

Brainstorming Workshop on Emerging Challenges Before Indian Agriculture—The Way Forward



Proceedings & Recommendations

March 6, 2009
NASC Complex, Pusa Campus,
New Delhi-110012



Progress Through Science

Trust for Advancement of Agricultural Sciences
Avenue II, Indian Agricultural Research Institute
New Delhi



TRUST FOR ADVANCEMENT OF AGRICULTURAL SCIENCES (TAAS)

GOAL

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

MISSION

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

OBJECTIVES

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

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Brainstorming Workshop
on
Emerging Challenges Before Indian
Agriculture—The Way Forward

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Organized Jointly By
Trust for Advancement of Agricultural Sciences (TAAS)
&
International Food Policy Research Institute (IFPRI)

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Background

India has made great strides in increasing foodgrain production since the Green Revolution era of the mid-sixties. During the last one decade, production of maize and cotton has doubled. In the recent past, the growth rates in horticulture, livestock and fishery sectors have been impressive and have significantly contributed towards agricultural gross domestic product (AgGDP). The average agriculture sector growth over the last three years has remained around 4.7%. Nevertheless, the declining total factor productivity, diminishing and degrading natural resources and stagnating farm incomes have become major concerns. The impact of trade liberalization on agriculture and the global climate change are new challenges. At the same time, new opportunities are emerging for Indian agriculture. Commercialization of agriculture, diversification towards high-value commodities and integration with the global markets are the new opportunities. It appears that the Indian agriculture, being at the cross-roads, is currently facing both unprecedented challenges and unparalleled opportunities.

The key challenges to be addressed are: (i) weakening of input delivery and local agri-governance systems; (ii) increasing risk in agriculture due to weather, prices and trade policies, including the impact of globalization; (iii) small, declining and fragmented holdings; (iv) growing marketing inefficiencies and increasing agri-waste; and (v) limited employment opportunities in non-farm sector. These challenges can have serious implications on the farm income and the future of Indian agriculture. In many ways, these can even neutralize the contributions made through various technological breakthroughs. Neglecting these challenges at this juncture could adversely affect the national food and livelihood security, especially for the resource poor farmers. Appropriate policy and institutional responses are, therefore, needed to address these challenges by up-scaling and out-scaling some of the successful models evolved both within and outside the country.

On a brighter side, new opportunities are unfolding in the form of increased demand for agricultural commodities in both the domestic and global markets as a result of higher economic growth and rising consumers' income levels. The growing international demand for rice, wheat and maize besides that for cotton, soy meal, fish, meat, poultry, etc. also opens up enormous opportunities for export. In addition, the increasing demand for high-value commodities such as fruits, vegetables, milk, meat, flowers, etc. and agri-processed products in the domestic markets is pointing towards potential prosperity that can be brought about in the farm sector. The entry of corporate sector in developing and delivering market-driven technologies, contract farming, processing agri-products, developing organized retailing and exploring markets for exports is providing a new dimension to Indian agriculture. Some of these encouraging developments are taking place around the value chain from plot to plate. But the moot question still remains as to how to involve the farming community, especially the small scale farmers, in capitalizing markets and sharing the benefits arising from the new opportunities. Failing to address this problem now can lead to the exploitation of the farming community, culminating in distress to small holders. Innovative policies, appropriate institutional arrangements and market-driven technologies can, on the contrary, harness the untapped opportunities and provide the needed benefits to the entire farming community.

A few scattered successful models that have taken advantage of the new options have come up by appropriately addressing the key challenges. It is, indeed, a daunting task for the policy makers to up-scale such successful models, and reform the agricultural sector to address the challenges and ably harness the opportunities. This brainstorming workshop was organized jointly by the Trust for Advancement of Agricultural Sciences (TAAS) and the International Food Policy Research Institute (IFPRI) for an in-depth discussion on the emerging challenges and opportunities with the objective of getting some insights into the various issues involved.

