2004-05

NCAP

annual report

राष्ट्रीय कृषि आर्थिकी एवम् नीति अनुसंधान केन्द्र

NATIONAL CENTRE FOR AGRICULTURAL ECONOMICS AND POLICY RESEARCH

भाकृअनुप
ICAR

NCAP Annual Report 2004-05

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National Centre for Agricultural Economics and Policy Research
NCAP

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ACRONYMS

ADRF	Asian Development Research Forum
AERA	Agricultural Economics Research Association
AERs	Agro-ecological Regions
AESRs	Agro-ecological Sub-regions
AgGDP	Agricultural Gross Domestic Product
AMIs	Agricultural Marketing Institutions
AMS	Aggregate Measure of Support
ANGRAU	Acharya NG Ranga Agricultural University
AOA	Agreement on Agriculture
APEDA	Agricultural and Processed Food Products Export Development Authority
APMC	Agricultural Produce Marketing Committee
ARIS	Agricultural Research Information System
ARM	Annual Regional Meeting
ASCI	Administrative Staff College of India
BARC	Bangladesh Agricultural Research Institute
BCC	Banker Charnes and Coopers
CAC	Codex Alimentarius Commission
CCR	Charnes, Cooper and Rhodes
CESS	Centre for Economic and Social Studies
CGIAR	Consultative Group on International Agricultural Research
CIFRI	Central Inland Fisheries Research Institute
CIMMYT	International Maize and Wheat Improvement Centre
CMA	Centre for Management in Agriculture
CMFRI	Central Marine Fisheries Research Institute
CMLI	Community Micro Lift Irrigation
CoPs	Communities of Practices
CRISP	Centre for Research on Innovations and Science Policy
CRS	Constant Returns to Scale
CU	Central University
CUTS	Consumers Unity and Trust Society
CWI	Consignment Wise Inspection
DMI	Directorate of Marketing and Inspection
DU	Deemed University
EFI	Economic Efficiency Index
ESI	Ecological Security Index
EU	European Union
FICCI	Federation of Indian Chambers of Commerce and Industry

FSMS	Food Safety Based Management Systems
GAU	Gujarat Agricultural University
GFCF	Gross Fixed Capital Formation
GHP	Good Harvest Practices
GMP	Good Manufacturing Practices
GOI	Government of India
HACCP	Hazard Analysis Critical Control Points
HRD	Human Resource Development
HVC	High Value Commodity
IAAE	International Association of Agricultural Economics
IARI	Indian Agricultural Research Institute
IATCBP	Indian Australian Training and Capacity Building Project
ICAR	Indian Council of Agricultural Research
ICRISAT	International Crops Research Institute for Semi-Arid Tropics
ICT	Information Communication Technology
IDS	Intrusion Detection System
IFPRI	International Food Policy Research Institute
IGKVV	Indira Gandhi Krishi Vishwa Vidyalaya
ILRI	International Livestock Research Institute
INARIS	Indian National Agricultural Research Information System
INSA	Indian National Science Academy
IPM	Integrated Pest Management
IPQC	In-process Quality Control
IPR	Intellectual Property Rights
IPS	Intrusion Prevention System
IRRI	International Rice Research Institute
ISAAA	International Service for the Acquisition of Agri-biotech Applications
ISEC	Institute for Social and Economic Change
ISED	Institute of Small Enterprise Development
JNU	Jawaharlal Nehru University
KSAMB	Karnataka State Agricultural Marketing Board
KVK	Krishi Vigyan Kendra
LAN	Local Area Network
MC	Management Committee
MIDGs	Millennium Development Goals
MOUs	Memorandum of Understanding
MSSL	Mahindra Shubhlabh Services Limited
MSSRF	M S Swaminathan Research Foundation
MTA	Material Transfer Agreement
NAARM	National Academy of Agricultural Research Management

NABARD	National Bank for Agricultural and Rural Development
NAFED	National Agricultural Co-operative Marketing Federation
NARIs	National Agricultural Research Institute
NARS	National Agricultural Research System
NATP	National Agricultural Technology Project
NCAP	National Centre for Agricultural Economics and Policy Research
NGOs	Non-Government Organizations
NISTADS	National Institute for Science, Technology and Development Studies
NPU	Net Present Value
NRC	National Research Centre
PME	Priority Setting, Monitoring and Evaluation
PPS	Pathas Panchayat Samiti
PTE	Pure Technical Efficiency
PVP	Plant Variety Protection
QRs	Quantitative Restrictions
QRT	Quinquennial Review Team
R&D	Research and Development
RAC	Research Advisory Committee
RAU	Rajendra Agriculture University
RDA	Recommended Dietary Allowances
S&D	Special and Differential
SACs	South Asian Countries
SAUs	State Agricultural Universities
SLSI	Sustainable Livelihood Security Index
SPS	Sanitary and Phyto-sanitary
SRC	Staff Research Council
STE	State Trading Enterprises
TBT	Technical Barriers to Trade
TE	Technical Efficiency
TFP	Total Factor Productivity
TIDE	Technology Informatics Design Endeavour
TNAU	Tamil Nadu Agricultural University
UNEP	United Nations Environment Programme
UR	Uruguay Round
UAS	University of Agricultural Sciences
USA	United States of America
WTC	Water Technology Centre
WTCER	Water Technology Centre for Eastern Region
WTO	World Trade Organization
ZT	Zero-tillage

PREFACE

This Centre continued to make significant research contributions in the area of agricultural economics and policy which have been widely recognized and acclaimed. The leadership for these activities was provided by Dr. Mruthyunjaya who was Director of NCAP till 24.03.2005.

The Centre completed large number of research projects under NATP in which several ICAR institutes and SAUs were involved. Other significant achievements include research on agriculture growth, food policy, agricultural diversification, seeds, livestock, exports, food security and sustainability. The Centre has carved out a special place for it in the ICAR by effectively responding to the needs and work entrusted to it by the Council. The Centre is now recognized as a reputed academic entity in the agricultural economics profession. The credit for these achievements goes to the dedicated team of scientists and other staff, strong support received from the Council and able leadership provided by my predecessors. The Centre has a small but dedicated team of scientists which produced outcome of high quality. Scientists of this Centre actively participated in policy discussions and national and international seminars. Faculty of this Centre is in high demand from national and international organizations to take up collaborative research projects in challenging areas.

The Centre got lot of inspiration from top leadership of the ICAR to undertake challenging research assignments. I express my gratitude to the Secretary, DARE and DG, ICAR for the encouragement and involvement of this Centre in various activities of ICAR. I am grateful to DDG (AS), ICAR and to ADG (ESM) for their strong support to NCAP. I feel indebted to Dr. Mruthyunjaya for ensuring rich research output from this Centre. I am highly grateful to Prof. Dayanatha Jha who retired as National Professor from NCAP on March 9, 2005 for his valuable advice and suggestions in taking this centre towards excellence in research.

Dr. Anjani Kumar has compiled this report and Mr. Ajay Tanwar prepared the manuscript. Dr. S. Selvarajan undertook special efforts to improve the contents of the report. I am thankful to them and to all those who helped this Centre in various ways.

September, 2005

(Ramesh Chand)
Acting Director

EXECUTIVE SUMMARY

Annual Report, 2004-2005

- National Centre for Agricultural Economics and Policy Research (NCAP) was established in 1991 by the Indian Council of Agricultural Research to strengthen policy research in agriculture. The mandate of NCAP includes; conducting policy research, strengthening research and teaching in agricultural economics and enhancing ICAR participation in policy dialogue and decision. The Centre has 17 scientists, including one National Professor, one National Fellow and one Principal Scientist on deputation to IFPRI, Washington D.C., USA. The total grant received by NCAP during the year was Rs. 307.75 lakh from ICAR and Rs. 73.91 lakh from other sources. The total expenditure during the year was Rs. 381.66 lakh.

- The Centre is guided by a Research Advisory Committee (RAC), chaired by an eminent agricultural economist, Prof. V. Rajagopalan. The members are: Dr G. K. Chadha (VC, JNU), Prof. Abhijit Sen (Member, Planning Commission, GOI), Dr. G. S. Ram (Former Chief Economic Advisor, Ministry of Labour, GOI), Dr. I. J. Singh (Former Dean, CCSHAU, Hisar), Dr. D. K. Marothia (Professor and Head, Department of Agricultural Economics, IGKVV, Raipur), Dr. J. P. Mishra (ADG, ICAR) and Dr. Mruthyunjaya (Director, NCAP). Two representatives from the farming community, Shri D.S. Ananth, and Prof. Ram Pravesh Singh, are the other members of RAC.

- The functioning of the Centre is supervised by a Management Committee (MC) which is constituted and mandated by ICAR under the chairmanship of the Director. A number of other internal committees facilitate decentralized management of the Centre's activities.

- The Centre continued its efforts towards achieving excellence in the area of agricultural economics and policy research. The research achievements of the Centre are described under five themes: Technology Policy, Sustainable Agricultural Systems, Markets and Trade, Institutional Change, and Agricultural Growth and Modeling.

- There were 25 ongoing projects in the Centre in the year 2004-05. The Centre undertook seven consultancy projects during the year. The Centre has maintained and increased linkages with many institutions in India and abroad. The Centre has organized several workshops, trainings and seminars covering topical areas such as Bio-informatics, assessing costs and commercial worth of agricultural technologies, quantitative methodologies for agricultural policy research, rural innovations etc.

  Technology policy research covered agricultural R&D, seed sector, intellectual property rights, resource use efficiency, agricultural diversification and food security issues.

- There has been an increasing trend for privatization of Indian seed industry. A significant proportion of farmers irrespective of farm size purchase seeds from commercial sources for quality consideration. There have also been increasing instances of partnerships and contractual arrangements between the seed agencies and research institutions.

- Considering the low labour absorption capacity of the farm economy, generation of gainful employment in non-farm sector in the rural areas is essential for poverty alleviation. Development of livestock, horticulture and fishery sectors and emphasis on agro-processing would generate

employment opportunities in rural areas through direct absorption of labour as well as strengthening of non-farm sector by fostering backward and forward linkages. Besides, concerted efforts should be made to equip and empower rural poor, particularly women, by upgrading their skills, and providing access to credit and technologies.

- The Indian agricultural R&D is still dominated by public organizations, but private R&D is now expanding rapidly. The analysis of public-private partnership in agricultural R&D advocated that collaboration between public-private institutions could complement each other's role. Both the sectors should develop mutual trust and confidence and learn from the experience. In particular, the public sector should take lead in transfer of technologies, and wherever necessary provide capacity building at the grass root level for technology adaptation.

- An analysis of resource allocation for agricultural research in National Agricultural Research System (NARS) revealed that about 95 percent of the scientists are in the public sector. Out of this, SAUs account for more than 56 percent. It was also observed that ICAR scientists are more research focused as compared to those in other institutions. Further, agricultural research in the country is dominated by crop sector. However, over the last decade or so the ICAR has been placing more emphasis on livestock and fisheries research. The private sector relatively paid less attention to livestock and fisheries research. A normative allocation profile by incorporating criteria like efficiency, equity, sustainability, trade and value addition suggests marginal readjustments – where to add incremental resources and where to consolidate. This exercise would be helpful in improving the information base for decision making process.

- A study of Indian oilseeds sector revealed the existence of technical inefficiencies in oilseed production to the tune of 25 to 40 percent. At the processing unit level, the inefficiencies were observed on an average at about 20 to 30 percent. Providing quality seeds in time, improving farmer's education and adoption of technical know-how need due attention to raise technical efficiencies in oilseeds production. For improving efficiencies at processing level, efforts should be made to improve machines for oilseeds crushing and regular supply of raw materials through institutional/contractual arrangements.

- The technological interventions and crop diversification in tribal, backward and hilly areas improved consumption of food items and bridged the consumption gap with respect to recommended dietary allowances (RDA). It also helped in augmenting income and generating employment.

- Livestock production is gradually getting intensified in India. The intensification would create opportunities for producers especially smallholders to enhance their income, however, in urban areas it would cause some adverse implications in terms of environmental pollution and deterioration in civic amenities. The current productivity of Indian livestock is low, suggesting considerable scope for productivity-led intensification with less stress on natural resources. Therefore, future growth in livestock production must come from productivity increases rather through increase in numbers.

- High value agriculture is likely to emerge as an important source of agricultural growth and it is expected to be more equitable as the smallholders have a greater tendency to diversify. Nevertheless, high value agriculture may come under stress for want of adequate technology, infrastructure and policy support. High value agriculture has greater production and market risks, and there is clearly a need to provide a cushion to producers against these risks. Mitigating

production risks would require improved technologies, quality inputs, insurance mechanisms and increasing participation of financial institutions, which hitherto have a thin spread and are not easily accessible to producers especially the smallholders.

- The study on technical efficiency in shrimp farming and freshwater aquaculture suggested that there was considerable scope to raise shrimp/fish production at existing level of input use and technology. Nevertheless, there were considerable differences in technical efficiency across farms. Large differences in productivity and efficiency across farms as well as states call for exchange of expertise and experience to improve and strengthen the aquaculture activity. The study suggested for evolving support system for small farmers, making leasing policy tenant friendly and developing appropriate and comprehensive extension and research strategies.

- The contribution made by technological change in the development of fisheries sector in India was found to be substantial and it had considerable impact on the social welfare of both producers as well as consumers. The internal rate of return to investment in fisheries research and development would be in the range of 42 to 55 per cent under different TFP scenarios.

Sustainable Agricultural Systems research gave thrust on impact of zero-tillage technology, IPM, spatial and temporal variations in agricultural productivity impacts, sustainability status and dimensions of agro-ecological regions.

- Adoption of zero-tillage technology in wheat has been found to be economically as well as environmentally beneficial in Indo-Gangetic Plain areas of Punjab, Haryana, Uttaranchal, Uttar Pradesh and Bihar. Reduced cost of land preparation and less use of groundwater would save 33 litres of diesel per hectare, which if translated in terms of reduced CO_2 emission will be equivalent to 88 kg per hectare. Thus, expected spread of zero-tillage technology to 3 million hectares by 2010 would bring in substantial economic as well as environmental benefits in the region.

- Economic benefits of integrated pest management (IPM) covering cabbage, tomato, pigeon pea, cotton, groundnut and chickpea have been quantified. The adoption of IPM technology could save the operational cost by Rs. 259 per hectare and increase the crop yield by 267 kg per hectare. Net incremental benefit due to IPM has been estimated at Rs. 4272 per hectare.

- The agricultural R&D in India over the past decades has boosted the productivity levels of several crops across districts. However, the states like Madhya Pradesh, Bihar and Orissa have been found lagging behind in the rice productivity growth. Even in the case of advanced states like Tamil Nadu, Andhra Pradesh and Punjab, the efficiency differential ranges from 2.5 to 4.3. Such efficiency gaps existing at farm level even in advanced states point towards the potential for targeting productivity growth with efficiency.

- Sustainable agricultural development has to balance the future production growth in diverse agro ecological regions without degrading the natural resource base. The analysis of sustainable livelihood security indices revealed that out of 52 agro-ecological sub-regions (AESRs), 10 AESRs have shown declining status of sustainability and 11 AESRs have improved their sustainability levels while the rest have maintained status quo during the 1990s.

Market and trade studies focused on reforms in agricultural markets, institutions, WTO related issues, trade liberalization impacts and food safety measures.

- An evaluation of functioning of agricultural markets showed that markets for large number of commodities are competitive in the segment where agro-commercial firms are involved in

transactions with other agro-commercial firms. Markets are less competitive where business firms are dealing with consumers and producers. This is reflected in collusive behaviour of the buyers and imperfections at retail level. In order to provide more competition at retail level and to benefit consumers and producers, innovative marketing mechanisms like *Apni Mandi* and Producers Sale Counters in consumer centers should be promoted.

- Growth in fisheries export was significantly affected by degree of competitiveness, level of global export of fisheries, and trade liberalization. World demand for fisheries exports contributed about 71 percent growth in fisheries exports from India. The trade liberalization emerged as the second most important determinant and boosted growth in fisheries export by about 24 per cent. Export of fisheries from India in future would be largely determined by the consistent compliance with food safety measures. Steps should be taken to devise appropriate institutional mechanisms to bring scattered small producers and processors under a network so that they can effectively participate in the emerging processing procedure to reap the benefits of expanding global fish trade.

- The reforms in major areas of agriculture marketing at country level need to be in tune with requirement of WTO. Some marketing institutions have initiated reforms and are moving towards commercialization using information technologies. The process of reforms in these marketing institutions, however, is slow and limited in coverage. Therefore, the reform canvas has to be widened and pace has to be accelerated.

