Annual Report

2006-07

राष्ट्रीय कृषि आर्थिकी एवम् नीति अनुसंधान केन्द्र
NATIONAL CENTRE FOR AGRICULTURAL ECONOMICS AND POLICY RESEARCH
ICAR

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National Centre for Agricultural Economics and Policy Research
New Delhi

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PREFACE

The agriculture scenario in India is rapidly changing due to numerous internal and external forces. The Indian farmers need to be involved in the process of agricultural transformation to share the benefits of ensuing agrarian changes. This requires developing and integrating pro-poor policies, appropriate institutional arrangements and region-specific innovations. The National Centre for Agricultural Economics and Policy Research (NCAP) is committed to accomplish this task by leveraging innovations for attaining efficient, inclusive and eco-friendly agricultural growth through agricultural economics and policy research. To realize this vision, the Centre is credited for having the best faculty in agricultural economics and policy research in the country.

This report provides some of the Centre's significant achievements during the year 2006-07. Besides making several outstanding contributions in agricultural economics and policy research, there were two major accomplishments during the reporting year: (i) the office building of the Centre was inaugurated by Shri Sharad Pawar, Honourable Union Minister of Agriculture, Consumer Affairs and Public Distribution, Government of India; and (ii) active involvement of few of our scientists in the XI Five-Year Plan formulation of the Government of India. On research front, the Centre was awarded a mega project on 'Visioning, Policy Analysis and Gender (V-PAGe)' under the World Bank funded National Agricultural Innovation Project of the Indian Council of Agricultural Research (ICAR).

During the year, important studies conducted were related to agricultural scenario planning for 2030; participation of smallholders in high-value agriculture; connecting smallholders with the markets; supply chain development in seed sector; geometry of information dissemination in agriculture; adoption of agro-chemicals across agro-ecological regions; food security of South Asian Countries; trade competitiveness in oilseeds and rice; investment in agriculture, livestock and fisheries sectors; problems and prospects of insurance in agriculture; and challenges and opportunities for agricultural development in North-Eastern region. In addition, the Centre provided policy support to the states of Uttarakhand and Chhattisgarh in devising their agricultural strategy. Three new in-house programmes were also initiated that included spatial and temporal changes in agricultural productivity and profitability in India; impact of biotechnology research and regulatory framework; and assessment of retail chains and supermarkets in enhancing marketing efficiency and sharing benefits with the producers.

In accomplishing its targets, the Centre received overwhelming support from the ICAR. We are especially grateful to Dr. Mangala Rai, Director-General, Indian Council of Agricultural

Research, and Secretary, Department of Agricultural Research and Education, Government of India, for extending his continuous encouragement and guidance to take the Centre to elevated heights. We offer our sincere thanks to Dr. K. M. Bujarbaruah, Deputy Director-General (Animal Sciences) and Dr. J. P. Mishra, Assistant Director-General (Economics, Statistics and Marketing) for their continued support and motivation in fulfilling the mandate of the Centre.

My colleague, Dr. Sant Kumar has superbly collated and packaged the large array of Center's activities and brought the report to the present format. Dr. Suresh Pal supervised and gave valuable suggestions in finalizing this report. Mr. Ajay Tanwar patiently processed and formatted the manuscript. I sincerely acknowledge their invaluable contribution in bringing out this report. I also acknowledge the remarkable contribution and team efforts of all the staff of NCAP for their incredible support in fulfilling the Centre's mandate.

I am sure that our stakeholders and partners would find the report useful and provide us their valuable suggestions in accomplishing our mission.

P. K. Joshi
Director

31 July 2007
New Delhi

LIST OF ACRONYMS AND ABBREVIATIONS

AgGDP	Agricultural Gross Domestic Product
AKI	Agricultural Knowledge Initiative
ARIS	Agricultural Research Information System
CAPSA	Centre for Allevation of Poverty through Secondary Crops' Development in Asia and Pacific
CCIS	Comprehensive Crop Insurance Scheme
CGIAR	Consultative Group on International Agricultural Research
CSSRI	Central Soil Salinity Research Institute
DARE	Department of Agricultural Research and Education
DRC	Domestic Resource Cost
EU	European Union
FMCs	Field Management Committees
FPS	Fair Price Shop
FYP	Five-Year Plan
GCA	Gross Cropped Area
GCFA	Gross Capital Formation in Agriculture
GDP	Gross Domestic Product
GEAHD	Government Expenditure on Animal Husbandry and Dairying
GM	Genetically Modified
GoI	Government of India
HYVs	High-Yielding Varieties
IAAE	International Association of Agricultural Economists
ICAR	Indian Council of Agricultural Research
ICICI	Industrial Credit and Investment Corporation of India
IFFCO	Indian Farmers Fertilizer Cooperative Limited
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ICT	Information Communication Technology
IP	Intellectual Property
IPRs	Intellectual Property Rights
MDFVL	Mother Dairy Fruits and Vegetables Limited
NAAS	National Academy of Agricultural Sciences
NAIP	National Agricultural Innovation Project
NAIS	National Agricultural Insurance Scheme
NAP	National Agricultural Policy
NARS	National Agricultural Research System
NASC	National Agriculture Science Centre
NATP	National Agricultural Technology Project
NCAP	National Centre for Agricultural Economics and Policy Research

NDUS	Novelty, Distinctiveness, Uniformity and Stability
NER	North-Eastern Region
NGOs	Non-Governmental Organizations
NIN	National Institute of Nutrition
NNP	Net National Product
NPC	Nominal Protection Coefficient
NRAA	National Rainfed Area Authority
NSDP	Net State Domestic Product
NSS	National Sample Survey
OECD	Organization for Economic Cooperation and Development
OPV	Open Pollinated Variety
PDS	Public Distribution System
PIF	Pesticides, Insecticides and Fungicides
PME	Prioritization, Monitoring and Evaluation
PRI	Panchayati Raj Institution
PVP&FRs	Plant Variety Protection and Farmers' Rights
PVP&FRA	Plant Variety Protection and Farmers' Rights Authority
PVPRs	Plant Variety Protection Rights
RAC	Research Advisory Committee
R&D	Research and Development
RCE	Real Capital Expenditure
RI	Rainfall Insurance
SAARC	South Asian Association for Regional Cooperation
SACs	South Asian Countries
SAIC	SAARC Agricultural Information Centre
SAUs	State Agricutural Universities
SDP	State Domestic Product
SEZs	Special Economic Zones
SHGs	Self Help Groups
TCFA	Total Capital Formation in Agriculture
TE	Triennium Ending
TFP	Total Factor Productivity
TMO	Technology Mission on Oilseeds
TRIP	Trade Related Intellectual Property
UK	United Kingdom
UR	Uruguay Round
USA	United States of America
WMCs	Water Management Committees
WTO	World Trade Organization

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Executive Summary

- The National Centre for Agricultural Economics and Policy Research (NCAP) continued its efforts towards achieving excellence in agricultural economics and policy research, and attained a wider visibility in the current year. The Centre is committed to strengthen agricultural economics research in the National Agricultural Research System (NARS) to provide economically-viable, socially-acceptable and environmentally-feasible policy options for the science-led agricultural growth. The Centre has a small team of 16 scientists (including one ICAR National Professor and one National Fellow) and 15 other staff members. The budgetary outlay of the Centre for the year 2006-07 was Rs 293.24 lakh.

- A high level Research Advisory Committee guides the Centre in developing and executing its research programmes. A Management Committee supervises the financial and administrative functioning of the Centre. In addition, a number of internal committees facilitate the decentralized participatory management and governance of the Centre.

- Research on contemporary issues is conducted at the Centre under five broad theme areas, viz. Technology Policy, Sustainable Agricultural Systems, Markets and Trade, Institutional Change, and Agricultural Growth and Modelling. Each theme, headed by a senior professional, has a small team of scientists. Research programmes within and across the themes are designed so as to accomplish the mandate of the Centre. During the year 2006-07, the Centre has undertaken 27 research studies. Two consultancy projects were also completed by the Centre during the year. NCAP has not only maintained but also increased the linkages and collaborations with many institutions in India and abroad. The Centre organized workshops, seminars, brainstorming sessions and training programmes covering topical areas such as rural innovations, system of rice intensification, project-based budgeting, use of SPSS, visioning of Indian agriculture, etc.

- A number of driving forces are expected to influence Indian agriculture in the next two decades. To envision the likely scenario of Indian agriculture in 2030, four scenarios were developed and explained using the popular descriptions, viz. (i) In the Valley, (ii) Along the Edge, (iii) Over the Mountains, and (iv) Through the Hills. The scenarios resolved around two main confronting issues: (a) social choice about equity versus efficiency, and (b) role of economic liberalization versus government interventions. These scenarios indicate broad environments in which the policy will play out to respond to the development challenges and thereby guide the strategic planning. This exercise would also help the organizations in formulating strategy to address uncertainties, accelerate the reforms process and facilitate innovations.

- Wheat import has sparked a debate on food-security related issues. It coincided with the declining global wheat production and rising wheat prices. In India, during the past few years, wheat production has remained stagnated at nearly 70 million tonnes, but demand for wheat has increased unabatedly. The supply–demand gap needs to be bridged to ensure

food security and stabilize wheat prices in the country. To better understand supply–side constraints, a study was conducted that revealed enormous possibility of increasing wheat production in the traditional wheat growing areas. It was estimated that raising wheat yield in only Bihar and Madhya Pradesh to the level of just national average will add over 5 million tonnes to the total production. Farmers' access to improved production technology, balanced application of fertilizers, use of other essential inputs at right time and adoption of appropriate management practices can add another 5 million tonnes of wheat. Bridging yield gap in both low-yielding and high-yielding states also has enormous potential to increase wheat production. If only 10 per cent of the unexploited yield potential is harnessed, the additional production of nearly 5 million tonnes can be raised. Only doubling the availability of quality seed to raise the replacement rate to 26 per cent even on 50 per cent of the wheat area would yield additional 10 million tonnes of production.

- Declining production of oilseeds in the face of their growing demand has been a critical challenge to the policymakers in India. Sources of production growth and total factor productivity (TFP) have been analyzed to assess the future prospects of edible oilseeds production. It was found that yield-effect dominated over area-effect in increasing oilseeds production during 1976-85 (except for soybean and sunflower). The trend reversed during 1986-95 (i.e. area-effect dominated over yield-effect), and thereafter (during 1996-04), the yield-effect turned negative. The results have confirmed that increased production of oilseeds after the launching of Technology Mission on Oilseeds (TMO) and till mid-1990s, was mainly due to area expansion. Efforts are needed to augment yield of oilseeds as area is becoming scarce due to its rising demand for alternative uses.

  The TFP growth contributed positively to groundnut production prior to mid-1990s, but this trend reversed afterwards in Andhra Pradesh. A positive and high TFP growth was noticed in the production of rapeseed and mustard in Rajasthan and Haryana. Similar results of TFP contribution was obtained for soybean in Madhya Pradesh. In the case of sunflower, contribution of TFP in production was found positive after mid-1990s, from a negative growth during 1986-95. These results have confirmed the positive contribution of TFP in production of major oilseeds.

- A wide array of literature resolved that India's edible oil sector is not competitive globally. Analysis has shown that during post-WTO period, India exported large quantities of vegetable oils and oilseeds (23 per cent each), and oilcake and oilmeal (54 per cent). During 2004-05, India earned Rs 5,700 crore, which is just half of its large import bill for edible oil. Competitiveness in the edible oil sector depends on the production of oilseeds and their processing efficiency. To become trade competitive, there is a need to reduce (i) cost of production, (ii) cost of marketing and transportation, and (iii) cost of processing. Besides, country should aggressively promote export niche of other oilseeds like castor, sesamum, groundnut, etc. with specific attributes of consumers' preference.

- Soybean export from the country was affected due to severe crisis in the East Asian countries, which were the major destinations for Indian soybean products. The export of soybean declined by over 50 per cent during 1991-95, and further to 30 per cent in recent years. India can take the advantage of growing high-potential varieties of soybean to remain competitive in the world market, due to their higher productivity and lower production cost. Countries like Brazil and Argentina are availing advantage of growing modern varieties (e.g. genetically-modified varieties) of soybean. Bridging large yield gaps by using adequate quantity of inputs and quality seeds can help in increasing soybean production. There is also a need to promote location-specific, high-yielding, pest-resistant and drought-tolerant varieties of soybean to break the present yield barrier.

- Study on rice trade has revealed that India exported about 4 per cent of its total rice production (90 million tonnes) during the past few years. India has comparative advantage in promoting export of rice but its level and competitiveness are affected by volatility in the international prices. The volatility in global prices has also seeped into the domestic market. Better market intelligence and quick policy response are needed to increase export under different scenarios.

- A study was conducted to assess the impact of trade liberalization on self-reliance of food in South Asian Countries (SACs) during 1991-2002. The results revealed that dependency on imports in SACs has increased sharply for vegetable oils. SACs are meeting nearly half of their total domestic requirements through imports. Even high tariff rates have not been able to deter the import surge. Dependence on imports has also increased for pulses in all SACs, except Nepal. India has guarded effectively against the import of cereals, fruits and dairy products during the post-WTO period through tariff and non-tariff measures. Pakistan and Sri Lanka could manage the same only for cereals, but have experienced import dependency for other food commodities. Bangladesh and Nepal have seen moderate-to-sharp increase in their import dependency for most food commodities.

- Rainfed agriculture is starving for water. Therefore, the role of watershed programme in rainfed areas in increasing crop productivity and improving livelihood security has assumed considerable importance. To harness the potential of watershed programme, equitable sharing of costs and tangible benefits is critical. In addition, access to improved technology, regular flow of information and local institutions are necessary for the success of watershed programmes.

- Considering the significance of agricultural diversification towards high-value food commodities such as fruits, vegetables, milk, meat, fisheries, etc., the Centre has been conducting studies to better understand its implications on smallholders. In this regard, a study was conducted to examine impact of vegetable production on income and employment of smallholders. It has revealed that vegetable production is not only more profitable and labour-intensive than that of cereals, but also more suitable to the needs and resource endowments of smallholders.

To test the hypothesis that agricultural diversification is smallholder-friendly, a study was undertaken based on the 54th and 59th rounds of NSSO. The study has revealed that smallholders do participate in the diversification process towards high-value agriculture, though it is capital, technology-and information-intensive. At all-India level, it has been found that smallholders allocate more than half of their cultivated area to vegetables and fruits. Their share in dairy animals and small ruminants has been noticed even higher. The need is to effectively link smallholders with the appropriate input markets and assured output markets for high-value agricultural commodities.

- Institutions like cooperatives and producers associations are considered the efficient means of linking farmers to markets. Integration of vegetable growers with a producers' association (namely SAFAL) was analyzed and it was found that members of SAFAL could reduce the transaction costs by 92 per cent, as against by independent producers. Producer members also realized the benefits of higher output prices by 7 per cent and net revenue by 78 per cent.

  Contract farming is another means of integrating farmers with assured markets. Its socioeconomic benefits were studied in the case of milk production in Rajasthan. Contract farming in milk was more profitable, which was mainly due to reduction in transaction costs. It also contributed to increasing milk yield and reducing cost of production due to improved management and technical advice. The other benefit of contract farming was that it induced competition in the rural milk market, which otherwise was absent and vendors often exploited the rural milk producers by paying less than the market price.

- Agricultural insurance guards farmers against production and income risks. Despite various efforts made in the past, its spread has been limited. The coverage of agricultural insurance in the rainfed areas which are prone to high risk and uncertainty, needs to be expanded. Various models of agricultural insurance were studied in Andhra Pradesh. It was noted that more transparency and efficiency are needed in settling of the claims. The study has suggested that modern communication networks may be adopted for loss assessment and claims settlement. Recently, the private sector has come out with some financially-viable insurance schemes, based on weather parameters. One such product, namely 'Rainfall Insurance', has been developed by ICICI-Lombard General Insurance Company and IFFCO-Tokio General Insurance Company. The advantages of this scheme include transparency, low cost and quick claim settlement. The opportunity of greater participation by the private sector can be tapped by allocating definite targets to cover agriculture. Considering wide fluctuations in prices, the study has suggested introduction of market insurance to cover price risks.

- Access to information by farmers is an integral part of agricultural transformation. A study was conducted to understand the flow and sources of information related to improved agricultural technologies. It was found that during 2003, only 40 per cent of the households received information on modern farming practices at the all-India level. The access to information across agro-ecosystems has been found to vary widely. It is too low in the arid agro-

ecosystem. In the coastal ecosystem, KVKs and training programmes are the main sources of information to farmers. In the irrigated ecosystem, input dealers are playing a major role in agriculture. In the hills and mountains ecosystem, mass media was reported to be the major means for providing information to farmers. Study has suggested that a need-based and demand-driven extension strategy should be evolved by using the vast potential of information and communication technology.

- Agricultural growth is showing a decelerating trend, which is starkly opposite to the economic growth. Studies were undertaken to determine factors responsible for slow and decelerating growth and sources of growth in agriculture. Declining public investment in agriculture has been identified as one of the important causal factors of decelerating agricultural growth. Analysis has revealed a steep decline in public investment during the past two decades. Growing subsidies is one of the main reasons for the declining public investment. Increasing subsidies and falling investments have serious implications on agricultural growth in the medium-and long-run. Increasing subsidies in agriculture have promoted indiscriminate use of natural resources which have caused falling watertable and deteriorating soil health, and ultimately leading to declining productivity.

  In the case of livestock sector, the government spending (expenditure on animal husbandry and dairying) had increased by one-and-a-half times during 1980s over the 1970s, but declined considerably during 1990s. The proportion of expenditure on livestock in the total expenditure on agriculture has also declined, which needs to be reversed.

  Among important sources of growth, it was found that technology played a major role during 1980s, while output prices became the important source of growth during 1990s. It was suggested that price-led growth may not sustain in the long-run and may benefit only those farmers who have enough marketable surplus. Technology-led growth may be sustainable and benefit all the farmers. Efforts are needed to disseminate promising technologies to harness demand-driven opportunities in the wake of liberalization and globalization.

- Non-IPRs mechanisms such as hybrids, trade secrets, contracts and favourable government policies have contributed to the growth of the private seed industry. The enactment of new IPRs legislation (PVP&FR Act, 2001) is expected to further balance the interests of all stakeholders. The Act may help safeguard the parental lines of a company, but it is not clear to what extent the Act would encourage the private sector to invest more in plant breeding for open pollinated variety (OPV) and meet the seed requirements of farmers in marginal environments. The experiences of other countries indicate that a major shift in private plant breeding priorities towards OPV is unlikely, and the incentive for investment in OPV is low. However, the private sector may enter the OPV market to get a foothold in the potential hybrid market for these crops by producing seeds of public or private OPVs. This is already happening in the case of rice and may expand to mustard, soybean and pigeon pea. Increased privatization of seed industry is however associated with increased seed prices, which is likely to continue, and the cost on establishing and maintaining PVP rights will further add to the seed cost.

- A strong programme has been developed to assess the problems and opportunities in the North-Eastern region. The aim is to tap opportunities for the benefit of farmers in the region, which has a high level of food insecurity and persistent poverty. A household survey conducted in 2005 has revealed that more than 74 per cent households do not have access to the minimum requirement of food. The traditional *Jhum* cultivation has led to several socioeconomic and environmental problems. *Jhum* practice covers a large area (1.5 million ha) and supports a sizable number of *Jhumias* for their food security. The region has opportunity to grow high-value food crops like fruits, vegetables, oilseeds, medicinal and aromatic plants, floriculture, etc. It was found that the pace and pattern of diversification towards high-value crops in the region was significant during the past two decades. Horticulture sector in the North-Eastern region is gaining importance. It contributed 35 per cent to the total value of agricultural output in 2002-03. The study has noted that the region is constrained by the lack of infrastructure for production, marketing and value-addition. There is a need to invest on infrastructure and encourage the private sector to connect farmers with markets by harnessing the potential of the region for social welfare. There is also a need to exploit the comparative advantage of production environment in the region.

- The NCAP website, http://www.ncap.res.in was redesigned and updated almost on a weekly basis. During the year, the website was accessed by 39,168 visitors, of which 70 per cent were from India and the rest from USA, Australia, China, UK and other countries. All the NCAP publications are available in the pdf format and can be downloaded from the website. Centre's publications were accessed 13,543 times, of which Policy Papers and Policy Briefs accounted for 55 per cent. The website for networking of social scientists, http://www.agrieconet.nic.in is facilitating research, resource-sharing and optimization of response time to address the methodology-related problems.

- The ARIS facility at the Centre has been equipped with 512 kbps leased line from ERNET to provide the E-mail and Internet facilities to NCAP staff. The Centre has its own independent mail server which is being used to its potential.

- Centre's publications are widely acclaimed by its stakeholders. During the year, the Centre published one Policy Paper, two Policy Briefs, one PME Notes, one book, twelve journal articles and twenty-seven other papers. The Centre's staff has been involved in a number of professional and policy interactions and organized several meetings, seminars, workshops and brainstorming sessions during the year. It also collaborated with a number of national and international research organizations. These activities were quite rewarding and contributed in attaining greater impact and wider visibility of the Centre.

  Scientists of the Centre were recognized for their outstanding research contributions, and most valuable among them being the election of Dr. P. K. Joshi, Director, NCAP, as Fellow of National Academy of Agricultural Sciences (NAAS).

I. PROFILE OF NCAP

The National Centre for Agricultural Economics and Policy Research (NCAP) was established by the Indian Council of Agricultural Research (ICAR) in March 1991, to strengthen agricultural economics and policy research in the national agricultural research system (NARS), comprising ICAR institutions and state agricultural universities (SAUs). The Centre acts as 'eyes and ears' of the Council. It serves as the nodal agency of ICAR in monitoring and interpreting research implications of changes in the agriculture sector and macroeconomic environment of the country as well as international developments.

Location

The Centre is located in the Pusa campus in New Delhi. It has in its close vicinity several institutes of ICAR and CSIR, like Indian Agricultural Research Institute (IARI), Indian Agricultural Statistics Research Institute (IASRI), National Physical Laboratory (NPL), Institute of Hotel Management. The Centre is very close to the National Agriculture Science Complex (NASC) which houses National Academy of Agricultural Sciences (NAAS), regional offices of nine Consultative Group on International Agricultural Research (CGIAR) centres and offices of many professional societies. The Centre thus has locational advantage in terms of multidisciplinary studies, inter-institutional interactions, research linkages, library facilities, etc.

Vision

Leveraging innovations for attaining efficient, inclusive and eco-friendly agricultural growth through agricultural economics and policy research.

Mission

To strengthen agricultural economics and policy research for providing economically-viable, socially-acceptable and environmentally-feasible policy options for science-led agricultural growth.

Mandate

The mandate of the Centre includes:

(1) To conduct policy-oriented research in network mode on
   (i) Technology generation, dissemination and impact;
   (ii) Sustainable agricultural production systems;
   (iii) Interaction between technology and other policy instruments like incentives, investments, institutions, trade, etc.; and
   (iv) Agricultural growth and modelling.

(2) To strengthen capacity in agricultural economics and policy research in the national agricultural research system.

(3) To enhance participation of ICAR in agricultural policy debates and decisions through policy-oriented research and professional interactions.

Research Activities

Research activities in the Centre are conducted in five broad theme areas, viz. technology policy, sustainable agricultural systems, markets and trade, institutional change, and agricultural growth

and modelling. The significant study areas of the Centre include research investment, research resource allocation, WTO and trade in agriculture, private sector participation in agricultural extension, food policy, monitoring and evaluation of agricultural research and O&M reforms, impact assessment, institutional aspects, growth and investment and high-value agriculture.

As a part of policy advocacy, the Centre organizes workshops where issues of major policy interests are discussed by policymakers and academicians. The Centre also organizes lectures of distinguished scholars and policymakers for a deeper understanding of the global developments and policy changes. Training and capacity building in frontier areas of agricultural economics research are the priorities of the Centre.

The Centre maintains close linkages with several national and international organizations involved in agricultural research, development and policy. Collaborative research projects, seminars, workshops, publications and participations in policymaking forums are the usual modes of policy interface which help improve the outreach activities of the Centre. The Centre regularly brings out publications like Policy Papers, Policy Briefs, Conference Proceedings, and PME Notes. These serve as the main agents for dissemination of its research findings. During the short span of its existence, the Centre has established a track record of impressive research studies. The Centre endeavours in developing a synergy between socioeconomic and biological sciences and provides economic inputs to specific areas of agricultural research.

Management

A high-powered Research Advisory Committee (RAC) comprising eminent professionals, mostly from outside the ICAR system, guides the Centre on its research policies. Prof. Y. K. Alagh, former Minister of State for Power and Science and Technology, Government of India, was the first Chairman of RAC. Prof. V. Rajagopalan, an eminent agricultural economist, was the Chairman of its recent RAC. The RAC provides guidance to the Centre in planning research thrusts and strategies. Initiatives in human resource development, approaches towards improving policy dialogues and evaluation are some other areas in which Centre receives guidance from the RAC.

The functioning of the Centre is supervised by a Management Committee (MC) which is constituted and mandated by the ICAR. A number of internal committees, such as Institute Research Council, Budget Committee, Academic Planning & Policy Committee, Scientists' Evaluation and Development Committee, Purchase Committee, PME/NATP Site Committee, Official Language Committee, Library Committee, Publications Committee, Consultancy Processing Cell, Grievance Cell, and Women Cell are operating at the Centre for decentralization of management. The Joint Staff Council of the Centre promotes healthy interaction and congenial work environment in the Centre.

Infrastructural Development

New Office Building

The Centre moved to its new building, which is adjacent to the old building, in February 2006. Approximately Rs 4.83 crore has been spent on the construction of this building. The Centre had

the approval for construction of office building and staff quarters in the IX Plan. The construction of quarters will start as soon as the Master Plan of IARI is approved by the civic authorities. Efforts are being made to get this approval.

NCAP Website

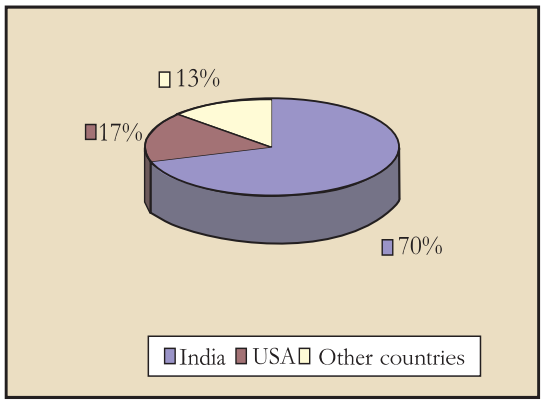


Figure 1: Visitors that accessed NCAP website during 2006-07

The website of NCAP (http://www.ncap.res.in) provides latest information about the Centre, particularly on its staff, infrastructure, research activities, research projects, publications and linkages. The website is being updated regularly. The publications of NCAP, namely annual reports, policy papers, policy briefs, conference proceedings and PME notes, etc. are available on this website in downloadable pdf file.