Objectives

The following were the specific objectives of the workshop:

1. To have an informed assessment of the future challenges and opportunities before Indian agriculture and project their explicit implications on small holder farming community.
2. To document and understand successful models and policies in India and abroad for facing the emerging challenges and harnessing new opportunities.
3. To evolve mechanisms for up-scaling and out-scaling of successful models in order to attain a higher, sustainable and inclusive growth in agriculture.
4. To identify appropriate policies, institutional arrangements and technological needs for future.

The workshop was attended by a select group of leading agricultural experts from national and international organizations, policy advisors, scientific community, leaders of corporate sector and financial institutions, and organizations representing farming communities and civil societies. The program of the workshop was structured to seek inputs from experts through two keynote addresses, a background presentation on the main theme, expert comments of panelists, and an open discussion. A copy of the program is provided in Annexure I, and the list of participants is given in Annexure II.

This document summarizes the proceedings and main recommendations that emanated from this brainstorming workshop.

Welcome Address

In his welcome remarks, Dr. R.S. Paroda, Chairman, TAAS and former Secretary, DARE and Director General, ICAR, outlined the main objectives of the brainstorming workshop. He mentioned that the workshop was extremely important in view of the rapidly changing national and international scenarios and emerging agricultural development challenges. He underscored the pressing need for raising the farm income in a sustainable manner, managing the impacts of climate change, and increasing the resilience of agricultural production systems to various adversities and shocks. In this context, a detailed discussion on policy issues was extremely important to suggest options and strategies to guide Indian agriculture on a sustainable and inclusive growth path. He appreciated the efforts of Indian Agricultural Research Institute (IARI), International Food Policy Research Institute (IFPRI) and National Centre for Agricultural Economics and Policy Research (NCAP) is collaborating with TAAS for organizing the present workshop.

Emerging Challenges and Opportunities

The session on ‘Emerging Challenges and Opportunities’ began with a keynote address by D.r M.S. Swaminathan, Member of Parliament and Chairman, MSSRF. He appreciated the timely initiative of TAAS in organizing the workshop since its recommendations could provide a new policy direction to the new government. Such efforts were necessary to address the current challenges like management of global food crisis, adaptation to climate change, and the cooperatives of increasing farm incomes. His address focused on the following five major issues:

1. The first and foremost issue was of conservation and, wherever possible, enhancement of ecological foundations for sustainable agriculture, which included land, water, biodiversity, and marine resources. Urbanization was exerting tremendous pressure on available land and water resources. Prime agricultural

land was getting converted to non-agricultural uses, which needed to be reversed through appropriate land use policy. Common property resources needed to be protected well.

2. There was a significant revolutionary development in small farm management in respect of all the sub-sectors, i.e., crops, animal husbandry and fisheries. This process needed to be encouraged to provide 'the power of mass production to production done by the mass of small farmers'. Institutional mechanisms enabling this process should encompass (i) a decentralized production for increasing the availability of quality seed with the required insurance coverage, (ii) delivery of improved technology and associated services to farmers, and (iii) aggregation of produce to improve market access, which essentially should target 'end-to-end' or 'farm-to-plate' approach covering production, processing, marketing, etc. In addition, agriculture should be made a professionally rewarding and intellectually satisfying occupation to attract the youth to farming.
3. Orientation of agricultural development should shift from increasing production to raising farm income. This was important to check the widening rural-urban disparity and to diversify rural livelihood options, covering crop, livestock, fisheries and horticultural activities. Hence, linking farmers to market must receive high priority.
4. Interdependence of technology and policy was increasing over time and therefore, it was, essential to develop a synergy between these two major drivers of agricultural growth. Also, there should be greater integration of programs of various government departments dealing with agriculture. This would help not only in maintaining the cohesiveness of various policy initiatives but also in implementing the programs effectively and timely. Convergence should also be realized between agricultural policies and safety net programs. In particular, food security program should link with non-food programs dealing with nutrition, health, women and child care.
5. Finally, a new orientation was to be given to the schemes meant for the betterment of farmers. The policy initiatives in future should help develop the skills and knowledge of resource poor farmers, increase their income levels, and help empower them to enhance their role in social, economic and political systems. In future, new initiatives for economic development and social empowerment should include farm labourers, besides the farmers.