The studies under institutional change touched upon the issues of agricultural research, food security and agricultural biotechnology, ICT based initiatives in public, private and NGOs, extension policies and success & failures of community organizations.

- Evaluation of ICT-based initiatives revealed subtle differences in implementing ICTs projects among public and private sector institutions and NGOs. Each initiative is a unique model in the application of ICTs to agriculture and has merits and constraints of its own.

- Some private companies initiated one-stop farm solution centers in different parts of the country. An evaluation of this initiative concluded that private extension intiatives were both a useful and viable alternative to public services for medium and large scale farmers but discriminated against the poor.

- The analysis of national extension policy in selected Asian countries revealed that the existing culture of extension organizations might prevent the emergence of learning based approaches to reinvent extension. Changing these cultures are yet the biggest challenge to reinvent extension in Asia.

Under the area of agricultural growth and modeling studies were focused on agricultural growth during the reforms, capital formation, contract farming.

- The growth rate analysis showed that initial years of reforms were somewhat favourable for agricultural growth but post WTO period witnessed sharp decline in growth rate of almost all commodity groups. The current growth rates are too low to achieve the goal of 4 percent growth in output as envisaged in the national agricultural policy.

- AgGDP is affected by both capital formation as well as subsidies, besides terms of trade. Instant return to one rupee spent in subsidy is much higher than that in the public sector capital formation.

However, long term return from capital formation is more than double the return from subsidies. Diverting one per cent resources from subsidies to public investment raises output by more than two percent. Therefore, diverting resources from subsidies to public sector capital formation is highly desirable to ensure growth of AgGDP.

- Analysis of contract farming in poultry in India showed that contract production was more efficient than production by independent growers and contract growers gain substantially even though their returns are not much different from what is received by independent growers. The study suggested that contract farming was a useful institutional arrangement for the supply of credit, insurance and technology to farmers.

- The website for NCAP, http://www.ncap.res.in has been redesigned and updated. It has linkages with two NATP-Mission Mode Projects namely, PME and INARIS. The Centre's publications are now available in downloadable PDF file. The website for Networking of Social Scientists, http://www.agrieconet.nic.in earlier created by this Centre is facilitating research information exchange, resource sharing and optimization of the response time for addressing methodology related problems.

- The ARIS at the center is equipped with 128 KBPS Leased Line from ERNET to cater to the e-mail and Internet requirement of the researchers and the administration. To utilize the full potential of ERNET, the Centre has now got its independent mail server configured.

- The Centre has brought out one Policy Brief, one Workshop Proceedings, and a PME Note during the year under report. Twenty research papers have been published in reputed journals by the scientists. A considerable number of papers have also been presented by the scientists of the Centre in different national and international workshops, seminars, conferences etc.

- The Centre had several distinguished visitors from the USA, the UK, SAARC countries, Netherlands, Australia, Japan etc., besides many dignitaries from government, public, private, and non-governmental organizations in India.

I. INTRODUCTION

The National Centre for Agricultural Economics and Policy Research (NCAP) was established in March 1991, by the Indian Council of Agricultural Research (ICAR), to strengthen agricultural economics research within the National Agricultural Research System (NARS) comprising Indian Council of Agricultural Research, its affiliated institutions and the state agricultural universities (SAUs). The mandate of NCAP includes:

- To conduct policy-oriented research on: (i) technology generation, diffusion 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 modeling.
- To strengthen agricultural economics research and teaching capability in the state agricultural universities and ICAR institutes.
- To enhance participation of ICAR in agricultural policy decisions through policy-oriented research and professional interactions.

Location

The Centre is located in New Delhi at the campus of the Indian Agriculture Statistical Research Institute (IASRI), which is a sister institute of the Indian Council of Agricultural Research (ICAR). It is adjacent to the Indian Agricultural Research Institute (IARI), a premier agricultural research institute in the country. This location offers specific advantages to the Centre in terms of opportunities for inter-disciplinary professional interaction as well as access to library, computational and other infrastructural facilities available at these institutes.

Faculty

The Centre has seventeen scientists in position. This includes the Director, one National Professor, one National Fellow, five Principal Scientists (including 1 on lien), one Senior Scientist and eight Scientists (Sr. Scale).

Management

A high-powered Research Advisory Committee (RAC) comprising eminent professionals mostly from outside the ICAR system guides the Centre in its research policies. Prof. Y.K. Alagh, the former Minister of State for Power and Science and Technology, Government of India, was the first Chairman of RAC. Currently, Prof. V. Rajagopalan, an eminent Agricultural Economist, is the RAC Chairman. The RAC provides guidance to the Centre in planning, research thrusts and strategies. Initiatives in human resources development, approaches to improve policy dialogues and evaluation are some other areas where Centre is receiving guidance from the RAC.

The functioning of Centre is supervised by a Management Committee (MC) which is constituted and mandated by the ICAR. A number of internal committees, such as: Staff 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 professional interaction and congenial work environment.

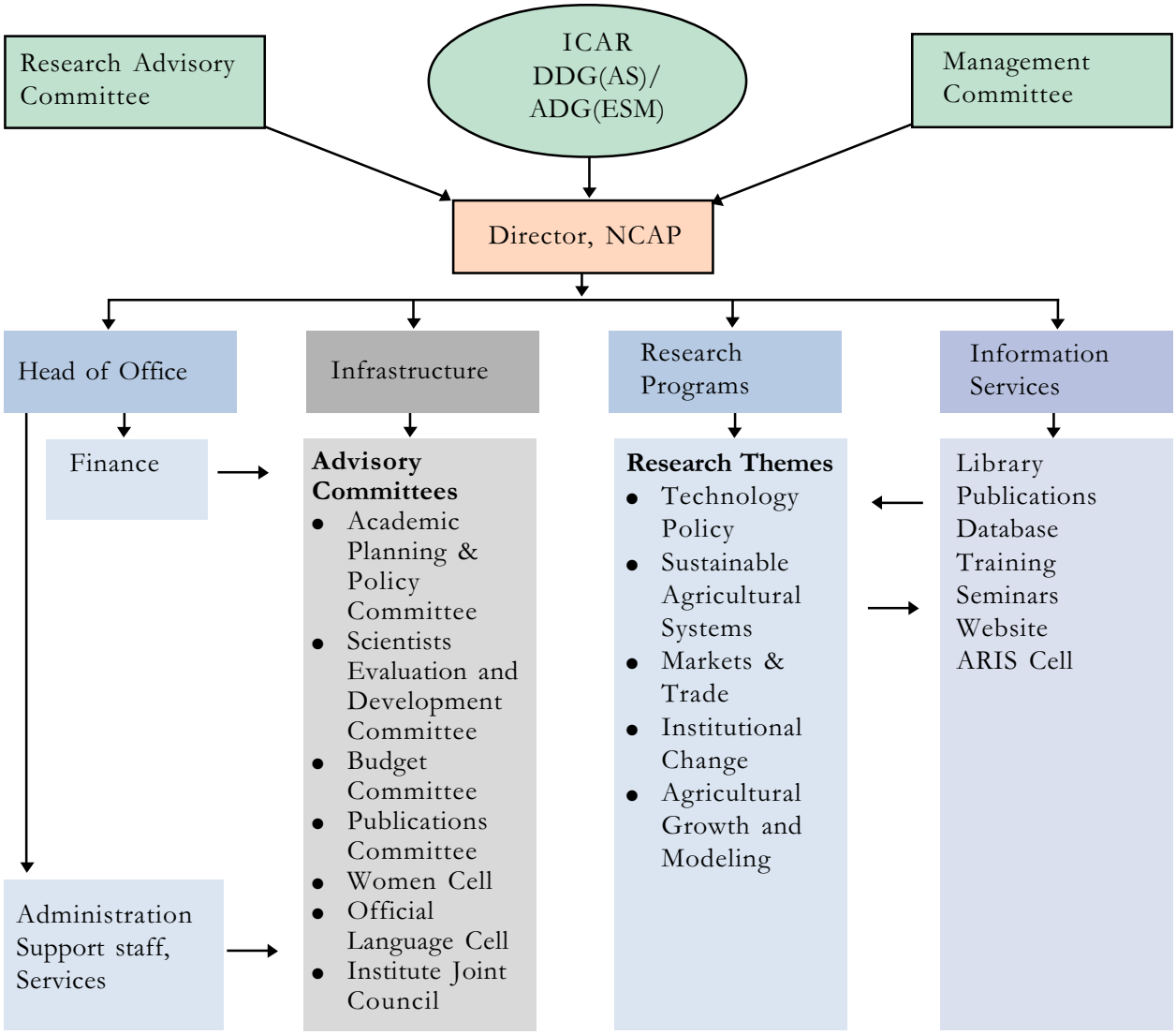


Figure 1: Organogram of NCAP

Budget

The expenditure pattern during the year 2004-2005 is presented in Table 1.

Table 1: Expenditure during 2004-2005 (in lakh Rs.)

Head of Account	Plan	Non-Plan	Total
Pay and allowance	—	73.65	73.65
OTA	—	0.25	0.25
Travelling expenses	3.08	0.55	3.63
Works	142.00	—	142.00
Other charges including equipments	60.63	26.93	87.56
HRD	0.66	—	0.66
Total	**206.37**	**101.38**	**307.75**
NATP	—	—	32.29
Other projects	—	—	41.62
Grand Total	**206.37**	**101.38**	**381.66**

Staff Position

Table 2: Staff Position (2004-05)

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

*1 on deputation; + 1 on study leave

II. RESEARCH ACHIEVEMENTS

Technology Policy

Development and Delivery of Improved Seeds

This study aims to examine institutional and policy options for improving the delivery of improved seeds and the associated information to Indian farmers. During the year under report, field visits were undertaken to study the functioning of seed system for the chosen crops in the selected states. The trends indicate increasing participation of private seed agencies in the development and delivery of improved variety seeds, even for self-pollinated crops. There are some strategic interventions by the private sector in multiplication of seeds for crops like potato in view of increasing demand of their seeds. For development of hybrids, there is even more intensification of private R&D, particularly by transnational seed companies. Also, there are increasing instances of partnerships and contractual arrangements between the seed agencies and research institutions.

In addition to the study of seed agencies, farm surveys were also conducted to understand farmers' seed acquisition, management and use patterns. The farm surveys were conducted for paddy in Haryana, cotton in Maharashtra, vegetables in Himachal Pradesh and potato in Uttar Pradesh. Preliminary results of the surveys indicate that a significant proportion of farmers irrespective of their farm size, purchases seeds from commercial sources for quality considerations. Further, a significant proportion of commercial seeds is supplied by the private seed companies, even for the self-pollinated crops like paddy. There is intensification of plant breeding in the private sector for development of hybrids, and therefore in highly commercial crops like cotton, proprietary hybrids are dominating. For self-pollinated and vegetatively propagated crops, the public varieties still dominate. However, there are some instances of multiplication and supply of foreign variety seeds of potato, especially for the processing sector. Thus, there is an increasing trend towards privatization in the Indian seed industry.

(Suresh Pal, Harbir Singh and Prasoon Mathur)

Delivery of Groundnut Seed

Groundnut is a special case of high-volume and low-value seed. High investment and low profit- margin do not provide much incentive to the private sector to participate in the delivery of its quality seeds. As of now, only two public sector agencies, viz. the AP Seeds and Development Corporation and Oilseed Growers' Federation, are involved in the procurement and distribution of seeds in Andhra Pradesh. Both the agencies work in close collaboration with the government line department. In addition, some public agencies like National Dairy Development Board, who is in oilseed business, are also undertaking seed distribution activities in Gujarat. Since, almost all farmers replace the seed every year, there is a high demand for fresh seeds, which means there is a scope for participation of small private seed suppliers in it. These farmers are, in fact, local progressive farmers having irrigation facilities. There is a need to encourage such decentralized seed activities with adequate technical and financial support.

(Suresh Pal, Harbir Singh and Prasoon Mathur)

Intellectual Property Rights (IPR) and Seed Industry in the Developing Countries

This study emphasizes that IPR regimes in plant breeding should provide incentives for diversifying and strengthening plant breeding and seed production. This implies that policymakers cannot consider IPR

regimes in isolation from wider issues of national agricultural policy. The role of National Agricultural Research Institutes (NARIs) is a subject of debate in the light of generally declining national budgets and growth of the private sector. Many NARIs are uncertain whether to complement or compete with the private sector and hence are confused about how to take advantage of IPRs. Policymakers need to set clear guidelines in this area. NARIs need to distinguish between using IPRs in order to facilitate the use and delivery of their varieties, and seeing IPRs as a contributor to institute budgets through royalty income. Most NARIs seem to have little knowledge about the costs of obtaining and enforcing IPRs, and there is little realistic assessment within the NARIs of their capacity to compete with the private sector in producing commercially-viable products (or in rewarding and maintaining staff for this task). Most NARIs are too poorly organized to acquire access to complementary technologies on equitable terms or to assess their 'freedom to operate' with protected techniques and tools. NARIs are no match to the legal and negotiation skills; and resources of the major technology firms. NARIs need assistance to formulate IPR policies and strengthen their legal and negotiation capacities.

Policymakers must recognize that systems of international germplasm exchange are being threatened by an almost exclusive focus on the possible financial advantages accruing to the control of germplasm, without appreciating the importance of facilitated access. Policymakers also need to ensure the development of the private domestic breeding sector. With few exceptions, domestic firms do not have the resources to invest in high technology and must depend on MNCs and advanced research institutions that protect their inventions. There are a few examples of incipient consortia of local seed companies formed to negotiate access to technology, and national policy should support such efforts. There are still serious challenges with respect to delivering useful varieties, particularly of non-hybrids and so-called 'orphan crops', to smallholders.

The combination of limited and isolated markets with widespread seed saving means that even fairly strong IPR regimes are unlikely to elicit commercial interests in the near future. Policymakers must find ways of combining (largely) public plant breeding, and appropriate formal seed delivery (most likely private or cooperative), and support the local seed diffusion mechanisms, to serve the farmers dependent on these crops. There are no indications in the case study countries to date that Plant Variety Protection (PVP) unduly contributes to a concentration in the seed sector. Early experiences in biotechnology patents in the case study countries are insufficient to establish any evidence for its concentration, despite the fact that most transgenics currently have one commercial source. However, it is important to support a critical assessment of developments in the coming years. This is an area in which industrialized countries could provide some useful guidance, given their longer experience in monitoring and regulating anti-competitive practices.

Finally, it is worth reiterating that the purpose of IPR regimes in agriculture is to provide appropriate incentives for science and commerce to better serve the nation's farmers. National policies need to ensure that farmers are made conversant with, and participate in, debates regarding possible IPR regimes; that they are well-informed consumers who understand their rights in agricultural input markets; and that their interests and priorities are reflected in the work of public agricultural research.

(Suresh Pal, L.P. Louwaars, R. Tripp, D. Eaten and V. Henson-Apollonio)

Agricultural Development in Marginal Areas: Technological and Other Options

The marginal areas constitute more than two-thirds of agricultural lands in the country, and therefore, their development would have tremendous effect in alleviating household food and nutritional insecurity

and poverty. Agricultural development approach for these areas should focus on addressing production constraints and tapping growth opportunities. In the arid and semi-arid areas, the focus should be on conservation of natural resources, particularly on improving water-use efficiency, and developing cultivars tolerant to yield reducers. In the eastern India, there is a considerable scope for increasing yield by developing crop varieties (mainly rice) tolerant to various abiotic and biotic stresses. An integrated approach could result in substantial increase in crop yields on mid-and low-lands. Agricultural technology system in these areas is not only weak in terms of human and financial resources, but also needs to be oriented towards location/situation-specific solutions. Scouting and sourcing of technologies developed by the national and international agricultural programs and their applicability under the real farming situation need to be prioritized to identify and promote location/situation-specific technologies. There is a need to coordinate the efforts of multiple agencies involved in technology development and its dissemination.

In terms of sectoral emphasis, livestock and horticultural development needs special consideration because these sectors are experiencing high growth in demand for food, offering tremendous opportunities for growth, employment and income generation. Moreover, both these activities are practised by smallholders and landless labourers, and therefore, concerted efforts to improve their productivity would have significant impact on rural poverty alleviation in the country. Management of pests and nutrition are the other high priority areas for these two sectors.

The success of the Green Revolution has shown that technological, institutional and policy dimensions are equally important for agricultural development; these fronts are yet to be made operational in the marginal areas. To begin with, policy reforms should be initiated to provide right signals and incentives for efficient institutions to emerge. Priority in public investment for infrastructure development, credible regulations, good governance, and incentives being pre-requisites for evolving efficient institutions for development, need focused attention of all stakeholders. Given the diversity of production environment, a number of institutional arrangements may evolve for provision of goods and services to farmers. The government should encourage institutional development through appropriate policy and regulatory mechanisms, particularly for better information dissemination, risk management, market integration and value-addition. Reforms in public organizations through debureaucratization, decentralization and accountability enhancement are necessary for increasing their efficiency and serving farmers more effectively. The experiences should be used to evolve institutions capable of efficiently serving the large as well as small farmers.