During the year, NCAP website was updated almost on a weekly basis. All external and internal links of the site were made functional updating them with latest URLs. The steps followed have resulted in tremendous response for referring NCAP website both in India and abroad. During the year, 39,168 visitors referred our website. Of which, two-thirds (70 per cent) were from India, and rest 30 per cent were from United States of America, Australia, China, United Kingdom and others (Figure 1). Publications of the Centre were also accessed/downloaded by a large number of visitors. Centre's publications were accessed 13,543 times. Figure 2 shows that policy papers were most referred (28%), followed by policy briefs (27%) and annual reports (20%). These results show wider acceptance of publications and visibility of the Centre.

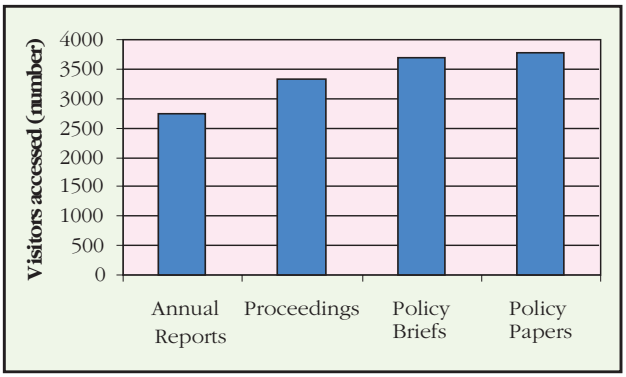


Figure 2: Visitors that accessed NCAP publications during 2006-07

Website on Networking of Social Scientists

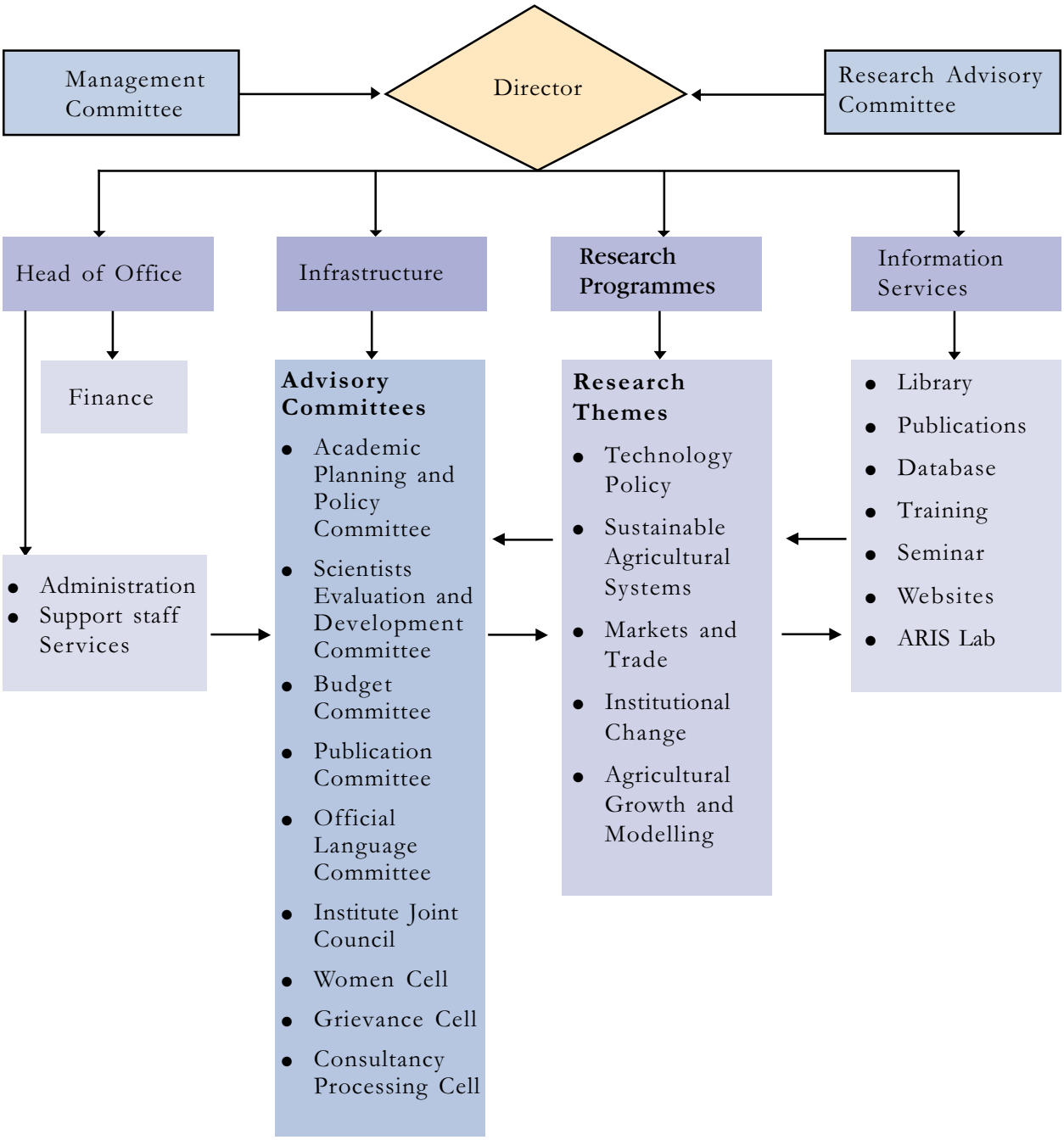
The website on Networking of Social Scientists (http://www.agrieconet.nic.in) facilitates exchange of information, resource sharing and response-time optimization for addressing methodology-related problems. The website has been hosted through NIC web servers since December 2000. The site facilitates details about Departments of Agricultural Economics in ICAR institutes and SAUs. It also provides access to research-oriented data of about 533 projects, 659 publications, 578 scientists, 646 courses and 1008 theses.

Agricultural Research Information System Lab

A new lab of Agricultural Research Information System (ARIS) has been built due to the shifting of the NCAP office to the new building. The Local Area Network (LAN) has been developed to cater

to the requirement of 100 users in the system. The LAN cabling has been done for 100 nodes using CAT 6. High Speed Nortel Switches have been incorporated to boost its performance. The ARIS is equipped with 512 kbps leased line from ERNET to provide E-mail and Internet facilities to NCAP staff. The Centre has its independent mail server placed at its location to manage E-mail account of NCAP staff. The other essential components of the network include a gateway for Internet services, file server for file sharing, mail server for communication and database server for management of data, desktops and laptops. To manage security of the network, a centralized antivirus system was designed and implemented in the network with the help of an anti-virus server system. Any system that is on the network is examined for the latest version of the antivirus software to protect the individual machines as well as the network. Hardware firewalls have also been incorporated in the network as the first line of defence. The firewalls have been integrated with Intrusion Detection System (IDS) and Intrusion Prevention System (IPS). A firewall also provides the gateway level virus protection and web content filtering features. Recently, the concept of E-diary has been evolved to keep NCAP staff informed about future activities (meetings/ announcements, etc.) and important notices. This system is helping in tracking day-to-day activities in the Centre. Besides, more than 30 office forms of daily use have been made available in pdf file on Intranet of NCAP. This facility has lowered the paper load of NCAP.

Figure 3: Organogram of NCAP



Budget and Manpower

The expenditure of NCAP for the year 2006-07 is presented in Table 1 and its staff position in Table 2.

Table 1: Expenditure during 2006-07

(in lakh Rs)

Head of Account	Plan	Non-Plan	Total
Pay and allowances	—	92.92	92.92
Over time allowance (OTA)	—	0.20	0.20
Travelling expenses	3.82	0.95	4.77
Works	4.08	—	4.08
Other charges including equipments	136.55	17.58	154.13
Human resource development (HRD)	2.35	—	2.35
Total	**146.80**	**111.65**	**258.45**
Other projects	—	—	34.79
Grand Total	**146.80**	**111.65**	**293.24**

Table 2: Staff position, 2006-07

Designation	Number
Director	1
National Professor	1
National Fellow	1
Principal Scientists	4
Senior Scientists	8*
Scientist (Sr. Scale)	1+
Assistant Administrative Officer	1
Assistant Finance and Accounts Officer	1
Assistant	1
Stenographer	1
Junior Stenographer	1
Upper Division Clerk	1
Lower Division Clerks	2
Technical Officer (T-6)	1
Technical Officers (T-5)	3
Driver (T-3)	1
Supporting Staff Gr. II	1
Supporting Staff Gr. I	1

* includes one on deputation;
+ on study leave.

II. RESEARCH ACHIEVEMENTS

TECHNOLOGY POLICY

Agricultural Scenario Planning

Suresh Pal (in collaboration with NAIP and the World Bank)

In the scenario development process, a group of experts were brought together to discuss the key driving forces of the agriculture sector. These included changing national and international market conditions, low productivity and fragmented agriculture, regulatory framework, growing economic inequalities and government support to smallholders. In order to sustain economic take-off, surplus labour from agriculture sector has to be absorbed gainfully in the non-farm sector, and small-scale operations have to be aggregated for value addition and increasing economic efficiency. Such a take-off will be confronted with two key uncertainties regarding (a) the social choice about equity versus efficiency, and (b) the approach of economic liberalization versus government interventions. Structuring of different assumptions about these uncertainties in a 2 by 2 matrix has resulted into four scenarios. These scenarios for 2030 are shown in Figure 4.

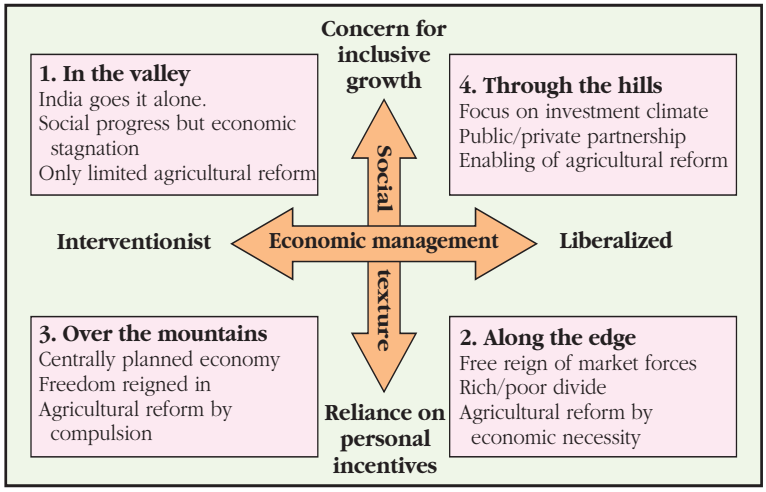


Figure 4: The four scenarios of Indian agriculture

The four scenarios describe different paths of agricultural reforms, resulting into varying rates of its growth. In the first scenario (Valley), agricultural reforms fail due to lack of alternative employment opportunities, and political preference swings towards more government interventions and community-based growth, at the cost of efficiency and individual opportunities. As an additional complication, climate change leads to lower aggregate freshwater availability. In the other three scenarios, agricultural reforms do take place, paving the way for 'aggregation process' and value-chain development. In the Edge scenario, portraying 'joyless growth', i.e. high growth with rising inequality, reforms are the economic necessity. Unviable landholdings force people to migrate in search of alternative employment opportunities and the 'aggregation' of production takes place through innovative institutional arrangements like 'reverse tenancy' and 'contract farming'. In the Mountains scenario, agricultural reforms are 'managed' by the government, which is a dominant player in guiding and organizing economic activities. In the last scenario (Hills), government facilitates the reforms, and the economic incentives and employment opportunities in other sectors pull out the labour force from agriculture.

R&D and Agricultural Distress

Suresh Pal

The study has examined the pattern of allocation of public research resources and strategy of agricultural R&D in the context of agricultural distress. It was observed that unfavourable production environments like dryland areas and management of vulnerability of Indian agriculture have received increasing attention in resource allocation and targeting of research programmes. Rainfed areas now account for nearly half of the national resources and the states witnessing stress among farming community are not underinvested. Management of extreme events like droughts requires pooling of knowledge and resources and should primarily be the responsibility of extension and state line departments, which need to develop such capacity in terms of more resources and trained manpower. Of course, research system will be an important ally in this task in provision of required technology and expertise. Sometimes, modern technology needs to be used in combination with indigenous knowledge and therefore, the research system will be helpful in educating the extension system and farming community in this regard. Increasing profitability and farm income by cost reduction or yield improvement and promoting sustainable and equitable use of natural resources are other important but long-term research issues. Any contribution to these development objectives will help in absorbing shocks that are likely to reduce the farm income drastically. These issues therefore should continue to receive high priority.

Restricted flow of information about technologies and market trends is a serious limitation. The government must address this problem. This requires capacity building to collate information, anticipate trends and shocks and disseminate enriched information to exploit growth opportunities and neutralize the adverse impacts. It may be noted that besides traditional yield risks, new sources of risks are emerging and important among these are the risks associated with adoption of new technology, erratic product pricing, non-availability of essential inputs, etc. Management of these new risks should be an integral part of development approach.

Economic viability of small farmers is a major concern, and measures should be taken to address this problem. Agricultural R&D should aim at addressing the needs of small farmers. Technologies for reducing the cost of cultivation, providing alternatives to those crops and products which are likely to lose under new trade regime, options to participate in high-value agriculture and development of value chains deserve special attention. The capacity building for addressing these and other emerging issues is accorded high priority under the Indo-US Agriculture Knowledge Initiative (AKI) and other externally-funded projects. It is likely that capital-intensity of technology will further increase, both because of capital-biased technological change and increasing participation of the private sector in R&D. In order to facilitate access of small farmers to such technologies, delivery of institutional credit should be strengthened. The regulatory system for technologies like seeds of improved variety will also have significant impact on farmers' access to such technologies. Therefore, regulatory mechanism should be credible and effective. Finally, any measure to promote agricultural development and manage vulnerability will be successful when it is supported with the efforts to reduce dependence of population on agriculture.

Wheat Production in India: Opportunities and Challenges

Sant Kumar

Wheat is the staple food crop accounting for about 40 per cent of the total cereals production in India. Government builds buffer stock of wheat for ensuring food security, feeding public distribution system and meeting the requirements for direct poverty reduction programmes. During 2005-06, Government of India (GoI) could not build adequate buffer stock of wheat. It was mainly because of the shortfall in production and also entry of private traders in wheat business, who offered higher prices to farmers than government procurement price.

In its efforts to build buffer stock, GoI decided to import 5.5 million tonnes (Mt) of wheat. But, the import should be the last resort and efforts need to be geared to increase production efficiently in the country. Therefore, a study was conducted to explore the possibility of increasing wheat production in the country.

Wheat production increased significantly from 35 million tonnes during triennium ending (TE) 1981 to a peak of 73 million tonnes during TE 2002, and remained around 70 million tonnes during 2003-05 (Figure 5). This has resulted due to adoption of high-yielding varieties and improved cultivation practices along with the use of other inputs, especially fertilizers and irrigation. A large share of increase in production came through rise in yield level, from 1.5 t/ha in 1981 to 2.7 t/ha in TE 2002. Increase in area during the period was 4 million hectares (Mha).

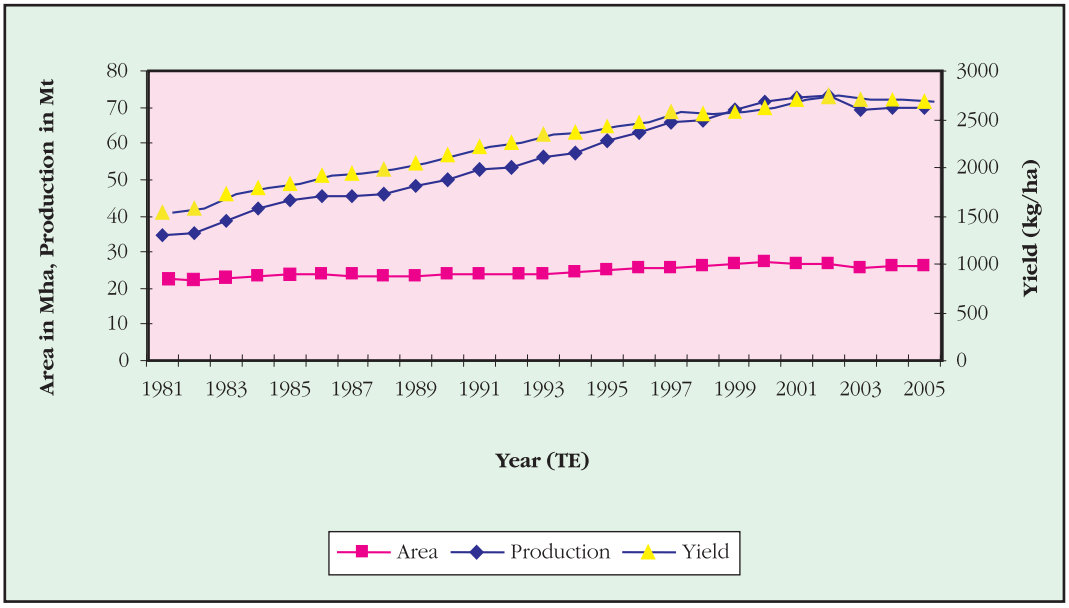


Figure 5: Progress in wheat production in India

The study has revealed that growth in wheat production decelerated during 1990s and beyond as compared to that in 1980s. The decline in growth was due to fall in both area and yield. To increase production, new areas need to be explored and yield levels need to be augmented under the constrained conditions, when expanding area and improving yield have become complex. In this exercise we have tried to propose a few technology options to increase wheat production in the country.

Impeding Factors

A number of supply-side problems affect the performance of wheat production, these include: (a) large yield gap, (b) imbalance fertilization, and (c) low level of seed replacement.

(a) Large yield gap

At the national level, a yield gap of about 2 t/ha exists. The yield gaps are high in the central zone, north-eastern plains zone and north-western plains zone. Farmers are harvesting yields of 3-4 t/ha in these zones. If only 10 per cent of this gap could be bridged, about 5 million tonnes of wheat can be added to the total production.

(b) Imbalanced fertilization

There is a considerable imbalance in the application of plant nutrients. Presently, the ratio of nitrogen, phosphorus and potash (N:P:K) in the *rabi* season is 6.9:2.6:1 at the national level against the recommended ratio of 4:2:1. The nutrient imbalance is a major concern in both the low and high fertilizer using states. In states like Madhya Pradesh and Bihar, the average fertilizer application is nearly 105 kg/ha, with N:P:K ratio as 10.6:4.5:1, while in the states of Punjab and Haryana, it is more than 200 kg/ha, with N:P:K ratio as high as 60.9:23.0:1 in Haryana, and 38.2:2.8:1 in Punjab. The role of micronutrients has become more important now than before. For example, zinc deficiency across the Indo-Gangetic plains and boron deficiency in the eastern regions, are limiting wheat yield.

(c) Low seed replacement

The seed replacement rate in wheat is low at the national level. In 2003-04, it was 13 per cent for wheat, as against 19 per cent for paddy, 24 per cent for maize and 27 per cent for sorghum. About 50-60 per cent farmers in Bihar and Madhya Pradesh use own farm-saved seeds, as against 28-30 per cent in Punjab and Haryana. Seed replacement enhances 25-30 per cent yield of wheat.

Augmenting Yield

R&D efforts have contributed in upward shifting the yield potential. Wheat yield in western India increased more than two-fold during the past forty years (3.4 t/ha in 1965 to 7.2 t/ha in 2003). Despite rise in yield, a large gap exists at farmers' fields across states and zones. This gap arises due to abiotic, biotic and socioeconomic problems.

It was estimated that abiotic problems (poor soil fertility, moisture stress, and delayed sowing) cause about 38 per cent loss in wheat yield. The corresponding figures of loss in yield due to socioeconomic factors (poor knowledge of production technology, inadequate capital, and non-availability of inputs in time) was 36 per cent, and biotic factors like lack of location-specific varieties, weeds (*phalaris minor,* and wild oats) and diseases (rusts and loose smut) was about 26 per cent. Though it is difficult to tap the entire yield potential, management of

these constraints can help to exploit it to a large extent. Empirical evidence from field has indicated that with efficient use of available resources, farmers could harvest 10-40 per cent additional yield.

The socioeconomic constraints can be managed by enhancing farmers' capability, access to credit and other inputs in time. The abiotic constraints can be addressed by awareness generation among farmers about managemnt of soil fertility. Availability of adequate amount of organic matter in soil enhances waterholding capacity of soil and to a limited extent, capacity of moisture stress. Method of sowing and its timing, and providing of critical irrigation are equally important. Delay in sowing can cause yield loss of wheat up to 1 t/ha in rice-wheat system, and 2.3 t/ha in cotton-wheat system. Application of zero tillage is an option to sow wheat crop in the short-run. This technique reduces time and saves on land preparation cost of Rs 2000 to Rs 2500 per ha as compared to the conventional method. For the long-run, there is a need to develop short-duration varieties of wheat and its preceding crop. Irrigation techniques such as sprinkler irrigation which can save water by 30-40 per cent, without affecting the crop yield, should be popularized. Development and dissemination of location-specific high-yielding wheat varieties and management of weeds and diseases are important to address biotic stresses.

Production Performance and Total Factor Productivity Growth in Oilseeds in India

Sant Kumar, Sonia Chauhan and A. K. Jha

With the inception of Technology Mission on Oilseeds (TMO), production of oilseeds in India increased significantly, from 11 Mt in 1986 to 25 Mt in 1998. But from late-1990s, this production has been highly unstable — it declined to 20 Mt in 1999 and further to nearly 15 Mt in 2002, but regained to 1998 level of 25.2 Mt in 2003-04. This had consequences to evolve appropriate policies for meeting the domestic demand of edible oilseeds. India meets about 40 per cent of its total edible oils demand (13 Mt) every year through import.

The continuous rising demand and fluctuating production of oilseeds have posed a critical challenge before the country. It is presumed that increase in production of oilseeds after mid-1980s has been mainly due to area expansion, and the total factor productivity (TFP) to output growth has not contributed much. The present study has examined production performance, sources of growth, and contributions of TFP to output growth. Four oilseeds, viz. groundnut, rapeseed/mustard, soybean and sunflower have been covered and data relate to the period 1986-03.

Growth Performance

The growth in production of selected four edible and total oilseeds was robust during 1986-95 (Table 3). It was due to both area expansion and yield increase. However, growth in production did not sustain during 1996-04 and turned out to be negative (except for soybean) due to decline in both area and yield. The decline in production of oilseeds may be due to high risks in production and prices, and import of edible oils from world market at cheaper rates.

Table 3: Annual compound growth rates of oilseeds in India

(per cent)

Oilseeds	1986-95			1996-04		
	Area	Production	Yield	Area	Production	Yield
Total oilseeds	4.3	7.6	3.1	-2.1	-2.1	negligible
Groundnut	2.2	3.9	1.7	-3.1	-3.9	-0.8
Rapeseed/mustard	6.9	9.2	2.6	-4.2	-3.1	1.1
Soybean	15.8	20.7	4.1	4.0	2.8	-1.1
Sunflower	12.9	17.4	4.0	-5.8	-7.1	-1.4

Decomposition of Growth

The study has revealed that area-effect dominated over yield-effect in increased production of oilseeds during 1986-95 (Table 4). This dominance of area-effect continued during 1996-04, but yield-effect became negative for two major oilseeds, viz. groundnut and rapeseed/ mustard after mid-1990s. This resulted in a negative yield-effect in total oilseeds production. Interestingly, these two oilseeds contribute about 60 per cent to total oilseeds production.

Data have shown positive area and interaction effects of oilseeds during pre-and post-mid-1990s. The positive area-effect, which was largely due to bringing additional area under oilseeds, that belonged to marginal and non-irrigated conditions, was visible during post-TMO period and after mid-1990s. However, a negative yield-effect is a matter of concern and demands of bridging large yield gaps by promoting improved management practices and supplying high-yielding quality of oilseeds.

Table 4: Sources of growth in oilseed production

(per cent)

Oilseeds	Periods	Area effect	Yield effect	Interaction effect
Total oilseeds	1986-95	50.6	36.1	13.3
	1996-04	207.8	-124.7	16.9
Groundnut	1986-95	36.8	56.7	6.5
	1996-04	132.0	-41.8	9.7
Rapeseed & mustard	1986-95	62.9	23.7	13.4
	1996-04	182.3	-104.1	21.8
Soybean	1986-95	72.5	7.5	19.9
	1996-04	108.4	-6.1	-2.2
Sunflower	1986-95	73.3	9.0	17.7
	1996-04	87.9	17.0	-4.9

Contributions of TFP Growth

The TFP growth in groundnut production in the states of Andhra Pradesh and Gujarat had contributed positively prior to mid-1990s, but the trend reversed afterwards (Table 5). The growth in TFP even turned negative in the case of Andhra Pradesh during late-1990s. A positive and improved TFP growth was noticed in production of rapeseed and mustard in the states of Rajasthan and Haryana. This showed that technology was relevant and had potential to contribute towards increasing production. Similar results of TFP contributions were obtained for soybean production in Madhya Pradesh. In the case of sunflower production in Maharashtra, contributions of TFP turned positive after mid-1990s from a negative growth previously. These findings have shown that farmers have adopted the best practices of improved technology and could confirm the positive contribution of TFP growth in production of major oilseeds.