Dr. P.K. Joshi, Director, NCAP, made a presentation highlighting the main development issues faced by Indian agriculture. These issues related to investment and subsidies, natural resource conservation, current global financial crisis, agricultural diversification and possible approach for sustainable agriculture. He emphasized

that the most important development related challenge was to make the small farmers economically viable and link them with markets. Small farmers constituting about 80 percent of the farming community held approximately 39 percent of total agricultural land. These farmers were efficient producers but they often incurred high transaction costs. Concerted efforts were required to reduce these costs through appropriate institutional mechanisms. Public investment in agriculture decreased from 5 percent of AgGDP in 1980/81 to 3 percent in 2006/07. This must be reversed. On the other hand, subsidies were expanding rapidly and these were currently almost three times of public investment. These subsidies needed to be rationalized and focused in order to release resources for investment, increase efficiency of public funds and control ongoing resource degradation. Deterioration of land through salinity, water logging, and erosion, depletion of water resources, climate change, and global shocks (fuel prices, food prices, financial crisis) were other major development related challenges needing immediate policy interventions.

Dr. Joshi also touched upon the emerging opportunities for Indian agriculture. There existed high untapped yield potential which could be realized for meeting the fast increasing food demand. At the same time, the demand for high-value commodities was also increasing rapidly and farmers were responding to this because of better price realizations. This was helping in agricultural diversification towards high-value agriculture. This positive trend was expected to continue in future also. This, coupled with increasing agricultural exports, had increased farm income to some extent. Innovative institutional arrangements were also emerging in agriculture. Important among these were contract and cooperative farming, growth of private sector for input supply and retail chain revolution, new financial products, etc. These innovations along with better delivery of public services would go a long way in increasing the yield as well as farm income. Future development approach should target efficiency, equity and environmental issues. Efficiency should be increased not only in production but also in marketing of inputs and outputs. Equity dimension should address the concern of food and livelihood security through employment generation and social safety net programs. Resource conservation and management of agricultural waste should in future form core programs for addressing environmental concerns. In his concluding statement, Dr. Joshi highlighted the need for a 'way forward' through concerted efforts towards input (seed, water, fertilizer, power) use efficiency for increased productivity, scientific land use planning, agricultural diversification with focus on high value enterprises, and equity, specially for food and livelihood security.

While making expert comments, Dr. Arjun Uppal shared the experience of *Haryali Kisan Bazar* of the Sriram group in the delivery of inputs and services to the farmers at 300 locations targeting all categories of farmers. He mentioned that the government

alone could not meet all the requirements of the farming community. The private sector was an important ally in this task. Therefore, public-private partnership was critical for the supply of technology and related inputs. Accordingly, all implementation issues for fostering such partnerships should be addressed through suitable policy interventions.

Dr. I.P. Abrol was of the opinion that the objective of higher agricultural growth should be pursued without compromising the sustainability and environmental concerns. This will require a shift from commodity-based to system-based development approach. Development and dissemination of improved technologies, decentralized planning, and eco-regional perspective to agricultural research for development must receive priority attention. He also pointed out that apparently there was some technology fatigue and hence we should address the concern of complacency. Eco-regional approach, tried under National Agricultural Technology Project (NATP) by the ICAR, must be institutionalized in the national agricultural research system to address location-specific issues.

Dr. R.M. Acharya highlighted the importance of livestock sector in agricultural income and rural livelihood options. Somehow, this important sector remained neglected in terms of public investment and lack of suitable policy options. We must correct this bias in order to reap the benefits from this very important sector.