Accelerating agricultural development in marginal areas is the necessary but not the sufficient condition for eradicating rural poverty. Considering the low labour absorption capacity of the farm economy, generation of gainful employment in non- farm sector in the rural areas is essential for poverty alleviation. However, the growth of this sector has been rather negligible in the recent past. In fact, most of the growth in employment generation has been in the urban areas, leading to wider rural-urban inequalities. Development of livestock, horticulture and fishery sectors and emphasis on agro-processing are expected to generate employment opportunities in rural areas through direct absorption of labour as well as strengthening of non-farm sector by fostering backward and forward linkages. In addition, concerted efforts should be made to equip and empower the rural poor, particularly women, by upgrading their skills, and providing them access to credit and newer technologies.

(Suresh Pal, A. R. Sadananda and E. Venkat Ramnayya)

Public-Private Partnership in Agricultural R&D

In spite of significant growth of private R&D, Indian agricultural R&D is still dominated by public organizations. It is quite unlikely that increase in private sector participation will bridge the gap in the intensity of agricultural R&D in the near future. Nevertheless, both the sectors can complement each other's role, and useful synergies could be obtained by fostering partnerships in development of technologies and their dissemination. A number of theoretical concepts have been applied to study the public-private partnerships. The new institutional economics literature views the partnership as a strategy to minimize transaction costs associated with developing and enforcing contractual relations in provision of a good or service. The transaction costs are mainly determined by the frequency and uncertainty of a transaction, limit to rational behaviour of economic agents, and asset-specificity of the transaction. For example, a private seed company has to transact with public plant breeding programes for new varieties and source of seeds. A high transaction cost with high asset-specificity of establishing a plant breeding program may help develop partnership with public plant programes (the ICRISAT model). On the other hand, a low transaction cost will favour market-based transactions, while low asset-specificity can lead to vertical integration, bringing seed production and plant breeding under a hierarchical structure.

The second important conceptual framework used is the recent development in the theory of organizational behaviour. The analysis blurs the classical difference between public and private sectors, and underlines the need for partnerships for efficient provision of a good or service with equitable social benefits, whilst maintaining higher flexibility and accountability of the private sector and social interest of the public sector. Other approaches focus on traditional welfare analysis in use of scarce resources, development of networks of innovations for the given social and economic institutions, and incentives and relationships that shape the flow of knowledge and information.

In practice, problems and risks associated with incentives, contextual realities and nature of goods or services are important for developing and enforcing partnerships. Since R&D is a risky activity with high asset-specificity, contractual relations that shape the flow of knowledge are critical for establishing research partnerships. Macro-economic policies and social and economic institutions further influence the attitudes and pace of research partnerships. For example, greater reliance on market forces and enabling institutions like IPRs may facilitate research partnerships, while the public and private sectors will continue to maintain a negative perception in an inward looking economic environment.

The experiences gained so far echo the trends observed in the developed countries. It is quite likely that majority of the partnerships could be developed through market-based transactions and the public and private sectors could complement each other's role. However, there are certain factors, which necessitate the need for collaborative partnerships. Most of the national R&D companies may not compete with the multinationals in the new regime of IPR and therefore they would look forward to the public system for R&D support, even on benefit-cost sharing basis. This type of arrangements can work better if there is a timely response from the public system, and the mechanisms, particularly for cost-benefit sharing, are transparent and simple. Both the sectors should develop mutual trust and confidence and learn from the experience. In particular, the public sector should take lead in transfer of technologies, and wherever necessary, provide incentives and funding support for delivery of sustainability-enhancing agricultural technologies, and capacity building at the grassroot level for technology adaptation. Finally, although it is necessary to honour secrecy of the agreements, it is

important that benefits and experiences of the public-private partnerships are adequately documented and widely disseminated for encouraging others to learn, participate and follow.

(Suresh Pal and Dayanatha Jha)

Resource Allocation for Agricultural Research in NARS

Ever since the identification of agricultural R&D as a high pay-off venture, analysts have been making a case for higher investments. Over the past thirty-odd years, agricultural research investment intensity in India has more than doubled. Though it still falls short of the modest goal of one per cent of agricultural GDP, the huge size of agricultural sector has made the Indian National Agricultural Research System (NARS) one of the largest in the world in terms of skilled human resources. Rapidly growing research agenda on the one hand, and scarcity of investible public funds in the reforms era on the other, have focused attention on efficiency in resource allocation. And this was the aim of a national study on resource allocation for agricultural research sponsored by the ICAR during 2000-05.

Such analyses in the past have been based on indirect indicators, mainly scientific publication data, since reporting and monitoring yardsticks used in public systems concentrate on budget heads and not on technical programme content, and rarely on human resources. The core objective of this study was to collect and compile current data on allocation of research resources by commodity, resource and agro-climatic regions of the country, and to identify opportunities for redeployment of resources based on objective criteria like efficiency, equity, market and trade issues, etc. This needed activity-specific data on resource deployment.

Though several studies have reported more than 10 per cent share of the private sector in agricultural R&D investments, its share in manpower resources is much smaller (Table 3). Nearly 95 per cent of the scientists are working in the public sector. The SAUs account for more than 56 per cent, but these have hardly been reviewed as intensively as the central system. These data also suggest that ICAR scientists are more research-focused as compared to those in other institutions where teaching (SAU), extension (other public), and management and extension (private) claim significant amount of scientists' time.

Commodity, resource and agro-climate have been treated as independent dimensions for the allocation exercise. This is an analytical classification only, since most agricultural research projects embrace all these dimensions.

Table 3: Distribution of agricultural scientists in the NARS

Category	Number of scientists	Full time equivalent (FTE)	
		Number	Per cent
Public	20921	9794	94.6
a) ICAR	4539	3069	29.7
b) SAUs	13633	5810	56.1
c) Others*	2749	915	8.8
Private	948	556	5.4
Total	**21869**	**10350**	**100.0**

** Includes institutions like other government departments, KVKs, and semi-government organizations.*
Source: Agricultural Scientists Census, 2001-02

Commodity Focus of Research

Indian agriculture is large and diverse. Even after aggregation at lower levels, more than 160 commodities appeared in the portfolio. Agricultural research in the country is dominated by the crop sector; four-fifth of all commodity-oriented research is so dedicated at the national level (Table 4). Livestock research claims 15 per cent and fisheries research accounts for only 5 per cent. Very broadly, the pattern is biased towards the crop sector. However, over the last decade or so the central sector (ICAR) has been trying to rationalize this and more and more emphasis is being laid on livestock and fisheries research. The SAUs, and 'other' public and private institutions continue to lag behind in fisheries research. The private sector misses out on livestock research too.

Further, the foodgrain research is most important nationally and cereals dominate in this. With attainment of higher level of food security, the relative importance of foodgrain research has gone down in recent years, but all institutions try to maintain core capacity and critical strength in this area, as grassroots level institutions, the SAUs, have greater rigidity in this regard. Interestingly, the share is also high in the private sector. Hybrids of maize and millets provided the entry point to the private sector in the country and these, alongwith hybrid rice, keep cereals attractive.

Horticulture is the emerging sector in India. Though the ICAR-SAU system allocates more than one-fifth of manpower resources currently to this sector, 'other' public institutions and the private sector appear to have responded more aggressively in this regard. Oilseeds follow next in priority and public

Table 4: Allocation of research resources across major commodity groups by institutions

(in per cent)

Commodity group	ICAR	SAUs	Institutions			All institutes
			Other public	Total public	Private	
Foodgrains	21.1	35.6	24.1	29.7	27.4	29.6
Cereals	16.5	26.8	20.4	22.8	27.0	22.9
Pulses	4.5	8.6	3.7	6.8	0.3	6.6
Horticulture	24.8	26.1	43.1	27.3	47.3	27.9
Vegetables	3.7	7.3	2.5	5.7	13.0	5.9
Fruits	7.1	9.4	4.8	8.2	2.8	8.0
Tubers	5.7	1.4	2.1	2.9	0.8	2.8
Plantation crops	4.5	3.8	21.1	5.6	26.9	6.4
Flowers/Ornamentals	1.3	1.2	2.1	1.3	1.5	1.3
Medicinal/Aromatic	1.0	1.3	8.4	1.9	0.7	1.8
Condiments/Spices	1.6	1.7	2.1	1.7	1.6	1.7
Oilseeds	7.4	11.2	4.4	9.3	4.9	9.2
Fibres	7.1	5.8	9.1	6.5	13.2	6.8
Commercial crops	7.2	3.9	2.4	4.9	2.3	4.8
Fodder crops	2.4	1.5	0.4	1.7	0.0	1.6
Total crops	69.9	84.2	83.5	79.4	95.0	79.9
Livestock	18.3	14.3	15.2	15.7	4.8	15.3
Fish	11.9	1.5	1.4	4.9	0.2	4.8
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

systems, particularly SAUs, accord relatively more importance to this group. In fibre crops research, the private sector institutions have been found paying relatively more attention.

Livestock and fisheries research, particularly the latter, receives higher priority in the public research system and, within this, in the ICAR. Broadly speaking, horticulture, livestock, and fisheries have emerged as the high-growth, high-potential sectors of Indian agriculture. The central system appears to be the most responsive; others, including the private sector, have not been able to switch resources from the crop sector as efficiently. Availability of incremental (plan) resources might have contributed to this.

Statistical tests reveal that there was a fair agreement in the rankings assigned to various commodity groups by the central (ICAR), state (SAUs), and private research institutions, implying that all these institutions are guided by similar research objectives and appear to prioritize commodities in a similar manner.

Resource Focus of Agricultural Research

Agricultural research is mostly mediated through production resources—genetic material, land and water, agro-chemicals, energy and so on. Germplasm, soil and water resources claim more than 55 per cent of all research attention (Table 5). This holds true across the board but the private sector research is sharply biased towards germplasm and has hardly any contribution to soil-water research. Within the public sector, the ICAR-SAU system accords a relatively high priority to research on germplasm and soil and water. Feed and fodder resources, which are important for the livestock sector, appear to be neglected even if the effort in commodity-oriented research is factored in.

Agro-chemicals (fertilizers, pesticides, weedicides, drugs/vaccines, other chemicals) rank second in the overall list. The state system appears to accord disproportionately high priority to them, particularly since these have high spillover potential; however, variations in local agro-climatic conditions necessitate considerable downstream research before optimal input-use strategies are finalized. Globally, private sector is the major player in this research; Table 5 does not show this pattern. Energy (power and machinery) resources account for 4.8 per cent of resource-focused research. As expected, private agricultural R&D pays significantly more attention to the latter as compared to other institutions.

Table 5: Resource-focused agricultural research by institutions

(in per cent)

Resource group	ICAR	SAU	Other public	Total public	Private
Germplasm	32.3	32.9	45.5	33.8	52.2
Soil / Water	25.9	20.3	16.6	21.6	3.1
Agro-chemicals	21.6	30.2	20.1	26.8	16.9
Power/Machinery	7.0	3.4	6.8	4.8	19.4
Feed / Fodder	1.5	1.8	1.6	1.7	0.1
Socio-economic	6.4	10.1	5.8	8.7	1.7
Statistics/Database	2.7	0.5	0.3	1.1	0.9
Others*	2.6	0.8	3.3	1.5	5.7
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

** Includes Fungi /Algae/ Bacteria, Insect/ Pest/ Parasite, Weed /Sea weed, Gases.*

Non-material resources account for a little more than 11 per cent of resources, most of it relates to socio-economic variables. The ICAR-SAU system pays more attention and the private sector does not accord any priority to this area. We need to note that human, social, economic, and institutional resources have not traditionally been parts of agricultural research till a few decades ago and other institutions have played the major role.

Regional Focus of Agricultural Research

Regionalization of Indian agriculture remains analytically challenging. The distribution of research resources in the 15 zones identified by the Planning Commission for each institutional category shows that the aggregate pattern is largely determined by the variation in the research base situation in the states (Table 6). The zones having a strong back up of the SAUs get a larger share. More than 56 per cent of ICAR resources are in six zones, viz. Zones 4, 5, 8, 10, 11 and 12; the last four have strong state support also.

The Himalayan region (Zones 1 and 2), Middle Gangetic Plains and the East and West Coast regions (Zones 11 and 12) have high (58 per cent) concentration of 'other' public institutions.

Table 6: Regional focus of agricultural research resources by institutions

(in per cent)

Sl. No.	Region*	ICAR	SAU	Other public	Total public	Private	All institutions
1	Western Himalayas	6.4	7.5	8.4	7.2	4.2	7.0
2	Eastern Himalayas	6.5	3.9	9.9	5.3	4.0	5.2
3	Lower - Gangetic Plains	4.4	2.7	3.0	3.3	4.2	3.3
4	Middle-Gangetic Plains	7.4	4.3	13.8	6.2	9.3	6.3
5	Upper-Gangetic Plains	9.3	4.4	6.0	6.1	9.3	6.2
6	Trans-Gangetic Plains	6.8	16.4	6.7	12.3	6.0	12.1
7	Eastern Plateau & Hills	4.7	3.1	4.1	3.7	4.6	3.8
8	Central Plateau & Hills	10.3	8.7	4.6	8.8	6.8	8.7
9	Western Plateau & Hills	6.1	8.9	4.4	7.6	8.6	7.7
10	Southern Plateau & Hills	9.6	10.1	7.2	9.7	11.5	9.8
11	East Cost Plains & Hills	10.5	7.7	9.8	8.8	8.8	8.8
12	West Cost Plains & Hills	9.4	11.4	15.9	11.2	7.8	11.0
13	Gujarat Plains & Hills	3.2	6.8	2.9	5.3	6.3	5.3
14	Western Dry	2.6	4.3	1.7	3.5	4.6	3.6
15	The Islands	2.9	0.0	1.5	1.1	3.9	1.2
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

*Planning Commission Zones.

Rationality Analysis

A normative allocation profile was worked out incorporating criteria like efficiency, equity, sustainability, trade and value-addition in a simple scoring model. This pattern was compared with the

existing allocation of research resources across commodities. From this analysis the following broad readjustment tendencies have been suggested:

Particulars	Commodities
Augmentation of resources	Cereals, Vegetables, Condiments/Spices, Commercial crops, Livestock
At the cost of	Pulses, Tubers, Medicinal/Aromatic plants, Plantation crops, Oilseeds, Fibres

Rationality analysis of research resources in terms of agro-climatic regions was also attempted. The following broad readjustment opportunities have been suggested:

Particulars	Agro-climatic Zones
Augmentation of resources	Lower Gangetic Plains, Upper Gangetic Plains, Trans Gangetic Plains, Eastern Plateau and Hills, Southern Plateau and Hills, East Coast Plains and Hills, and Gujarat Plains and Hills
At the cost of	Western Himalayas, Eastern Himalayas, Middle Gangetic Plains, Central Plateau and Hills, Western Plateau and Hills, West Coast Plains and Ghat, and Western Dry Region

It may be noted that the intention of this exercise was to provide signals for marginal adjustments - where to add incremental resources and where to consolidate. This exercise only helps in improving the information-base for decision-making process, and is not to replace it.

(Dayanatha Jha, Sant Kumar Pandey, Laxmi Joshi, Surabhi Mittal, Parveen Kumar and Sanjeev Garg)

Assessment of Technical Efficiency in India's Oilseeds Sector

Several issues like inefficiency in production and processing of oilseeds, lower yield levels and higher prices have been highlighted as the major causes of poor performance of the oilseeds sector by research studies. This study has attempted to estimate the inefficiencies in oilseeds and oil production based on the primary data collected through farm survey from oilseeds growers and processors for the agricultural years 2002-03 and 2003-04.

The mean technical efficiencies (TE) in different states ranged from 0.64 to 0.75 for groundnut, 0.65 to 0.67 for rapeseed and mustard, 0.59 to 0.73 for soybean and 0.69 to 0.76 for sunflower (Table 7). The minimum and maximum values of TEs on the farms varied across states and oilseed crops. The results have revealed the existence of technical inefficiencies to the tune of 25 to 40 percent at the average level and even more at the individual farm level.

The mean TE in oil production in small scale processing units (*ghanis*) under the private sector varied from 0.64 to 0.74 (Table 8). The variability was the highest in the case of rapeseed and mustard. Even at the processing unit levels, inefficiencies were observed to the tune of 25 to 30 percent in oil production from different crops.