Table 5: Contribution of TFP growth to output growth in oilseeds

Oilseeds	States	Total factor productivity growth (per cent)	
		TE 1986-95	TE 1995-02
Groundnut	Andhra Pradesh	3.4	-37.8
	Gujarat	274.0	26.8
Rapeseed & mustard	Rajasthan	20.0	58.9
	Haryana	1.7	46.8
Soybean	Madhya Pradesh	16.1	162.3
Sunflower	Maharashtra	-185.9	327.8

Impact of Vegetable Production on Income and Employment of Small Farms

P. K. Joshi, Laxmi Joshi and Pratap S. Birthal

There is an emerging concern about the viability of small farm agriculture, particularly in the context of on-going process of globalization. It is contended that viability of small farms can be improved through diversification of agriculture towards high-value crops like fruits and vegetables. In this study, the impact of diversification of agriculture

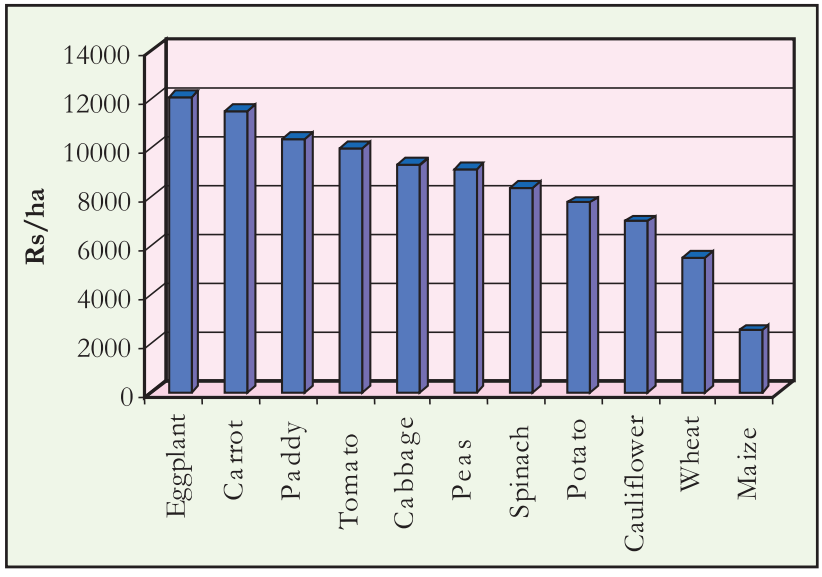


Figure 6: Net returns from vegetables and cereals

towards vegetables has been assessed on farm income and employment using household level information from the western Uttar Pradesh. The results clearly reveal that vegetable production is more profitable and labour-intensive as compared to cereals and it fits well in the small farm production systems (Figures 6 and 7). The small farms are relatively more efficient in production due to more family labour in contrast to large farms. Women are also benefited, as the vegetable production engages relatively higher women labour in various operations.

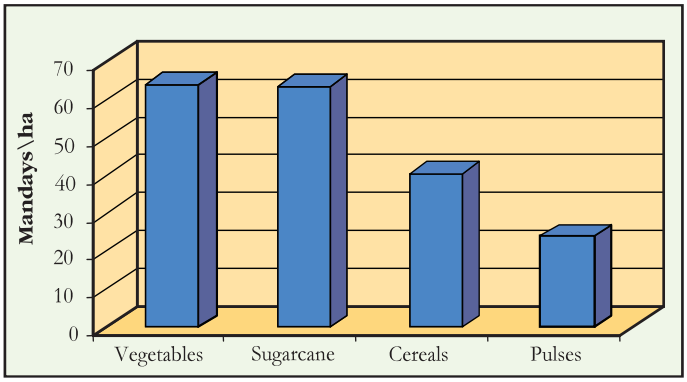


Figure 7: Labour use in vegetable production

Table 6: Share of major crop groups in area and value of output by farm size

(per cent)

Crop groups	Small farms (< 2.0 ha)		Medium farms (2.0-4.0 ha)		Large farms (> 4.0 ha)	
	Area	Value	Area	Value	Area	Value
Foodgrains	30.7	29.4	33.7	27.6	53.4	50.7
Vegetables	55.4	65.6	46.7	61.8	28.1	46.4
Other crops	13.9	5.0	19.6	10.6	18.5	2.9
All crops	100.0	100.0	100.0	100.0	100.0	100.0

Vegetable production is an important source of income for small farms. It accounts for 66 per cent share in the value of crops output (Table 6). Among vegetables, potato, cauliflower and tomato contribute 57 per cent to the total farm income. Large farmers also gain much from vegetable cultivation. With nearly 28 per cent of the area under vegetable cultivation, they realize about 46 per cent in terms of value. Potato, cabbage and tomato account for about 66 per cent of the total value of vegetable production in the production portfolio of large farmers.

IPRs and Seed System Development

Suresh Pal and Harbir Singh

The Government of India has enacted all the legislations to comply with the provisions of the TRIPS Agreement of the WTO. The Patents Act (1970) – Amended in 1999, 2002 and December 2004—has the provisions for both process and product patents in all fields of technology, including biotechnology. For protection of plant varieties, the Plant Variety Protection and Farmers Rights (PVP&FR) Act, 2001 and the PVP&FR Authority to oversee its implementation are in place. The Act provides protection to a new variety including an "essentially derived variety" (a variety derived from another variety while retaining expression of its essential characteristics) and a farmer's variety of specified genera and species provided it conforms to the criteria of "novelty, distinctiveness, uniformity and stability (NDUS)". Also, there is a provision for protection of an

'extant variety', a variety already notified under the Seed Act (1966), or a variety about which there is common knowledge or is in public domain. Further, the Seed Bill aims to provide control for regulating the quality of seeds for sale, import and export and to facilitate production and supply of quality seeds and other related matters. The question is how will the new IPRs regime impact the seed system and what should be done to promote the equity concerns?

Though it is too early to assess the impact of IPRs regime in agriculture, the available evidences provide a good canvas of the likely scenario for the seed sector. In the past, the non-IPRs mechanisms such as hybrids, trade secrets, contracts and favourable government policies have contributed to the growth of the private seed industry. The enactment of new IPRs legislation (PVP&FR Act, 2001) is expected to further balance the interests of all the stakeholders. However, the ultimate impact cannot be assessed at this juncture. For example, the PVP&FR Act may help safeguard the parental lines of a company, but it is not clear to what extent the Act would encourage the private sector to invest more in plant breeding for open pollinated variety (OPV) and meet the seed requirements of farmers in marginal environments. The experiences of other countries indicate that a major shift in private plant breeding priorities towards OPV is unlikely, and the incentive for investment in OPV is low. However, the private sector may enter the OPV market to get a foothold in the potential hybrid market for these crops by producing seeds of public or private OPV. This is already happening in the case of rice and may expand to mustard, soybean and pigeon pea.

The new IPRs regime will most likely increase the transaction cost for accessing the plant genetic resources through more formal (contracts, material transfer agreements, etc.) channels, and decrease flow of informal germplasm and exchange of information. This will have implications for small plant breeding companies and public breeding for niche markets. Under such circumstances, consolidation in seed industry through mergers and acquisitions cannot be ruled out. Recent studies have indicated that increased privatization of seed industry is associated with increased seed prices, which is likely to continue, and the cost on establishing and maintaining PVP rights will further add to the seed cost.

The IPR policy of public sector should address the goals of revenue generation, recognition of achievements and technology transfer to achieve efficiency and equity under the new IPRs regime. Further, the public IP portfolio and other resources should be used to reduce entry barriers for new entrants to promote competitiveness and enhance farmers' access to improved technology. The NARS should also have adequate institutional capacity to protect and enforce their IPRs, and also learn to determine its freedom to operate and to access protected material and technologies, particularly from the private sector. The application of genetic power in public agricultural research is surely going to be influenced by the capacity and skills to manage the IPRs. The recent ICAR guidelines for IP management seek to balance these objectives and align the IPRs policy with the broad objective of transforming Indian agriculture into a globally competitive venture. Development of these guidelines is a step in the direction for evolving a comprehensive IPRs policy for the whole public research system. One of the immediate outcomes of this IPRs policy could be greater emphasis on rapid transfer of technology and stabilization of contracting relations with private seed industry.

SUSTAINABLE AGRICULTURAL SYSTEMS

Comprehensive Assessment of Watershed Programme

Harbir Singh and F. A. Shaheen

Watershed programme has the potential to increase agricultural productivity and improve livelihood security in the rainfed areas. The past performance of watershed development programme has been mixed. Evaluation studies on watershed have reported both beneficial impacts and failure of programmes on account of long-term sustainability and poverty reduction. Yet, watershed approach is seen as one of the most important strategies to bring socio-economic change in the rainfed regions. However, lack of appropriate institutional support and a host of other factors are impeding the replication of success stories to harness the potential benefits.

The success of a watershed programme relies on multiple factors. Important among these are: (i) equitable sharing of costs and tangible benefits, and (ii) assured access to markets, latest technology, continuous information flow and effective local institutions. The policy reforms on watershed should provide speedy and transparent devolution of required financial resources to the implementing agencies. It is expected that establishment of National Rainfed Area Authority (NRAA) would provide much needed guidance for effective implementation of watershed strategy. The success of watershed development would give impetus to a faster reduction in poverty through sustainable transformation of the agricultural sector in the rainfed regions.

Application of Plant Nutrients across Crops and Irrigation Conditions

Rajni Jain and Ramesh Chand

Pattern in use of fertilizers and manure has been studied using NSS 54th round rural household data on cultivation practices pertaining to year 1998. Each crop was treated as a separate case, and divided into four categories depending on the use of these inputs, viz. (i) only fertilizers, (ii) only manures, (iii) both fertilizers and manures, and (iv) neither fertilizer nor manure (None). Analysis revealed that 4 per cent farmers under irrigated and 27 per cent under non-irrigated conditions did not use any fertilizer or manure (Table 7). Under irrigated

farms, about 21 per cent farmers relied solely on fertilizers and 8 per cent only on manures. In contrast, the percentage of farms using only fertilizer was much lower (9.6%) and that of farms using manure alone was much higher (27.9%) under non-irrigated conditions. Use of both fertilizers and manures was reported in more than two-third cases under irrigated and 36 per cent cases under non-irrigated conditions. It could be inferred that irrigation promotes use of manures and fertilizers. Complimentarity between irrigation and fertilizers is clearly visible from a comparison between irrigated and non-irrigated cases.

Table 7: Distribution of cultivators using manures and fertilizers across India

(per cent)

Crop groups	Irrigated farms				Non-irrigated farms			
	Fertilizer	Manure	Both	None	Fertilizer	Manure	Both	None
Foodgrains	22	7	68	3	10	27	41	22
Oilseeds	22	7	67	4	13	25	40	22
Mixed crops	21	8	63	8	7	26	22	45
Sugarcane	16	3	80	1	14	14	43	29
Fruits & vegetables	14	16	64	6	6	37	21	36
Fodders	21	7	64	8	8	18	40	34
Other cash crops	18	9	70	3	11	24	44	21
All India	**20.9**	**7.6**	**67.3**	**4.2**	**9.6**	**28.0**	**35.8**	**26.6**

State level investigation on the use of fertilizer and manure has revealed that 99 per cent farms in Punjab and Himachal Pradesh applied some nutrients, be it manure, fertilizer or both. Haryana ranked first (37%) in the use of only fertilizers, whereas Sikkim topped (75%) the list of states applying manures only. Infact, farmers in the North-Eastern states depend predominantly on manure for meeting the nutritional requirements of crops.

Adoption of Pesticides and Weedicides across Crops and Irrigation Conditions

With the adoption of high-yielding varieties and spread of area under fruits and vegetables, use of pesticides, insecticides, fungicides (PIF) and herbicides has become widespread. The study has examined the profile of use of chemical inputs in crop production across irrigation conditions and has found that use of PIF under non-irrigated conditions was just half of that

under irrigated conditions (Table 8). The higher use of PIF under irrigated conditions was because of prevalence of favourable conditions for infestations of pests and diseases. Overall, more than one-third of the farmers used some sort of chemicals for crop production, including seed treatment.

Table 8: Adoption of pesticides, insecticides, fungicides (PIF) and weedicides across crops and irrigation conditions in India

(per cent)

Particulars	Adoption of PIF on farms			Adoption of weedicides on farms		
	Irrigated	Non-irrigated	All	Irrigated	Non-irrigated	All
Paddy	58	30	47	30	8	21
Wheat	38	18	34	21	6	18
Other cereals	37	18	26	17	5	10
Pulses	39	23	30	15	5	9
Oilseeds	47	26	38	20	9	16
Mixed crops	44	18	26	16	7	10
Sugarcane	41	22	39	22	7	20
Vegetables	54	18	33	19	8	13
Fodder	33	12	29	19	6	16
Fruits & nuts	43	23	31	16	7	10
Other cash crops	68	41	56	23	10	17
Other crops	46	15	27	27	12	18
Total	**46**	**23**	**36**	22	7	16

Table 8 also shows that use of weedicides was higher under irrigated (22%) than non-irrigated (7%) conditions. Among crops, use of weedicide has been found highest in paddy for both irrigated (30%) and non-irrigated (8%) conditions. Their lowest use has been reported in pulses. It is hypothesized that use of weedicides is higher at large farms and vice versa. The results across crops have confirmed this hypothesis (Figure 8). For all the crops, less than 15 per cent of marginal farms reported to use weedicides, and at medium-and large farms level, 18 per cent and 24 per cent cases used weedicides, respectively.

Further, large variations have been observed in state-wise use of PIF (Table 9) in the selected five crops, it was highest in West Bengal (82%), followed by Tamil Nadu (80%), Andhra Pradesh (79%) and Punjab (71%). Study revealed that more than 95 per cent farmers growing paddy in Punjab, Haryana and Tamil Nadu used PIF.

Table 9: Use of pesticides, insecticides and fungicides in various crops across major states in India

(per cent)

States	Paddy	Wheat	Pulses	Oilseeds	Vegetables	Total five major crops
West Bengal	85	79	62	77	82	82
Tamil Nadu	96	67	66	70	74	80
Andhra Pradesh	87	56	77	65	89	79
Punjab	95	84	62	84	100	71
Karnataka	75	19	61	51	67	55
Haryana	95	54	31	39	88	48
Maharashtra	31	42	44	33	67	43
Uttar Pradesh	27	22	20	18	35	23
All India	**47**	**34**	**30**	**38**	**33**	**36**

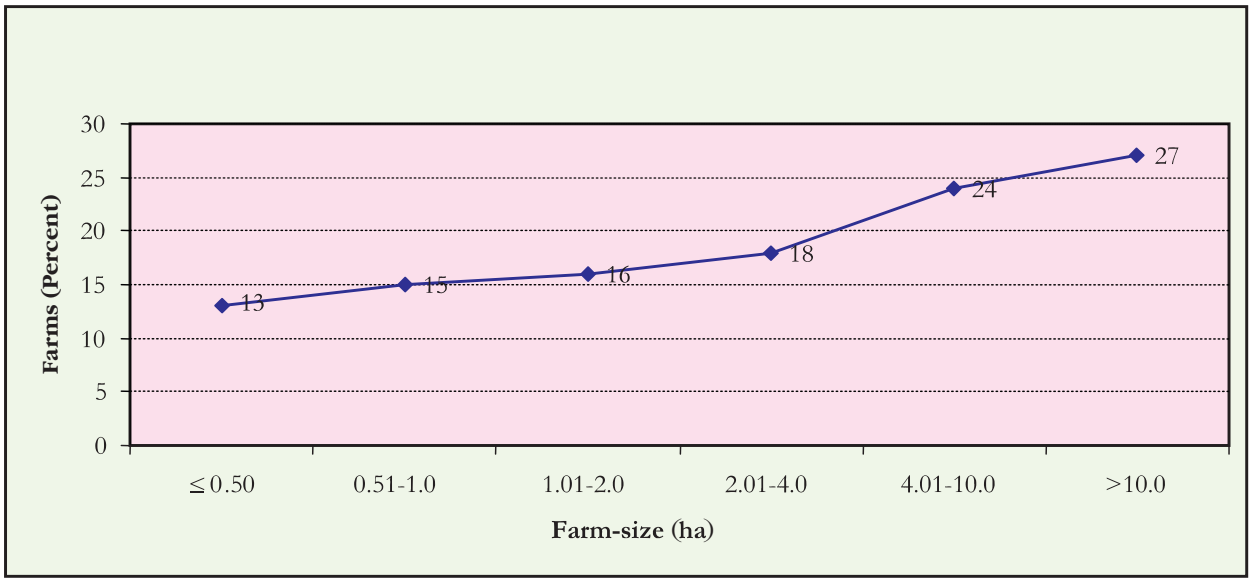


Figure 8: Adoption of weedicides across farm-size in India

Smallholders Participation in High-value Agriculture

Pratap S. Birthal and P. K. Joshi

The share of high-value food commodities such as horticulture, livestock and fish in total value of agricultural output increased from 33 per cent during the triennium ending (TE) 1982-83 to 44 per cent in TE 2002-03 (Figure 9). At the disaggregated level, fruits and vegetables accounted for

about 18 per cent of the agricultural output, followed closely by dairy products during TE 2002-03. Further, the share of most of the high-value food commodities has increased over the past two decades, indicating their increasing contribution to the agricultural output.

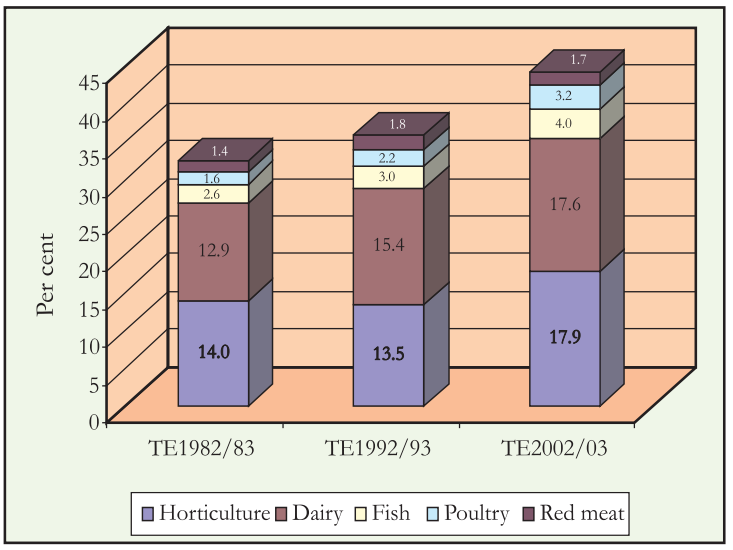


Figure 9: Share of high-value food commodities in the total agricultural output (at 1993-94 prices)

Nevertheless, there are apprehensions about the ability of smallholders to participate in high-value agriculture, which is capital-and knowledge-intensive and faces risks of low production and market uncertainties. Most high-value food commodities are bulky and perishable. They need immediate transportation to consumption centres, cold storage or processing centres for conversion into less perishable forms. On the other hand, rural markets for these commodities are mostly thin and the marketable surpluses with smallholders are usually too small to be traded economically in the distant markets due to high transportation costs. Thus, the lack of access to output markets, agri-inputs, improved technology, market information, credit and risk-mitigating instruments could be the important impediments to smallholders' participation in high-value agriculture.

Despite these limitations, smallholders do participate in high-value agriculture. They control 61 per cent of the area under vegetables and 52 per cent under fruits, as compared to their share of 44 per cent in the total operated area (Figure 10). Their share in dairy animals and small ruminants is much higher. This indicates that smallholders have more opportunities in the high-value agriculture than staple food production. Assuming that productivity is invariant to farm size, their shares in area under horticultural crops and animals could be treated as their contribution to high-value agricultural production. A larger share of smallholders in high-value agricultural production and a faster growth therein suggest that high-value agriculture can make a significant contribution to their well-being. The need is to plan agricultural diversification in a way that optimizes farm income, without causing damage to the natural resources.

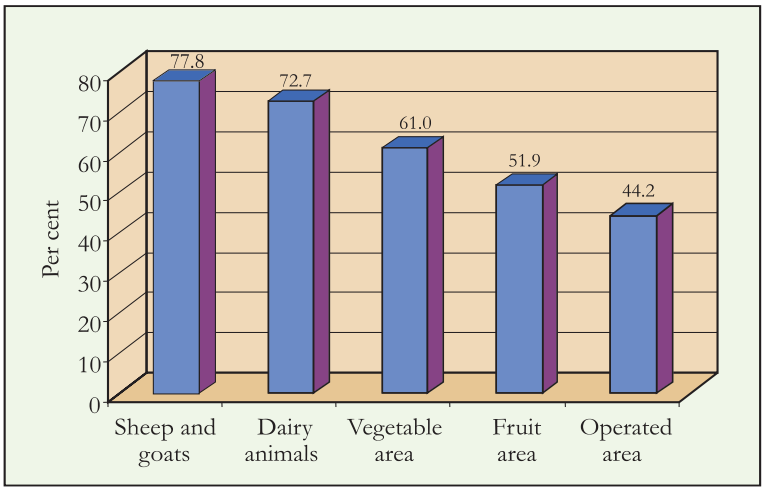


Figure 10: Share of smallholders in horticulture area (1997-98) and in animal population (2002-03)

MARKETS AND TRADE

International Trade, Food Security and Response to WTO in South Asian Countries

Ramesh Chand

The study analyzed changes in agricultural trade, dependence on food imports, trade orientation of agriculture, food security and agricultural growth in South Asian Countries (SACs) before and after WTO regime. Based on the experience in implementation of Uruguay Round (UR), the study has discussed issues concerning SACs for negotiations in the next round of WTO agreement employing trade-related data for the period 1991-04. Four-yearly average has been used for interpreting the results; terming 1991-94 as before-WTO, 1995-98 as initial years of WTO and 1999-02 as post-WTO period (Table 10). In all the SACs, except Nepal and Pakistan, agricultural imports have increased during post-WTO as compared to the start of WTO.

Table 10: Agricultural trade of South Asian Countries before and after WTO regime

(US $ million)

Countries	Before -WTO	Start of WTO	Post-WTO
Bangladesh			
Exports	128	139	105
Imports	663	1248	1623
Net trade	-535	-1109	-1518
India			
Exports	3085	5557	5087
Imports	1336	2711	3699
Net trade	1749	2846	1388
Nepal			
Exports	49	48	58
Imports	141	217	194
Net trade	-92	-169	-136
Pakistan			
Exports	956	1101	1067
Imports	1405	2135	1814
Net trade	-449	-1034	-747
Sri Lanka			
Exports	528	923	969
Imports	500	779	766
Net trade	28	144	203

The impact of trade liberalisation on food self-sufficiency in different SACs can be seen from the share of imports in domestic consumption (Table 11). In all SACs, the dependence on imports has increased sharply for vegetable oils, and almost half of the total requirements are met through imports. Even high tariff rates could not deter the import increase. Dependence has also increased for pulses in all SACs, except Nepal. India has guarded effectively against the import of cereals, fruits and dairy products in the post-WTO regime with high tariffs, or in some instances, with non-tariff measures. Pakistan and Sri Lanka could manage the same only in the case of cereals, and thus experienced increased import dependency on the part of all other foods. Bangladesh and Nepal have seen moderate to sharp increase in their import dependence of most food items.

Table 11: Dependence of South Asian Countires on import for food: 1991-02

(per cent)

Countries	1991-94	1995-98	1999-02
India	0.89	2.02	3.76
Pakistan	8.46	8.12	7.45
Bangladesh	9.20	13.57	17.87
Sri Lanka	34.47	41.08	43.24
Nepal	2.89	2.93	4.87

Like food self-sufficiency, self-reliance on food, as indicated by the ratio of net trade to AgGDP and ratio of import to export, has also been adversely affected (Table 12). Out of the five SACs, only India and Sri Lanka have positive net trade in agriculture, and the other three have depicted negative agricultural trade balance. In the case of India, net earnings from agriculture increased from 2.22 per cent of AgGDP in pre-WTO period to 2.90 per cent in the initial years of WTO, but declined to 1.28 per cent during post-WTO period. Similarly, India spent only 43 per cent of its export earnings to finance imports during 1991-94. During 1999-04, more than 72 per cent of the export earnings were used for meeting the agricultural imports. Thus, both the indicators of self-reliance reveal sharp decline during the post-WTO period.

Table 12: Self-reliance in agriculture measured as the ratio of net trade to AgGDP and ratio of imports to exports

Countries	Particulars	1991-94	1995-98	1999- 02
India	Net trade/AgGDP, %	2.22	2.90	1.28
	Imports/exports, %	43.31	48.78	72.72
Bangladesh	Net trade/AgGDP, %	-6.26	-11.70	-12.47
	Imports/exports, %	517.99	900.64	1547.56
Nepal	Net trade/AgGDP, %	-5.96	-9.87	-7.06
	Imports/exports, %	288.16	452.76	332.65
Pakistan	Net trade/AgGDP, %	-4.38	-7.68	-5.00
	Imports/exports, %	146.89	193.91	170.07
Sri Lanka	Net trade/AgGDP, %	1.44	5.44	6.98
	Imports/exports, %	94.57	84.42	79.10

The policy of trade liberalization as followed by the SACs, particularly since implementation of the WTO in 1995, has considerably increased their dependence on imports for meeting food requirements. All SACs, except Sri Lanka, have indicated deterioration in agricultural self-reliance in the post-WTO period. The deterioration is a reflection of the much higher growth in food imports than agricultural exports because domestic production of the SACs, even after high tariffs, could not compete with cheap imports. Furthermore, their exports faced stiff competition in the global markets. The underlying reason for both developments was unexpectedly low level of international prices.

Trade Competitiveness in Oilseeds

Ramesh Chand

India has seen a large-scale surge in imports of major edible oilseeds from mid-1990s onwards, despite 75-100 per cent import tariff, except soybean where tariffs can't go beyond 45 per cent. This raises serious concern about trade competitiveness of India's oilseed sector. Import dependence was also high during late-1970s, but perceptible increase in production of edible oilseeds during early-1980s helped in bringing down imports of edible oil from 1.60 million tonne during 1980-81 to 1.09 million tonne by 1985-86, and resulted in an improvement in per capita availability of edible oil in the country. This phase was followed by a stagnation in domestic production, big increase in imports and little increase in per capita consumption of oilseeds. As imports were seen to put a serious drain on scarce foreign exchange, Technology Mission on Oilseeds (TMO) was initiated to raise the domestic production of oilseeds. This paid dividends and imports of edible oil declined to 0.1 million tonne in 1992-93 from nearly 2 million tonne in 1987-88. On demand side, the per capita availability of edible oils remained static at around 6.5 kg but the real prices of edible oils increased sharply.

In the liberalized regime of post-WTO period, imports started rising again from 1995-96 and domestic production of edible oil started declining due to steep fall in their real prices. Table 13 shows that during 2004-05, India spent about Rs 11,000 crore on import of edible oils and vegetable oils. Out of this, palm oil accounted for 71 per cent, soybean oil 26 per cent and the remaining oils 3 per cent.

India is exporting moderate to large quantities of some oilseeds and its products were competitive in global markets in post-WTO period. Oilcakes and oilmeal accounted for 54 per cent, and oil and oilseeds 23 per cent of total oilseeds. Castor oil ranked second, after oilcake, followed by sesamum seeds. In terms of total export, India earned more than Rs 5,700 crore during 2004-05, which is just half of the large import bill of the sector.