A number of important issues were discussed in the session. Dr. J.N.L. Srivastava highlighted the policy and institutional aspects of credit delivery to farmers that should get priority attention. Some of the institutional systems such as primary cooperatives and Small Farm Agribusiness Consortium (SFAC) were not able to address all the concerns. Hence, there was a need to have a relook at their functioning in order to overcome the existing constraints and make them more resilient. Similarly, there were a number of informal institutions such as NGOs, farmers' associations, private sector, etc., which were active in transfer of technology as well as product marketing. These institutions must be activated and involved while designing future interventions for agricultural development. It was also pointed out that currently there was a high level of inefficiency in the use of inputs and resources. This must be addressed through better agronomic practices.

Dr. J.C. Katyal, Vice-Chancellor, HAU, reemphasized the importance of input use efficiency and the need for precision farming to achieve the required resilience in agriculture. He also underscored the importance of agricultural innovations especially for technology generation, verification and dissemination with the active participation of farmers.

Dr. S.S. Johl, former Chairman, CACP, emphasized on basic and applied research for developing competitive futuristic state-of-the-art technologies, extension

through Information and Communication Technology (ICT) to effectively reach the millions of small and resource poor farmers, and resource management, particularly land and water, for raising the productivity and income levels. Equal emphasis needed to be given to both storage and management of foodgrain stocks in view of the rising uncertainties caused by production fluctuations, mainly because of climate change and erratic behavior of monsoon. Investments in production were bound to go infructuous in the absence of investments in scientific storage and appropriate management of stocks.

Dr. C.D. Mayee, Chairman, ASRB, underscored the need for aligning the R&D agenda, policy and institutional arrangements with the development challenges because of the increasing interdependence among these three main drivers of development. Hence, a paradigm shift in R&D agenda was needed.

Dr. Joachim von Braun, Director General, IFPRI, and co-chair of the session, highlighted three process related issues in his concluding remarks. First, there was a need for a systematic approach to conduct foresight studies indicating major driving forces and scenarios for future agriculture. This would help evolve a long-term development strategy to overcome the existing gaps/constraints. The second issue pertained to an institutional mechanism to learn from past experiences and incorporating the lessons so learnt into future program development and implementation. Such a mechanism should entail the study of impacts of policies and programs. Thirdly, the agenda to manage climate change should be strengthened and the processes to manage both adaptation and mitigation should be in place. A prerequisite for this would be to initiate a discussion on climate change and its implications for land use, crop and livestock systems, input use and management practices to reduce methane emission, etc.

Shri Sompal Shastri, former Minister of State for Agriculture, and Chairman of the session, covered in his remarks a number of policy issues. He reiterated the need for an immediate halt to the migration of population from agriculture to non-agricultural sector. Bridging yield gap, targeting for non-food crops and activities, and rationalization of priorities for public investment in agriculture with special focus on irrigation and infrastructure development (especially storage, communication, roads and markets) needed immediate attention. In spite of the impressive contribution of livestock sector, it remained neglected in terms of investment and proper policy environment. As a result, a number of valuable local breeds were getting eroded. There was also increasing pressure on farm profitability owing to the rising cost of inputs and adoption of new proprietary technologies. The role of the government in this regard could not be undermined. In this context, allocation of budget to agriculture needed to be enhanced substantially.

The Way Forward

In the Plenary Session on 'The Way Forward', the keynote speaker Dr. Abhijit Sen, Member (Agriculture), Planning Commission, spoke mainly on climate change and its implications on Indian agriculture. He was of the view that the adaptation strategy should evolve internally based on discussions and on an international agenda. Also, the strategy should be coherent with the long-term agricultural development policy. Immediate efforts were needed to mitigate the impacts of glacier melting and reduced river water flows, extreme weather events, seasonality, and changing monsoon patterns. These efforts should entail dovetailing of policy, technology and production management practices. The likely drop in crop yields (10-15%) owing to climate change could effectively be checked by appropriate R&D efforts. Technological innovations for sustainable and equitable use of natural resources should also be accorded high priority. Extreme weather events could be local in nature and their mitigation would require local response needing accelerated efforts on capacity building. Perhaps judicious management, including storage of critical inputs like seed, water and food, could be a part of the mitigation strategy. The technology testing mechanism should take into consideration the region-specificity. Similarly, program planning and implementation process should be more decentralized and capacity for this should be built both at the district and village levels. This might even help in better targeting of public resources for effective utilization at the local level.