Table 7: Technical efficiencies in oilseeds production

Crop/ State	Mean TE	Standard Deviation	Minimum TE	Maximum TE
Groundnut				
Andhra Pradesh	0.64	0.04	0.47	0.69
Gujarat	0.75	0.11	0.43	0.89
Karnataka	0.68	0.06	0.51	0.76
Tamil Nadu	0.74	0.11	0.42	0.91
Rapeseed and mustard				
Rajasthan	0.67	0.19	0.07	0.88
Uttar Pradesh	0.65	0.16	0.21	0.90
Soybean				
Madhya Pradesh	0.59	0.29	0.05	0.95
Maharashtra	0.73	0.19	0.33	0.93
Sunflower				
Andhra Pradesh	0.60	0.41	0.32	0.79
Karnataka	0.69	0.11	0.42	0.82
Maharashtra	0.76	0.04	0.66	0.81

Table 8: Technical efficiency in oil production

Crop	Mean TE	Standard Deviation	Minimum TE	Maximum TE
Groundnut	0.74	0.17	0.17	0.87
Rapeseed & mustard	0.69	0.21	0.24	0.77
Soybean	0.64	0.11	0.38	0.85
Sunflower	0.70	0.09	0.25	0.82

The analysis of determinants of technical efficiencies has shown that soil quality, use of quality seeds, and education level of farmers are the important factors influencing TE in oilseeds production. These variables are significant and have expected signs. Provisions for timely supply of quality seeds and latest technical know-how to farmers need due attention to raise the technical efficiencies in oilseeds production.

Technical efficiencies in oil production are influenced mainly by oil recovery and availability of raw materials. Efforts should be made to modify machines for oilseeds crushing and regular supply of raw materials (oilseeds) through institutional / contractual arrangements should be ensured.

(Mruthyunjaya, Sant Kumar Pandey, M.T. Rajashekharappa and L.M. Pandey)

Impact of Technology Interventions and Crop Diversification on Food Security, Income and Employment in Tribal, Backward and Hilly Areas

Technological progress in agriculture has made India self-sufficient in food production, but the food security at the household level is yet to be achieved. A large majority of farm households living in tribal, backward and hilly areas still do not have access to adequate food and suffer from chronic nutritional

insecurity. Widening the food basket of these people through horticulture, livestock and fishery products will help improve their nutritional, income and employment levels. To achieve this, a mission mode project of NATP was launched in the tribal, backward and hilly areas, particularly in the states of Chhattisgarh, Jharkhand, Madhya Pradesh, Rajasthan, Uttaranchal, Himachal Pradesh and the North-Eastern states. Improved seeds, balanced use of fertilizers, and newer sowing methods were adopted for life-support crops and horticulture, while for livestock, the interventions were in breeding, feeding (nutrition), health care, technical know-how etc. Fish production and post-harvest management and value-addition were also included in the programme.

Technological interventions, in general, could help in increasing the intake of food items. Though the consumption of food items is still below the recommended level, interventions could help in bridging the consumption gap. The gap bridged in the case of pulses varied from 1.6 per cent in pen culture to 34.3 per cent in post-harvest management. In case of fruits, the consumption gap-bridge varied from 1.3 per cent under poultry programme to 32 per cent in post-harvest management; while in vegetables, it varied from 0.9 per cent in life-support crops to 24 per cent in freshwater aquaculture (Bastar). Positive changes have been observed in other food commodities like edible oils and milk.

Besides bridging the food-consumption gap, technological interventions could also help in improving the income level and employment status. The increase in income was nearly 37 per cent in the case of fisheries (freshwater aquaculture). Other programmes of integrated piggery, backyard poultry and pen culture have also shown positive changes, although a decline was noticed in the case of life-support crops, probably due to consecutive droughts. The increase in employment was 16 per cent in the crops sector over benchmark and nearly 10 per cent under integrated piggery programme. These impacts need to be examined further.

(Mruthyunjaya, Sant Kumar Pandey, Shalendra and Anil K. Dixit)

Intensification of Livestock Production

Livestock production is intensifying in India, *albeit* slowly. Intensification occurs in response to a number of interactive forces including ecological, technological and socio-economic factors. Intensification of livestock production is, by and large, demand-driven, although other factors are also important in species-specific intensification. Striking regional differences are observed in the species-specific intensification. Intensification has been more in favour of buffalo and goat. Region wise, intensification of cattle production is more in the high rainfall regions and that of buffalo in the intensively cultivated irrigated regions. Goat intensification is taking place in almost all the regions but less so in the intensively cultivated regions. Sheep intensification is higher in the low rainfall (arid and semi-arid) regions having sufficient land area under grazing. From the socio-economic point of view, intensification is associated more with small farms.

This study has some important implications. Firstly, the structure of livestock production is undergoing a change. In the well-endowed regions, structural shift is in favour of high-yielding stall-fed animals like buffalo, while in the less-endowed regions, cattle and small ruminants continue to dominate. Secondly, due to the rising urban demand for animal-based foods, peri-urban and urban dairy and meat production systems are likely to be more intensified. Although this will create opportunities for the producers to enhance their incomes, it will occur at a cost to the urban environment. Intensification will add to urban environmental pollution and put additional pressure

on civic amenities. Improving rural infrastructure (roads, transportation, markets, etc.) would help create strong linkages between rural production and urban consumption without much stress on urban environment and amenities.

Thirdly, since livestock intensification is significantly associated with small landholders, it has the potential to contribute towards improving the livelihood of the poor. The process may, however, come under stress due to their poor resource base. Thus, to keep the process of intensification going, smallholders' livestock production needs policy support in terms of credit, insurance, technology, extension, markets, etc. Fourth, common property resources are critical to small ruminant production and evidence indicates that these have deteriorated quantitatively as well as qualitatively in India. This may act as a constraint to improvement in production of small ruminants. Therefore, there is a need to check deterioration of common property resources through policy, legal and institutional means.

Finally, India has a huge livestock population, and increasing intensification may strain the carrying capacity of the natural resources. Nevertheless, the current productivity of Indian livestock is low, suggesting considerable scope for productivity-led intensification with less stress on natural resources. Thus, future growth in livestock production has to come from productivity increases rather than through increase in numbers.

(P.S. Birthal and P. Parthasarathy Rao)

Agricultural Diversification and Urbanization

Sustained economic growth and increasing urbanization are fuelling rapid growth in demand for high-value food commodities like fruits, vegetables, milk, meat, eggs and fish. The producers are responding positively to the emerging demand patterns by altering their production portfolios. On an average, high-value agriculture accounts for about 40 per cent of the total value of agricultural output. Although high-value agriculture is widespread in the country, there are substantial spatial differences. Intensive high-value agriculture is practised in about 11 per cent of the area, mainly in the coastal and hill regions. On more than half of the area, high-value agriculture is extensive in nature and is confined mostly to the central and northwestern regions. Irrigated regions in the north and the east have moderate incidence of high-value agriculture. Nevertheless, high-value agriculture is increasing faster than rest of the agriculture in the country as a whole. Characteristics of intensive high-value agriculture, in terms of commodity, agro-climate, land and labour endowments, are distinct. Fruits are the most important in the intensive High Value Commodity (HVC) regions, followed by milk, vegetables and poultry. In the extensive HVC regions, milk is the major commodity with vegetables, fruits and poultry being next in the order. In general, high-value agriculture is more prevalent in areas with high rainfall, low level of irrigation and mechanization, smaller landholdings and higher endowment of labour.

Urbanization is an important determinant of intensification and growth of high-value agriculture and infrastructure facilitates it. In general, the density of roads and markets is higher in the intensive HVC regions. Better connections between the urban demand centres and the near urban districts through national highways further confirm the role of infrastructure.

The findings imply that high-value agriculture is likely to emerge as an important source of agricultural growth, which has started showing signs of fatigue mainly due to deceleration in yield

growth of foodgrains. High-value agriculture-led growth is expected to be more equitable as the smallholders have a greater tendency to diversify. Nevertheless, high-value agriculture may come under stress for want of adequate technology, infrastructure and policy support. High-value agriculture has greater production and market risks, and there is clearly a need to provide a cushion to producers against these risks. Mitigating production risks would require improved technologies, quality inputs and formal insurance mechanisms, which hitherto have a thin spread and are not easily accessible to the producers, especially the smallholders. High-value agriculture is capital-intensive, while the producers, especially the smallholders have limited resources of their own to invest. This implies increasing participation of financial institutions in high-value agriculture to sustain the growth momentum.

Access to markets is critical to the growth of high- value agriculture. In general, markets for high-value commodities are concentrated largely in the urban centres. This increases costs associated with transportation of produce from the rural production centres to urban markets, more so for the smallholder producers in remote areas. Further, the prices of most of the high-value commodities are highly volatile and fall drastically even with a small increase in volume of their arrivals at the market place. Options to mitigate market risks and reduce transaction costs include establishment of special markets for high-value commodities in the rural areas and promotion of private sector participation in agriculture through institutions like producers' associations, cooperatives and contract farming.

Infrastructural requirements of high-value agriculture are different from that of other food and non-food commodities. Being perishable, high-value food commodities require refrigerated transport, cold storages and immediate processing after harvesting. These however are woefully inadequate in the country. Considerable investment is required to facilitate such an infrastructure.

(P. Parthasarathy Rao, P.S. Birthal and P.K. Joshi)

Technical Efficiency in Shrimp Farming in India

This study examined technical efficiency and identified the sources of inefficiency in shrimp farming in three major shrimp-producing states of India. It is based on farm level data and employs stochastic production frontiers to measure efficiency. The average technical efficiency in shrimp farming was found as 0.69, suggesting considerable scope to raise shrimp production even at the existing level of input-use and technology. There were considerable differences in technical efficiency across farms (Figure 2). About a quarter of the farms operate below 60 per cent of their potential. The inefficiency could arise due to a number of personal, household and farm specific factors. The influence of different factors is shown in Table 9. Some important implications have emerged from this study. Large differences in productivity and efficiency across farms as well as states call for an exchange of expertise and experience to improve and strengthen the aquaculture activity. Large farmers appear to be more efficient probably because of their higher capital investment capacity. This calls for evolving a support system for small farmers to facilitate higher capital investment and adequate credit support as a mean for enhancing technical efficiency. Leased-in farms have been found less efficient than owner-operated farms. The leasing policy should be made tenant-friendly without compromising the security of the ownership. The terms and conditions of the tenure should encourage tenants to undertake long-term investment in the aquaculture activity. This would facilitate improvement in its productivity and technical efficiency. Further, the role of education and experience of farmers in enhancing technical efficiency in shrimp production has

Figure 2. Distribution of shrimp farms by level of technical efficiency

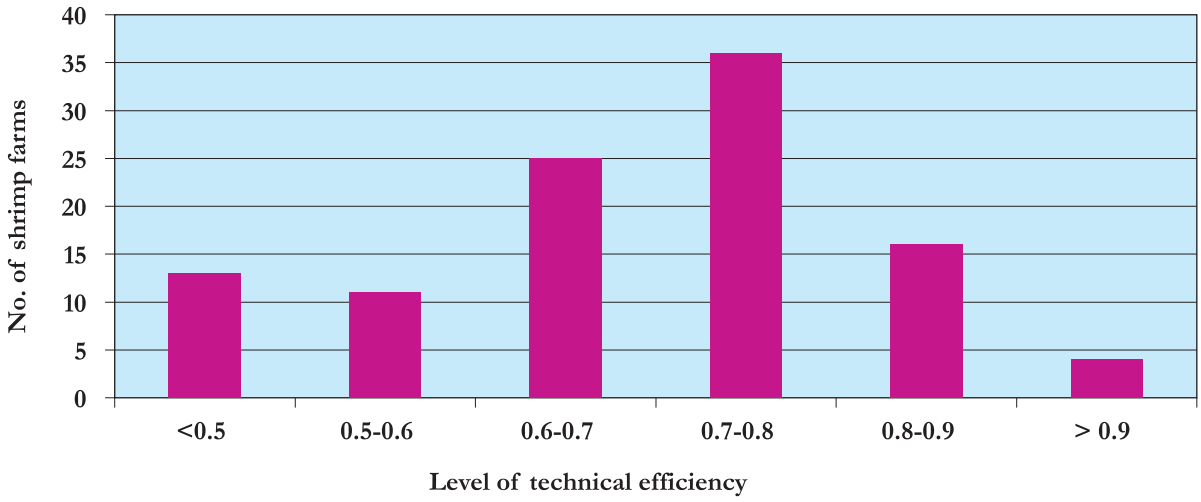


Table 9: Impact of farm specific variables on technical efficiency in shrimp production

Variables	Coefficient	Standard error
Constant	0.20050**	0.0483
Education	0.00840**	0.0028
Experience	0.04110**	0.0031
Farm Size	0.00690**	0.0026
Lease	-0.00065**	0.0002
Source of water	-0.00480	0.0151
Source of seed	0.02490	0.0020
Capital	0.00001*	0.0001
Distance from market	-0.00014	0.0002
State		
Andhra Pradesh	0.07350*	0.0246
Karnataka	0.10080**	0.0246
R^2	0.87	
Adjusted R^2	0.85	
F-test	51.34**	

** and * denote significance at 1and 5 per cent levels, respectively.

been clearly established. These results have important implications for the development of appropriate and comprehensive extension and research strategies.

(Anjani Kumar, P. S. Birthal and Badruddin)

Technical Efficiency in Freshwater Aquaculture in Uttar Pradesh

During the mid-1990s, the fisheries production witnessed a significant change. The share of inland fish production started rising and it became more than half of the total fish production in 2002-03. This rise in inland fish production has been attributed to the development of freshwater aquaculture in our

country. Uttar Pradesh is a land-locked state and therefore offers opportunities for inland fisheries only. Fish production in the state from different sources has increased from 0.04 million tonnes in TE 1984 to about 0.20 million tonnes in TE 2002-03 and has registered a growth rate of about 8 per cent per annum. However, the productivity of freshwater aquaculture is still very low. Increase in productivity can result from the development and adoption of new technologies and improvements in the economic efficiency of fish farming. The efforts designed to improve efficiency as a means of increasing agricultural output are more cost-effective than introducing a new technology if farmers are not efficient in using even the existing technology.

The technical inefficiencies were observed at fish farmers across different size-categories were found inefficient, indicating the presence of input-output slacks. However, the large-sized fish farmers were more efficient in utilizing the resources than small ones. The average technical efficiency under CCR model was 0.54 and under BCC model 0.67. These were 0.77 and 0.83 for small farms, 0.61 and 0.77 for medium farms and 0.75 and 0.88 for large farms. Moreover, all the farms were found scale inefficient, as the scale efficiency score was less than one (Table 10)

Table 10: Average efficiency scores for sample of fisheries farms

Category	CCR model (TE)	BCC model (PTE)	Scale efficiency
Small farm	0.77	0.83	0.92
Medium farm	0.61	0.77	0.78
Large farm	0.75	0.88	0.86
All farm	**0.54**	**0.67**	**0.85**

About 25 per cent of fisheries farms in the study area have achieved technical efficiency of above 95 per cent (Table 11). However, about 34 per cent farms had the technical efficiency level below 50 per cent, indicating that on these farms the consumption of inputs can be reduced up to 50 per cent without affecting the output. About 36 per cent of aquaculture farms had achieved the scale efficiency level of above 95 per cent.

Table 11: Distribution of sample by pure technical efficiency and scale efficiency

Efficiency (%)	Uttar Pradesh	
	Pure TE	Scale efficiency
< 50	35 (33.7)	7 (6.7)
50-55	5 (4.8)	1 (1.0)
55-60	7 (6.7)	4 (3.8)
60-65	8 (7.7)	1 (1.0)
65-70	4 (3.8)	5 (4.8)
70-75	0 (0.0)	9 (8.7)
75-80	6 (5.8)	7 (6.7)
80-85	3 (2.9)	7 (6.7)
85-90	7 (6.7)	10 (9.6)
90-95	3 (2.9)	16 (15.4)
> 95	26 (25)	37 (35.6)
Total numbr of farms	**104 (100)**	**104 (100)**

Note: Figures within the parentheses indicate percentages to total

Except labour-input on large farms, all the other inputs were being utilized inefficiently across different categories (Table 12). The highest amount of slack was found on small farms in the utilization of other inputs to the extent of Rs 944. Fish farmers could save 10 per cent in cost of seed, 6 per cent in labour expenditure, and 5 per cent in expenditure on feed and hence increase profitability. There was a potential to reduce expenditure by about 30 per cent in the case of other inputs, without affecting the level of fish production.