Table 13: Trade in oilseeds and oilseed products: 2004-05

(Quantity: '000 tonne, Value: in crore Rs)

Particulars	Export		Import	
	Quantity	Value	Quantity	Value
Oilcakes/Oilmeal, etc.	3516.09	3100.75	67.35	48.06
Oils				
Palm oil	0.41	2.04	3561.96	7877.38
Soybean oil	7.51	33.48	1048.04	2841.95
Castor oil	260.64	1032.55	26.53	96.58
Groundnut oil	45.82	215.06	0.003	0.07
Coconut oil	5.95	29.44	12.71	39.49
Sunflower /safflower/cottonseed oil	0.33	1.33	38.33	109.86
Rape, colza, mustard oil	0.44	2.57	0.02	0.04
Linseed oil	0.60	3.33	0.51	1.92
Sesamum oil	2.28	13.94	0.04	0.59
Olive oil	0.64	3.24	0.87	14.37
Seeds				
Groundnut in shell/unshelled	177.11	503.00	0.001	0.002
Sesamum seed	156.67	662.45	1.49	5.80
Rapeseed/mustard/colza	16.12	26.88	2.27	5.23
Niger seed	24.60	61.14		
Safflower	6.22	12.72	0.002	4.51
Sunflower	2.95	9.19	0.01	0.01
Soybean	2.06	3.45		0.002
Castor seed	1.34	3.19		
Cottonseed	0.73	0.97		
Copra	0.76	1.29	1.14	1.74
Linseed	0.05	0.25	0.55	0.99
Total		**5722.26**		**11049.59**

International Price Volatility and Price Transmission: Impact on India's Rice Export

Ramesh Chand

India produces 90 million tonnes of rice, of which about 40 per cent is retained by producers for self-use and 60 per cent is disposed of through various channels. Out of the total marketed

surplus of 54 million tonnes, around 40 per cent is procured by public agencies and remaining 60 per cent is handled by the private trade. Distribution of total production has shown that 96 per cent is retained within the country and 4 per cent is exported.

A very striking aspect of rice export in post-WTO period has been the violent fluctuations in year-to-year export. The wide fluctuations in export of non-basmati rice (Figure 11) had implications for their domestic supply and prices. Export of rice during post-WTO period was significantly affected by the difference in its international and domestic prices and the position of rice stock with public agencies in the beginning of year. It has been found that volatility in global price has been a major cause of instability in India's rice exports.

Study has shown that government intervention helped in maintaining some stability in domestic prices and guarding against complete transmission of international price volatility into domestic market. Price instability has been found much higher in international (0.164) than domestic (0.077) prices. However, there has been a significant change in integration of domestic market with international market after 1995, as revealed by their correlation coefficient; it increased from 0.10 before-WTO to 0.67 after-WTO. Estimation of price transmission equation has shown that during 1995-04, there was a significant though not full transmission of variation in international prices on domestic prices. The elasticity of transmission has been found to be 0.284.

Nominal Protection Coefficient (NPC), which indicates export competitiveness at the existing prices and is a guiding indicator for private trade, shows that export from Andhra Pradesh and Punjab was competitive during 1997-98 and 1998-99 (Table 14). Subsequently, as international prices declined, export did not remain attractive from these two states. However, in West Bengal, domestic prices moved with international prices, and therefore exports remained competitive.

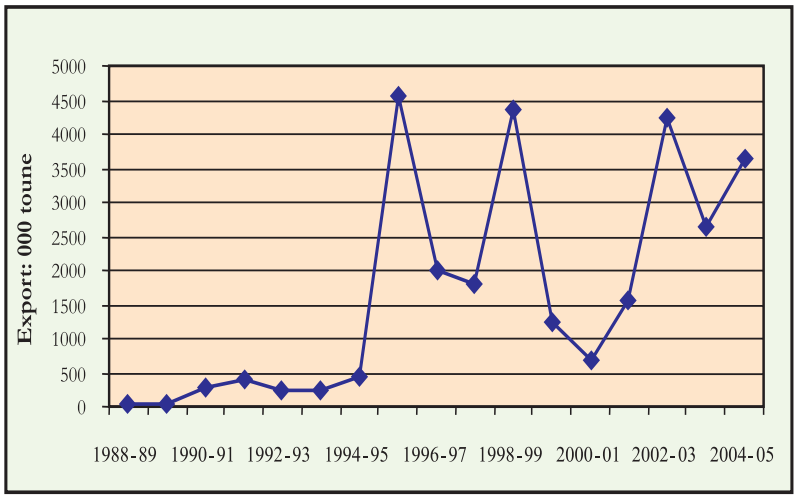


Figure 11: Export of non- basmati rice from India

Analysis has revealed that in five years (1997-98 to 2001-02), only in 2001-02, domestic resource cost (DRC) in Andhra Pradesh and Punjab turned out to be more than one. In West Bengal, it remained below one throughout. These results indicate that it is highly paying for the country to promote export of rice, though in some years it may not be profitable due to high domestic prices or low international prices.

Table 14: Estimation of competitiveness for paddy/rice under exportable hypothesis

States	Particulars	1997-98	1998-99	1999-00	2000-01	2001-02
West Bengal						
	Domestic price, Rs/q	785	986	853	791	741
	World price, Rs/q	1174	1325	1096	946	844
	World reference price, Rs/q	1111	1250	1026	876	774
	NPC	0.707	0.789	0.832	0.903	0.957
	DRC	0.404	0.551	0.606	0.743	0.879
Andhra Pradesh						
	Domestic price, Rs/q	910	1085	1032	913	1054
	World price, Rs/q	1174	1325	1096	946	844
	World reference price, Rs/q	1105	1245	1017	891	758
	NPC	0.824	0.872	1.015	1.024	1.390
	DRC	0.640	0.559	0.760	0.950	1.183
Punjab						
	Domestic price, Rs/q	733	783	858	812	813
	World price, Rs/q	1174	1325	1096	946	844
	World reference price, Rs/q	994	1128	880	714	593
	NPC	0.737	0.694	0.975	1.137	1.370
	DRC	0.441	0.457	0.620	0.870	1.180

Appraisal of Sector and Farm Diversification in India: A Case of Soybean

Ramesh Chand

New varieties of soybean were introduced in India to meet the demand for pulses and dietary protein deficiency. However, it could not become popular as *Dal* (pulse) but emerged as one of the major oilseeds. Soybean was initially introduced in Madhya Pradesh and Uttar Pradesh, for cultivation during *kharif* (monsoon) season when land was kept fallow. During 1971-72, soybean was cultivated on only 30 thousand hectares in the country and now it is grown on more than 6.5 million hectares. After late-1980s, soybean area in India has increased four-fold and production more than five-fold. The growth rate in area and output at this scale is unparallel in the history of Indian agriculture (Figure 12). It was because of (a) suitability of soybean for cultivation in fallow lands, and (b) yield and price advantage over other crops.

Use of soybean for oil purpose witnessed rapid growth in domestic market and soycake and soymeal found attractive markets in the East and South East Asian countries and Europe. It is

estimated that 88-89 per cent of soybean produced in India is used for oil extraction. Almost the entire refined soyoil is consumed within the country. De-oiled soycake is largely exported, but its domestic demand is also increasing. The soycake and soymeal accounted for more than 95 per cent of total export of all soybean products till late-1990s. However, after 1998-99, the export of soymeal and soycake fell sharply mainly due to crisis in East Asian countries, which were the major destinations for these products. The share of export in total production fell from over 50 per cent till mid-1990s to 30 per cent in the recent years.

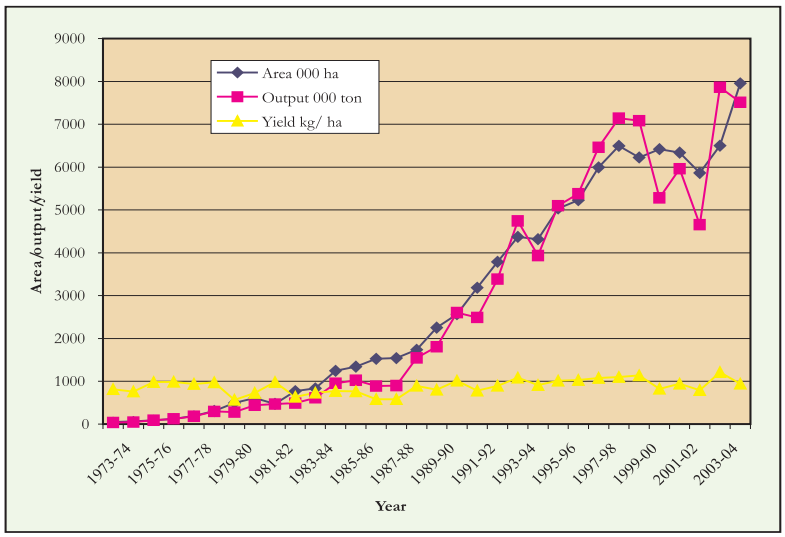


Figure 12: Area, output and yield of soybean in India, 1974-04

Due to very high ratio of trade to production of soybean, their price is largely affected from global prices. Consequently, fluctuations in international prices of soyoil, soycakes and soybean affect the domestic prices, price stability, and income of soy-farmers and profitability of soy-processors. It is easy to check against volatility in international prices passing to domestic market through imports by applying appropriate tariffs. However, adverse impact of volatility in international prices cannot be checked on export. This way, volatility in international prices becomes a factor in affecting commercial viability and farmers' income.

In major soybean-producing countries, a large area has been put under genetically modified varieties. In India, GM variety of soybean is not being cultivated so far. This gives only a small advantage to the Indian produce, in terms of export of soycakes, particularly to the European countries. On the other hand, the countries cultivating GM varieties of soybean enjoy considerable advantage over Indian soybean in terms of higher productivity and lower cost of production.

Indian soybean loses its competitive edge because of poor productivity also, which is about half of that in China and one-third of that in USA, Argentina or Brazil. Moreover, soybean yield in India is stagnant at around 1000 kg/ha, but input requirement is rising due to increasing susceptibility to insect/pests, and nutritional imbalances in soil. This is resulting in a squeeze albeit small in farm income.

Future of soybean in India would depend on couple of factors on demand side as well as supply side. In India, soybean has two major uses (a) soycake and soymeal, and (b) soyoil. The soyoil is used in domestic market and soycake/meal is largely exported. Price of soyoil in domestic market is strongly influenced by quantum of import of palm and soybean oils and their international prices. To keep pace with rest of the world in adopting new technologies for soybean production and to meet the rising demand of soyoil in the domestic market, India should seriously consider adoption of GM varieties of soybean. The niche India enjoys in export of non-GM soy products to EU is too small to lose international market.

INSTITUTIONAL CHANGE

Linking Smallholders to Markets for High-value Crops: Role of Farmers' Organizations

Pratap S. Birthal and P.K. Joshi

For smallholders, the process of diversification is unlikely to be smooth. Production of high-value agricultural commodities is capital, technology- and information-intensive and is more risky compared to that of staple food crops, while smallholders lack access to these facilities. The local rural markets for high-value commodities are thin, and their sale in distant urban markets is costly due to lack of scale-economies and higher price-uncertainty. Besides, smallholders are now confronted with a new challenge of ensuring food safety and quality, as food standards are becoming stringent in domestic as well as international markets.

Institutions such as farmers' cooperatives, producers' associations and contract farming are considered efficient means of linking smallholders to markets. This study has examined the integration of vegetable producers on supply chain through growers' associations and its impact on costs and profits of the producers. The village level associations of fruit and vegetable growers called as SAFAL, promoted by the Mother Dairy Fruits and Vegetables Limited (MDFVL), have been considered for the study.

The MDFVL places its demand for different commodities with the growers' associations of fruits and vegetables in advance of the crop season. To meet the demand, SAFAL in association with farmers decides the amount of land to be allocated to different crops. For producer-members, the association decides who will produce 'what' and 'how much'. Individual producers, however, are free to produce beyond their quota limit. The MDFVL provides technical support to growers associations in the preparation of crop calendar, and sowing schedules to get the desired supply on a regular basis. Besides, the firm also provides inputs like bio-pesticides and bio-fertilizers, and extension services to the producer-members. For other inputs, the MDFVL maintains a panel of some reputed input dealers and recommends them to producers to source their requirements; independent producers, however, are free to buy from anywhere. In general, the input prices charged by these dealers are marginally less than their market prices. Extension services, such as selection of quality inputs, sowing techniques, irrigation management practices, identification of pests and diseases and their management, harvesting techniques, grading and standardization, and packaging methods, etc., are provided free of cost.

The survey was conducted in Haryana and semi-urban Delhi during November-December 2002, and the information pertains to the spinach crop grown during July-October 2002. Analysis has indicated that transaction costs are higher in wet markets and the institution-linked sales reduce these costs by as much as 92 per cent (Table 15). Since smallholders have low marketed surplus and face higher transaction costs, they are most benefited from participation in growers' associations. Price realization is also higher in institution-linked sales, indicating producers' collective bargaining

power and no extraction of monopsonisic rent in the output market. Post-stratification of sample vegetable producers shows considerable involvement of smallholders in growers' associations; 50 per cent members in the selected associations were smallholders. This does not lend much support to the argument that smallholders are excluded from institutional arrangements like contract farming, farmers' cooperatives and producers' associations.

Table 15: Production costs, transaction costs and net returns from spinach: 2002

(Rs/tonne)

Particulars	Member producers	Independent producers	Difference, %
Crop yield (tonne/ha)	8.6	8.3	3.5
Cost of production	1485	1630	-8.9
Transaction cost	35	437	-92.0
Total cost (production + transaction)	1520	2067	-26.5
Output price	3311	3074	7.7
Net revenue	1791	1007	77.9

Equitable Intensification of Market-oriented Smallholder Dairy Production through Contract Farming in India

Pratap S. Birthal, A. K. Jha, M. Tiongco, Chris Delgado, Clare Narrod and P. K. Joshi

Contract farming is emerging as an important form of vertical coordination in agri-food supply chain in India, and its socioeconomic consequences are attracting considerable attention in public policy debates. This study is an empirical assessment of costs and benefits of contract farming in production of buffalo milk, using household data from two districts of Rajasthan collected through farm survey during 2005. It has been found that contract farming is more profitable than independent production (Table 16). The major benefits accrue from reduction in transaction costs, which otherwise are much higher in the open markets. It also contributes towards improving milk yield and reducing production cost, but not significantly. Dairy producers are also benefited from provision of services and technical advice by the integrators.

The benefits of contract farming are not scale-neutral. Scale economies are important determinants of competitiveness, but on a similar scale smallholders contract farmers derive significant benefits from reduction in transaction costs. Further, the study has not found any tendency on the part of integrators to extract monopsonistic rent in the output market. The output price under contract farming is less than the open market price, but the contract producers are compensated by a substantial reduction in transaction costs. In fact, this compensation is much more than the sale price difference. Another major effect of contract farming is that it has induced competition in the rural milk markets, which otherwise were being dominated by vendors who often exploited the producers by paying less than the market price.

Table 16: Economics of milk production on contract and independent farms in Rajasthan

Particulars	Contract farms	Independent farms	
		Open market	Vendors
Milk yield (litre/in-milk-animal/day)	9.30	9.00	9.24
Production cost (Rs/litre)	8.58	8.86	8.90
Transaction cost (Rs/litre)	0.81	2.47	0.93
Total cost (Rs/litre)	9.39	11.33	9.83
Price (Rs/litre)	12.16	12.93	11.88
Net revenue over total cost (Rs/litre)	2.77	1.60	2.05

Supply Chain Development: Role of Seed

Suresh Pal and Harbir Singh

Consumers now demand food products with specific quality. Most of such attributes can be embodied in the seed which is one of the basic inputs in the supply chain. This has increased the seed demand of improved varieties and thus has increased incentives for the commercial seed sector to participate in the supply chain. As a result, there is a lot of private seed activities linked with the supply chain. For example, in the case of potato, private seed producers have tied up with the processing industries to supply to their contract growers the seeds of the varieties suitable for processing. Similar cases are also found in rice (with specific aroma) and wheat (with higher protein content). Since these markets enjoy considerable price premium, there is an incentive to maintain product quality, and quality of seed has an important role to play in this process. Therefore, the R&D has to provide good quality seed with desired attributes to participate effectively in the supply chain.

For breeding of crop varieties with desired product attributes and producing their quality seed, cutting-edge technologies (e.g., biotechnology tools) are increasingly used. Use of such technologies is governed by the strength of IP portfolio of a firm. Since large amount of resources, intellectual inputs and innovative skills are needed for development and use of these techniques, management of IPs would become one of the prime concerns. The firm with strong IP portfolio will have more freedom to operate and can exercise considerable influence on the structure of seed system and supply chain development. The companies with a rich IP portfolio, including crop varieties, will dominate the supply chain utilizing both formal and informal mechanisms for protection of their IPs, resulting into several institutional innovations in the development of supply chains.

Supply Chain and Institutional Change in Agriculture

Harbir Singh and Suresh Pal

Indian agriculture is transforming from subsistence to high-value agriculture. Such a transformation requires a new set of technologies, institutions and infrastructural arrangements. One of the

ways, the agriculture sector can regain growth momentum is by applying the principles of supply chain management and ensuring information flow to the stakeholders. Supply chain in agriculture helps both producers and consumers from increased knowledge, better quality and food safety, reduced costs and losses, higher sales and greater value-addition in production. This study has attempted to answer specific research questions in potato supply chain framework. The main objective of the study was to assess the impact of innovations in supply chain on potato growers.

Initial interactions with the stakeholders have revealed that production of disease-free quality seed is one of the weakest links in the potato supply chain. It is also reflected by low levels of potato productivity at the national level (16-18 t/ha) in comparison to that in the European countries and USA (30-40 t/ha). The seed cost in potato accounts for nearly one-third of the total variable cost of cultivation and seed replacement rate is very low. There are a few private companies that are producing disease-free quality seeds using technological innovations and are delivering commercial potato seeds in 2-3 field generations as against 6 field generations using traditional methods. It will be interesting to know how the private sector sources get supplies from farmers and how the quality and information issues are addressed in the supply chain.

Agricultural Insurance in India: Problems and Prospects

S. S. Raju and Ramesh Chand

The National Agricultural Insurance Scheme (NAIS) was introduced in the country from the 1999-2000 r*abi* season, replacing the Comprehensive Crop Insurance Scheme (CCIS) which was in operation since 1985. This scheme is available to both borrowers and non-borrowers. It covers all food grains, oilseeds and annual horticultural/commercial crops for which past yield data are available for adequate number of years. Among the annual commercial and horticultural crops, sugarcane, potato, cotton, ginger, onion, turmeric, chillies, coriander, cumin, jute, tapioca, banana and pineapple are covered under the scheme. The scheme is operating on the basis of both 'area approach', for widespread calamities, and 'individual approach' for localized calamities such as hailstorm, landslide, cyclone and flood.

The premium rates applicable on the sum insured are:	
Bajra and oilseeds:	3.5 %
Other kharif crops:	2.5 %
Wheat:	1.5 %
Other rabi crops:	2.0 %
Annual commercial/horticultural crops:	Actuarial rate

The premium in the case of small and marginal farmers is subsidized by 50 per cent, which is shared equally by the Government of India and the concerned State/Union Territories. The premium subsidy was to be phased out over a period of five years, and during 2005-06, only 10 per cent subsidy was provided on premium payable by small and marginal farmers.

At present, the NAIS is being implemented by all the states, except Arunachal Pradesh, Manipur, Mizoram, Nagaland and Punjab. During the past six years of its implementation, the scheme covered 9-13 per cent farmers, 9-16 per cent crop area and 2-4 per cent of crop output in value terms in different years (Table 17).

The amount of claims was much higher than that of premium, which indicates magnitude of loss in the scheme. During 2000-01 and 2002-03, claims were five-times of the premium, while during 2003-04 and 2004-05, these were double of the premium collected. Thus, there has been a net loss in the scheme even without considering the administrative cost. The magnitude of loss can also be seen by comparing the ratio of 'claims to sum assured' with ratio of 'premium to sum assured'. During 2005-06, claims constituted 6 per cent as against nearly 3 per cent premium on the sum assured. This implies a loss of about 3 per cent of the insured value of output.

Table 17: Performance of National Agricultural Insurance Scheme in India

Year	Farmers covered, %	Area covered, % of GCA	Sum assured as % of value of crop output	Claims ratio (Claims/ Premium)	Premium/ sum assured, %	Claims/ sum assured, %
1999-00	0.48	0.41	0.09	1.60	1.40	2.25
2000-01	8.69	8.73	2.14	5.45	2.76	15.06
2001-02	8.75	8.42	2.17	1.91	3.20	6.20
2002-03	9.84	11.12	2.83	5.52	3.23	17.84
2003-04	9.99	9.88	2.41	3.29	3.11	10.22
2004-05	12.96	15.53	3.57	2.24	3.16	7.06
2005-06	13.23	14.56	-	1.90	2.99	5.69

Note: *Authors' calculations.*

Farmers' Perception on NAIS

The partial expansion of scope and content of insurance scheme in the form of NAIS over CCIS seems to have not fully satisfied the farming community. There are several uncovered issues relating to operation, governance and financial feasibility. A survey conducted in October 2006 in Vizianagaram and West Godawari districts of Andhra Pradesh raised some pertinent issues concerning benefits. The important ones were:

1. Insurance unit in most instances is located at the Mandal level. However, yield achieved by farmers at farm-level significantly differs with aggregation at the Mandal level. Farmers, therefore, believed that *Gram Panchayat* was the ideal unit over Mandal.
2. The guaranteed yield is decided based on consecutive adverse seasonal year to compen-

sate farmers. This estimation pulls down the average yield and does not fairly compensate the farmers. They believed that considering best 5 out of 10 years yield should be taken for compensation purposes.

3. Farmers suggested for a quick settlement of claims, soon after losses so that the agricultural operations did not hamper.

4. The scheme should be applicable for insuring prevented sowing/planting and post-harvest losses.

5. Farmers demanded inclusion of all horticultural crops under the insurance scheme.

Insurance programme is as an important tool in mitigating agricultural risk, and needs to be expanded. However, every improvement has financial implications and effect on insurance practices.

Private Sector Initiatives

The private sector has recently come out with financially viable insurance in agriculture, based on weather parameters. The insurance losses due to vagaries of weather, i.e. excess or deficit rainfall, aberrations in sunshine, temperature and humidity, etc. could be covered on the basis of weather index. If specific index of weather is less than the threshold, the claim becomes payable as a percentage of deviation of actual index. One such product, namely Rainfall Insurance (RI) has been developed by ICICI-Lombard General Insurance Company and by IFFCO-Tokio General Insurance Company. Under the scheme, coverage for deviation in rainfall index is extended and compensations for economic losses due to less or more than normal rainfall are paid. The advantages of RI scheme are: (a) low or negligible administrative costs, (b) transparent and objective calculation of rainfall index, and (c) quick settlement of claims.

Despite various schemes launched from time to time in the country, agriculture insurance has served very limited purpose. It requires renewed efforts by the government in terms of designing appropriate guidelines and providing support for insurance. With the improved integration of rural countryside and communication network, the unit area of insurance could be brought down to a village *panchayat* level. Insurance products for the rural areas should be simple in design and presentation so that they are easily understood.

With increased commercialization of agriculture, price fluctuations have become highly significant in affecting farmers' income. Accordingly, market risk is now quite important in affecting farmers' income. The study has suggested implementation of market insurance to cover the price risk. For this, the interested farmers should register their marketable surplus with the insurance agency or market committee at the time of sowing the crop. The insurance agency should offer insurance cover with price guarantee which could be the minimum support price in some cases or market price in the past. Farmers should pay premium on this kind of price insurance and initially, the government should share some burden of the premium. During harvest if price in the notified market falls below the guaranteed price, then insurance agency should pay the indemnity. There is a lot of interest in the private sector to enter into the general insurance business. This opportunity

can be used by allocating some targets to different general insurance companies to cover agriculture. To begin with, this target could be equal to the share of agriculture in national income.

Farmers' Access to Different Information Sources

P. Adhiguru and Pratap S. Birthal

Farmers' access to information remains one of the key issues in agricultural development. A study on 'geometry of information flow in agriculture' was undertaken to address some of these issues employing household survey data from NSS 59th round which relates to the year 2003. The survey data covered 51,770 farming households from 6638 sample villages. The household data were aggregated into different agro-ecosystems following the classification of National Agricultural Technology Project (NATP). Under this classfication, the entire country has been divided into five broad agro-ecosystems, namely Arid, Coastal, Hills & Mountains, Irrigated, and Rainfed.

The study has revealed that a majority of farmers (60%) do not have access to information through any source on modern technology. Only about 40 per cent of households receive information on modern technology through the progressive farmers, input dealers, radio and television (Table 18). Analysis has shown a wide variation in accessing of information by farmers across regions. In the arid region, access to information through mass media is negligible (4% each from radio and television, and 2% from newspapers, etc.). Also, farmers' access to information through any source has been found lowest in this ecosystem as compared to other ecosystems and at all-India level. In this ecosystem, pearl millet and pearl millet-oilseed-based cropping systems are followed, and the productivity of these crops is low with poor infrastructure base. This could be the possible reason for low access to information in the arid ecosystem. In contrast, irrespective of sources, farmers in the coastal, rainfed, and hills & mountains ecosystems have a better access to information. These ecosystems have diversified cropping systems comprising rice, groundnut, fruits, cotton, and oilseeds and the farmers are willing to acquire more information.

Information access through participation in 'training' and visit to *'Krishi Vigyan Kendra'* is better in the coastal than other ecosystems. In the irrigated ecosystem, input dealers play the role of extension workers in providing information to farmers (13%). In the hill & mountain ecosystem, farmers are mainly dependent on mass media (21% on radio and 14% on television). Access to information through interpersonal channels (for example, input dealers, progressive farmers, etc.) is lower, which implies the possibility of physical barriers, and suggests a scope for information and communications technology (ICT). Among all sources, access to information through 'farmers study tour' is lowest, possibly due to high cost involved for extension agency and farmers. These results imply that only a segment of the farmers have access to information and suggest framing of a suitable extension strategy for a better information flow in agriculture.