Dr. V.L. Chopra, Member (Science), Planning Commission, expressed concern over the lack of fresh thinking and new insights into the planning process which could help in moving forward. He also mentioned that policy formulation, implementation mechanism and ground level actions must be given equal emphasis for successful interventions. Any policy and institutional change should be transforming in nature rather than touching upon peripheral issues and should be linked to effective implementation of strategy. Such a change could be brought about by inspirational leadership that could unleash the creative potential. There should be a clear vision of the desired changes, and the process of change, adjustments and resource needs should be derived from these targets. It was also mentioned that stepping up of investment was essential but, at the same time, it was equally important to ensure that the available resources were used efficiently. Such questions were increasingly being raised for agricultural R&D, and there were not adequate models and interventions which could be replicated on a large scale. The technology delivery system should equip farmers with knowledge, skill and resources so that they could foresee the opportunities and respond effectively. There was a need to identify models of success and replicate them for overall growth and development.

Dr. S.S. Johl, former Chairman, Commission for Agricultural Costs and Prices, outlined the challenge mainly of sustaining growth along with a higher production function through technological interventions. In this context, acceleration of R&D efforts, particularly in the area of biotechnology and nanotechnology, human resource development in research, and resource conservation deserved high priority. Good agricultural practices (GAP) should be popularized and information communication technology (ICT) should be used to reach the small and resource poor farmers. He emphasized the need for creating a fund to manage distress of farmers rather than giving them *ex-post facto* concessions. Storage capacity for additional 20 million tonnes of foodgrains should be created to minimize the losses and to meet the shortfall in adverse production years. Retail chains should reduce market spread but these should not be allowed to enter in production. There is an urgent need to link farmers to markets for which innovative approaches were a must.

Dr. Arvind Kapur, a representative of the private seed industry, shared the information on growth trends in Indian seed industry which presently had a market size of about 1.5 billion US dollars ranking fifth in the world. The country could produce 3.5 million tonnes more corn just through large scale adoption of single cross hybrids. About 80 percent of millet area was under hybrids and 80 percent of vegetable seed was currently supplied by the private seed sector. Rice hybrids were also spreading rapidly, even on small farms but the current pace needed to be accelerated. The industry was now focusing on small seed segments like hot pepper in Rajasthan. Policy decision and accelerated efforts on genetically modified crops would further promote the growth of Indian agriculture.

Dr. Ashok Gulati, Director, Asia Program, IFPRI, in his expert comments elaborated on agricultural development priorities in the context of climate change. Policy making was usually under compulsion, and the issue of food security still compelled the policy makers from taking bold policy initiatives. The country held a stock of 45 million tonnes of foodgrains but storage capacity existed for only 24 million tonnes. There was a need to rationalize our strategy on buffer stocking vis-à-vis food security. More modern storage capacity was, therefore, required, especially on regional basis, to address the issue of food security. Another step to strengthen food security should be to increase the productivity in the eastern region, which needed development of infrastructure and mechanism to provide effective price support. The Food Corporation of India (FCI), perhaps, should focus more on eastern India, and the private sector should be encouraged in the surplus regions (Punjab and Haryana). A major concern was to raise farm income, and this could be done by promoting other sectors (horticulture, livestock, fisheries) of agriculture, and a shift towards high value agriculture. In order to promote this sector, the participation

of private sector should be encouraged. This had been done in sugar, rice milling and recently in dairy. Legal issues relating to private sector participation should be addressed, and examples of high growth states like Gujarat should be replicated. Finally, more storage of water to check floods, and storage of grains to tackle volatility of foodgrain production should be done, as these phenomena would be more frequent as events of climate change unfold.