There are various factors that determine the level of technical efficiency of a particular farm. The size of the pond did not seem to influence the level of technical efficiency significantly in the study area (Table 13). Training and experience of the fish farmer in aquaculture increased the technical efficiency

Table 12: Average target inputs and estimated slack inputs among the fisheries farms

(in Rs per farm)

Particulars	Size of aquaculture farms			
	Small	Medium	Large	All
Seed				
Target	6220	2958	2221	4413
Slack	501	353	515	449
Per cent slack to target	8.05	11.95	23.20	10.18
Labour				
Target	6029	3424	3721	4722
Slack	488	266	—	283
Per cent slack to target	8.09	3.87	-	5.99
Feed				
Target	3362	2529	2247	2886
Slack	100	169	161	134
Per cent slack to target	2.97	6.67	7.15	4.66
Other inputs				
Target	2722	2232	1493	2354
Slack	944	466	587	714
Per cent slack to target	34.67	20.89	39.29	30.35

Table 13: Determinants of technical efficiency in Uttar Pradesh

Variables	Coefficients
Constant	0.8642**
Pond size	0.0086
Education	0.0254
Training	0.0803*
Aquaculture experiment	0.0077**
No. of family members	-0.0002**
Distance from output market	-0.0023**
Distance from input market	-0.0128**
R^2 (F)	0.2268**

** and * indicate significance at 1 and 5 per cent levels, respectively .

of the farm. The total number of family members was related negatively with technical efficiency, implying that bigger the family size, higher would be the inefficiency in utilizing labour -input. The distance from the output and input markets was related negatively to the technical efficiency of fish farms, implying that access to input and output markets helped in improving the technical efficiency. The results have clearly indicated that experience, training and access to infrastructure affect TE significantly. These results have important implications for the development of appropriate and comprehensive extension strategies and infrastructural development for improving the technical efficiency of freshwater aquaculture.

(Anjani Kumar, Elumalai and Badruddin)

Total Factor Productivity and Socio-economic Impact of Fisheries Technology in India

This study assessed the total factor productivity (TFP) growth in the Indian fisheries sector (separately for marine fisheries and aquaculture), and examined the impact of fisheries sector on different stakeholders. The rate of return to public investments on fisheries research and development was also estimated. The time series-cum-cross-section data by state for inland and marine fisheries resources, production, input-use, prices and investment on fish research and development were compiled from various published sources and used in the study. Divisia-Tornqvist index was used for computing the total factor productivity (TFP) for the inland and marine fisheries sector. The TFP annual growth was estimated to be 4.0 per cent for the aquaculture sector and 2.0 per cent for the marine sector in India. Multi-market fish sector model developed at World Fish Center was used for India. Given a time horizon (2005–2015), projections for price, supply, demand, and export were obtained under different fish technological scenarios.

The contribution made by technological change in the development of fisheries sector in India is found to be substantial. The analysis shows considerable impact of the fisheries sector development on the social welfare of both producers as well as consumers. Technological developments in fisheries would make the fish available at cheaper rates to the consumers and thus improve their nutritional security while the producers' income would be enhanced. The internal rate of return to investment on fish research and development is found to be in the range of 42 to 55 per cent under different TFP scenarios.

(Praduman Kumar, Anjani Kumar and C.P. Shiji)

Sustainable Agricultural Systems

Economic and Environmental Benefits of Zero-Tillage Technology

Enhancing productivity and profitability of wheat in rice-wheat growing areas is targeted through timely sowing of wheat and lowering of production cost by modifying tillage operations. Zero-till sowing with zero-till-fertiseed drill improves crop yield, reduce cost of field preparation and saves irrigation water. Increased use of seed is also reported with the adoption of zero-tillage technology. The economic benefits of zero-tillage (ZT) technology have been quantified based on the data drawn from 250 adopters spread over the Indo-Gangetic Plains of Punjab, Haryana, Uttaranchal, Uttar Pradesh and Bihar. The adoption domain of zero-tillage technology along with the changes in average economic costs and benefits have been highlighted in Table 14.

Table 14: Zero-tillage technology: Adoption domain and impacts

Zero-tillage technology	Unit	Impact
(a) Adoption domain		
Area under rice-wheat system in India	Mha	10
Area under rice-wheat system in Indo-Gangetic Plains of India	Mha	9
Potential rice-wheat system area for zero-tillage technology adoption	Mha	5
Area estimated to be under zero-tillage technology, 2004	Mha	2.03
Area projected to be under zero-tillage, cumulative, 2010	Mha	3.00
(b) Impacts		
Yield impact		
Average base yield	kg/ha	5300
Increase in yield due to zero-tillage technology	%	1.9 to 2.8
Average incremental yield	kg/ha	125
Parity price of wheat grain	Rs/kg	6.05
Value of incremental yield	Rs/ha	753
Cost impact		
Average operational cost (2004 prices)	Rs/ha	13000
Decrease in cost	%	18 to 22
Reduction in sowing time	hours/ha	8
Reduction in fuel consumption	litres/ha	24
Tractor hiring charges	Rs/hours	150
Average saving in sowing	Rs/ha	1080
Increase in seedrate	kg/ha	20
Seed cost	Rs/kg	13.5
Increased cost of seeding	Rs/ha	243
Saving in water	%	20 to 25
Water use in wheat for 5t/ha yield in IGP areas	cm	40
Saving of water	m^3/ha	900
Water productivity for irrigated wheat in IGP region	kg/m^3	0.30
Value of water saved	Rs/ha	1633
Average net savings in costs	Rs/ha	2470
(c) Average net economic benefit due to zero-tillage	**Rs/ha**	**3223**

Adoption of the technology increases the cost by Rs 243/ha but results in the incremental economic benefits of Rs 3466/ha due to savings in land preparation cost, saving in irrigation water and increase in yield. Net economic benefit due to ZT in wheat has been assessed as Rs 3223/ha at 2004 prices. Additionally, reduced cost of land preparation and use of water in terms of groundwater would entail on an average a saving of 33 litres of diesel per ha of ZT wheat, which if translated in terms of reduced CO_2 emission will be equivalent to 88 kg per ha of ZT wheat. Expected spread of ZT technology to 3 million hectares by 2010 would thus bring in substantial benefits-economic as well as environmental to the region.

(S. Selvarajan, L.M. Pandey and Mruthyunjaya)

Economic Benefits of Integrated Pest Management

Economic benefits of integrated pest management (IPM) covering cabbage, tomato, pigeonpea, cotton, groundnut and chickpea have been quantified based on a sample of 270 adopters spread over the states of Jharkhand, Uttar Pradesh, Karnataka, Punjab, Haryana and Rajasthan. All yields, costs and price-related parameters have been aggregated by using the potential adoption area for each crop as the weight for estimating the yield and cost-related impacts due to the adoption of IPM technology. The average impact of IPM technology in terms of cost, yield and net incremental benefits to the farmers across crops and region has been presented in Table 15. Adoption of IPM technology could save the operational costs by Rs 259/ha and has increased the crop yield by 267 kg/ha. Net incremental benefit due to IPM has been estimated at Rs 4272/ha across crops and regions. The IPM components included use of

Table 15: IPM technology: Adoption domain and impacts

IPM technology	Unit	Impact
(a) Adoption domain		
Potential crop area for IPM adoption in Jharkand, UP, Karnataka, Punjab, Haryana, Maharashtra and Rajasthan	Mha	6.6
Area estimated to be under IPM, cumulative, 2004	Mha	0.34
Area projected to be under IPM, cumulative, 2010	Mha	0.79
(b) Impacts		
Yield impact		
Average base yield	kg/ha	1274
Average change in yield due to IPM	%	21
Average change in yield due to IPM	kg/ha	267
Economic price of IPM crops	Rs/kg	15.1
Average value of incremental yield	Rs/ha	4013
Cost impact		
Average operational cost, 2004	Rs/ha	14588
Decrease in cost	%	2
Average saving in operational cost	Rs/ha	259
(c) Average net economic benefit due to IPM	**Rs/ha**	**4272**

pheromone traps, seed treatment, ridge sowing, disease-resistant varieties and T-shaped bird perch, application of need-based pesticides, bio-agents and botanical pesticides to control pests and diseases like white grubs beetles in groundnut; collar rot and termite in chickpea; wilt, phytophthora diseases and helicoverpa larvae in pigeonpea; foliar diseases, white fly and helicoverpa larvae in tomato; and diamond moth caterpillar in cabbage.

(L.M. Pandey, S. Selvarajan and Mruthyunjaya)

Spatial and Temporal Variations in Agricultural Productivity Impacts

Agricultural R&D has enhanced the productivity of all crops significantly. Now, agriculture contributes about 22% of India's GDP but still 2/3rd of the population depends on it. Agricultural growth continues

to be critical for poverty alleviation with equitable regional and societal development. The goal of doubling per-capita income as projected in the Tenth Five-Year Plan is possible only if agricultural growth is pegged at over 4% every year from now. Further, this rate of growth needs to be achieved efficiently to remain competitive both domestically and globally. Higher growth with higher efficiency in the agriculture sector will contribute positively to the competitiveness of India's economy. The agricultural R&D in India over the past decades has boosted the productivity levels of several crops spatially across districts. Both the average state productivity levels and the number of districts above the average state productivity levels have gone up in 2002 as compared to those in 1968. Taking the example of rice, it has been estimated that in 1968, there were just two rice-growing districts in the country accounting for just 1% of the rice area producing more than 2 t/ha of yield but in 2002, the number of such districts has gone up to 103 or 44% (Table 16).

Table 16: Distribution of districts based on rice productivity

States\Productivity	Average for 1966-68, t/ha				Average for 2000-02, t/ha				
	< 1	1-2	2-3	Total districts	< 1	1-2	2-3	> 3	Total districts
Andhra Pradesh	2	18		20		2	12	6	20
Bihar	10			10	1	9			10
Gujrat	10	2		12	5	6	1		12
Haryana	1	5		6		2	4		6
Karnataka	2	15	1	18	1	5	10	2	18
Madhya Pradesh	33	2		35	21	11	3		35
Orissa	11	2		13	5	8			13
Punjab	1	10		11			2	9	11
Rajasthan	9	2		11	3	8			11
Tamilnadu	1	10	1	12		1		11	12
Uttar Pradesh	45	3		48	2	18	28		48
West Bengal	7	8		15		4	11		15
Maharastra	21	4		25	11	10	4		25
Total number of districts	153	81	2	236	49	84	75	28	236
Percentage of districts	65	34	1	100	21	36	32	12	100

The states like MP, Bihar and Orissa have lagged behind in rice productivity growth with almost all their rice-growing districts still getting less than 2 t/ha yield. These districts, accounting for more than one-fourth of the rice area in the country provide opportunities for future agricultural growth. Even in the case of states like Tamil Nadu, Andhra Pradesh and Punjab for example, the efficiency differential (ratio of least efficient to most efficient farmers as measured by the operational cost per quintal of rice out put) ranges from 2.5 to 4.3. Such efficiency gaps existing at farm level even in advanced states point towards the potential for targeting productivity growth with efficiency.

(S. Selvarajan, Anil Rai and G.C. Sharma)

Sustainability Status and Dimensions of Agro-ecological Regions in India

Sustainable agricultural development has to balance the future production growth in diverse agroecological regions (AERs) without degrading the natural resource-base. Indexing appropriately

identified variables to represent various dimensions of sustainability is one of the commonly used approaches to measure sustainability status. This methodology was used earlier for classifying 52 Agro-ecological sub-regions (AESRs) of India using 1995-96 as the data reference year. Three dimensions of sustainability, namely ecological, economic and equity dimensions were captured through a set of nine variables covering forest, groundwater, demography, productivity and poverty status by AESRs. This analysis was further extended to cover 1990-91 for temporal and spatial comparison of sustainability status of AESRs in the country. The set of variables were first integrated separately for the three dimensions of sustainable agricultural development and again indexed, using the ratio of the inverse of their proportional contribution as weighting scheme to generate sustainable livelihood-security indices for each of the AESRs. All AESRs have been categorized into six groups based on the sustainable livelihood indices and this grouping of indices has been done using quartiles (Tables 17 and 18).

Table 17: Sustainability dimension matrix of AESRs (1990)

Ecological Security Index (ESI)		Economic Efficiency Index (EEI)									Social Equity Index (SEI)
		High			Medium			Low			
High	High		6.4		18.4 14.3 14.4 19.1						High
		14.5 8.1 12.1 15.4	7.3		10.4	11 15.3				14.2	Medium
			4.1 15.2			17.1					Low
	Medium	19.2 5.1		16.2		1.1			10.2 12.2	14.1	High
						2.4 4.4 5.3 6.3 8.2 10.3 10.1			7.1 3.0	12.3 5.2 7.2	Medium
			2.3			4.2 8.3				6.2	Low
	Low	19.3									High
						18.1 6.1 18.2				18.5 15.1	Medium
			9.1	13.2		4.3	9.2 2.1			13.1	Low
		High	Medium	Low	High	Medium	Low	High	Medium	Low	
		Sustainable Livelihood Security Index (SLSI)									

Table 18: Sustainability dimension matrix of AESRs (1995)

Ecological Security Index (ESI)		Economic Efficiency Index (EEI)									Social Equity Index (SEI)
		High			Medium			Low			
High	High				14.3 14.4 19.1	14.5					High
		15.4			10.1	15.3			1013 11.0 12.1	10.4 14.2	Medium
		17.1									Low
	Medium	19.2			16.2	5.3 10.2 12.2					High
		7.3 8.1 9.1	7.2		4.4	1.1 2.4 6.3 6.4 7.1 8.2				14.1 3.0 5.2	Medium
				15.2		8.3 12.3				2.1 4.2 6.1 6.2	Low
	Low	19.3				5.1 18.1 18.4					High
			4.3 4.1			2.3 18.5					Medium
			9.2 15.1				13.2 18.2			13.1	Low
		High	Medium	Low	High	Medium	Low	High	Medium	Low	
		Sustainable Livelihood Security Index (SLSI)									

The temporal analysis of ecological-security status of AESRs has revealed that, out of 12 agro- ecological sub-regions with low level of ecological security in 1990, at least nine AESRs continue to be in the same security group in 1995 also. These regions are: Konkan, Karnataka and Kerala coastal plains (AESR 19.3), Ganga, Yamuna Doab, Rohilkhand and Avadh plains (AESR 4.3), Rohilkhand, Avadh and South Bihar plains (AESR 9.2), Bengal Basin (AESR 15.1), South Tamilnadu coastal plains (AESR 18.1), North Tamilnadu coastal plains (AESR 18.2), Gangetic Delta (AESR 18.5), Foothills of Central Himalayas (AESR 13.2), and North Bihar and Avadh plains (AESR 13.1). These need priority in terms of improving their ecological-security levels. Along with these, the ecological-security status of four AESRs, namely

4.1, 5.1, 2.3 and 18.4, which have come down in 1995 as compared to 1990 also needs priority intervention.

The temporal analysis of economic-efficiency status of AESRs has revealed that out of 13 AESRs with low economic-efficiency rank in 1990, six AESRs continue to be in the same efficiency levels. These regions are: South Kashmir and Kumaon Himalayas (AESR 14.2), South Kashmir and Punjab Himalayas (AESR 14.1), North Bihar and Avadh plains (AESR 13.1), Deccan Plateau (AESR 3.0), Madhya Bharat Plateau, Western Malwa Plateau, Eastern Gujarat plain, Vindhyan and Satpura range and Narmada Valley (AESR 5.2), Central and Western Maharashtra Plateau and North Karnataka Plateau, and North-Western Telengana Plateau (AESR 6.2). These need to be accorded priority in investment to improve their agricultural system.

The temporal analysis of social-equity status of AESRs has revealed that out of 13 AESRs with low social-equity level in 1990, nine AESRs continue to be in the same efficiency levels. These regions are: Meghalaya Plateau and Nagaland Hill (AESR 17.1), Middle Brahmaputra plain (AESR 15.2), Tamilnadu uplands and plains (AESR 8.3), Marusthali (AESR 2.1), North Gujarat plain (AESR 4.2), Central and Western Maharashtra Plateau and North Karnataka Plateau and North -Western Telengana Plateau (AESR 6.2), Rohilkand, Avadh and South Bihar plains (AESR 9.2) Foothills of central Himalayas (AESR 13.2), North Bihar and Avadh plains (AESR 13.1). These require priority attention for improving their social-equity status.