Table 18: Accessing information through various sources in different agro-ecosystems

(per cent)

Information sources	Agro-ecosystems					All-India
	Arid	Coastal	Hills & Mountains	Irrigated	Rainfed	
Participation in training programmes	0.23	2.92	1.76	0.53	0.81	0.93
Krishi Vigyan Kendras	0.15	2.76	1.00	0.43	0.50	0.69
Extension workers	6.49	6.51	2.50	1.64	8.86	5.75
Television	4.43	16.90	14.59	6.98	9.51	9.38
Radio	4.09	14.86	21.49	15.23	10.89	13.09
Newspapers	2.07	17.45	4.57	5.38	6.82	7.02
Village fairs	0.04	2.69	1.55	2.02	2.06	2.03
Government demonstrations	1.81	3.96	1.99	0.93	2.53	2.05
Input dealers	9.19	14.89	5.16	13.29	13.71	13.15
Other progressive farmers	8.69	15.70	10.66	16.24	18.32	16.75
Farmers study tours	0.00	0.17	0.21	0.20	0.30	0.24
Para-technicians/ private agency/NGOs	0.08	0.61	0.36	0.47	0.73	0.59
Primary cooperative society	2.26	4.04	2.23	2.44	4.58	3.61
Output buyers/food processors	0.37	3.73	0.94	1.83	2.67	2.33
Credit agencies	0.41	4.71	0.64	0.89	2.22	1.85
Others	1.02	1.79	0.49	1.91	1.67	1.69
All sources	**25.89**	**51.01**	**40.13**	**37.48**	**41.55**	**40.49**

AGRICULTURAL GROWTH AND MODELLING

Capital Formation in Indian Agriculture

Ramesh Chand

There is a renewed interest in the issue of capital formation in Indian agriculture, as the country is looking for options to accelerate the sagging growth of agriculture sector. During early-1980s, magnitude of public investment was 3.51 per cent of AgGDP and a slightly more investment came from the private sources, primarily from the farmers. The level of public investment declined year-after-year and the recent level of public investments is less than three-fourth of the level attained during 1980-81. After 1995, the level of public investments has remained below 2 per cent of AgGDP.

It is observed that decline in the public sector investment after 1981-85 coincided with increase in subsidies in agriculture (Table 19). The increase in subsidies with decrease in public investment seems to be due to resource transfer from capital account to revenue account to meet the rising bill of subsidies. This has implications for long-term growth of agricultural output and degradation of soil and water resources.

Table 19: Trends in investments and subsidies in agriculture as percentage of AgGDP

Periods	Investment as percentage of AgGDP			
	Public	Private	Total	Subsidy
1981-1985	3.51	3.77	7.28	4.01
1986-1990	2.96	4.09	7.05	4.96
1991-1995	2.09	4.60	6.68	5.17
1996-2000	1.91	4.45	6.36	5.67
2001-2003	1.89	4.80	6.69	7.42

State Level Public Expenditure in Agriculture

Public investment data at the state level are published by only a few states. In the absence of such data, state level public investments in agriculture were studied by taking recourse to data on capital expenditure on four major heads, namely (a) agriculture and allied areas, (b) rural development, (c) special area programmes, and (d) major and medium irrigations and flood control. The first head included eleven items in it which were: (i) crop husbandry, (ii) soil and water conservation, (iii) animal husbandry, (iv) dairy development, (v) fisheries and allied heads, (vi) forestry and wild life, (vii) plantations, (viii) food storage and warehouses, (ix) agricultural research and education, (x) cooperation, and (xi) others.

Due to wide fluctuations in the annual data, changes in capital expenditure at the state level have been examined by taking average of the selected periods. These are for Eighth and Ninth Five-Year Plans and the first three years of the Tenth Five-Year Plan (FYP).

Total real capital expenditure (RCE) on agriculture and allied heads at 1993-94 prices, at the aggregate level of all states, has shown a very small increase during the Ninth FYP over Eighth FYP (Table 20). The annual allocation in the two Plans increased from Rs 6250 crore to Rs 6572 crore, depicting an increase of mere 5.2 per cent in the five-year period. There was a substantial increase in capital expenditure on agriculture during the Tenth FYP. The average capital expenditure during first three years of the Tenth FYP was Rs 10,440 crore, which is 59 per cent higher than allocation for public investment during the Ninth FYP.

There is a considerable variation in the state-level trends in funds allocated for capital formation. States like Andhra Pradesh, Bihar, Assam, Karnataka, Madhya Pradesh, Maharashtra, Gujarat and Uttar Pradesh have shown sharp increase in their respective public sector capital expenditure in

agriculture during the Ninth and Tenth FYPs. In contrast, there was a sharp decline in the states of Haryana, Orissa, Punjab, Kerala and West Bengal (Table 20).

Table 20: Capital expenditure on agriculture and related heads in relation to NSDP and area

Unit: Rupees

State	RCE/ha net sown area			NSDP/ha	Capital expenditure as per cent of NSDP agriculture		
	1993-96	1997-01	2002-04	2002-04	1993-96	1997-01	2002-04
Andhra Pradesh	590	660	1193	37383	3.51	3.60	6.26
Assam	383	466	1350	40374	1.96	2.27	6.57
Bihar*	297	666	1174	32921	1.68	3.25	4.98
Chhattisgarh		93	574	11167	—	4.05	10.85
Gujarat	563	799	903	23711	4.49	6.90	6.68
Haryana	357	556	279	46304	1.49	2.30	1.01
Himachal Pradesh	409	602	868	66354	1.87	2.17	2.57
Jammu & Kashmir	1408	1232	1478	66274	5.17	4.58	5.27
Jharkhand	—	775	3787	42817	—	13.47	12.23
Karnataka	645	811	1300	19877	5.29	5.21	10.54
Kerala	660	435	341	55221	2.28	1.94	1.62
Madhya Pradesh*	225	248	602	14109	2.56	2.45	5.78
Maharashtra	710	548	1484	19175	6.40	5.15	15.06
Orissa	358	509	304	23786	3.39	5.00	3.29
Punjab	663	827	475	63988	2.15	2.33	1.23
Rajasthan	293	299	356	13037	4.00	3.53	4.77
Tamil Nadu	153	373	468	33231	0.76	1.74	2.68
Uttaranchal		257	863	50923	—	2.11	2.87
Uttar Pradesh*	296	378	569	38839	1.62	1.89	2.56
West Bengal	335	260	202	70524	1.06	0.75	0.75
Arunachal Pradesh	731	1079	1847	34599	4.94	5.29	9.14
Manipur	2803	2285	2759	55842	10.59	6.92	7.53
Meghalaya	694	622	1106	44632	3.85	2.62	3.94
Mizoram	2101	1539	3310	51889	9.22	6.85	12.43
Nagaland	709	900	2784	80699	5.18	3.25	4.10
Sikkim	114	470	563	22672	0.84	4.49	5.60
Tripura	1005	1751	2524	53376	5.73	5.70	7.45
Goa	2014	1714	1958	161727	13.78	8.52	8.59
All states	**438**	**464**	**751**	**30348**	**2.85**	**3.16**	**5.17**

* includes the states carved out from them

RCE = Real Capital Expenditure

NSDP= Net State Domestic Product

The per hectare capital expenditure declined and turned lower than the national average in Punjab, Haryana, West Bengal and Kerala. Among the eight agriculturally more under-developed states, having per hectare NSDP lower than the national average, RCE was higher than national average in three states, namely Maharashtra, Karnataka, and Gujarat. These states are now paying higher attention to improve infrastructure for agriculture. On the other hand, Orissa, Rajasthan, Chhattisgarh, Madhya Pradesh, and Sikkim allocated lower than average resources for infrastructure development. Among the other major states, Bihar and Jharkhand are seemingly allocating higher resources for capital formation, whereas Uttar Pradesh continues to lag behind the national average. The average capital expenditure in West Bengal in the recent years was less than one-third of all-India average. Despite very low level of capital formation, agriculture productivity in West Bengal is the highest.

The capital expenditure on agriculture and related heads accounted for 2.85 per cent of NSDP during the Eighth FYP, which increased to 3.16 per cent during the Ninth FYP. The ratio of capital expenditure to NSDP crossed 5 per cent level during the first three years of the Tenth FYP. Among major states, highest allocation of resources in recent years has been observed in Maharashtra. In fact, Maharashtra had maintained this lead during the Eighth and Ninth FYPs also. This state allocated proportionately three times more resources to agriculture compared to the average of all states. It is a matter of concern that agriculture productivity in Maharashtra is less than two-thrid of all-India average, despite relatively higher allocation of resources for more than a decade. The agriculturally-developed states, namely Punjab, Haryana, West Bengal and Kerala, spend less than 2 per cent of NSDP on capital formation in agriculture. It seems these states do not see much prospects of agriculture growth through infrastructure development and what is needed here is the technological breakthrough. While low level of allocation for infrastructure doesn't cause much effect on growth in agriculturally-developed states, it certainly is a major factor in states like Rajasthan and Orissa.

The first three years of Tenth Plan, have shown some encouraging trends. Firstly, annual allocation of resources for infrastructure development in agriculture during 2002-03 to 2004-05 was about 60 per cent higher than that during 1996-97 to 2001-02, i.e. Ninth FYP. Secondly, resource allocation has been much higher in most of the agriculturally highly-underdeveloped than highly-developed states. It is pertinent to mention, however, that states like Orissa, Rajasthan, Madhya Pradesh and Chhattisgarh, continue to lag behind the average of all states, even during the Tenth FYP. Finally, the resource allocation for capital formation in agriculture during the Tenth FYP offers a ray of optimism to reverse the declining trend in public sector investments through allocation of more resources to agriculturally laggard regions. This augurs well for growth as well as equity.

Analysis of Investment in Livestock Sector in India

M. B. Dastagiri

Livestock is an important component of agriculture. Approach paper of 11th Five-Year Plan and National Agricultural Policy (NAP) documents have given more focus on the livestock sector to

achieve the targeted growth rate of 4 per cent in agriculture. However, there is a decline in public investment in both agriculture and livestock. The decline in public investment has emerged as an important issue in recent policy debates. There is a notion that livestock is the neglected sector in terms of investment and its distribution is also skewed. The present study has analysed the status and growth trends of government spendings on the livestock sector using all-India time-series data on expenditure on livestock and other related variables published by the Department of Animal Husbandry. Data covered the period 1970 to 2004.

The study has revealed that government expenditure on animal husbandry and dairying (GEAHD) increased by one and a half times in real terms during 1980s as compared to that in 1970s (Table 21). However, this trend did not continue in the later decades. The situation worsened more after 1990s. It is a serious concern and needs policy attention. The share of GEAHD in total gross capital formation in agriculture was nearly 3 per cent during 1970s; it declined to 2 per cent during 1990s and further to 0.5 per cent during 2000s.

Table 21: Investments in agriculture and livestock in India (at 1993-94 prices)

(in crore Rs)

Periods	GEAHD	Public GCFA		Private GCFA		GCFA		Public GCFA as % of TCFA	Private GCFA as % of TCFA
1970s	316.8	4642.6	(6.8)	6948.9	(4.6)	11600.8	(2.7)	40.0	59.9
1980s	497.1	6423.8	(7.7)	8568.9	(5.8)	14686.3	(3.4)	42.8	57.1
1990s	268.3	4331.8	(6.2)	11069.4	(2.4)	15408.4	(1.7)	28.1	71.8
2000s	94.7	4338.4	(2.2)	13630.9	(0.7)	17969.3	(0.5)	24.1	75.9
Before 1990s	382.8	5313.4	(7.2)	7210.7	(5.3)	12401.8	(3.1)	42.4	57.6
After 1990s	218.7	4333.7	(5.0)	11801.3	(1.9)	16140.1	(1.4)	26.8	73.1
Overall	279.4	4910.0	(6.4)	9100.9	(3.5)	13941.1	(2.2)	35.0	65.0

Figures within the parentheses are percentages of GEAHD with column variables

Note: GCFA is termed as total gross capital formation in agriculture

The growth rates of public investment in livestock and total agriculture have shown no clear trends during the study period. However, the private investment in agriculture has been increasing during 1990s and onward. It was also noted that growth rates of livestock GDP and per capita NNP were steady, but were fluctuating for AgGDP.

Sources of Agricultural Growth in India

P. K. Joshi, Pratap S. Birthal and N. Minot

The sources of agricultural growth in India have been decomposed during pre-reform (decade of 1980s) and reform (decade of 1990s) periods. A clear trend has emerged at the national level that during the pre-reform period, it was technology (crop yields as proxy) that was dominating the different sources of growth (Figure 13). On the other hand, during the reform period, output

prices became the important sources of growth in agriculture. Share of agricultural diversification towards fruits and vegetables has consistently increased in agricultural growth during the past two decades, with much faster rate during the reform period.

Some important policy implications have emerged from this study. First, the descending contribution of technology to agricultural growth should be viewed seriously. The agricultural sector is already under crisis, and is showing stagnation or deceleration in growth of major commodities due to various ailments. It may be recognized that contribution of technology must be stepped-up for sustaining agricultural growth and meeting the global challenges. This would require (i) higher efficiency of investment on agricultural R&D, (ii) reprioritization of R&D agenda, keeping in view the emerging challenges in different regions, and (iii) strengthening of public-private partnership in research, extension and input-delivery system. Higher allocation of research resources would be necessary for developing technologies to enhance yield potential of all commodities. Additional research resources would also be required to promote agricultural diversification in the non-traditional areas. New high-value crops in non-traditional areas would require deeper research on production, marketing and processing to sustain their technical feasibility and economic viability.

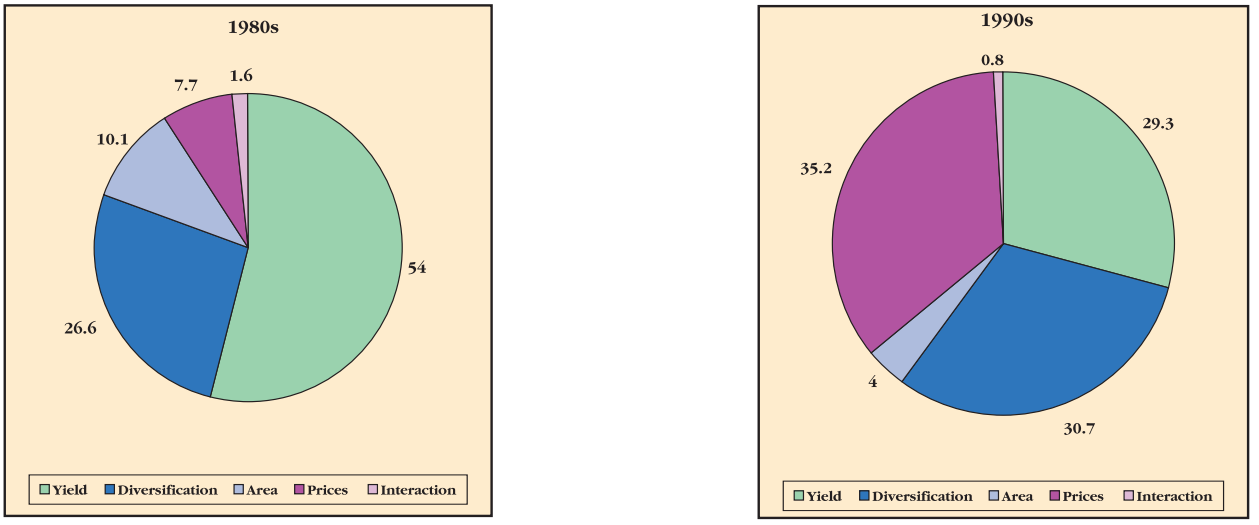


Figure 13: Sources of agricultural growth

Second, the contribution of agricultural diversification to agricultural growth must be viewed as an opportunity in the rainfed areas, which were by-passed during the 'green revolution' period. Promoting agricultural diversification towards high-value commodities and creating their appropriate markets and processing technologies can be used as effective tools to alleviate poverty and conserve natural resources in the niche areas. It may require investment on development of infrastructure and institutional arrangements, which suit the needs of high-value commodities. The study has suggested that better market integration, effective vertical coordination and value addition would be the pre-requisites for promoting agricultural diversification towards high-value commodities.

Third, output prices have emerged as important source of agricultural growth in all the regions during the reform period. Price-led agricultural growth may not be sustained unless supported by the government, as has been practised for rice and wheat. During the reform period, prices of rice and wheat were raised to protect the interests of farmers. On the other hand, rising demand for fruits & vegetables led to a rise in their prices. These high prices may not continue in the event of globalization when demand-induced cheaper import would suppress their prices. The other problem with the price-led growth is that it would benefit only those farmers, who have sufficient marketable surpluses. The smallholders, who have tiny marketable surplus, will be deprived of the benefits of rising prices. Such a phenomenon may lead to growth with wider inequality.

Fourth, area expansion may not continue as a future source of growth in the land-scarce regions. The growth in such regions will come from agricultural diversification towards more remunerative commodities and technological breakthroughs. It is, therefore, important that these growth sources are targeted for sustainable and equitable growth in agriculture.

III. RESEARCH ON NORTH–EASTERN REGION

Challenges and Opportunities for Agricultural Development in North-Eastern Region of India

B. C. Barah

Agriculture is an important sector in the economy of the North-East Region (NER), with its share in State Domestic Product (SDP) ranging from 19 per cent to 37 per cent in different NE states. Rice is the major staple crop commonly grown in these states, but, the rice-based agriculture system has failed to provide the required household income-security. Rice is a three-season crop, viz. autumn (*Ahu*), winter (*Sali*) and summer (*Boro*) in many areas of the region. Although winter rice accounts for more than two-thirds of the total rice area, the average yield is only 1.53 t/ha, which is nearly half a tonne less than the national average. A notable change has taken place in rice production system due to the emergence of *boro* rice, which provides 30-40 per cent higher yield than the normal rice. It has increased cropping intensity, leading to a situation of surplus production in Assam. This successful venture should be replicated in other NE states also.

Shifting Cultivation

A slash-and-burn system of cultivation, *Jhum* practice is a unique feature of the NE region, which covers nearly 2 million hectares area. The system faces criticism due to its low productivity and

environmental diseconomies; however, it provides support to about 443 thousand *jhumia* households and ensures household nutritional security. Being a socially-preferred practice, instead of banning, it needs a focussed R&D effort to improve the overall productivity and food security.

Crop Diversification

A large number of households traditionally practice crop diversification in the NER by growing multiple crops as well as livestock, fishery, piggery, etc. High-value crops like fruits and vegetables, spices and nuts are also widely grown in the region. The climate is also favourable to floriculture, but its huge potential remains untapped due to a number of constraints and institutional rigidities.

In a situation of extreme diversities and geographically limited cultivable area, vertical intensification rather than horizontal expansion is more relevant in many parts of NER. To reap the benefits of the huge opportunities for societal welfare, the following strategies have been suggested:

- The rice productivity in NER should be improved through (a) adoption of HYVs of rice, specifically in Arunachal Pradesh, Nagaland and Mizoram; (b) improving agri-inputs services; (c) developing pro small farmers' technologies; (d) laying higher emphasis on *boro* rice; (e) promoting aromatic rice like *kala joha*, particularly in Assam, Manipur and Tripura; and (f) developing market incentives in the region.
- Rain-water harvesting should be emphasized to take advantage of high rainfall. Appropriate watershed programmes with people's participation need to be encouraged.
- Agricultural diversification should be promoted, particularly towards high-value crops, through following strategies:

  (a) Rice-dominated states like Assam and Tripura should practise a synergized-mix of rice, pulses, oilseeds, horticulture, livestock and fishery. *Boro* rice should be accompanied by more diversification. High-value crops such as pachauli, passion fruit, and aromatic and medicinal plants having good potential in both domestic and international markets, should be widely practised.

  (b) A combination of food crops with livestock, fishery, piggery, forestry and horticulture is suggested for the states of Arunachal Pradesh and Mizoram, based on their geographical situation.

  (c) For the hilly terrains of Mizoram, Meghalaya and Nagaland, the production of staples (rice, maize and pulses) and high-value crops along with livestock and sericulture should be promoted. The climate being favourable to horticultural crops, their cultivation, specifically of the off-season vegetables should be emphasized.
- The comparative advantage of production systems based on low chemical-inputs should be harnessed by promoting the produce as 'organic products', for which demand is fast rising in national and international markets. A suitable mechanism may be evolved for the certification of these products.

- The public-private partnership should be strengthened. Special Agri-economic Zones (SAZs) may be established to capture the economic advantage, especially for tea, coffee, aromatic and medicinal plants, and horticulture products.
- The credit delivery system should be streamlined. Suitable strategy should be evolved to promote community-based collaterals for the effective credit delivery.
- The rural institutions being valuable social capital and strong agent of change, should be revitalized. Promoting high-value agriculture through contract farming, and reviving the village institutions like Field Management Committees (FMCs), Water Management Committees (WMCs) and village panchayats and councils would harness the emerging opportunities.

Investment in agriculture R&D should be increased for generating demand-driven technologies. For enhancing productivity of traditional *jhum* cultivation practised in Arunachal Pradesh, Manipur, Mizoram, Nagaland and Meghalaya, location-specific R&D is needed.

Assessment of Food Security in North-Eastern Region of India

K. K. Datta, Subhasis Mandal, A. K. Tripathi and S. B. Singh*

There has been a moderate increase in production and productivity of foodgrains during 1991-03 in the North-Eastern region (NER) of India. However, a high level of food insecurity and poverty persist in the region, with 26 per cent households below the poverty line. The status of food security is worse than poverty. A survey of farming households in NER during 2005 has revealed that more than 74 per cent of households do not have access to the minimum requirement of food. To meet the dietary needs, the households are dependent on public distribution system (PDS) and open market operations.

Survey has shown that allocation and lifting of foodgrains from the central pool is not proportionate to the prevailing level of food insecurity in the region. This is due to a narrow gap between prices of foodgrains at the fair price shops (FPS) and in the open market. This emphasizes on the need of focused efforts to manage the issue of food insecurity in the area. Survey has also pointed out that in most cases, foodgrains are not available at FPS, because of several reasons including delayed or non-arrival. Survey has indicated that FPS is not viable financially due to high transaction costs. Whatever may be the reason, the problem of food insecurity persists on a large scale. It

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suggests that policy regimes are inappropriate and ineffective. Improvement in productivity and profitability in agriculture will help improve the socioeconomic conditions of farmers. It requires appropriate blending of technologies and policies to increase production to ensure household food security. Also, factors affecting agricultural growth need to be identified and appropriate strategy should be adopted to tackle the problems of the region.

Prospects of Agricultural Development in North-Eastern Region

K. K. Datta and Subhasis Mandal*

The agricultural sector in the North-Eastern region (NER) is experiencing a transition phase-slowly shifting from the traditionally low-income enterprise to a self-sustaining enterprise. In this stage of transition, some sectors of agriculture and allied activities seem to have high growth potential. To explore these, it is important to prioritize agricultural enterprises having potential in both short-and long-run, the main objective being increasing production efficiency. Studies have shown that rather relying on any single activity, agriculture should be diversified towards high-value enterprises (crops, fruits, vegetables, spices, fishery, livestock, etc.) to enhance farm income and employment opportunities. This region has congenial environment to grow vegetables, fruits, spices, and medicinal and aromatic plants.

The shifting (*Jhum*) cultivation is a common practice in the region. The analysis of income distribution derived from *Jhum* has indicated that though it provides low income, distributes it equally among households. In total farm income, the share of crops was highest (36%), followed by wage earnings (30%) (both on & off farm), business (17%), and livestock (6%). The income derived from wage earnings is quite high (30%) and it is a good alternative. But, the concern is that about 28 per cent farmers are still practising solely *Jhum* and the rests follow both shifting (part of land) and permanent agriculture. This may be due to a number of reasons: first, farmers consider the *Jhum* cultivation as a way of life. Second, this practice does not require any intensive input management, and suits to their low resource endowment. Third, due to abundance of land (though land-man ratio is shrinking, but is not an issue in NER) and finally, this practice is highly labour-intensive, and suits the regions where agriculture operates under high risk conditions due to widely fluctuating weather.

The study has suggested that sub-sectors of agriculture like growing off-season vegetables, fruits, spices and condiments, organic products, meat and fish should be given priority. The volume of marketed surplus must be increased by promoting farmers' organizations and value addition at primary production centres to increase farm income. Integration of markets is important to realize the potential of this region. Finally, the process of economic growth in the region is primarily dependent on the agricultural sector. Therefore, agriculture must receive highest priority in the region.

Agricultural Diversification in North-Eastern Region of India

Pratap S. Birthal, A. K. Jha, P. K. Joshi and D. K. Singh

Agriculture is an important economic sector in the North-Eastern region (NER), but it lags behind other regions of India. Agriculture in the region is characterized as subsistence, low-

input and technology laggard. Transformation in agriculture is necessary to augment income and employment opportunities for the rural people in the region. The NER has a congenial agro-climatic environment favouring cultivation of a variety of seasonal and off-season vegetables, fruits, flowers, spices, and aromatic and medicinal plants. The region has the potential to leapfrog from the existing subsistence agriculture towards commercial agriculture through agricultural diversification and value addition. High-value crops have registered a significant increase in their shares over the past two decades in this region. Fruits and vegetables have emerged as the largest crop group with a share of 35 per cent in the total value of agricultural output in TE 2002-03 (Table 22). Between TE 1982-83 and TE 2002-03, their share improved by 9 percentage points. Share of condiments and spices also improved consistently from 8 per cent to 10 per cent during this period, while share of drugs and narcotics (mainly tea) remained almost unchanged at 11 per cent. Together high-value crops accounted for about 57 per cent of the output of agriculture in TE 2002-03, which was about 46 per cent in TE 1982-83.

Despite a decline in their share, cereals have maintained their growth momentum of about 2 per cent a year since 1980-81. Oilseeds and pulses were the fastest growing segments during 1980-81 to 1991-92, but subsequently there was a significant deceleration in their growth rates. Growth in sugarcane and fibre crops remained negative throughout. However, as expected, fruits and vegetables experienced a robust growth during both the periods of 1980-91 and 1992-02. So were the case with condiments and spices. In fact, during 1992-02, these crops emerged as the fastest growing segments of agriculture in the region. Drugs and narcotics also experienced acceleration in growth.

Table 22 also presents contribution of different crops/crop groups to the overall growth in agriculture in NER. The share of cereals in agriculture growth declined from 32 per cent during 1980-81 to 1991-92 to 23 per cent during 1992-93 to 2002-03, and the share of oilseeds and pulses fell drastically. Fruits and vegetables were the main drivers of growth in agriculture in both the periods. These accounted for 49 per cent of the growth during 1992-93 to 2002-03, up from 40 per cent during 1980-81 to 1991-92. Contribution of condiments and spices and drugs and narcotics also

improved, but only marginally. Together high-value crops contributed 62 per cent to agricultural growth during 1980-81 to 1991-92 and 75 per cent during 1992-93 to 2002-03.