Expert comments of the panelists were followed by an intensive discussion. Dr. J.C. Katyal, Vice Chancellor, CCS HAU, mentioned that there were some positive aspects of climate change which should also be looked into and exploited for the benefits of farmers. Technological solutions to agricultural problems should be attempted, and this would require re-orientation of research strategy. Research should be innovation-driven, system oriented and contextual. Extension approach should also encourage the development of non-formal approaches for technology transfer, and all efforts should be directed to make Indian agriculture more productive, profitable and stable.

The participants were of the view that issues of women and child nutrition were indeed very important for inclusive growth. Successful experiences in this regard should be scaled up and documented for appropriate policy interventions.

Dr. S.A. Patil, Director, IARI, expressed his concern over the slow and rather restricted exchange of germplasm, which was affecting the efficiency of crop breeding programs. He also mentioned that there should be strong linkages between research institutions, industry and farmers. Progressive or champion farmers should be identified, encouraged and involved in frontline technology demonstration programs. The main goals must be farmer centered. Public-private-partnership (PPP) should be institutionalized through suitable policy interventions.

Dr. Ramesh Chand, National Professor, NCAP, highlighted the importance of technologies that could provide more output with less input/resource use. In this context, he drew attention towards the future role of biotechnology, especially GM technology, for increasing productivity, saving on inputs and increasing nutritional security. He also emphasized that mere physical access to food had no meaning unless economic access was ensured through increase in income of the people below poverty line.

Dr. K.R. Koundal, Joint Director (Research), IARI, and other participants raised the issues related to increasing the availability of quality seed, improving soil health, better marketing system, reduction in post-harvest losses, and improving nutritional security. Dr. Abhijit Sen suggested that the constitution of India recognized 14 subjects, including agriculture, at *Panchayati Raj* Institutions level, and it was necessary to study how these institutions were doing in terms of discharging their

responsibility. One could also look into how these institutions would do in terms of effective use of resources to address their priorities. This was necessary to ensure the decentralization of plan implementation and monitoring through people's participation.

Dr. Braun, in his remarks, highlighted four issues which could form a part of IFPRI's research agenda in support of India's agricultural policy: (i) Research on productivity drivers, on innovative market institutions, on environmental impacts, and on resources, especially policies for efficient water use, and on the how to of setting clear development priorities in these areas. Impact studies and scenario analyses can help in these areas; (ii) New risks and uncertainties emerging in agriculture from climate change, volatility of markets, external shocks, etc. Research would help on how these could be managed with grain reserve policy at national and regional level, with knowledge sharing and technological interventions; (iii) Study of best business models to promote efficient value chains and ensure product quality; and (iv) Improvement of ecosystem services and district level policy formulation and implementation critical for addressing some of the challenges. India has rich experience which helps in defining a suitable agricultural development strategy for the long run. A strong agricultural science policy remains fundamental for this.

In his concluding remarks, Dr. R.S. Paroda, Chairman of the session, summarized the main issues, which emerged during the discussion. He focused particularly, on the positive futuristic scenario of Indian agriculture, the need for accelerating technology transfer efforts through institutional reforms, the need for establishing partnership and effective coordination among the stakeholders and various institutions/development related programs in various Ministries/Departments in sharing responsibilities, and the need for developing synergies, and resetting the priority of research agenda and future R&D strategy in the context of climate change, globalization of agriculture and the internal market demand which is expanding fast. He also pointed out the roles of public and private sectors in capacity building for TOT and for technology uptake by the resource poor farmers and eventually strengthening their linkages with the markets for increased income to the producer and comparative benefits to the consumers. All these would require a paradigm shift in policy reforms towards institutional innovations, eco-regional and system oriented approach and execution of programs in a truly Mission Mode approach.