Integrated sustainable livelihood-security status by AESRs has shown that out of 13 AESRs with low sustainability-levels in 1990, six AESRs continue to be in the same sustainability-levels. These regions are: South Kashmir and Kumaon Himalayas (AESR 14.2), South Kashmir and Punjab Himalayas (AESR 14.1), North Bihar and Avadh plains (AESR 13.1), Foothills of Central Himalayas (AESR 13.2), Madhya Bharat Plateau, Western Malwa Plateau, Eastern Gujarat plains, Vindhyan and Satpura ranges and Narmada Valley (AESR 5.2), Marusthali (AESR 2.1), Central and Western Maharashtra Plateau and North Karnataka Plateau, and North-Western Telengana Plateau (AESR 6.2). In particular, AESR 13.1 covering North Bihar and Avadh plains, which is lowly ranked in terms of all dimensions of sustainability, namely ecological-security, economic-efficiency and social-equity in both time periods deserves priority interventions for improving its sustainable livelihood-security levels. AESR 13.1 comprises of 28 districts in Bihar, 8 districts in Uttar Pradesh and 2 districts in Jharkhand.

To sum-up, out of 52 AESRs considered in this analysis, 10 AESRs have shown declining status of sustainability and 11 AESRs have improved their sustainability levels while the rest have maintained status quo during the 1990s.

(S. Selvarajan and B. Natesh)

Markets and Trade

Agricultural Markets in India: Implications for Competition

The functioning of agricultural markets shows that markets for a large number of commodities are competitive in the segment where transactions are involved amongst agro-commercial firms. Markets are less competitive where business firms are dealing with consumers and producers. This is reflected in collusive behaviour of the buyers and imperfections at the retail level. This calls for improving

competition in agricultural markets, particularly at farm and retail levels. Alternative avenues for sale and purchase through cooperative marketing agencies have been found to dilute market power of private trade to some extent. Besides cooperative agencies, removing all kinds of restrictions on entry of private firms at various levels of agricultural marketing, particularly in purchase of farm produce, would help in improving the competition.

The main reason for high charges and lack of competition in agricultural markets seems to be that small local players dominate the market. Though their number is large, it does not improve the market efficiency. Due to the large number and small operation, these players require large margins and can't take the advantage of scale economies. There is a need to attract big business firms to invest and operate in agricultural markets in bulk buying and selling. This would impart scale advantage that should help in better deals for consumers and producers.

There is no effective regulation for agricultural commodities at retail level. Quality and price aspects are hardly displayed. In the case of fruits and vegetables retailers charge the prices from each consumer based on his/her willingness to pay and in the process extract as much consumer surplus as they can rather than charging uniform and competitive prices. There is a need to frame and implement regulations providing complete information about product quality and prices to consumers through visual display. In order to provide more competition at the retail level and benefit both consumers and producers, innovative marketing mechanisms like *Apni Mandi* and 'Producers Sale Counters' should be promoted in consumer markets.

(Ramesh Chand)

WTO Agriculture Negotiations and South Asian Countries

What was projected as a benefit for South Asian Countries (SACs) from Agreement on Agriculture (AOA) and the expectations based on that did not come true. SACs should work together in the ongoing negotiations on AOA to addresses their concerns adequately. A common agenda for SACs should suggest that *de minimus* support in the case of developed countries should be fixed at 5 per cent of value of output as product plus non product support and Aggregate Measure of Support (AMS) commitment should apply at the product level. The negative support should appear as such in computing Aggregate Measure of Support. Green box should include purely non-trade distorting measures like training, inspection, extension services, infrastructural services, and public stockholding for food-security purpose. There should be a cap on green box assistance in the developed countries. All export subsidies should be eliminated at the earliest. Measures like export credit guarantee and insurance should be allowed only to the developing countries.

Tariff reduction should be based on bound tariff and not applied tariff. SACs need not ask for unreasonably high tariffs particularly those above 100 per cent. The developing countries should propose tariff reduction in three slabs as:

UR bound tariff	Proposed bound tariff
Above 100 %	2/3rd of bound tariff with maximum of 100%
50 to 100 %	3/4th of bound tariff with maximum of 67%
Less than 50 %	4/5th of bound tariff with maximum of 37.5 %

There should be no quantitative restrictions (QRs) except in the case of balance of payments problem in less developed countries. SACs require some State Trading Enterprises (STE) to address food-security concerns, particularly of weaker sections of society. SACs should agree to abolish monopoly of STEs in domestic or international trade. Special and differential (S&D) treatments to developing countries should include (i) enlarged green box for the developing countries, (ii) exemption to selected 'Special Products', related to food security and livelihood, from market access commitments, and (iii) 'Special Safeguard Mechanism' to protect against flooding of imports and injury to domestic products.

(Ramesh Chand)

Indian Fisheries Exports: Impact of Trade Policy Reforms and Food Safety Standards

This study was undertaken to examine the determinants and sources of fisheries export growth, and impact of liberalization, alongwith assessing the status of implementation of food safety standards and their implications for fisheries exports from India. A clear relationship was observed between the fisheries export growth and the competitiveness, world demand for fisheries, and trade liberalization (Table 19). The coefficients of these variables were found to be significant. The long-run world demand elasticity of fisheries export has been observed as 2.23, and that of long-run competitiveness elasticity as – 1.10. This implies that with the expansion of world fisheries markets and improvement in the competitiveness in fisheries trade, their exports from India can be enhanced substantially. The high value of competitiveness elasticity indicates the possibility of increasing export revenues in the process of making fisheries sector more competitive. The liberalization coefficient has shown that the removal of major trade policy distortions had significant influence on the fisheries export. The diversification of exports within the fisheries sector does not influence fisheries export significantly. The negative sign in its coefficient may be attributed to the fact that unlike the agriculture sector, the diversification in fisheries export has taken place in favour of low-value fishes.

Table 19: The determinants of fisheries exports

Dependent variable : Fisheries exports		
Explanatory variables	**Coefficient**	**Standard error**
Constant	-16.1198	5.8916
Export diversification	-0.5007	0.3465
Competitiveness	-0.9306*	0.3808
World export	1.8876**	0.4339
Liberalization	0.4942**	0.1598
Lagged fisheries export	0.1547	0.2465
R^2		
Adjusted R^2	0.9548	0.9407
Long-run world demand elasticity	2.23	
Long-run elasticity to competitiveness (price)	-1.10	

** and * indicate significance at 1and 5 per cent levels, respectively.

World demand for fisheries has generated more than 71 per cent growth in fisheries exports from India (Table 20). The trade liberalization has emerged as the second most important determinant and boosted growth in fisheries export by about 24 per cent. The other demand-side factors have contributed very

Table 20: Sources of fisheries export growth: 1980-81 to 2002-03

Sources	Annual growth rate (%)	Relative contribution by each factor	Share of fisheries export growth explained (%)
Export diversification	4.56	-0.022	-1.89
Competitiveness	-2.25	-0.172	7.22
World export	4.45	0.855	71.16
Liberalisation	-	0.252	23.51

little to the growth of fisheries export. The diversification in fisheries export contributed negatively, maybe because fisheries exports have diversified away from high-value to low-value commodities. For instance, the share of shrimp has declined (the highest unit price fetching item) and that of frozen fish has improved in the fisheries export. However, the lower contribution by the competitiveness to the growth of fisheries export is a matter of concern and raises questions about the sustainability of fisheries export from India.

Food safety and technical barriers follow the recommendations of Codex Alimentarius Commission (CAC) 1993 to adopt Hazard Analysis Critical Control Points (HACCP) as a process for managing food safety. The CAC recommendations were endorsed and made mandatory by the 1995 agreements on Sanitary and Phytosanitary (SPS) and Technical Barriers to Trade (TBT) measures. The SPS measures intend to protect human or animal health from food-born risks, animal or plant-born diseases, and pests or diseases. The TBT measures cover all technical regulations, voluntary standards and procedures and the issues ranging from car safety to engine-saving devices, the shape of food cartons, labelling requirements, nutritional claims and concerns, quality and packaging, etc.

Food safety issues are becoming a major concern in the fisheries exports from India to developed countries. India has been facing increasing number of non-tariff measures (mainly SPS and TBT) in its main importing countries. A close examination of detention of shipments by USFDA provides a better understanding about the application of SPS in the importing country. The US is perhaps the only country which provides information on detention of shipments based on pre-inspection basis. During 2002 (January to December), the number of refusals of food products originating from more than 100 countries were 9668. Out of these, 1040 shipments originated from India. It was the third highest number of shipments rejected by the USFDA originating from a single country. Canada and Mexico faced the highest number of detentions. The top three categories of rejected Indian consignments included vegetables (22 %), fisheries (21 %), and processed foods (21 %), showing the importance of SPS issues in fisheries exports.

A majority of Indian consignments of fish products were detained/ rejected by the USFDA on the grounds of (a) Filth, i.e. the article appears to consist in whole or in part of a filthy, putrid or decomposed substance, (b) Presence of Salmonella i.e. the article appears to contain a poisonous and deleterious substance, and (c) Insanitary, i.e. the item was prepared, packed or held under in-sanitary conditions. Most detentions were for contamination of fish with filth, followed by for the presence of salmonella. Thus, a majority of the rejections are attributable to lack of basic hygiene and microbial contamination. The average rate of reasons for rejection has been observed to be 1.76, implying that most of the consignments were found deficient on more than one grounds. Overall, the USFDA data confirm that SPS standards are important challenges for the fisheries exports from India.

Status of Implementation of Food Safety Measures in Indian Fisheries Sector

The EIC offers export inspection and certification services under the following systems: consignment-wise inspection (CWI); in-process quality control (IPQC); or self certification. Any one or more of the systems may be specified in the notifications of individual commodities. However, fish and fish products along with egg products and milk products are subject to mandatory export certification based on Food Safety Based Management Systems (FSMS). The FSMS is based on international standards of food safety management systems such as HACCP/GMP/GHP and involves approval and surveillance of food processing units. As a result of EU ban on Indian fisheries products accompanied with US automatic detention/refusals of Indian shipments, certain seafood processing plants and freezer vessels have been re-inspected and approved for exporting to the EU countries, the USA and other countries. As on 31 August 2004, there were about 425 fish processing plants in India, out of which only 145 units have been approved for export to the European Union. Rest have been approved for processing fish and fish products for export to countries other than the EU markets . India has been making additions to the list of EU-approved fish processing plants every year; In 1997 (the year of EU ban), only 10 fish processing plants were allowed to export to the EU, this number has risen to 145 in 2004. This reveals the serious concern of the Indian government and the fish processing industry in India to comply with the food safety regulations.

The liberalized trade in the fisheries sector has boosted fisheries export substantially. The future of fisheries export would be determined largely by the consistent compliance with food safety measures. Steps should be taken to devise appropriate institutional mechanisms to bring scattered small producers and processors under a network so that they can effectively participate in the emerging processing procedure to reap the benefits of expanding global fish trade. Vigorous efforts should be made to minimize the cost of compliance across the board by bringing more efficiency in fish production and processing. Maintaining quality and consistent compliance with international food safety standards should be propagated as a strategy to be ahead of our competitors in the global fish market. At the same time, efforts should be made through regional co-operation to argue for a transparent and participatory approach in preparation of international food safety standards.

(Anjani Kumar)

Agricultural Trade Liberalization Reforms: Effects on Agricultural Marketing Institutions

In the liberalized era, the paradigm of agricultural marketing is changing and therefore the emphasis is on the improved performance of all marketing functions. Indian marketing organizations need to be relooked in the context of increasing surpluses in production, liberalization of domestic markets, and opening of the trade in a gricultural commodities. This study examines the effect of trade reforms on the existing mandates and functions of selected Agricultural Marketing Institutions (AMIs) in the light of new marketing challenges and trade reforms.

Table 21 reveals the nature of reforms in major areas of agricultural marketing in the country to meet WTO liberalization requirements, particularly in the domestic markets, export and import, regulated markets, sanitary and phytosanitary measures and TRIPS. Some of the typical informal liberalized model markets such as alternative markets, viz. *Rythu Bazaar*, *Apni Mandis*, Farmers Markets, Future Markets and commodity exchanges, e- trading, Food World etc., are already in operation.

Table 21: Major areas of reforms in agricultural marketing in India

S. No.	Area of reforms	Reforms carried out
1.	Domestic markets	Restrictions on the movement of agricultural commodities withdrawn Licensing requirements and stocking limits for wholesale and retail trade removed Dereservation of milling industry from SSIs
2.	Export and Import	Export of all major agricultural commodities, barring a few like niger seed, cotton, etc., liberalized Role of canalizing agencies diluted Quantitative restrictions removed Tariff structure modified Licensing requirements eased
3.	Regulated markets	APMC Act amended to allow private sector participation in setting up regulated markets Model law on agricultural marketing formulated
4.	Sanitary and phytosanitary related measures	Export of fresh, frozen and processed fish and fishery products (quality control, inspection and monitoring) order and rules, 1995 National Codex Committee set up Export Inspection Council and its agencies such as APEDA have started framing standards, etc.
5.	TRIPS	Protection of plant varieties and Farmers Rights Act 2002 passed Geographical indication of goods (Registration and Protection) Act in offing
6.	Alternate marketing systems	*Rayuthu Bazaar*, Andhra Pradesh *Apni Mandis*, Punjab Farmers markets, Tamilnadu Future markets and commodity exchanges e –trading in agricultural commodities Food world

The results of reforms or changes in selected marketing institutions shown in Table 22 reveal that all the institutions have initiated reforms, using IT, and are marching towards commercialization. The notable reforms are: Model APMC Act by DMI, introduction of Agmarknet, launching of Nafed Bazaars by NAFED on commercial business line, and setting-up of National Codex Committee and widening of export basket by APEDA. It provides online information on international prices and export zones, and utilize the services of private marketing agencies in framing the marketing strategies. Karnataka is the first state in India to initiate market reforms. Agricultural Produce Marketing Committee (APMC) Act was amended to allow cooperatives to set up regulated markets for marketing of agricultural produce. 'Coffee Board' had a monopolistic control over the marketing of coffee in India but since 1995 marketing of coffee has become a private sector activity. Central Warehousing Coorporation has appointed a Steering Committee to consider the introduction of modern technology in handling and transportation of foodgarins.

Table 22: Status of agricultural marketing institutions and trade liberalization reforms in India

S. No.	Agricultural marketing institutions	Status of reforms
1	DMI	Marketing Research and Information Network: Agmarknet – It is a nation-wide information network for speedy collection and dissemination of market information for its efficient utilization; started in 2000. It has evolved objective criteria to fix developmental priority of markets at state/regional level. Framed a model act to provide guidance and bring out uniformity in state legislations dealing with agricultural marketing. Improved the AGMARK standard.
2	NAFED	It has started many commercial business operations on competitive basis, e.g. Nafed Bazaars. It has launched NAFED brand products in consumer packs.
3	APEDA	It developed a certification mark/standard called "Quality Produce of India" ('Made in India' logo) for agricultural products being exported. It provides online information on international prices, agri-export zones, international trade, European Union regulations on export, etc. It has framed standards for processed food and agricultural produce for export promotion. Widened its export basket; plans to add liquor, medicinal plants and herbs to it. Services of a private marketing agency, 'Lintas' are being availed to evolve a marketing strategy for India. It has identified new markets including China and Australia. Thrust on Agricultural Processing Zones to achieve the targets. Initiatives undertaken include integrated training programmes, development of infrastructure and pre-and post-harvest protocols for specific varieties of fresh agricultural produce. Advises farmers on hygienic standards for their produce. Developing quality control standards for many processed foods. National Codex Committee has been set up.
4.	Karnataka State Agricultural Marketing Board (KSAMB)	It established export promotion cell in 1994. Floor price scheme for agricultural/horticultural commodities from 24 November, 1999.
5	Regulated markets	The draft model legislation titled the State Agricultural Produce (Development and Regulation) Act, 2003 formulated as the Model Act.
6	Coffee Board	Till 1995, it had monopolistic control over the marketing of coffee in India but after that marketing of coffee has become a private sector activity.
7	Central Warehousing Coorporation	The Steering Committee appointed in 1997 to consider the introduction of modern technology in handling and transportation of foodgarins, submitted its report in 1998 and government constituted a task force to implement the same. Department of Food and Civil Supplies prepared a sub-project for training and capacity building in the area of bulk grain management and implemented it with the help of Indian Australian Training and Capacity Building Project (IATCBP).

In general, the reforms introduced in these organizations are in the right direction, but these have to be many and in place soon.

The reforms in major areas of agricultural marketing are being initiated at the country level to face post WTO liberalization environment. Some selected marketing institutions have initiated reforms and are marching towards commercialization using information technologies. This process is, however, slow and limited in coverage. Therefore, the reform canvas has to be widened and its pace has to be accelerated.