The NER of India has congenial agro-climatic environment for growing a number of high-value crops. The region can emerge as an important centre of high-value agriculture considering the rapidly rising demand for these products. Notwithstanding favourable climatic conditions, upscaling of high-value agriculture in the region is constrained by the lack of infrastructure for production, marketing and processing. This is an important impediment in realizing the potential of high-value agriculture in the region.

Table 22: Share of high-value crops in agricultural output and growth in NER

Commodities	Share in value of output, %			Annual growth, %		Share in growth, %	
	1982-83	1992-93	2002-03	1980- 91	1992-02	1980- 91	1992-02
Cereals	39.3	37.7	33.6	1.9	2.0	31.6	23.2
Pulses	1.3	1.6	1.5	4.8	2.3	2.7	1.4
Oilseeds	3.0	4.0	3.5	6.5	1.9	7.7	2.1
Fibres	2.0	1.4	0.8	-2.3	-2.4	-1.0	-0.4
Sugarcane	3.5	1.8	0.9	-3.9	-4.6	-3.3	-1.7
Fruits & vegetables	25.9	29.4	35.0	4.0	5.1	40.0	49.0
Condiments & spices	8.2	9.1	10.6	4.6	4.8	12.5	13.4
Drugs & narcotics	11.3	10.9	11.3	2.2	2.8	9.7	11.8
Other crops & byproducts	5.5	4.1	2.6	-0.03	1.6	0.0	1.2
Total	**100.0**	**100.0**	**100.0**	**2.6**	**3.2**	**100.0**	**100**

Local markets for high-value food commodities are thin, and transport, cold storage and processing infrastructure is limited. Road network is poor in most of the states in the region. The situation warrants greater investments on roads and transportation, and development of innovative market institutions like cooperatives, self-help groups and contract farming that provide an assured market, quality inputs, technology and credit to producers. High-value agriculture in the region, by and large, has characteristics of organic agriculture, and growing markets for organic foods in the western countries as well as in the domestic high-income segment offer a good opportunity to the region to harness this potential.

IV. POLICY INTERACTIONS

Dr. B. C. Barah, Principal Scientist

- Expert Member of the Working Group on Agricultural Indebtedness, Eleventh Five-Year Plan (2007-12), Planning Commission, New Delhi.

Dr. Ramesh Chand, ICAR National Professor

- Participated in the Pre-Union Budget discussions with Union Finance Minister and other agricultural experts.
- Member of Steering Committee on Agriculture and Allied Sectors for Formulation of the Eleventh Five-Year Plan (2007-12).
- Member of Working Group on Crop Husbandry, Agricultural Inputs, Demand and Supply Projections and Agricultural Statistics for the Eleventh Five-Year Plan (2007-12).
- Member Secretary of the Sub-Group on Agricultural Economics, Marketing and Agri-Business, as a part of the Working Group on Agricultural Research and Education for the Eleventh Five-Year Plan (2007-12).

Dr. Suresh Pal, Principal Scientist

- Facilitated the Outcome Budget 2007-08 of the Department of Agricultural Research and Education/Indian Council of Agricultural Research.
- Member Secretary, Planning Commission Sub-Group on 'Organization, Finance and Management, Department of Agricultural Research and Education.
- Member Secretary, Committee of Indian Council of Agricultural Research on Projectized Mode of Agricultural Research.
- Member Secretary, Quinquennial Review Team of the National Centre for Agricultural Economics and Policy Research (NCAP).
- Member, Draft Committee for Management of Intellectual Property and Commercialization of Technologies of Indian Council of Agricultural Research (ICAR).
- Coordinator, Evaluation of Indian Council of Agricultural Research Plan Scheme: CSSRI, Karnal.
- Member, National Committee of the Department of Science and Technology for Impact Assessment of Agro-Advisory Services of the National Centre for Medium Range Weather Forecasting.

Dr. Pratap S. Birthal, National Fellow

- Member of the Steering Committee on Livestock Policy, Government of Chhattisgarh.
- Member of the Sub Group on Animal Husbandry Statistics for the Eleventh Five-Year Plan (2007-12), Government of India.

V. LINKAGES AND COLLABORATIONS

- Dr. Suresh Pal, Principal Scientist, actively collaborated in the preparation of Indian agricultural scenarios with National Agricultural Innovation Project (ICAR) and the World Bank.

VI. AWARDS AND RECOGNITIONS

Dr. B. C. Barah, Principal Scientist

- Joint Secretary, Agricultural Economics Research Association (India).

Dr. Pratap S. Birthal, National Fellow

- Review Editor for the 'Report on International Assessment of Agricultural Science and Technology for Development' on the East and South Asia and the Pacific (ESAP).

Dr. Ramesh Chand, ICAR National Professor

- Member, Editorial Board of the Indian Journal of Agricultural Economics, Mumbai.
- Member, Governing Body of Agro Economic Research Centre, University of Delhi, Delhi

Dr. P. K. Joshi, Director

- Elected as Fellow of the National Academy of Agricultural Sciences, New Delhi.
- Elected as Chairman, Governing Council, SAARC Agricultural Information Centre (SAIC), Dhaka, Bangladesh.
- Elected as Chairman, Governing Board, United Nation's Centre for Alleviation of Poverty through Secondary Crops' Development in Asia and Pacific (CAPSA), Bogor, Indonesia.
- Member, Coordination Committee for Organization of Research Studies on Agricultural Economics, Ministry of Agriculture, Government of India, New Delhi.
- Member, Research Advisory Committee, Central Arid Zone Research Institute, Jodhpur.
- Member, Quinquennial Review Team, Indian Agricultural Statistics Research Institute, New Delhi.
- Member, Research Programme Committee, Indian Society of Agricultural Economics, Mumbai.
- Secretary, Agricultural Economics Research Association (India), New Delhi.

Dr. Suresh Pal, Principal Scientist

- Member, Editorial Board of the Agricultural Economics Research Review, New Delhi.

VII. PUBLICATIONS

a) NCAP Publications

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Dayanatha Jha and Sant Kumar. *Research Resource Allocation in Indian Agriculture.* Policy Paper No. 23

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Pratap S. Birthal and P. K. Joshi. *High Value Agriculture for Accelerated and Equitable Growth.* Policy Brief No. 24

B. C. Barah. *Agricultural Development of North East India: Challenges and Opportunities.* Policy Brief No. 25

PME Notes

Suresh Pal. *Strategic Conversations on Agricultural R&D Policy*. PME Notes No. 15

b) Book

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h) TV Talk

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Ramaswami, B., Pratap S. Birthal and P. K. Joshi. 2006. Efficiency and distribution in contract farming: A case study of poultry in India. In: *Workshop on From Plate to Plough: Agricultural Diversification and its Implications for Smallholders*, organized by the International Food Policy Research Institute, Washington, DC, and Institute of Economic Growth, New Delhi, at New Delhi, 20-21 September.

Singh, Harbir and P. K. Joshi. 2006. Watershed impact assessment, In: *Inception Workshop on Comprehensive Assessment of Watershed Programs in India*, organized by International Crops Research Institute for Semi Arid Tropics, at NASC Complex, New Delhi, 6-7 June.

Singh, Harbir, F. A. Shaheen and P. K. Joshi. 2007. Potential of watershed development in improving the productivity of rainfed areas: Important insights from meta-analysis, In: *6th IWMI-Tata Annual Partners' Meet*, organized by IWMI-TATA group at IRMA, Anand, 8-10 March.

VIII. ON-GOING RESEARCH PROJECTS

Sl. No.	Projects	PI / CCPI
1.	Analyzing impact of agricultural policy, technology, institutions and trade on agricultural growth, farm income, sustainability and rural poverty	Ramesh Chand
2.	Future sources of growth in agriculture in North-East India with reference to agricultural diversification in favour of high-value crop and livestock	B. C. Barah and Pratap S. Birthal
3.	System of rice intensification: A productivity enhancing and resource conserving practice	B. C. Barah Ratna Reddy and K. N. Selvaraj
4.	Productivity and impact of agricultural research	Suresh Pal
5.	Economics of agricultural biotechnology: Investment, regulations and impact	Suresh Pal
6.	Returns to investment on livestock research and development: Implications for growth, equity and sustainability	Pratap S. Birthal
7.	Agricultural insurance in India : Problems and prospects	S. S. Raju and Ramesh Chand
8.	Rural distress and farmers' suicides in Andhra Pradesh	Aldas Janaiah
9.	Impact assessment of fisheries research in India	Aldas Janaiah
10.	Geometry of information flow in agriculture	P. Adhiguru and Pratap S. Birthal
11.	Subsidies and investments in livestock sector	M. B. Dastagiri
12.	Determinants of improved cultivation practices: Data mining approaches	Rajni Jain and Ramesh Chand
13.	Spatial and temporal changes in productivity and economics of Indian agriculture	Sant Kumar
14.	Supply chain and institutional change in agriculture: A case study of potato	Harbir Singh

IX. CONSULTANCY PROJECTS

Name of Scientist	Institution to which consultancy was provided	Area of consultancy
Pratap S. Birthal and S. S. Raju	Centre for Agriculture and Rural Development, Bhopal	Macroeconomic dimensions of livestock sector of India
Pratap S. Birthal	International Food Policy Research Institute, Washington, DC, USA	Equitable intensification of market-oriented smallholders dairy production through contract farming in India

X. MANAGEMENT AND OTHER COMMITTEES

Members of Management Committee (MC)

Dr. P. K. Joshi
Chairman &
Director
NCAP, Pusa
New Delhi - 110 012

Dr. B. C. Barah
Principal Scientist
NCAP, Pusa
New Delhi - 110 012

Dr. V. K. Gupta
ICAR National Professor
IASRI, Pusa, New Delhi - 110 012

Dr. S. L. Goswami
Joint Director (Research)
National Dairy Research Institute
Karnal - 132 001

Shri Viond Kumar
Member Secretary &
Assistant Administrative Officer
NCAP, Pusa
New Delhi - 110 012

Dr. R. S. Deshpande
Head, Agricultural Development and Rural Transformation (ADRT) Unit
Institute for Social and Economic Change
Nagarabhavi P.O., Bangalore - 560 072

Dr. P. G. Chengappa
Director of Instructions (Agriculture)
University of Agricultural Sciences
Bangalore - 560065

Dr. Mahesh Pathak
Honorary Advisor Agro Economic Research Centre
Sardar Patel University, P. Box. No. 24,
Vallabh VidhyaNagar - 388 120 Dist. Anand (Gujarat)

Shri M. L. Sharma
Economic and Statistical Advisor to
Government of Haryana, Chandigarh

Dr. B. K. Sharma
Director
Economics and Statistics Department
Delhi State, Old Secretariat, Delhi

Ms. Sanjeevan Prakash
Finance & Accounts Officer
NBPGR, Pusa, New Delhi-110 012

Meeting of the Management Committee

A meeting of the Management Committee was held on 11 December 2006. The major observations of the Committee were:

The Committee appreciated the achievements made by the Centre at the research and development front. It approved the expenditure incurred by NCAP during the years 2004-05, 2005-06 and expenditure till November 2006. The Committee was happy to note that NCAP is now placed in new building and operating smoothly. The Committee suggested that having built the necessary infrastructure, NCAP should now focus on human resource development. In this regard, the Committee suggested that younger faculty of the Centre should be exposed to macro policy environment as well as ground realities. The Management Committee desired that training hall, and committee room should be equipped with modern facilities, including video conferencing facility.

The Committee stressed on pursuing and expediting the construction of staff quarters on priority basis. The main reason of delay in construction of staff quarters was non-approval of Master Plan of Indian Agricultural Research Institute, Pusa, New Delhi. The Management Committee suggested to take up research in the following areas on priority basis: (a) Bt cotton impacts & regulations, (b) model farm database for district, (c) model for crop insurance, and (d) efficiency in allocation and use of resources. Committee reiterated that NCAP should give more focus on multidisciplinary research for a visible impact. In view of increased cadre strength of scientists at NCAP, Committee felt the need to increase the number of technical positions to provide necessary help in research coordination.

Meetings of the Institute Research Council (IRC)

Eight meetings of the IRC were held during the year. The IRC is comprised of the Director, NCAP, the scientific staff of the Centre as well as Assistant Director General (Economics, Statistics and Marketing) of ICAR. The IRC discussed the progress of the on-going research activities and new research proposals. The scientists and research staff of the Centre delivered seminars on their new proposals and presented results of the ongoing studies during these meetings. Presentations were also made at the IRC meetings to share the experiences and the outcome of the foreign deputations of the scientists and other staff.

Other Committees

A number of internal committees have been constituted for the decentralized management of the Centre. These committees and their terms of reference are as follows:

Academic Planning and Policy Committee

- To strengthen internal planning, functioning and policy direction.

Scientists Evaluation and Development Committee

- To encourage critical participation and strengthen socially-acceptable incentives and deterrent mechanism.

Internal Management Committee

- To regularly monitor the functioning of the Centre, and suggest ways to improve human resource productivity.

Budget Committee

- To plan, review and monitor the expenditure and income, including those for the sponsored projects of the Centre.
- To ensure compliance of proper procedures.

Purchase Committee

- To purchase materials and services according to the prescribed official procedures and in accordance with the Budget Committee guidelines/directions on utilization of funds.

Publication Committee

- To plan, format and make recommendations regarding Centre's publications.
- To prepare guidelines and arrange internal and external reviewing of publications, and coordinate revisions.
- To help and advise younger faculty of the Centre on publication-related matters.
- To identify printers and suggest pricing, circulation norms, etc. for Centre's publications.

Consultancy Processing Cell

- To examine proposals related to Consultancy with reference to guidelines of the Council issued from time to time and recommend appropriate action.

Computer Committee

- To plan and monitor computer facilities at the ARIS cell and its maintenance.
- To facilitate and monitor IT facilities (LAN, e-mail, Internet) at the Centre.

Women Cell

- To recommend measures for the welfare of the women employees of the Centre.
- To make recommendations for expeditious relief and redressal of grievances, including those related to sexual harassment.

Grievance Cell

- To examine the grievances received and to suggest the follow-up action accordingly.

Official Language Committee

- To monitor the progress of works done in official language from time to time and suggest relevant measures for improvement.
- To organize *Rajbhasa* Month/Fortnight/Week/Day as intimated by the Council from time to time.
- To report to the Council and other agencies on progress from time to time.
- To propose ways of increasing use of Raj Bhasha in the Centre.

PME Cell

- To plan, promote and monitor PME activities of the Centre.
- To report the progress on PME activities.

IPR and Technology Commercialization Committee

- To take up issues related to IPR of products developed for commercialization.
- To develop conditions for commercialization of products.
- To suggest ways for resource generation.

Staff Recreation Committee

- To plan indoor and outdoor recreational activities for the staff of the Centre.
- To organize recreational activities for the Centre's staff.

Workplace Committee

- To regularly monitor the working environment.
- To provide feedback on improving the working environment in the Centre.

XI. PARTICIPATION IN SCIENTIFIC ACTIVITIES

Name	Topic and date(s)	Place
P. Adhiguru	Tele-support Seminar on Sharing Lessons and Looking for Synergies—Two Way Interaction Model for Sharing Information for Sustainable Development 8 November 2006	NCAP, New Delhi
	Fifth Conference of the Asian Federation for Information Technology in Agriculture 9-11 November 2006	IIS, Bangalore
	Regional Workshop on Research-Extension Linkages for Effective Delivery of Agricultural Technologies in SAARC Countries 20-22 November 2006	NAARM, Hyderabad
	Global Open Food and Agriculture University (GOFAU) Consultation Workshop for Course Curriculum Designing in Agricultural Ecology 23 November 2006	ICRISAT, Patancheru
	National Seminar on Information and Communication Technology: Opportunities and Challenges for Revitalizing Extension System 27-29 December 2006	Navsari Agricultural University, Navsari
	Third International Conference on Linking Markets and Farmers: Exploring Leading Practices to Foster Economic Growth in Rural India 11-15 March 2007	Taj Palace Hotel, New Delhi
B. C. Barah	Comprehensive Assessment of Watershed Programmes in India 6-7 June 2006	NASC Complex, New Delhi
	NAIP Satellite Workshop 15 September 2006	NBPGR, New Delhi
	Second International Rice Congress 9-14 October 2006	NASC Complex New Delhi
	A National Colloquium on Innovation in Rural Institution : Driver for Rural Prosperity 24 October 2006	NASC Complex, New Delhi

	Sixty-sixth Annual Conference of the Indian Society of Agricultural Economics 8-10 November 2006	ICAR RC for NEH Region, Barapani
	National Seminar on System of Rice Intensification: Present Status and Prospects 17-18 November 2006	ANGRAU, Hyderabad
	Green Revolution II 18 November 2006	Hotel Oberoi, New Delhi
	Look East Policy: A Reality Check vis-a-vis North-East India 31 January 2007	Chinmay Mission Auditorium, New Delhi
	System of Rice Intensification and Beyond 23 February 2007	NCAP, New Delhi
	Expert Group on Agricultural Indebtedness, Govt. of India 16 March 2007	IGIDR, Mumbai
P. S. Birthal	Workshop on From Plate to Plough: Agricultural Diversification and its Implications for Smallholders 20-21 September 2006	NASC Complex, New Delhi
Ramesh Chand	National Conference on Macro Economic Policy, Agricultural Development and Rural Institutions 9 April 2006	ISEC, Bangalore
	Workshop on Business Intelligence, Forecasts and Planning for the Fertilizer Sector 17-19 April 2006	Qutub Hotel, New Delhi
	Workshop on Value Chains in Agriculture 29 May - 2 June 2006	NASC Complex, New Delhi
	National Seminar on Emerging Issues in Food Management 2 June 2006	NASC Complex, New Delhi
	Workshop on Impact Assessment of Fisheries Research 3-4 July 2006	CMFRI, Cochin
	Twenty-sixth Conference of International Association of Agricultural Economists 12-18 August 2006	Brisbane, Australia

	Workshop on Regional Synthesis of Research Needs in the Asia-Pacific Region 18-19 August 2006	Bangkok, Thailand
	Workshop on From Plate to Plough: Agricultural Diversification and its Implications for the Smallholders 20-21 September 2006	NASC Complex, New Delhi
	Second International Rice Congress – A Session on Market Intelligence and International Trade 9-13 October 2006	NASC Complex, New Delhi
	Sixty-sixth Annual Conference of Indian Society of Agricultural Economics 8-10 November 2006	ICAR RC for NEH Region, Barapani
	FAI Annual Seminar on Fertilizers and the Revival of Agriculture 28-30 November 2006	Hotel Ashok, New Delhi
	Workshop of Increasing Demand for Wheat with Specific Quality Characteristics and Resulting Implications for Farmers, Consumers, Milling/ Baking Industry and Wheat Breeding Priorities 7-8 December 2006	CIMMYT, Mexico
	Preceding Meeting of Senior Officials of SAARC Agriculture / Food Ministers Meeting 13-14 December 2006	Islamabad, Pakistan
	Workshop on Agrarian Distress in India 30 December 2006	IGIDR, Mumbai
	National Seminar on Changing World Vegetable Oils Scenario Issues and Challenges before India 29-31 January 2007	DOR, Hyderabad
	Workshop on Indian Agricultural Market Reforms 8-9 February 2007	Melbourne, Australia
	International Seminar on Saving Doha and Delivering on Development 12-13 March 2007	Maurya Hotel, New Delhi

	Policy Workshop on Asian Economic Renaissance: Challenges and Consequences on Agriculture, Food Security, and Poverty 19-20 March 2007	Chiangmai, Thailand
	Seminar on Building Trade Safety Nets in Agricultural Systems in South Asia 26 March 2007	CESS, Hyderabad
K. R. Chaudhary	Seminar on Benchmarking and Best Practices in Special Libraries	IIPA, New Delhi
M. B. Dastagiri	Brainstorming on Economic Consequences of Global Climate Change for India 12 January 2006	ICRIER, New Delhi
	International Conference on Agriculture for Food, Nutritional Security and Rural Growth 25-27 May 2006	India Habitat Centre, New Delhi
	Symposium on The Doha Impasse: Which Way Are We Heading? 25 July 2006	Centad, New Delhi
	Agriculture Summit 2006: Reforms for Empowering the Farmer 18-19 October 2006	Vigyan Bhavan, New Delhil
	UK and India: Partnering to Meet Global Challenges 3 November 2006	The Imperial Janpath, New Delhi
	International Conference on India and the Global Economy 6-7 November 2006	Vigyan Bhavan, New Delhi
	Technology Frameworks for e-governance 16 November 2006	ITC Hotel Maurya Sheraton & Towers New Delhi
	International Conference on Growth in India and the World 14-15 December 2006	Hotel Taj, New Delhi
	Multilateralism under Threat 29 January 2007	India Habitat Centre, New Delhi

	Painful Geopolitics, Stellar Geoeconomics: Can Globalization Continue to Apply to One, But Not the Other? 22 February 2007	India International Centre, New Delhi
	WTO Negotiations on Agriculture: Perspectives and Options 6 March 2007	LeMeridien Hotel, New Delhi
	Discussion on Union Budget 2007-08 7 March 2007	India Habitat Centre, New Delhi
Rajni Jain	Brainstorming on Projectized Mode of Research in ICAR 19 July 2006	NCAP, New Delhi
	Agriculture Summit 2006: Reforms for Empowering the Farmer 18-19 October 2006	Vigyan Bhavan, New Delhi
	Fifth International Conference of the Asian Federation for Information Technology in Agriculture 9-11 November 2006	IIS, Bangalore
	National Conference on Methods and Models in Computing 18-19 December 2006	JNU, New Delhi
	Pre-conference Workshop on Hotspot Geo-informatics on Statistics and Informatics in Agricultural Research 26 December 2006	IASRI, New Delhi
	Pre-conference Workshop on Regression Diagnostics on Statistics and Informatics in Agricultural Research 26 December 2006	IASRI, New Delhi
	International Conference on Statistics and Informatics in Agricultural Research 27-30 December 2006	NASC Complex, New Delhi
	National Conference on Computing for National Development 23-24 February 2007	Bhartiya Vidya Institute, New Delhi

	Third International Conference on Linking Markets and Farmers: Exploring Leading Practices to Foster Economic Growth in Rural India 11-15 March 2007	Hotel Taj Palace, New Delhi
Aldas Janaiah	National Workshop on Assessing the Impacts of Fisheries Research in India 21-22 April 2006	NAARM, Hyderabad
	Training Workshop on Concepts and Tools for Agricultural Research Evaluation and Impact Assessment 24 July–4 August 2006	IRRI, Philippines
	Twenty–Sixth Conference of the International Association of Agricultural Economists (IAAE) 12-18 August 2006	Brisbane, Australia
	National Workshop cum Training Programme on Bioinformatics and Statistics in Aquaculture Research 22-25 January 2007	CIFA, Bhubaneshwar
	International Conference on the 21st Century Challenges Sustainable Agri-Food Systems 15-17 March 2007	UAS, Bangalore
P. K. Joshi	Workshop on From Plate to Plough: Agricultural Diversification and its Implications for the Smallholders 20-21 September 2006	NASC Complex, New Delhi
	Second International Rice Congress: A Session on Market Intelligence and International Trade 9-13 October 2006	NASC Complex, New Delhi
	Agriculture Summit 2006: Reforms for Empowering the Farmer 18-19 October 2006	Vigyan Bhavan, New Delhi
	Expert Consultation on Agricultural Innovations: Linking Farmers to Market; and APAARI General Assembly 6-8 November 2006	NASC Complex, New Delhi
	Plenary Session on What Ails Indian Agriculture for Green Revolution II 22-24 November 2006	Hotel Oberoi, New Delhi

	International Conference on Statistics and Informatics in Agricultural Research, Diamond Jubilee Celebrations of Indian Society of Agricultural Statistics 27-30 December 2006	NASC Complex, New Delhi
	National Seminar on Changing Global Vegetable Oils Scenario: Issues and Challenges before India 29-31 January 2007	DOR, Hyderabad
Sant Kumar	National Workshop on Scenario Analysis for Indian Agriculture 8 May 2006	NCAP, New Delhi
	Brainstorming on Projectized Mode of Research in ICAR 19 July 2006	NCAP, New Delhi
	Agriculture Summit 2006: Reforms for Empowering the Farmer 18-19 October 2006	Vigyan Bhavan, New Delhi
	International Conference on India and the Global Economy 6-7 November 2006	Vigyan Bhavan, New Delhi
	National Seminar on Accelerating Agricultural Production: Agri-input Policy Initiatives and Directions 5 December 2006	NCUI, New Delhi
Suresh Pal	National Workshop on Scenario Analysis for Indian Agriculture 8 May 2006	NCAP, New Delhi
	Comprehensive Assessment of Watershed Programmes in India 6-7 June 2006	NASC Complex, New Delhi
	Workshop on Impact Assessment of Fisheries Research 3-4 July 2006	CMFRI, Cochin
	Brainstorming on Projectized Mode of Research in ICAR 19 July 2006	NCAP, New Delhi

S. S. Raju	Brainstorming on Projectized Mode of Research in ICAR 19 July 2006	NCAP, New Delhi
	Agriculture Summit-2006 Reforms for Empowering the Farmer 18-19 October 2006	Vigyan Bhavan, New Delhi
	International Conference on India and Global Economy 6-7 November 2006	Vigyan Bhavan, New Delhi
	Brainstorming on Developing Effective Technology Transfer System 19 December 2006	NCAP, New Delhi
Harbir Singh	A Comprehensive Assessment of Watershed Programmes in India 6-7 June 2006	NASC Complex, New Delhi
	Brainstorming on Projectized Mode of Research in ICAR 19 July 2006	NCAP, New Delhi
	Workshop on Maintenance of PERMIS Net and Launch of Intelligent Reporting System 21-22 July 2006	NASC Complex, New Delhi
	Fourteenth Annual Conference of Agricultural Economics Research Association (India) 27-28 September 2006	GBPUA&T, Pantnagar
	Sixty–sixth Annual Conference of the Indian Society of Agricultural Economics 8-10 November 2006	ICAR RC for NEH Region, Barapani
	Sixth IWMI-Tata Annual Partners' Meet 8-10 March 2007	Institute of Rural Management, Anand
	Third International Conference on Linking Farmers and Markets: Exploring Leading Practices to Foster Economic Growth in Rural India 11-15 March 2007	Taj Palace Hotel, New Delhi

XII. VISITS ABROAD

Name of Scientists	Purpose	Place	Duration
B. C. Barah	Agriculture Production Network Launch Workshop, GECAFS IGP CPW&F	Kathmandu, Nepal	27-30 June 2006
Ramesh Chand	Twenty-Sixth Conference of International Association of Agricultural Economists	Brisbane, Australia	12-18 August 2006
	Workshop on Regional Synthesis of Research Needs in the Asia-Pacific Region	Bangkok, Thailand	18-19 August 2006
	Workshop on Increasing Demand for Wheat with Specific Quality Characteristics and Resulting Implications for Farmers, Consumers, Milling/Baking Industry and Wheat Breeding Priorities	CIMMYT, Mexico	7-8 December 2006
	Preceding Meeting of Senior Officials of SAARC Agriculture/Food Ministers Meeting	Islamabad, Pakistan	13-14 December 2006
	Workshop on Indian Agricultural Market Reforms	Melbourne, Australia	8-9 February 2007
	Policy Workshop on Asian Economic Renaissance: Challenges and Consequences on Agriculture, Food Security, and Poverty	Chiangmai, Thailand	19-20 March 2007
Aldas Janaiah	Twenty-Sixth Conference of the International Association of Agricultural Economists	Brisbane, Australia	12-18 August 2006
P. K. Joshi	Twentieth Meeting of Governing Board of SAARC Agricultural Information Centre (SAIC)	Dhaka, Bangladesh	16-18 October 2006
	Third Technical Committee of UNESCAP-CAPSA (Centre for Alleviation of Poverty through Secondary Crops' Development in Asia and the Pacific)	Bogor, Indonesia	16-17 January 2007
	Third Governing Council Meeting of UNESCAP-CAPSA (Centre for Alleviation of Poverty through Secondary Crops' Development in Asia and the Pacific)	Bogor, Indonesia	18-19 January 2007
	Regional Workshop on Pro-poor Agricultural Technology Choices, Coalition of the Rural Poor, and Strategic Thrusts in Asia and the Pacific	Seoul, Korea	13-15 March 2007

XIII. POLICY ADVOCACY ACTIVITIES

Third Meeting of SAARC Technical Committee on Agriculture and Rural Development

18-19 September 2006

The Centre and ICAR organized jointly the third meeting of Technical Committee on Agriculture and Rural Development (TCARD) of South Asian Association for Regional Cooperation (SAARC) at New Delhi from 18-19 September 2006. The meeting was inaugurated by Dr. Mangala Rai, Secretary, Department of Agricultural Research and Education (DARE) and Director-General (DG) of Indian Council of Agricultural Research (ICAR). Delegates from SAARC Secretariat and SAARC countries, namely Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka, attended the meeting.