Recommendations

The current challenges before Indian agriculture are: ensuring household food and nutrition security, increasing farm income, alleviating poverty and minimizing production risks on account of climate change, besides ensuring overall natural resource management and environmental security. Appropriate policies, institutions and technologies would play an important role in facing these challenges boldly. Following are ten key recommendations as a ‘way forward’ to ensure higher and inclusive growth in Indian agriculture. Although all these recommendations are important, the first four demand immediate attention.

1. Increasing agricultural productivity is a key challenge for ensuring national food security. To increase production, exploiting the potential of existing yield gaps offers a tremendous opportunity. Hence, a Mission Mode Program on “Bridging the Productivity Gap” with real missionary zeal and effective monitoring is required to be launched with meticulous planning as a matter of priority. For this, attention to agriculture in science policy is needed, and the existing technology dissemination and input supply system needs to be revitalized and tuned to meet the emerging needs of farmers. Special emphasis on seed sector, input use efficiency, financial and insurance institutions and a paradigm shift in technology transfer mechanisms involving both the private sector and NGOs would be critical in achieving the desired goals.
2. Rainfed areas have a huge potential to raise production and increase farm income. These grey areas can soon be made green to harness a second green revolution. Role of technologies, policies and infrastructure would be very important in realizing the potential of rainfed agriculture. In this context, it has to be ensured that public policies and technologies have appropriate synergies to move forward. The initiative of the government to establish the ‘Rainfed Authority of India’ is a welcome step. However, this Authority needs a proper policy framework, legal and funding supports as well as empowerment for effective coordination and monitoring of all rainfed related programs run by various Ministries/Departments. The sooner it is ensured, the better it would be in the national interest as time is otherwise running out.
3. Linking farmers to markets is a pre-requisite for augmenting farm production and farmers’ income. Role of innovative institutions would be critical in this context to reap the benefits of emerging opportunities. A silent revolution of innovative institutions is already taking place in the Indian agricultural production and marketing system (farm to plate continuum) encompassing effective functioning of value chains and marketing efficiencies. The current need is to replicate such ‘best practices’ through formation of producers’ associations and self-help groups

or cooperatives so as to harness fare and efficient contract opportunities through value addition by organizing the farmers. KVKs, constituting an existing institutional mechanism at the district level, could play a very important role in the entire supply chain through access to best practices in production to marketing continuum. Information and communication technology offers new opportunities in support of this.

4. There is a dire need to significantly expand the capital investment in agriculture by both public and private institutions in the non-green revolution regions, particularly in the eastern and north-eastern India, where there is a great potential for agricultural growth. Hence, investment priorities must now be oriented towards realistic accelerated growth of agriculture for meeting the growing needs of the population. Therefore, public policies should be such that these trigger the much needed private sector investments for infrastructure development.
5. Agriculture is confronted with new forms of risks and uncertainties. These are related to natural calamities, global climate change, use of food for biofuels, uncertainty over prices, etc. Role of knowledge system and institutional mechanisms for input supply, credit, crop and livestock insurance, etc., would, therefore, be important in reducing both risks and uncertainties in order to attain the much needed resilience in Indian agriculture. At the same time, less dependence on the use of chemical fertilizers and pesticides, and efficient use of water, energy and other inputs, including timely farm operations with major emphasis on small farm mechanization and bioenergy (solar and wind), would help achieve faster growth in agriculture.
6. Water will be the most critical natural resource for the future growth of agriculture. Currently, the water sector for irrigation is invariably neglected both at the central and state levels. High inefficiencies in water delivery, distribution and on-farm use are adversely affecting our agricultural production. Irrigated area can be expanded considerably with improved efficiency in water use. Innovations in governance and pricing of surface and ground water for the desired water use efficiency, through an integrated approach among irrigation department, private sector, and farmers' water user associations are urgent issues for coordinated action by all stakeholders.
7. Climate change has added a new dimension to future agricultural growth, which is a major concern. The worst affected would be small farm holders located in the marginal and under-privileged areas. Therefore, investment options for both adaptation and mitigation, and policies which can help in reducing the impact of climate change, are urgently needed at this stage, especially to provide

incentives to the small farm holders for the adoption of technologies and practices such as conservation agriculture, carbon sequestration, etc., that can mitigate the impact of climate change.

