for roping in and bring onboard the private sector with public sector for harnessing the potential of emergence of disruptive technology.

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WITH the growth of Indian R&D system, there was a realization of the fact that public funding need not be exclusive for public organizations and that private sector may become an important ally in addressing national R&D needs. Nearly 10% ICAR budget is now spent on demonstration of new technology and skill development of farmers, in partnership with private and civil society organizations. In view of this, there is need to create conducive economic and policy environment by public sector for induction of more investment by private sector either through sponsored research or competitive funding. Hence, there is need to have public-private partnership in R&D. As the R&D system expanded, research managers constantly need to turn their attention to sharing information and resources among different disciplines, programmes and

institutions, which is required to maintain productivity of the system. Concerns about relevance of research and linkages with the state line departments and stakeholders lead to management innovations for better research planning, regulation of R&D and linkages with farmers and other end users.

The Indian agricultural R&D system has so far responded well to the national challenges, but complexity of research and regulatory issues needs to be addressed now. There are multiple development challenges like efficient and inclusive growth, sustainability of natural resources, nutritive and quality products, environmental safety, etc., which are often cumulative and conflicting requiring more research resources and their targeting. These tasks will need more resources to put required mechanism in place and balance concerns of all the

stakeholders. R&D system may not have adequate capacity to handle multiplicity of issues. This may require national efforts and capacity building within the government departments and fostering close interaction among them. Moreover, a pluralistic system of farm extension and advisory services should evolve in the years to come. The concept of agricultural innovation system is also gaining popularity, which recognizes the role of various sources of knowledge creators, including traditional knowledge, interactions among the actors for sharing of knowledge and promoting innovations in use of this knowledge to address production constraints and harness growth opportunities in agriculture. In this context, the extension system should play a larger role in developing linkages with various stakeholders and help farmers gain access to markets and farm

services, and acquire necessary technical skills.

Perusal of literature reveals strong agricultural growth poverty alleviating effects. It seems for example that a yield increase of one third might reduce the numbers in poverty by a quarter or more. The ability of agriculture to generate employment, to stimulate the rural economy through linkages, and to reduce the real cost of food, accounts for much of the poverty reducing effects observed. This is a pro poor bias of agricultural growth. But R&D expenditures were quite modest in the past.

Specific areas requiring R&D budgetary support

- Indian agriculture and its post-harvest management have been suffering from poor infrastructure for decades mainly due to lack of coordination among the various ministries and departments. Individual ministries and departments often worked in silos leading to poor planning and execution, which ultimately led to delays in the projects. This not only caused great inconvenience but was also a wasteful expenditure. It is important to reduce logistics costs in India including agriculture which is currently about 13% of GDP (which is quite high) causing decreased competitiveness of Indian exports in the global markets. Studies by the RBI and the National Institute of Public Finance and Policy have shown that for every rupee spent by the government in creating infrastructure, GDP gains worth ₹2.5-3.5 accrue. Moreover, infrastructure spending has a multiplier effect on the economy. There is urgent need to generate more research based evidences to convince policy makers ensuring last-mile connectivity by working with all stakeholders. Hence it becomes essential to put in place a mechanism for developing holistic infrastructure with hope to bring a positive change. This mechanism needs to be coupled with a stable and predictable regulatory and institutional framework.
- Level of hard and soft infrastructure development decides the distribution of gains from agricultural productivity. Following an increase in supply; the price decrease, determining the distribution of benefits between producers and consumers depend on the elasticity of demand of the commodity considered. The more inelastic demand, the greater the fall in price and hence the benefits are accruing to consumers. On the other hand, if the demand is perfectly elastic, only producers would gain. The elasticity of demand the producers face depends largely on the size of the market supplied –and hence on tradability. Liberalization of trade means that producers are capturing an increasing share of the benefits from agricultural growth, while any consumer gain becomes increasingly global. Where agricultural markets are poorly integrated and market infrastructure poorly under-developed, farm produce becomes effectively non-tradable so that increased output is likely to cause substantial fall in output prices with consequent gains to consumers. It is likely that poor in poorer region should benefit more from domestic agricultural growth than the poor in well developed region. The greatest achievement of fight against poverty comes from the supply of affordable food to the masses.
- Moreover, the emergent situation has created new avenues for agri-businesses. There is a need to conduct research on financing startups and for development of digital ecosystem for agriculture enterprise. This could be possible by harnessing the potential power of emergence of Industry 4.0 technology in agriculture. Such excises may be undertaken and institutionalized in public-private mode. To imbibe and to put in practice the knowledge emanating from Industry 4.0 revolution, capacity development of stakeholders at village level is vital. Hence it becomes essential to empower citizens to skill, re skill or upskill through training and extension education.
- The price asymmetry among stakeholders in agricultural markets is the biggest challenge. The farmers are not aware about the prices in national and international markets. The impact of use of information on crop/livestock production by Indian farmers for income enhancement is substantial. There is need to generate information on demand, supply, price, trade, stocks and other industrial uses on real time basis. Besides, market intelligence for agricultural commodities need to be developed regularly for advising farmers when to sell or not to get better price in volatile market.
- Market led extension and crop production is going to be decisive for farmers to adopt suitable varieties of commodities in general and high value commodities viz. fruits and vegetables, in particular. There is need to synchronize the pace of consumption pattern of the consumers with production portfolios at farmers' field levels. There is need to generate policy based empirical evidences for discerning and quantifying the dimensions for governing market led growth in agriculture. Availability of complete, useful, relevant, and understandable and ease of use in taking appropriate decision will bring more transparency and accountability among stakeholders in markets. There is need to develop and put in place a mechanism for generation and dissemination of vital information for agricultural commodity market outlook, and market intelligence for taking informed decision. This is a clarion call to bring a paradigm shift from price asymmetry to price symmetry among stakeholders in agri-markets.
- Resources allocated to sector have not been proportional to the contribution of the sector to the agriculture and allied sector economy. Over the years, less than 5% of the total financial resources allocated to the agriculture and allied sector have been allocated to the livestock sector. This has resulted in inadequate human