In his inaugural address, Dr. Mangala Rai stressed the need for accelerating agricultural growth in South Asian Countries (SACs). Since dependency on agriculture is still very high in SACs, the future economic growth should be inclusive and job-oriented. He highlighted the challenges being faced by the region and expressed concern about slow and stagnating agricultural growth. Dr. Rai also highlighted the importance of agro-processing and retailing. He stressed on the need for sharing the benefits of value addition by producers and consumers by improving the marketing efficiency. He underlined the need for effective dissemination of agricultural technology and called for establishing efficient research-extension linkages.

While welcoming the delegates, Dr. P. K. Joshi, Director NCAP, mentioned that the Association provides a platform for the people of South Asia to work together in a spirit of friendship, trust and understanding. It aims to promote the welfare of people of South Asia and improve their quality of life through accelerated economic growth, social progress and cultural development in the region.

Mr Sufiur Rahman, Director, SAARC Secretariat, underscored the need for higher investment in rural economy and effective rural development strategies at the national and regional levels to accelerate agricultural growth and alleviate poverty.

The meeting identified areas for rural development such as rural income generating projects; training programmes on skill development in rural areas, seed production, hybrid technology, IPM, etc.

Innovations in Rural Institutions: A Driver for Rural Prosperity

24 October 2006

Rural Institutions play a critical role in agricultural production process. In fact, these institutions could be a potential agent of change in the rural areas. India has a rich tradition of people's institutions since ages. However, these institutions are being neglected, and as a result farmers are deprived of access to information, technology, etc. Neglect of these institutions has increased vulnerability of rural livelihood, and a deplorable status of rural community as clearly reflected in the 59th Round Survey of NSSO. This is a matter of concern for the policymakers and researchers. Several models of modern institutions, including Panchayati Raj Institution (PRI) and the Self-help Groups (SHGs) are being experimented to bridge the existing gaps. Notwithstanding these changes, their impact at the grassroot level is meagre and spread is limited. With a view to understand the pathways of rural development and suggest measures to reach target group effectively, a national colloquium on '*Innovation in Rural Institutions: A Driver for Rural Prosperity'* was organized jointly by the National Academy of Agricultural Sciences (NAAS) and the National Centre for Agricultural Economics and Policy Research (NCAP) on 24 October 2006. Agricultural experts from all over the country and stakeholders from NGOs, and agri-business corporate leaders, participated in this meet. The programme included three technical sessions on (i) institutional framework building, (ii) innovative technologies and new initiatives partnership, and (iii) knowledge gaps and capacity building.

Dr. Mangala Rai, Secretary, DARE and DG, ICAR, in his inaugural address emphasized on the need for rural institutional framework for bridging the knowledge gap. Knowledge is infinite, and its intensity, utility and profitability are important. More production from less area with higher profitability is the essence of sustainability. For better job opportunities, agri-based technology linked with end users, is essential. In concluding remarks, Dr. Panjab Singh, Vice Chancellor, Banaras Hindu University, highlighted the need for sharing of available knowledge with the farmers through rural institutions. People want to involve and hence, a partnership approach should be adopted for rural development. It is time to learn lessons from the available successful models that are being experimented by both public institutions and corporate sector. The colloquium discussed various models of Tata Kisan Sanchar, Hariyali Bazaar, Mother Dairy, National Foundation of India, Reach India, Field Management Committee, and Panchyati Raj Institution. Relevant

research for the people and community under the institutional framework should be the focal point for multi-pronged development of agriculture.

System of Rice Intensification and Beyond: Implications on Rice Production

23 February 2007

Rice is a staple food and occupies an important position in India's food security. During the past few years, production and productivity of rice have stagnated. This calls for immediate attention of policymakers and researchers to upgrade innovations in rice production system. Among the modern methods, the system of rice intensification (SRI) is an innovative smallholder-friendly practice and has potential to raise yields and farm income and conserve irrigation water.

To better understand the technique and its implications on rice economy, the Centre organized a seminar on '*System of Rice Intensification and Beyond: Implications on Rice Production'* on 23 February 2007 at NCAP, New Delhi. Prof. Norman Uphoff of Cornell University, USA, a promoter of SRI worldwide provided a global perspective of SRI. It was followed by two presentations, one on *'Indian experiences at the experimental station',* and other on *'Socioeconomic aspects of SRI practice at the farmers' fields'*. The studies state that SRI provides more yields (about 20 to 30 per cent higher over normal rice yield). with lesser resources (particularly 40-50 per cent less water and 80-90 per cent less seed). It was demonstrated that the practice is pro-poor and especially favours smallholders and utilizes off-season idle family labour force. In view of the extreme scarcity of irrigation water and decline in farm income, this practice has good scope requiring further promotion for wider adoption. In order to effectively "reach out" the practice to the small farmers, it requires careful knowledge dissemination and capacity building.

XIV. LECTURES DELIVERED BY NCAP SCIENTISTS

Speaker	Topic and Date	Venue
P. Adhiguru	ICT in Agriculture: Issues and Strategies 26 November 2006	IARI , New Delhi
	ICT Applications in Agricultural Extension to Farmers and Other End users—Current Status and Future Plan 2 March 2007	IARI, New Delhi
Ramesh Chand	Strategy for Exports of Agriculture and Agri-Products from India 17 June 2006	IIFT, New Delhi
	Impact Assessment of Policy Changes in Fisheries 3-4 July 2006	CMFRI, Cochin
	Trade Liberalization, WTO and Indian Agriculture 3 August 2006	IIPA, New Delhi
	Pattern and Determinants of Agricultural Growth in States of India 22 September 2006	IEG, New Delhi
	WTO and Future of Indian Agriculture 1 November 2006	IEG, New Delhi
	Development Economics and Indian Scenario 15-19 January 2007	IEG, New Delhi
	Implications of Trade Liberalization under WTO for Small Farmers and Agriculture Trade 24 March 2007	Asian Productivity Organization, Tokyo
Aldas Janaiah	Determination of Counterfactual in Impact Assessment 24 July-4 August 2006	IRRI, Los Baòos, Philippines
	Determination of Counterfactual in Impact Assessment 22-25 January 2007	CIFA,Bhubaneswar
P. K. Joshi	Agricultural Diversification and Constraints to Growth in Agriculture 27 October 2006	IEG, New Delhi
	Growth Opportunities in Uttarakhand Agriculture (*Dr. S. L. Shah Memorial Lecture*) 23 March 2007	GBPUA&T, Pantnagar
Suresh Pal	Impact Assessment of Agricultural Research 3-4 July 2006	CMFRI, Cochin

XV. DISTINGUISHED VISITORS

Dr. Mangala Rai, Secretary, Department of Agricultural Research and Education & Director-General, Indian Council of Agricultural Research, New Delhi.

Dr. Rita Sharma, Additional Secretary and Financial Advisor, Department of Agricultural Research and Education, New Delhi.

Professor S. S. Johl, former Vice Chairman, Punjab State Planning Board and Chairman of NCAP Quinquennial Review Team.

Professor G. K. Chadha, Member, Prime Minister's Economic Advisory Council, Vigyan Bhavan Annexe, New Delhi, and Member of NCAP Quinquennial Review Team.

Dr. P. V. Shenoi, former Special Secretary, Department of Agriculture and Cooperation, New Delhi, and Member of NCAP Quinquennial Review Team.

Dr. V. N. Misra, former Economic and Statistical Advisor (DAC), New Delhi, and Member of NCAP Quinquennial Review Team.

Dr. P. Pingali, Director, ESA, Food and Agricultural Organization of United Nations, Rome, Italy.

Prof. C. H. Hanumantha Rao, Chairman, Centre for Economic and Social Studies, & former Member, Planning Commission, Nizamiah Observatory Campus, Begumpet, Hyderabad.

Dr. Ram Badan Singh, former Member, National Commission on Farmers, NASC Complex, New Delhi.

Dr. S. S. Acharya, Honorary Professor, Institute of Development Studies (IDS), Jaipur, Rajasthan.

Dr. William (Bill) Thorpe, Regional Representative, Asia, International Livestock Research Institute (ILRI), NASC Complex, New Delhi.

Dr. L. I. Weimin, Professor & Senior Research Fellow (International Agriculture & Trade), Institute of Agricultural Economics, Chinese Academy of Agricultural Sciences, Beijing, China.

Dr. Wais Kabir, Director, SAARC Agricultural Information Centre (SAIC), Dhaka, Bangladesh.

Dr. Narpat S. Jodha, Senior Research Associate (Policy Analyst) ICIMOD, Kathmandu, Nepal.

Dr. Sushil Kumar, Director, National Dairy Research Institute, Karnal, Haryana.

Dr. John Dixon, Director, Impacts Targeting and Assessment Program, International Maize and Wheat Improvement Centre (CIMMYT), Mexico.

Prof. Norman Uphoff, International Professor, College of Agriculture and Life Sciences, Cornell University, New York, USA.

XVI. PERSONNEL

Name	Designation	Area of Specialization
P. K. Joshi	Director (since 1 September 2006)	Technology Policy Sustainable Agricultural System
Ramesh Chand	ICAR National Professor	Markets and Trade Agricultural Growth and Modelling
S. Selvarajan	Principal Scientist (till 20 April 2006)	Sustainable Agricultural System Institutional Change
B. C. Barah	Principal Scientist	Agricultural Growth and Modelling Sustainable Agricultural System
K. K. Datta	Principal Scientist (since 2 January 2007)	Sustainable Agricultural System Agricultural Growth and Modelling
Suresh Pal	Principal Scientist	Technology Policy Institutional Change
Pratap S. Birthal	National Fellow	Technology Policy Agricultural Growth and Modelling
Aldas Janaiah	Senior Scientist	Technology Policy Agricultural Growth and Modelling
M. B. Dastagiri	Senior Scientist	Markets and Trade Institutional Change
P. Adhiguru	Senior Scientist	Technology Policy Institutional Change
S. S. Raju	Senior Scientist	Markets and Trade Institutional Change
Rajni Jain	Senior Scientist	Markets and Trade
Anjani Kumar*	Senior Scientist (since 20 January 2006)	Technology Policy Markets and Trade
Sant Kumar	Senior Scientist (since 22 August 2006)	Technology Policy Agricultural Growth and Modelling
Harbir Singh	Senior Scientist (since 9 January 2007)	Sustainable Agricultural System Institutional Change
P. A. Lakshmi Prasanna**	Scientist (Sr. Scale)	Institutional Change Sustainable Agricultural System

* on deputation to ILRI ** on study leave

Technical

Name	Designation
Prem Narayan	Technical Officer (T-6)
Khyali Ram Chaudhary	Technical Officer (T-5)
Mangal Singh Chauhan	Technical Officer (T-5)
Sonia Chauhan	Technical Officer (T-5)
Satender Singh Kataria	Technical Officer (T-3)

Administrative

Name	Designation
Vinod Kumar	Assistant Administrative Officer
S. P. Ashra	Assistant Finance & Accounts Officer
S. K. Yadav	Assistant
Inderjeet Sachdeva	Upper Division Clerk
Sanjay Kumar	Lower Division Clerk
Ajay Tanwar	Lower Division Clerk (since 14 August 2006)
Umeeta Ahuja	Stenographer
Seema Khatter	Junior Stenographer
Mahesh Kumar	S.S.Gr II
Mahesh Pal	S.S Gr I

XVII. TRAININGS ATTENDED

Scientists

Name	Topic	Duration	Institution
Rajni Jain	Design and Development of Web-based Application using Net Technology	22 November to 12 December 2006	IASRI, New Delhi
Harbir Singh	Seed Industry Executive Development Programme	21-24 March 2007	ICRISAT, Patancheru

Administration and Others

Name	Topic	Duration	Institution
Prem Narayan	Importance of Hindi Sections in Promotion of Rajbhasha	5-6 September 2006	NBAGR, Karnal
K.R. Chaudhary	Re-engineering Office Processes for Right to Information Act 2005	22-24 August 2006	National Productivity Council, Bhubaneswar
Umeeta Ahuja	DECC Language	21-25 August 2006	Department of Official Language, Khan Market, New Delhi
Seema Khatter	DECC Language	18-22 September 2006	Department of Official Language, Khan Market, New Delhi

XVIII. OTHER INFORMATION

Retirement of Staff

20 April 2006

Dr. S. Selvarajan, Principal Scientist of the Centre took voluntary retirement from Agricultural Research Services (ARS) of Indian Council of Agricultrual Research (ICAR) on 20 April 2006. He Joined NCAP as Principal Scientist in 1996, and worked in the area of sustainability of agricultural systems. Before joining NCAP, Dr. Selvarajan worked at Water Technology Centre, Indian Agricultural Research Institute, New Delhi and Central Soil & Water Conservation, Research & Training Institute, Research Centre, Bellary, Karnataka.

NCAP Annual Day

2 May 2006

The NCAP Annual Day was celebrated on 2 May 2006 in the Centre premises. Prof. G. K. Chadha, Member, Prime Minister's Economic Advisory Council, delivered the Annual Day lecture on '*Employment Scene in India*'. The session was chaired by Prof. Ram Badan Singh, former Member, National Commission on Farmers and Ex-Director, Indian Agricultural Research Institute, New Delhi. The lecture was followed by a lively discussion on various issues related to economic growth and employment in India. The discussion emphasized the need for job-led and inclusive growth. Suggestions were made to promote non-farm employment to reduce burden on agriculture by shifting workforce from agriculture to non-agriculture occupations.

In the evening a get-together and cultural programme was organized, which was attended by entire NCAP staff with their families.

Inauguration of NCAP Building

26 July 2006

The new office building of the National Centre for Agricultural Economics and Policy Research (NCAP) was inaugurated on 26 July 2006 by Shri Sharad Pawar, Hon'ble Union Minister of Agriculture, Consumer Affairs and Public Distribution, Government of India. Several dignitaries of NARS and CGIAR Centres attended the inaugural function.

In his inaugural address, Shri Pawar drew attention to various challenges confronting Indian agriculture like declining output growth, dwindling natural resources, increasing rural distress, price risk, competition from global markets, etc.

Shri Pawar mentioned that addressing of these challenges requires appropriate policies and strategies, innovative institutional mechanisms, and new technologies. He emphasized that NCAP has comparative advantage of having better understanding of agricultural technologies and knowledge of grassroot reality through the ICAR network. He advised that the Centre should develop pragmatic policies to address the problems and to achieve the development goals of agriculture sector.

Shri Sharad Pawar suggested that NCAP should continuously review, monitor and appraise the state of technologies and suggest suitable policies, and intervention strategies for maximizing gains from investment made in research. He asserted that trade liberalization in agriculture has

increased both price and income risks. There is a need to devise farmer-friendly strategies to deal with these risks. He further asserted that in the changing market environment, producers and planners need additional information about market prospects to plan their activities. He suggested that NCAP should take lead in providing policy options to accelerate agricultural growth.

Dr. Mangala Rai, Director General, ICAR and Secretary, Department of Agricultural Research and Education (DARE), in his remarks appreciated the research activities of the Centre and assured to provide all support for building the Centre unique in the area of agricultural policy research of international repute.

Dr. V. K. Taneja, Deputy Director-General (Animal Sciences) welcomed the dignitaries and guests. In his welcome address he highlighted the countribution of NCAP in the area of agricultural economics and policy research.

Dr Ramesh Chand, Acting Director, NCAP, extended thanks to all dignitaries and guests and said that agricultural economists of India had cherished a dream for a long time to have an independent infrastructure and premises as a part of their identity. That dream has been fulfilled with the inauguration of new NCAP building. He expressed his gratitude to Dr. Mangala Rai (DG, ICAR) for providing unflinching support to NCAP, for building scientific capability and infrastructure.

Promotion of Official Language

To promote the use of *Rajbhasha* in the Centre, a Committee on Official Language (Hindi) is in place. It monitors the progress of official activities being undertaken in Hindi and suggests measures for improvement. It coordinates and helps in executing the Council's orders and reports from time to time.

The Official Language Committee of NCAP organized a series of events during '*Hindi Chetna Month*' to create awareness among the staff about the use of Hindi. Among the activities which were performed during the *Chetna* month included essay writing, poem recitation, debates, knowledge of administrative words, etc. The participation of staff in these events was overwhelming.

Shri Harish Chand Joshi, Director *(Rajbhasha),* ICAR, Krishi Bhawan, New Delhi, was the chief guest on the occasion of prize distribution. Dr. Ramesh Chand, ICAR National Professor, Dr. B.C. Barah and Dr. Suresh Pal, Principal Scientists (all from NCAP) served as Judges to decide the winners.

The details of events and prize winners were as follows:

S. No.	Events	Prize winners
1	Essay writing	Sonia Chauhan Sushil Kumar Yadav A. K. Jha
2	Debate	Sonia Chauhan Rajni Jain Khyali Ram Chaudhary
3	Ashubhashan	Sushil Kumar Yadav Sant Kumar Sonia Chauhan
4	Dictation	Sushil Kumar Yadav Rajni Jain Sonia Chauhan
5	Translation in Hindi	Khyali Ram Chaudhary Sonia Chauhan Sushil Kumar Yadav
6	Poem recitation	Sushil Kumar Yadav Inderjeet Sachdeva Sonia Chauhan

The Committee also organized a training on 'Use of Computers in Hindi' for staff of the Centre during 7-8 September 2006. For day-to-day progress of Official Language (Hindi), Centre has procured the Hindi software and it has been installed in all the computers.

In Memory of Prof. Dayanatha Jha

On the occasion of 67 birth anniversary of late Prof. Dayanatha Jha, the former Director of NCAP and ICAR National Professor, an in-house meet was organized at the Centre on 9 March 2007. Rich tributes were paid to Prof. Dayanatha Jha by the staff of NCAP.

It was recalled that in his passing away on 24 October 2006, the agricultural economics community has lost its mentor, his friends have lost a guide and companion, and the society has

lost a great thinker and philosopher. He was a personality of great vision and professional wisdom. His contributions in the area of agricultural research policy and technological change are recognized internationally.

As a part of event, Centre organized a sports meet and arranged *Dr. Dayanatha Jha Memorial Badminton Competition* on this occasion. Teams of both men and women participated in these competitions and paid tributes to Dr. Dayanatha Jha.

Prof. Jha was a great lover of nature and he always emphasized on the importance of planting trees. On this occasion, a *Kadamb* tree was planted in his memory by Dr. Mruthyunjaya, National Director, NAIP, Indian Council of Agricultural Research. Staff of the Centre also planted trees of various types on the occasion.

विशिष्ट सारांश

राष्ट्रीय कृषि आर्थिकी एवम् नीति अनुसंधान केन्द्र ने कृषि अर्थशास्त्र तथा नीतिशोध में अपने प्रयास एवं कौशल को इस वर्ष भी कायम रखा है। राष्ट्रीय कृषि अनुसंधान व्यवस्था (एन. ए. आर. एस.) के अन्तर्गत यह केन्द्र ऐसी नीतियाँ सुझाने के प्रति वचनवद्ध है, जोकि सामाजिक–आर्थिक दृष्टि से उपयुक्त हों, तथा वातावरण के अनुकूल हों, जिनसे कृषि में विज्ञान–सम्मत विकास हो सके। वर्ष 2006–07 में केन्द्र में 16 वैज्ञानिक (एक राष्ट्रीय प्राध्यापक तथा एक राष्ट्रीय अध्येता सहित) तथा 15 अन्य कर्मचारी कार्यरत थे। इस सत्रावधि में केन्द्र का कुल बजट 293.24 लाख रूपये था।

एक उच्च स्तरीय अनुसंधान सलाहकार समिति (आर. ए. सी.) इस केन्द्र के शोध कार्यक्रमों का निर्धारण, संचालन एवं मार्गदर्शन करती है। एक प्रबंधन समिति, इस केन्द्र की आर्थिक एवं प्रशासनिक गतिविधियों पर निगरानी रखती है। इसके अतिरिक्त इस केन्द्र के विकेन्द्रीकृत प्रबंधन तथा संचालन हेतु कई आंतरिक समितियाँ भी कार्यरत हैं। प्रत्येक क्षेत्र के अन्तर्गत शोध कार्यक्रम इस प्रकार संयोजित किए जाते हैं, जिससे यह केन्द्र निर्धारित लक्ष्यों को पूरा कर सके।

इस केन्द्र में सामयिक विषयों पर शोध–कार्य पाँच क्षेत्रों–तकनीकी नीति, सतत् कृषि व्यवस्था, विपणन एवं व्यापार, संस्थागत बदलाव तथा कृषि वृद्धि एवं माडलीकरण–में किये जाते हैं। प्रत्येक क्षेत्र में एक लघु वैज्ञानिक समूह, एक वरिष्ठ कृषि अर्थशास्त्री की देख–रेख में कार्य करता है। वर्ष 2006–07 में इस केन्द्र ने 27 अध्ययन विषयों पर शोध किया तथा दो परामर्शदायी परियोजनाओं को पूरा किया। इस वर्ष भी केन्द्र ने विभिन्न भारतीय तथा विदेशी संस्थानों के साथ अपने शोध संबंधों एवं अनुबंधों को न केवल कायम रखा वरन् उन्हें और अधिक सुदृढ़ एवं व्यापक बनाया। चालू वर्ष में केन्द्र ने अनेक कार्यशालाओं, संगोष्ठियों, ब्रेनस्टार्मिंग सैशनों तथा प्रशिक्षण कार्यक्रमों का आयोजन किया। इनमें ग्रामीण प्रौद्योगिकियों का उन्नयन, चावल उत्पादन की सघन पद्धति, परियोजना–आधारित बजट आवंटन, कृषि शोध में एसपीएसएस का प्रयोग, भारतीय कृषि का भावी स्वरूप, आदि प्रमुख विषय थे।

अगले दो दशकों में भारतीय कृषि अनेक स्थितियों से प्रभावित होगी। वर्ष 2030 में भारतीय कृषि के संभावी स्वरूप को दर्शाने हेतु चार परिदृश्यों की कल्पना की गई और उन्हें निम्नलिखित रूपों द्वारा समझाया गयाः (अ) वैली में, (ब) एलांग दॉ एज, (स) ओवर दॉ माउन्टेन, तथा (द) थ्रु दॉ हिल्ज। इन परिदृश्यों के निर्धारण में दो विरोधाभासी मुद्दों (i) 'क्षमता बनाम सामाजिक समरसता' और (ii) 'आर्थिक उदारीकरण बनाम सरकारी नियंत्रण' को ध्यान में रखा गया है। ये चार प्रकल्पित परिदृश्य व्यापक कार्यक्षेत्रों की तरफ इशारा करते हैं जोकि भविष्य में विकास की चुनौतियों से निपटने तथा नीति निर्धारण में सहायक होंगे। इनसे संस्थाओ की अनिश्चितता कम करने, कृषि सुधार में तेजी लाने तथा कृषि के उन्नयनीकरण में सहायता मिलेगी।