8. There is an urgent need for agricultural diversification by identifying the key crops/commodities which can help small farm holders to raise their income. Incremental gains in income through diversification will help capital formation which will be instrumental in attaining higher productivity and profitability. In this context, agro-ecological zone-wise planning, adoption of new area, new crops approach using GIS and land use planning, and effective district level implementation of the strategy by involving grass root organizations and the stakeholders would be the best option to move forward.
9. Food processing and distribution sector needs to be strengthened by evolving policies for greater private sector participation in the entire value chain. Incentives through appropriate tax structure should be such that agro-processing, especially in the rural areas, becomes a lucrative option both for the farmers and the private sector. Current post-harvest losses are also to be minimized for which construction of modern silos is a matter of national priority.
10. Globalization of agriculture offers immense opportunities for enhanced agricultural export of a number of products. This can be harnessed only through increased efficiency in our production systems, improved quality of produce, value addition, market intelligence and long term well targeted export policies and planning, supported fully well by an enabling environment both within and outside the country. An institutional mechanism, with emphasis on a single window system, would catalyze the whole process of agricultural exports from India, for which tremendous opportunities exist but have not been tapped presently.

Action on all above recommendations will ensure the ‘way forward’ for a much faster growth of Indian agriculture.

Annexure - I

**Brainstorming Workshop
on**

Emerging Challenges before Indian Agriculture – The Way Forward

(Organized jointly by TAAS and IFPRI)

Program

Date: 6th March, 2009 Venue: NAAS Conference Hall

14:00-16:00 Opening Session: Emerging Challenges and Opportunities

Chairperson: Shri Sompal Shastri

Co-Chairperson: Dr. Joachim von Braun

14:00-14:10 - Welcome Address Dr. R.S. Paroda

14:10-14:30 - Keynote Address Dr. M.S. Swaminathan

14:30-14:45 - Highlighting the Issues Dr. P.K. Joshi

14:45-15:15 - Expert Comments Dr. Arjun Uppal, Dr. I.P. Abrol,
Dr. R.M. Acharya

(10 minutes each)

15:15-15:40 - General Discussion

15:40-16:00 - Concluding Remarks Chair/Co-Chair

16:00-16:20 - *Tea/Coffee Break*

16:20-18:30 Plenary Session: The Way Forward

Chairperson: Dr. M.S. Swaminathan

Co-Chairperson: Dr. R.S. Paroda

16:20-16:40 - Keynote Address Dr. Abhijit Sen

16:40-17:30 - Expert Comments Dr. V.L. Chopra, Dr. S.S. Johl,
Dr. Arvind Kapur

(10 minutes each) Dr. Ashok Gulati

17:30-18:15 - General Discussion

18:15-18:25 - Concluding Remarks Chair/Co-Chair

18:25-18:30 - Vote of Thanks Dr. S.A. Patil

Annexure -II**List of participants**

1. Dr. M.S. Swaminathan, Chairman, MSSRF
2. Shri Sompal Shastri, Ex-MOS Agriculture
3. Dr. Joachim von Braun, Director General, IFPRI
4. Dr. Abhijit Sen, Member (Agri.), Planning Commission
5. Prof. V.L. Chopra, Member, Planning Commission
6. Dr. R.S. Paroda, Chairman, TAAS
7. Dr. S.S. Johl, Ex-Vice Chancellor
8. Dr. S. Nagarajan, Chairperson, PPV&FRA
9. Dr. P.L. Gautam, Chairperson, National Biodiversity Authority
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Participants presenting their views



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