(M.B. Dastagiri, Mruthyunjaya and L.M. Pandey)

Institutional Change

Costs and Benefits of Contract Farming in Poultry in India

The literature on contract farming emphasizes the role of insurance and credit in explaining the existence and success of contract farming arrangements. This is undoubtedly the case in the instance of poultry farming as well. In terms of value, the processor advances the bulk of inputs. The gains to contract growers (relative to non-contract growers) have been found higher, greater is the cost of funds. Contracting shifts a large portion of market risks from the grower to the processor. In addition to these aspects, the poultry case considered here highlights the efficiency factor that has not received much attention in the contract farming literature. It has been found that contract production is more efficient than production by independent growers. As a result, by contracting, processors generate an efficiency surplus that is almost entirely appropriated by them. However, and despite this, contract growers do gain substantially even though their returns are not much different from what are received by independent growers.

The fact that contract production in poultry has benefited growers substantially suggests that these growers are not bereft of bargaining power. But what is the source of this bargaining strength? Why the processor does not offer growers a contract that is only slightly better than their reservation utility in their alternative enterprise (say as subsistence growers)? Poultry contracting needs the use of improved and standardized technology and production practices. This involves supply of inputs, close contact and training of the contract grower. Protecting this investment (in inputs and training) requires that default by growers and turnover in their ranks should be minimum. This in turn is achieved by processors offering above reservation utility contracts akin to efficiency wages. In its absence, the threat of denial of future contracts is not a major deterrent to default and defection by contract growers. The study has suggested that contract farming is a useful institutional arrangement for the supply of credit, insurance and technology to farmers – all of which are otherwise highly demanding problems. For many commodities, however, contract farming in India is not legal because of the agricultural produce marketing acts which make it mandatory for commodities under the act to be wholesaled in regulated markets. Removing these prohibitions would be important to widen the scope of contract farming. Some observers believe that contract farming should be regulated to ensure that processors live up to the promises made in the contract regarding the quality of inputs, provision of credit and the buy-back arrangements.

(B. Ramaswami, P.S. Birthal and P.K. Joshi)

Agricultural Research, Food Security and Agricultural Biotechnology

Agricultural R&D capacity is an important factor in using new pathways for increasing agricultural productivity, building food security and contributing towards economic stability of agriculture-based economies, like India. Agricultural R&D in India accords high priority to the application of biotechnology to evolve new genetically-engineered strains of plants, resistance to pest and diseases, animals and fishes of high nutritional quality, and attaining environment-friendly farm practices. Therefore, a well-developed agricultural research system is one of the important pre-requisites for proper utilization of the cutting-edge and better-targeted technologies and their effective adoption and dissemination along with the conventional methods of production.

The success of such technological intervention largely hinges upon a re-furbished and reoriented agricultural research system which is efficient and cost-effective and addresses the problems of marginal environments and interests of small and marginal farmers who dominate Indian agriculture. Since biotechnology research is complex and highly capital intensive, the research system should allocate scarce capital resources optimally so as to ensure research efficiency, restraining from spreading resources thinly. This can be achieved by prioritization of biotechnology research, keeping in view the national and regional goals. Therefore, proper research planning, prioritization of agricultural biotechnology research and an effective policy framework are the essential components of utilization of agricultural biotechnology in a way that contributes towards food and nutritional security.

(Harbir Singh and Mruthyunjaya)

ICT-based Initiatives: Differential Features and Needed Strategies

A study was undertaken to analyze ICT-based initiatives in agriculture and rural development, for selecting, seven important projects. A comparison of these ICT-based initiatives revealed subtle differences in approach in implementing ICTs projects among public and private sector institutions and NGOs (Table 23).

Each initiative is a unique model in the application of ICTs to agriculture and has merits and constraints of its own. Based on learning from these initiatives, some suggestions are being provided for greater success of ICT initiatives:

- Involve local people in content development (as in Village Knowledge Centre) to assess information needs and collection of indigenous knowledge, which can be synthesized with information from experts/ institutions.
- Prepare user-friendly content in the regional languages also with visuals.
- In kiosks, supplement the digital information with public address system, vernacular print media, and bulletin boards for wider dissemination.
- Use alternative technologies to substitute electricity (batteries and solar panel) and telephone connectivity (wireless network).
- Use space in rural institutions (*Panchayat* office, school, temple) to overcome infrastructure barriers (e.g. Soya-choupal, Village Knowledge Centre).
- Appoint facilitators exclusively for information service; they should be motivated and accountable, well qualified with adequate knowledge on subject matter and computer operation.
- Facilitative role of institutions like village *panchayat*, agricultural extension offices, and *Krishi Vigyan Kendras* is desirable to enhance access to information (e.g. Helpline service).

Table 23: Differential features of selected ICT-based initiatives

Features	Public sector	Private sector	NGOs
Investment	Funds from central and state governments	Company expenditure	Funds from international organizations, state governments, etc.
Area of interest	Research, education, training and capacity building	Business goals with social orientation	Uplifting of remote/rural area people
Salient services	Researcher-farmer linkage, Call centres	Input-output marketing, technology dissemination	Agriculture and animal husbandry, social developmental work
Study areas	Based on the research and training needs, villages/ districts	Commercial, strong marketing areas of the companies	Remote and socially under-developed areas
IT facilitator at the grassroot	Government officials, trained local personnel	Local trader, professional personnel	Volunteers from local areas and service-oriented level personnel
Goals	To make a role model for agriculture and the allied development	To generate economic benefits for the people as well as the company	To create awareness about socio-economic benefits of innovative technologies

- Sustainability from ICT-enabled information service can be achieved if and only if such service offers wide range of assured higher economic benefits to the farmers (e.g. improved yield cost reduction, etc.). Initiatives can be maintained in a sustainable manner through either win-win profit-driven option (e.g. Soya-choupal) or through continuous sponsorship (e.g. Village Knowledge Centre).
- Support these initiatives by other quality services and rural infrastructure (extension expert's advice, market access, transport service, roads, development schemes, etc.) to translate knowledge-based decisions into actions without bottlenecks.
- Encourage networking of institutions and public-private partnership for improving rural teledensity, information generation and delivery, capacity building of the facilitators, etc.
- Public sector institutions have to play a greater role in synthesizing information while private sector institutions and NGOs disseminate it through information centres. Even though, the 'Ten point agenda' of the Union Ministry of Communications and Information Technology has emphasized ICT as of extreme importance for bringing about an all-round economic development, it needs to be pursued further by framing explicit ICT policy, which is well integrated with sectoral policies (e.g. agriculture, rural development, etc.).

(P. Adhiguru)

Institutional Innovation as an Instrument for Rural Prosperity

In Assam, Field Management Committees (FMCs) are formed at the village level and constituted with about 50 voluntary members, who possess land holdings in contiguous area. About 26,000 FMCs, have

been involved in many beneficial activities. Although majority of them are not able to show visible impacts, some of them are performing successfully.

The government has recognized the FMCs as village intermediary for schemes like million Shallow Tubewell Schemes (STW), Samridhi Kisan Yojana (SKY) of the Government of Assam and for several NABARD schemes. A sample of 25 FMCs in five selected districts of Assam were studied to understand their functioning and constraining factors. FMCs helped the farmers in capacity building, access to information and forming cohesive groups. In doing so it has increased crop production and enhanced the adoption of modern technology including crop diversification.

The Ulani FMC (Nizora *Beel* Project): A Case of an Organizational Excellence

Ulani Darbham is a small village situated at a distance of 40 km from the state capital Dispur, Assam. It is well connected by road to various important places. But due to unfavourable ecological and topographical conditions, the village has been traditionally risk prone. Regular floods destroy the crops and deprive the farmers of their own livelihood, and as a result people are unable to get even 2 meals a week, which has been pushing them to pauperization.

The Ulani PPS in the Khetri Block, Kamrup is a case of excellence and success. The village until 5 years ago, was a typical poverty ravaged village. A vast cropped area (1000 bigha) in the village suffer from three-pronged problem of flood from nearby Brahmputra on one side, run off from the foothills of Khasi Hills on the other side, besides stagnating rain water due to lack of drainage at the kharif season. Unable to meet the basic needs from their own production, the farmers decided to form a PPS with 151 members to bring out a change. The members planned an excellent resource management strategy and approached the World bank aided scheme ARIASP for its funding support to achieve their objectives. The villagers discovered, a huge Beel (125 bigha swamp land), in the middle of their cultivating field, which they decided to convert to a fishery. About Rs.8.5 lakh was invested on it with 30% margin money and 70% subsidy from ARIASP to develop the Beel into a fishery. The training programmes were arranged for various groups in the village on fish nursery, fish harvesting, storage and post-harvest processing of fish, network marketing and general management techniques. The specific farmer groups were trained on capacity building, overall management, catching fishes, processing and packaging fish and identify marketing network for fish disposal. Simultaneously, four Community Micro Lift Irrigation pumps (CMLIP) are installed to lift water from the beel to provide irrigation facility in rabi season. The ARIASP funding (70:30 ratio) was provided. The CMLI is an underground irrigation system with water outlets at desired points. Each of the CMLI connected with 650 meter of PVC pipes and fitted with 8 HP diesel pump. Each CMLI irrigates 120 bigha of land in rabi season, creating a total irrigation capacity for 500 bighas. Compared with an existing lift irrigation facility, it was found that CMLI with 8 HP pump irrigates 120 bigha whereas the state-run system with 10 HP pump irrigated only 80 bigha. Encouraged by this innovation, currently, farmers are engaged in cultivation of Boro rice in the entire 500 bighas during rabi season. The rice yield this year was expected to be about 7 ton/ha. Thus, the farmers not only saved themselves from starvation but also created a permanent source of enhanced income through diversified farming system (paddy-fish system). Farmers also constructed a permanent concrete threshing ground in the field for post harvest operations and built some temporary sheds for cattle in the middle of their cultivating fields. The management strategy of the PPS affairs and the resource generation plan are worth emulating by others.

(B. C. Barah)

Effectiveness of Private Sector Extension in India-A Case of Mahindra Krishi Vihar

Mahindra Shubhlabh Services Limited (MSSL) has initiated one-stop farm solution centres called Mahindra Krishi Vihar, in some selected districts of India. The performance of one such centre set up by a private entrepreneur under a franchise agreement with MSSL in Thirinelveli and Thotthukkudy districts of Tamil Nadu has been analysed in this study and the major findings are:

- Farmers are willing to pay for the delivery of an integrated set of services that provide them access to quality inputs, credit and procurement services and field-based advice on technology use.
- Farmers registered with the private extension service provider could substantially increase their yield and income from farming in comparison to non-participant farmers.
- The increase in yields and income could be attributed to suggestions offered by the private extension provider on the application of right type of inputs at the right stage of crop growth based on field-specific technical advice.
- A private extension approach of this type focuses more on medium and large scale farmers.
- A private organisation has been able to develop a sustainable and profitable business selling extension services, although these services go beyond the traditional task of production technology and include market services and linkages also.
- This apparently successful private extension approach has been developed through a learning-based approach

Policy Implications

- Private extension is a useful and viable alternative to public services for the medium and large farmers growing cash crops, but may discriminate against the poor and small farmers.
- Efforts should be made to encourage private service delivery in areas characterised by farmers with an effective demand for extension services, allowing the public sector to concentrate on poor areas / households and alternative roles such as quality regulation of private service providers
- Successful approaches to extension need to go beyond technology transfer, and should include support to farmers in accessing markets and better prices for their crops.
- An important lesson for reform in the public extension service is that it may need to foster an organisational culture that facilitates experimentation and learning as a way of developing relevant extension approaches locally.

(Rasheed Sulaiman V., Andy Hall and N. Suresh)

Extension Policy at the National Level in Asia

Extension is clearly facing challenging times in Asia. This study has drawn together experiences across Asia to find the extension policy and the extension policy process. Four cases of recent developments in extension policy and policy process (India, Indonesia, Iran and China) have been presented to illustrate the challenges involved in developing and implementing extension policy. The major findings from this study are:

- Extension policy in Asia needs to tackle two major sets of issues; the first concerns the content of extension policy in view of the broader role extension needs to play in the present context. The second issue concerns the nature of the policy process itself. Instead of prescribing reforms, the policy process should ideally facilitate a continuous incremental change through experimentation, reflection and learning.
- The experiences indicate that reform processes informed only by prescriptions generated within or from outside are bound to fail. The message for extension policy in Asia is that the process of reform must be led from within.
- There is an urgent need to undertake an institutional analysis of historical and current approaches of implementing different extension approaches and building development capacity within the country on experimenting with different approaches and evaluating them. These learning-based approaches should inform policy development.
- The existing culture of extension organisations may prevent the emergence of learning-based approaches to reinvent extension. Changing these cultures may be the biggest challenge to reinventing extension in Asia.

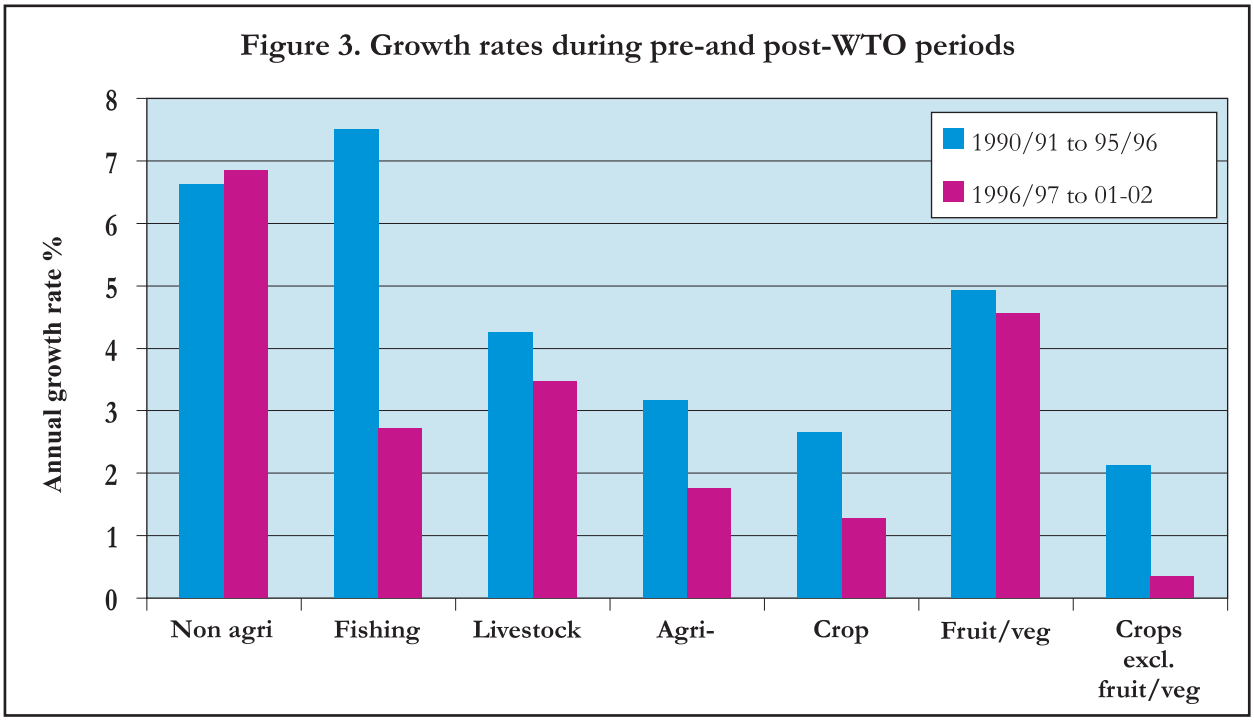
(Rasheed Sulaiman V. and Andy Hall)

Agricultural Growth and Modeling

Agricultural Growth during the Reforms

The growth rate analysis has shown that initial years of reforms were somewhat favourable for agricultural growth but post-WTO period witnessed a sharp decline in the growth rate of almost all commodity groups, one by one. The current growth rates are too low to achieve the goal of 4 per cent growth in output, as envisaged in the National Agriculture Policy. If corrective measures are not initiated

Figure 3. Growth rates during pre-and post-WTO periods



soon to reverse the deceleration in agricultural growth then even the growth targets of 10th Five-year Plan would not be met. Another disquiet aspect of recent growth process is that agriculture and non-agriculture sectors are on disparate growth paths. The probable causes for slowdown in agricultural growth are adverse impact of depressed international prices on domestic prices, neglect of price intervention for underdeveloped region having large growth potential, slowdown in adoption of improved technology, and stagnation in public investments in agriculture for a long time.