वर्ष 2006–07 की अवधि में गेहूँ के आयात से खाद्य सुरक्षा का मुद्दा नीति संवाद का विषय बन गया है। यह निर्णय उस समय लिया गया जब देश तथा विश्वस्तर पर गेहूँ के उत्पादन में गिरावट आयी है तथा इसकी कीमतें भी बढ़ रही हैं। भारत में पिछले कुछ वर्षों से गेहूँ का उत्पादन 700 लाख टन के स्तर पर थम सा गया है, जबकि इसकी माँग में बढ़ोतरी निरन्तर जारी है। देश में गेहूँ की कीमत में स्थिरता लाने तथा खाद्य सुरक्षा सुनिश्चित करने के लिए, गेहूँ की माँग तथा आपूर्ति के बीच की खाई को पाटना आवश्यक है। गेहूँ के उत्पादन में उपस्थित बाधाओं को समझने के लिए किए गए एक अध्ययन से यह ज्ञात हुआ है कि पारम्परिक गेहूँ उत्पादन करने वाले क्षेत्रों में भी इसके उत्पादन बढ़ाने की बहुत अधिक संभावनाएं हैं। केवल बिहार और मध्य प्रदेश में गेहूँ की प्रति हेक्टयेर उपज को राष्ट्रीय उत्पादन स्तर तक लाने से ही 50 लाख टन गेहूँ की वृद्धि की जा सकती है। किसानों तक उन्नत प्रौद्योगिकी पहुँचाने, उर्वरकों के सन्तुलित प्रयोग करने, तथा अन्य आवश्यक कृषि कार्यों के सही समय पर अपनाने से भी गेहूँ के उत्पादन में 50 लाख टन की बढ़ोतरी की जा सकती है। गेहूँ की अधिक और कम उपज वाले राज्यों के बीच उपज–अन्तर को कम करके भी उत्पादन बढ़ाने की असीमित संभावनाए हैं। यदि उपज–अन्तर स्तर में 10 प्रतिशत की भी वृद्धि की जा सके तो 50 लाख टन अतिरिक्त गेहूँ प्राप्त किया जा सकता है। गेहूँ के कुल क्षेत्र के 50 प्रतिशत हिस्से में उन्नत बीजों को उगाकर भी गेहूँ उत्पादन में 100 लाख टन गेहूँ की वृद्धि की जा सकती है।

तिलहनों की बढ़ती माँग तथा इनका घटता घरेलू उत्पादन नीति–निर्माताओं के लिए कड़ी चुनौती है। भविष्य में तिलहनों की उत्पादन स्थिति की जानकारी हेतु इनके उत्पादन वृद्धि के स्रोतों तथा 'कुल कारक उत्पादकता' (टी. एफ. पी.) का अध्ययन किया गया। अध्ययन से यह ज्ञात हुआ कि 1976–85 की अवधि में तिलहनों (केवल सूरजमुखी एवं सोयाबीन को छोड़कर) के उत्पादन को बढ़ाने में 'उत्पादकता प्रभाव' का योगदान 'क्षेत्र प्रभाव' से अधिक था। 1986–95 की अवधि में यह क्रम उलट गया, अर्थात् 'क्षेत्र प्रभाव' का योगदान अधिक रहा और उसके बाद (1996–2004 के दौरान) 'उत्पादकता प्रभाव' का योगदान ऋणात्मक हो गया। अध्ययन से स्पष्ट है कि 'तिलहन प्रौद्योगिकी मिशन' के लागू होने तथा 1990 के दशक के मध्य तक तिलहनों के उत्पादन में वृद्धि मुख्य रूप से इनके क्षेत्र में वृद्धि के कारण हुई। खेती की भूमि की कई अन्य उपयोगों में बढ़ती मांग के कारण कृषि में इसकी बढ़ोतरी की संभावनाएं कम हैं। अतः तिलहनों का उत्पादन बढ़ाने के लिए इनके उत्पादकता स्तर को बढ़ाने के प्रयास किये जाने चाहिए।

तिलहनों के उत्पादन में 'कुल कारक उत्पादकता' वृद्वि का अध्ययन दर्शाता है कि आन्ध्र प्रदेश में मूँगफली के उत्पादन में 'कुल कारक उत्पादकता' वृद्धि का प्रभाव 1990 के दशक के पूर्वाध में सकारात्मक था, परन्तु बाद के वर्षों में नकारात्मक हो गया। राजस्थान तथा हरियाणा में 'कुल कारक उत्पादकता' वृद्धि का प्रभाव सरसों/तोरिया के उत्पादन में सघन तथा सकारात्मक था। इसी तरह के परिणाम मध्य प्रदेश में सोयाबीन उत्पादन के सन्दर्भ में भी मिले हैं। सूरजमुखी उत्पादन वृद्धि के सन्दर्भ में यह ज्ञात हुआ है कि 'कुल कारक उत्पादकता' का प्रभाव 1986–95 की अवधि में नकारात्मक था तथा बाद के वर्षों में यह प्रभाव सकारात्मक हो गया। उपरोक्त परिणामों से यह निष्कर्ष निकलता है कि खाद्य–तिलहनों के उत्पादन पर 'कुल कारक उत्पादकता' का प्रभाव सकारात्मक रहा है।

विभिन्न साहित्यों के अध्ययन से पता चला है कि भारत का तिलहन क्षेत्र विश्वव्यापार में प्रतिस्पर्धी नहीं है, जबकि एक विश्लेषण में पाया गया है कि व्यापार उदारीकरण के बाद के वर्षों में भारत ने काफी अधिक मात्रा में तिलहन उत्पादों का निर्यात किया है। इनमें खलियाँ तथा आयल–मील (54 प्रतिशत) और वनस्पति तेल एवं तिलहन (प्रत्येक 23 प्रतिशत) शामिल हैं। वर्ष 2004–05 में, तिलहनों के निर्यात से 5,700 करोड़ रूपये की आमदनी हुई जोकि खाद्य तेलों के आयात व्यय का लगभग 50 प्रतिशत है। तिलहन क्षेत्र में व्यापार प्रतिस्पर्धात्मकता मुख्य रूप से इनके उत्पादन एवं प्रसंस्करण क्षमता पर निर्भर करती है। तिलहनों में प्रतिस्पर्धात्मक क्षमता बढ़ाने हेतु तीन तरह के खर्चों में कमी लानी पड़ेगी (i) उत्पादन खर्च, (ii) विपणन तथा यातायात खर्च, और (iii) प्रसंस्करण खर्च। इसके अतिरिक्त, देश को अन्य तिलहनों जैसे अरण्डी, कुसुम, मूँगफली, आदि के निर्यात को बढ़ाने के लिए भरसक प्रयत्न करने चाहिए और साथ ही में इनके उपभोक्ताओं की पसंद के अनुरूप बदलाव लाने चाहिए।

पूर्वी एशियाई देशों में आई विकराल समस्या से भारतीय सोयाबीन का निर्यात काफी प्रभावित हुआ है, क्योंकि ये देश सोयाबीन उत्पादों के प्रमुख खरीददार हैं। 1991–95 की अवधि में सोयाबीन के निर्यात में 50 प्रतिशत की कमी हुई और हाल के वर्षों में तो यह स्तर 30 प्रतिशत तक सिमट गया है। सोयाबीन की अधिक उपज देने वाली उन्नत किस्मों को उगाकर, तथा उत्पादन लागत में कमी करके, भारत विश्व व्यापार में प्रतिस्पर्धी बना रह सकता है। ब्राजील तथा अर्जेन्टाइन जैसे देश सोयाबीन की उन्नत किस्में (जी. एम. किस्में) उगाने का लाभ उठा रहे हैं। उन्नत किस्मों के बीज तथा अन्य कृषि उत्पादन कारकों के समुचित मात्रा में प्रयोग तथा उपज अन्तर को कम करके सोयाबीन के उत्पादन में बढ़ोतरी की जा सकती है। इसके अतिरिक्त, सोयाबीन के उपज स्तर को बढ़ाने के लिए स्थानीय, अधिक उपज देने वाली कीटरोधी तथा सूखा सहन करने वाली किस्मों के विकास की आवश्यकता है।

चावल निर्यात पर किये गए एक अध्ययन के अनुसार हाल के वर्षों में भारत ने चावल के कुल उत्पादन (900 लाख टन) का 4 प्रतिशत हिस्सा ही निर्यात किया है। विश्लेषण से ज्ञात हुआ है कि भारत में चावल निर्यात को बढ़ावा देने में तुलनात्मक लाभ है लेकिन इसका निर्यात स्तर तथा प्रतिस्पर्धात्मक क्षमता, अर्न्तराष्ट्रीय मूल्यों में उतार–चढ़ाव से काफी प्रभावित होती है। वैश्विक कीमतों में उतार–चढ़ाव देशीय बाजार को भी प्रभावित करता है। विभिन्न परिस्थितियों में निर्यात को बढ़ावा देने के लिए, अधिक मात्रा में बाजार सूचनाओं की जानकारी पर अमल करने की आवश्यकता है।

दक्षिण एशियाई देशों में व्यापार उदारीकरण का खाद्य आत्मनिर्भरता पर हुए प्रभाव के अध्ययन से ज्ञात हुआ है कि 1991–2002 की अवधि में इन देशों में खाद्य तेलों के आयात पर निर्भरता तेजी से बढ़ी है। ये देश खाद्य तेलों की अपनी आवश्यकता का लगभग आधा हिस्सा आयात से पूरा कर रहे हैं। शुल्कों में भारी वृद्धि के बावजूद भी आयात में कोई कमी नहीं आयी है। सभी दक्षिण एशियाई देशों में (केवल नेपाल को छोडकर) दलहनों का आयात भी बढ़ा है। भारत ने उदारीकरण के बाद के वर्षों में शुल्कों को बढ़ाकर तथा अन्य उपायों को अपनाकर अनाजों, फलों तथा दुग्ध–उत्पादों के आयात को सफलतापूर्वक नियंत्रित कर रखा है। पाकिस्तान एवं श्रीलंका, केवल अनाजों के आयात को ही

नियंत्रित कर पाये हैं, जबकि अन्य कृषि–पदार्थों के लिए आयात निर्भरता बढ़ी हैं। बांग्लादेश और नेपाल में अधिकांश खाद्य–वस्तुओं के आयात में मध्यम दर्जे से लेकर तेज वृद्धि हुई है।

पादप–पोषक तत्वों तथा अन्य कारकों की कृषि वृद्धि में अहम् भूमिका हैं। पोषक तत्वों के प्रयोग पर किये गए एक अध्ययन से पता चला है कि राष्ट्रीय स्तर पर सिंचित क्षेत्रों में अधिकांश किसान तथा असिंचित क्षेत्रों में तीन–चौथाई किसान विभिन्न फसलोत्पादन में खाद/उर्वरक का प्रयोग करते हैं। फसलों में, खाद/उर्वरक का सर्वाधिक प्रयोग गन्ने की खेती में तथा उसके बाद गेहूँ उत्पादन में किया जाता है। हरियाणा राज्य में 37 प्रतिशत किसान विभिन्न फसलोत्पादन में केवल उर्वरकों का प्रयोग करते है, जबकि उत्तर–पूर्वी राज्यों के किसान अधिकांशतः कार्बनिक खादों का प्रयोग करते हैं।

बारानी कृषि सिंचाई जल के लिए तरस रही है। बारानी क्षेत्रों में जलाशय कार्यक्रमों की भूमिका फसल–उत्पादकता बढ़ाने तथा जीविका सुरक्षित करने में महत्वपूर्ण है । जलाशय कार्यक्रमों की संभाव्य क्षमता का लाभ उठाने के लिए कीमतों तथा लाभों का न्यायसंगत वितरण आवश्यक है। इसके अतिरिक्त, इन कार्यक्रमों की सफलता के लिए उन्नत तकनीकों, सूचनाओं के सतत् प्रवाह तथा सक्षम स्थानीय संस्थाओं की सहभागिता भी जरूरी है।

सहकारी समितियाँ तथा उत्पादक संघ आदि संस्थायें किसानों को बाजार व्यवस्था से जोड़ने में प्रभावी माने जाते हैं। सब्जियां उगाने वाले किसानों के 'फल एवं सब्जी उत्पादक संघ लिमिटेड' (सफल) से जुड़ने पर किये गए एक अध्ययन से पता चला है कि सदस्य किसानों का 'स्वतंत्र रूप' से खेती करने वाले किसानों की अपेक्षा व्यापार–संचालन व्यय (transaction cost) 92 प्रतिशत तक कम हो गया। इसके अतिरिक्त सदस्य किसानों को उनके उत्पादों का मूल्य 7 प्रतिशत अधिक मिला और शुद्ध लाभ 78 प्रतिशत रहा।

किसानों को बाजार व्यवस्था से जोड़ने के लिए अनुबंध या ठेका एक महत्वपूर्ण माध्यम है। इस व्यवस्था का राजस्थान में भैंस के दुग्धोत्पादन का सामाजिक–आर्थिक लाभों पर अध्ययन किया गया। इस अध्ययन से ज्ञात हुआ है कि यह व्यवस्था स्वतंत्र दुग्ध उत्पादन की अपेक्षा अधिक लाभदायी है जोकि मुख्य रूप से व्यापार–संचालन व्यय में कमी के कारण होता है। इस उत्पादन पद्धति में सदस्यों को निःशुल्क तकनीकी सलाह के साथ–साथ अच्छे प्रबंधन के गुर भी सिखाए जाते हैं। जिनसे दुग्ध उत्पादन में बढ़ोतरी होती है, और उत्पादन लागत कम होती है। इस उभरती उत्पादन व्यवस्था ने ग्रामीण दुग्ध–बाजार में प्रतिस्पर्धा की भावना विकसित की है। प्रतिस्पर्धा की कमी से ग्रामीण दुग्ध–उत्पादकों को स्थानीय बाजार में कम कीमत मिलती है तथा उनका प्रायः शोषण होता है।

कृषि बीमा किसानों को उत्पादन तथा आमदनी में जोखिमों से सुरक्षा प्रदान करता है। पिछले वर्षों में अनेक प्रयासों के बावजूद, इसके विस्तार में अपेक्षित वृद्धि नहीं हुई है। बारानी क्षेत्रों, जहां कृषि अनिश्चितता तथा जोखिमों से भरी है, में कृषि बीमा का विस्तार आवश्यक है। कृषि बीमा के विभिन्न प्रारूपों का अध्ययन आंध्र प्रदेश में किया गया। इस अध्ययन से ज्ञात हुआ कि बीमा राशि के भुगतान में

अधिक कुशलता तथा पारदर्शिता की आवश्यकता है। इस अध्ययन में नुकसान के आँकलन तथा दावों के निपटान हेतु आधुनिक तंत्रों के उपयोग की सलाह दी गई है। निजी क्षेत्र की कई बीमा कम्पनियों ने मौसमी–प्राचालों पर आधारित तथा आर्थिक दृष्टि से अनुकूल एक 'कृषि बीमा योजना' को विकसित किया है। इनमें से एक कृषि बीमा योजना, 'वर्षा आधारित बीमा' है, जिसे आई. सी. आई. सी. आई. –लोम्बर्ड जनरल इन्सुरेन्स कम्पनी तथा इफको–टोकियो जनरल इन्सुरेन्स कम्पनी ने विकसित किया है। इस बीमा योजना की मुख्य विशेषताएं यथा पारदर्शिता, कम लागत तथा दावे का शीघ्र निपटान एवम् भुगतान हैं। बीमा व्यवसाय में निजी क्षेत्र की सहभागिता का लाभ उठाने के लिए इन कम्पनियों के लिए कृषि बीमा हेतु कुछ लक्ष्य निर्धारित किये जाने चाहिये। कृषि पदार्थों की कीमतों में अधिक उतार–चढ़ाव के जोखिम से बचने के लिए, इस अध्ययन में बाजार बीमा को लागू करने का सुझाव दिया गया है।

कृषि में अधिक मूल्य वाले खाद्य पदार्थों, जैसेकि फल, सब्जियाँ, दूध, माँस, मछली, आदि के उत्पादन की ओर झुकाव कृषि में विविधीकरण को दर्शाता है। यह केन्द्र पिछले कई वर्षों से कृषि विविधीकरण की बढ़ती प्रवृत्ति तथा इसके प्रभाव, का गहन अध्ययन कर रहा है। इसी क्रम में, एक अध्ययन छोटे किसानों पर सब्जी उत्पादन का प्रभाव, उनकी आय तथा रोजगार के आधार पर किया गया। इस अध्ययन में पाया गया कि छोटे किसानों के लिए सब्जी उत्पादन न केवल अनाज उत्पादन (मोटे अन्न तथा दालें) की अपेक्षा अधिक लाभदायक है वरन् उनकी आवश्यकताओं तथा संसाधनों के भी अनुरूप है।

'कृषि में विविधीकरण छोटे किसानों के लिए लाभदायी हैं', इस परिकल्पना के परीक्षण हेतु एक अध्ययन किया गया। जिसमें राष्ट्रीय प्रतिदर्श सर्वेक्षण के 54वें तथा 59वें अध्ययन से आकड़े लिए गये। इस अध्ययन से ज्ञात हुआ है कि छोटे किसान भी कृषि विविधीकरण पद्वति (जोकि अधिक आय वाली कृषि पदार्थों की तरफ उन्मुख है) में सहभागिता करते हैं, यद्यपि इसमें अधिक पूँजी, उन्नत तकनीक तथा नवीन सूचना की आवश्यकता होती है। राष्ट्रीय स्तर पर यह देखा गया है कि छोटे किसान अपने कुल कृषित क्षेत्रों के आधे से अधिक भाग में सब्जियाँ तथा फल उगाते हैं। दुधारू पशुओं तथा छोटे पशुओं (बकरी, भेड़, आदि) में इनकी हिस्सेदारी और भी ज्यादा है। आवश्यकता इस बात की है कि इन छोटे किसानों को आवश्यक उत्पादन कारक उपलब्ध कराने के साथ–साथ इनके उत्पादों की बिक्री के लिए बाजार से जोड़ा जाये ताकि वे अधिक मूल्य वाले कृषि–पदार्थों की ओर अग्रसर हो सकें।

कृषि बदलाव में सूचना उपलब्धता का बहुत अधिक महत्व है। किसानों को उन्नत कृषि तकनीकों के विषय में सूचनाओं की उपलब्धता तथा स्रोतों का पता लगाने के लिए एक अध्ययन किया गया। विश्लेषण दर्शाता है कि राष्ट्रीय स्तर पर वर्ष 2003 में केवल 40 प्रतिशत किसानों को ही खेती की उन्नत विधियों की जानकारी मिली। विभिन्न कृषि पारिस्थितिकियों में सूचना उपलब्धता में काफी विषमता मिली है। मरूस्थलीय क्षेत्रों में सूचना उपलब्धता का स्तर काफी कम था। समुद्रतटीय क्षेत्रों में 'कृषि विज्ञान केन्द्र' तथा 'प्रशिक्षण कार्यक्रम' सूचना उपलब्धता के मुख्य स्रोत पाये गये। सिंचित क्षेत्रों में 'उत्पादन कारक विक्रेता' इस काम में एक प्रभावी भूमिका निभा रहे हैं। जबकि पर्वतीय एवं पहाड़ी क्षेत्रों मे जनसंचार माध्यम (रेडियो, दूरदर्शन, आदि) ही किसानों को सूचना उपलब्ध कराने के प्रमुख स्रोत हैं।

इस अध्ययन में सुझाव दिया गया हैं कि सूचना एवं संचार प्रौद्योगिकी के सशक्त माध्यम द्वारा आवश्यकता आधारित तथा माँग–प्रेरित विस्तार कार्यक्रमों का विकास किया जाना चाहिए।

देश में एक ओर तो कृषि उत्पादन दर में गिरावट जारी है। तथा दूसरी ओर ठीक इसके विपरीत, आर्थिक वृद्धि में बढ़ोतरी हो रही है। कृषि में वृद्धि के स्रोतों तथा इसकी धीमी एवं गिरती वृद्धि दर से संबंधित कारणों का पता लगाने के लिए इस केन्द्र में कई अध्ययन किये गये। कृषि में सरकारी निवेश की घटती दर को घटती कृषि वृद्धि दर के प्रमुख कारक के रूप में चिन्हित किया गया है। विश्लेषण दर्शाता है कि पिछले दो दशकों से सरकारी निवेश में गिरावट लगातार जारी है। सरकारी अनुदान की बढ़ती दर, सरकारी निवेश में आई कमी के प्रमुख कारणों में से एक है। घटते निवेश तथा बढ़ते अनुदान का मध्यम तथा दीर्घावधि में कृषि विकास पर काफी प्रभाव पड़ेगा। बढ़ते अनुदानों के कारण प्राकृतिक संसाधनों का दुरूपयोग बढ़ रहा है, जैसेकि घटता भूजल स्तर, मृदा पोषण मे गिरावट, आदि जोकि अन्ततः कृषि उत्पादकता को कम करते हैं।

पशुपालन क्षेत्र में सरकारी खर्च में 1980 के दशक में 1970 के दशक की अपेक्षा डेढ़ गुने से अधिक की बढ़ोतरी हुई, लेकिन 1990 के दशक में इसमें कमी दर्ज की गई। विश्लेषण दर्शाता है कि कृषि के कुल खर्च में भी पशुपालन क्षेत्र में खर्च की राशि का अनुपात कम है।

कृषि में वृद्वि के स्त्रोतों के अध्ययन से मिला है कि 1980 के दशक में प्रौद्योगिकी की मुख्य भूमिका रही थी, जबकि 1990 के दशक में 'उत्पाद कीमतों' ने कृषि वृद्वि दर में काफी योगदान दिये। अध्ययन में सुझाव दिया गया है कि कीमत–आधारित कृषि वृद्धि दीर्घावधि में स्थायी नहीं रह सकती है, तथा इससे वे ही किसान लाभान्वित होंगे जिनके पास बिक्री हेतु अतिरिक्त कृषि पदार्थ होंगे। प्रौद्योगिकी–आधारित कृषि वृद्धि दर स्थायी होती है तथा सभी प्रकार के किसानों को लाभ पहुँचाती है। इसलिए उदारीकरण एवं वैश्वीकरण के वर्तमान दौर में आवश्यकतानुरूप अवसरों का लाभ किसानों तक पहुँचानें के लिए उन्हें उन्नत प्रौद्योगिकियाँ उपलब्ध कराना आवश्यक है।

देश के उत्तर–पूर्वी क्षेत्र की समस्याओं एवं संभावनाओं का पता लगाने के लिए इस केन्द ने एक विस्तृत शोध कार्यक्रम बनाया है। इसका उद्वेश्य इस क्षेत्र में उपलब्ध अवसरों का लाभ किसानों तक पहुँचाना है। इस क्षेत्र में खाद्य–असुरक्षा तथा गरीबी दोनों ही का स्तर काफी अधिक है। वर्ष 2005 में किये गये एक सर्वेक्षण से पता चला है कि 74 प्रतिशत परिवारों में भोजन की न्यूनतम आवश्यकता भी पूरी नहीं होती है। इस क्षेत्र में 'झूम' कृषि पद्वति काफी प्रचलित है, परन्तु इससे अनेक सामाजिक–आर्थिक एवं वातावरणीय समस्याएं पैदा हो रही हैं। झूम पद्वति के अन्तर्गत लगभग 15 लाख हेक्टेयर भूमि में खेती की जाती है तथा किसानों की एक बड़ी संख्या अपनी खाद्य जरूरतों के लिए इस पर आश्रित है। इस क्षेत्र में अधिक मूल्यों वाले कृषि पदार्थों जैसेकि फलों, सब्जियों, तिलहनों, औषधीय एवं सुगंधीय पौधों तथा पुष्पों की खेती की अपार संभावनाएं हैं। इस क्षेत्र में कृषि में विविधीकरण की गति तथा दिशा का अध्ययन दर्शाता है कि पिछले दो दशकों में कृषि में विविधीकरण की प्रवृति बढ़ी है। वर्ष 2002–03 में, फलों तथा सब्जियों से प्राप्त आय का कुल कृषि आय में योगदान 35 प्रतिशत था। मसालों से प्राप्त आय में भी मामूली वृद्वि देखी गयी है। अध्ययन में पाया गया है कि इस क्षेत्र में कृषि–पदार्थों के उत्पादन, विपणन तथा मूल्य–वर्धन हेतु आधारभूत संसाधनों का अभाव है। इस दिशा में निजी क्षेत्र को आधारभूत

संसाधनों में निवेश के साथ किसानों को बाजार से जोड़ने के प्रयास करने चाहिये। ताकि इस क्षेत्र की विविधता का लाभ समाज को मिल सके। इसके अतिरिक्त इस क्षेत्र की उत्पादन दशाओं का अधिक से अधिक उपयोग करने के प्रयास किये जाने चाहिये।

इस केन्द्र की वेबसाइट (http://www.ncap.res.in) को पुर्ननिर्धारित किया गया तथा लगभग प्रत्येक सप्ताह इसे अद्यतन भी किया गया। इस वर्ष के दौरान केन्द्र की वेबसाइट को 39,168 लोगों ने देखा, जिसमें 70 प्रतिशत भारतीय थे और शेष 30 प्रतिशत विदेशी थे, जोकि प्रमुख रूप से संयुक्त राज्य अमेरिका, आस्ट्रेलिया, चीन, इंग्लैड तथा अन्य देशों से थे। केन्द्र के सभी प्रकाशन पी. डी. पफ. प्रारूप में उपलब्ध हैं तथा इन प्रकाशनों को 13,543 लोगों ने देखा, जिनमें केन्द्र द्वारा प्रकाशित नीति पत्र तथा नीति सार देखने वालो की संख्या 55 प्रतिशत थी। केन्द्र द्वारा विकसित एवं संचालित वेबसाइट (http://www.agrieconet.nic.in) पर कृषि अर्थशत्रियों के शोध–कार्यों से संबंधित सूचनाएं उपलब्ध हैं। 'केन्द्र में स्थापित कृषि शोध एवं सूचना प्रणाली' इसके कर्मचारियों की ईमेल तथा इंटरनेट जरूरतों को पूरा करनें के साथ–साथ शोध एवं सूचना प्रबंधन में भी सहयोग कर रही है। केन्द्र का अपना मेल सरवर है जिसकी क्षमता का पूरा उपयोग हो रहा है।

केन्द्र के प्रकाशन इनके उपयोगकर्ताओं के बीच काफी लोकप्रिय एवं विश्वसनीय हैं। इस वर्ष के दौरान केन्द्र ने एक नीति पत्र (Policy Paper), दो नीति सार (Policy Briefs), एक पी एम ई टिप्पणी (PME Notes), एक पुस्तक (Book), बारह शोध पत्र (Research Papers) तथा सत्ताईस अन्य लोकप्रिय लेख (Popular Articles) प्रकाशित किये हैं। केन्द्र के वैज्ञानिकों ने अनेक व्यावसायिक तथा नीति संबंधी बैठकों में भाग लिया तथा अनेक संगोष्ठियों, कार्यशालाओं तथा ब्रेनस्टार्मिंग सैशनों का आयोजन किया। इन सभी प्रयासों से केन्द्र की ख्याति तथा अनुसंधान विश्वसनीयता बढ़ी हैं। केन्द्र के वैज्ञानिकों को उनके शोध कार्यों के लिए सराहना भी मिली है, जिनमें प्रमुख रूप से डा. प्रमोद कुमार जोशी, निदेशक, एनकैप, को राष्ट्रीय कृषि विज्ञान अकादमी का अध्येता नामित किया जाना है।

राष्ट्रीय कृषि आर्थिकी एवम् नीति अनुसंधान केन्द्र

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