resource deployment as well. These have limited the sector to achieve a much higher growth. Currently, some of the key issues and challenges that impact development of the livestock sector including improved productivity and restrict income of farmers from livestock rearing include a host of animal management practices. These can be overcome by improving efficiency in Extension Services not only on animal health care and breeding but also for information dissemination on feeding and management practices. This could be possible by initiating startups by entrepreneurs by putting in place a mechanism of real time MIS (Management of Information System) and robust database for establishing inter-linkages among various sub-sectors for analysis and mid-course corrections to be undertaken if any.

- In the sunrise sector like fisheries and aquaculture, India has yet to tap and utilize around 50% the Fresh Water Aquaculture and Marine Fisheries. Fish catching is considered a risky livelihood option given the unpredictable sea conditions, and is full of uncertainties along with high cost of navigation. Continuous research and emerging technologies are being attempted to ensure fishing as a safer livelihood option with precise and predictable outcome. To make it possible, disruptive technologies are providing ways to gather and store information, adhere to compliances regarding regulations and traceability to ensure sustainable management of resources. Adoption of such technology would lead to substantial increase in catch and reduction in diesel consumption. India, being one of the largest fish producing nations in the world has been focusing on research and development in this sector to increase productivity while creating work opportunities in fishing, post-harvesting and other affiliated operations.
- The desirable path for agricultural growth and development is yield improvement and not output price

led growth in long run. Hence the generation of innovation technology for dissemination to farming community is a continuous process based on changing circumstances. The agricultural technology should be ecological sustainable, farmer's friendly and economically viable. There is need to cull out components of cost enhancing from cost structure of cultivation of crops and replace them with indigenous sources. Such farming systems may not only help in brining cost of cultivation at minimal level but also enhance farmers' income. Scientific community needs to steer research efforts to generate research based empirical evidences to validate low budget farming systems which are climate smart and offer resilient food systems.

- Honey has been an important ingredient for development of therapeutics and curative measures in different disciplines of health care management system. Beekeeping is a part of the Integrated Farming System in the country and has shown potential for income and employment generation for farm and nonfarm households besides empowerment of women. Without bees, our food security is at risk. There is need to promote holistic growth of beekeeping industry and achieve the goal of "Sweet Revolution". The solid research based evidences need to be generated on potential of high altitude honey, production of special honey in special commodity production zones and use of specific commodity based honey for curing fatal diseases for better health of population.
- In agriculture, artificial chemical use in farming is a massive contributor to global warming because of the high methane and nitrous oxide emissions. This draws attention of policy makers to the problem of ecological footprint. Kuznets curve shows the relationship between growth processes and carbon emissions. Low-carbon agriculture may be defined as an agricultural system that enables efficient production of the raw materials,

food, feed, and fibres while reducing energy inputs and greenhouse gas (GHG) emissions from agriculture and respecting the principles of sustainable development. These problems do not have a clear-cut solution. There is a need to establish tradeoff between economic (income, economic performance) and environmental (provision of public goods, protection of the environment, internalization of externalities, and preservation of biodiversity) gains. To achieve this, a global and local shift in farming can help the transition to a low-carbon economy. Hence, the national plans and strategies for low emission and climate-resilient economic growth are crucial for sustainable development. There is need to devote research funds to generate credible research based evidences to tackle emergent issues in energy policy. The knowledge emanating from such research would help in smooth transition from high carbon footprint to low-carbon farming which requires high annual investments to meet the goals of the Paris Agreement. Therefore, it has become essential to take complementary actions at the national and local levels to create incentives for developing a low-carbon economy. It is also necessary to increase the awareness of farmers on these issues through education and training.

SUMMARY

Budgetary support in emerging areas of agricultural research and development, and enhancing organizational skills of actors engaged in interdisciplinary areas and inter ministries/departments is expected to create an enabling environment for interactions and knowledge sharing among multiple-stakeholders and to create capacity to innovate products, processes and institutions to respond to market opportunities and enhance economic efficiency.

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