(Ramesh Chand)

Determinants of Capital Formation and Agricultural Growth

Rate of return to private investments, which in turn depends on terms of trade and technology, is found to be the most important determinant of private capital formation. The second most important determinant of private investment is the addition of new farm-holdings. As most of the capital assets are indivisible and perfect sharing is not possible, addition of new farm-holdings, resulting mainly from division of earlier holdings, necessitates investments in new farm buildings, machinery, etc. Institutional credit to agriculture as short-term, medium-term or long term loan has been found to be the other determinant of private capital formation. The impact of subsidies for agriculture has been observed positive on private investments. There is asymmetry in effect of rising and falling public investments on private investments. Increase in public investment definitely induces increase in private investments while decline in public investment forces farmers to cope up with its adverse impact, again through increasing private investments.

Public sector investments depend mainly upon fiscal resources. Increase in farm subsidies and decrease in revenue receipt from agriculture cause adverse impact on public sector capital formation. One per cent increase in farm subsidies reduces public sector capital formation by 2.5 per cent while 1 per cent decline in revenue contribution of agriculture reduces public investments by 1.9 per cent (Table 24). The study has shown a clear trade-off between resources transferred to agriculture on revenue account and allocation for agriculture on capital account.

Table 24: Impact of subsidy and GFCF in agriculture on AgGDP agriculture at 1993-94 prices

(value in Rs)

Particular	Impact
Impact of 1 rupee spent in subsidy on AgGDP	3.19
Impact of 1 rupee spent in capital formation on AgDP	0.607
Average life of public capital: Years	58.00
Impact of 1 rupee spent on GFCF on AgGDP over whole life of capital:	
Absolute value in 58 years	35.21
Present value at 10 % rate of discount	6.02
Present value at 8 % rate of discount	7.42
Gain/loss due to one rupee going in subsidy rather than public capital formation:	
At 10% discount rate	-2.83
At 8 % discount rate	-4.23
Impact of shift of 1 % subsidy amount to public sector capital formation on AgGDP %:	
At 10% discount rate	1.82
At 8 % discount rate	2.73

GDP agriculture is affected by both capital formation as well as subsidies, besides terms of trade. Instant return to one rupee spent in subsidy is much higher than that for public sector capital formation. However, long-term return from capital formation is more than double the return from subsidies. Diverting one per cent resources from subsidies to public investment raises output by more than two per cent. As there is a trade-off in resources going into subsidies versus resources available for public investment, diverting resources from subsidies to public sector capital formation is highly desirable to ensure growth in GDP agriculture.

(Ramesh Chand)

India's Rice Economy

India achieved four-fold increase in food production when it reached 213 million tonnes of food grains in 2001-02, by adding 32 million tonnes every decade over and above 50 million tonnes in 1950-51. But, the sustainability of foodgrain production has come under question in the recent years. Rice dominates foodgrain basket and trend in its production is a major determinant of trend in foodgrain production.

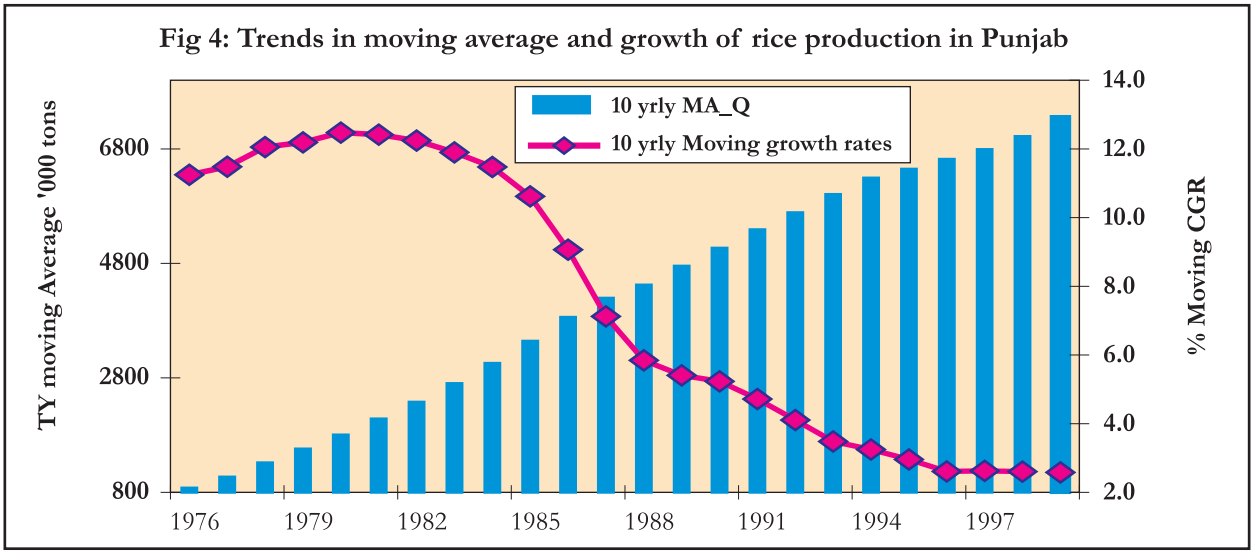
The historical analysis shows that the phenomenal pace in increase in rice production has been uneven and the regional disparity is highly pervasive among the states and across the diverse ecosystems. Clearly, the gain due to modern rice technology has been discriminatory against the resource poor areas, which is also dominated by small and marginal farmers (Table 25).

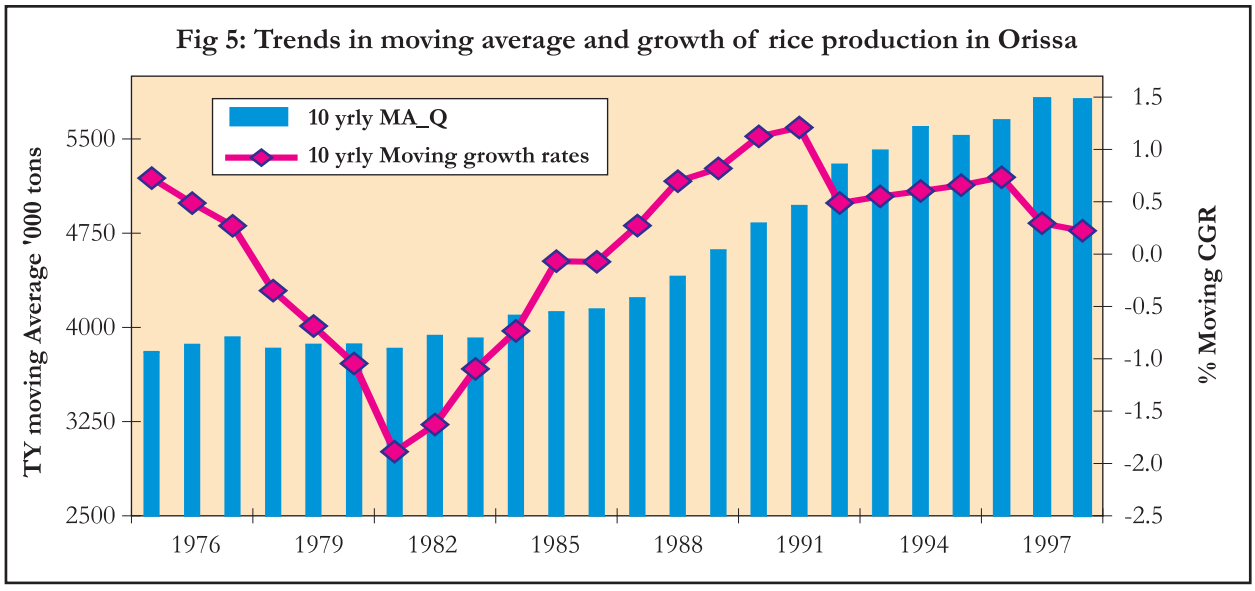
The regional dimension of rice production systems depicts a contrasting scenario. The irrigated rice in Punjab demonstrates a highly progressive picture (Fig 4). The decadal average production was 7.38 million tonnes in 1999-00, while the compound growth slides down from about 10% in the early 1980s to 2.58%

Table 25: Decadal compound growth of Area, Production and yield on rice in India

	1970s	1980s	1990s
Area	0.87	0.42	0.35
Yield	1.05	3.62	1.32
Production	1.92	4.04	1.68

Fig 4: Trends in moving average and growth of rice production in Punjab





in 1999-00. The rainfed rice in Orissa, on the other hand shows a diametrically opposite and unequal picture (Fig. 5). The average production was hovering around 5.8 million during the same period while the growth rate stagnating below 1% in most of the 1990s.

In comparison to other zones, the productivity of rice in northern zone (comprising of Punjab & Haryana) is impressive, though there is slight declining tendency in recent years. The next best performance is in the southern zone though the productivity is declining (Table 26). The lowest performing is the eastern zone. During the last three years, the proportion of rice area has increased from 65 % to 68% despite low and fluctuating productivity. The green revolution has generally bypassed the less developed rice production system in eastern India which is a matter of concern and needs to be addressed.

While combined areas under wheat and rice is stagnating around 69 million hectares (57 per cent of area under foodgrains), at the same time, the productivity of rice in over two-third area has been hovering around 2 tonnes per hectare, which affects the household food security of the millions of small and poor farmers, a phenomenon, likely to reach an un-manageable situation in future. The low productivity and vulnerability to natural calamities push a large number of the population towards abject poverty.

Table 26: Share of Area, Production and Yield of Rice

Zones	2000-01			2001-02			2002-03			
	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield	Irrigation
	%	%	(t/ha)	%	%	(t/ha)	%	%	(t/ha)	% area
East Zone	65	52	1.36	67	57	1.58	68	55	1.33	36.0
North Zone	8	14	3.03	9	12	3.10	8	15	3.12	94.8
South Zone	18	27	2.73	16	23	2.66	14	22	2.53	79.0
West Zone	5	4	1.42	5	4	1.65	5	3	1.23	49.7
All India	100	100	1.91	100	100	2.08	100	100	1.80	52.3

Source: Govt. of India, 2003, Agriculture Statistics at a glance, Ministry of Agriculture, New Delhi

It, therefore, implies the need for productivity enhancement and providing more entitlement to livelihood to the rice growing population, which is a major challenge to the agricultural research and development system.

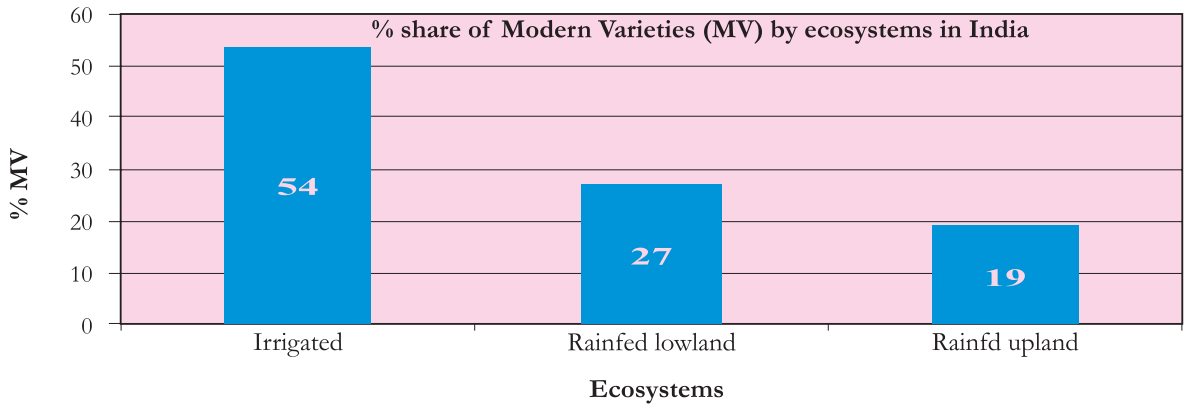
Shifting Production Base from Irrigated to Rainfed Areas

Spread of Rice-wheat system has environmental implications. Punjab is seriously trying to shift area under rice-wheat rotation through crop diversification. If this is pursued on a large scale then to compensate the loss of total production and depleting central pool of foodgrain in particular, obviously eastern India has to play a significant role. This would require at least three times additional area compared to the reduction in Punjab at the given level of productivity of rice or productivity of rice in eastern India should increase 2 to 3 times. Since the former option is untenable, apparently, the future production increase must come from productivity enhancement. Improved performance of rice productivity in Assam and other parts of the rainfed areas shows that there exits huge untapped potential in eastern India for the next green revolution to emerge from rainfed areas.

Rice Growing Environments

Rice is grown in highly diverse environments in India and rainfed area accounts for more than half of the total area under rice. The rainfed area is dominated by cultivation of traditional varieties as can be seen from Fig 6.

Fig 6: Percentage share of modern rice varieties across the ecosystems in India



Source : DRR 2001: High yielding varieties of rice in India, Hyderabad

The productivity enhancement of rice and rice-based systems with special emphasis on regional priority has become a necessary condition for increase in production. It however, requires a well articulated design of system research in genetic improvement and stability in rice variety, better crop management and crop care techniques, effective post harvest technology, and to strengthen the capacity building of the stakeholders. Not only developing modern and new technology but also imbibing the traditional knowledge base on the rice production systems need be considered. Therefore, it calls for more in-depth understanding of the synergy among the varieties and on-farm dynamics of the existing production systems and their changing pattern.

(B. C. Barah)

III. POLICY INTERACTION

The Centre has been involved in a number of activities including informal discussions with academicians, policymakers and analysts. A series of group discussions and brainstorming sessions were organised on important topics, involving peers and policymakers during the year. Some of the NCAP scientists have been members of important committees and such participations have helped the Centre to gain newer insights and disseminate research findings and professional experiences to other organizations.

Dr. Mruthyunjaya served as the Chairman, PME Task Force and was SAARC Coordinator at ICAR. He also served as a member of: Governing Body of SAARC Agricultural Information Centre (SAIC); RAC of NCAP; RAC of AERC, Delhi; CAPART, NewDelhi; IMC-NAARM, Hyderabad; O&M Taskforce, NATP, ICAR; NEC Steering Committee; Policy Analysis and Advisory Network for South Asia (PANSA) of IFPRI, USA; Editorial Board of ICAR News, ICAR Reporter and Indian Farming; Punjab Agricultural University, Ludhiana; Committees on R&D Services; Working Group on Sericulture Extension and Training, CSR&TI, Mysore; AIMA-Programmes Committee; and ORYZA Editorial Board, CRRI, Cuttack. He was a member of QRT of NRC for Grapes, CTCRI, Thiruvananthapuram, and CPCRI, Kasaragod, Kerala. He is Nodal Officer and TAC Member of CGPRT Centre of ESCAP, Bogor, Indonesia and the Secretary of the AERA, New Delhi; Nodal Officer of Indo-French Seminar, and Member, Commission on Agriculture, Andhra Pradesh.

Dr. Dayanatha Jha was the member of: QRT, Project Directorate of Cropping Systems Research, Modipuram; Research Advisory Committee, Directorate of Wheat Research, Karnal; Advisory Group on Bihar Development Report, Planning Commission; Institute of Human Development, Delhi; NATP Task Force on PME; NSS 59th Round Working Group, New Delhi; Inter-Academy Committee on Ethics in Science, INSA, New Delhi; and Review Team for Rice-Wheat Consortium. Dr. Jha also served as the Editor of *Agricultural Economics Research Review*; member of Scientific Panel on Crop Sciences; and QRT, Central Institute of Fisheries Education, Mumbai.

Dr. Ramesh Chand was invited by the Ministry of Finance, Govt. of India for pre-budget consultations. He was member, Board of Governing Body, Agro Economics Research Centre, University of Delhi; Convernor, Sub-committee on "Demand and Supply of Urea", constituted by Ministry of Chemicals and Fertilizers, GoI, New Delhi. He has been an elected member of Research Advisory Committee of Indian Society of Agricultural Economics, Mumbai.

Dr. S. Selvarajan served as a member of the Review and Appraisal and Technical Missions dealing with Ravine Stabilization programmes in Uttar Pradesh, and the Integrated Water Resource Management Strategy Development and Water Sector restructuring programmes in Madhya Pradesh.

Dr. Suresh Pal served as the Nominated Member Secretary of the PME Task Force of NATP (ICAR), and Member, National Committee of the Department of Science and Technology for the Impact Assessment of the Agro-Advisory Services of the National Centre for Medium Range Weather Forecasting. He was Member of the High Power Review Team of ICAR for "Development and Strengthening of SAUs, DUs and CUs and one-time catch-up grant.

IV. AWARDS AND RECOGNITIONS

Dr. Mruthyunjaya was selected as Member of the Commission on Agriculture, Government of Andhra Pradesh, Department of Agriculture, Hyderabad.

Dr. Anjani Kumar received the Best Paper Award at South Asia Regional Conference of International Association of Agricultural Economists (IAAE) on Globalization of Agriculture in South Asia, held in Hyderabad, India during 23-25 March, 2005 for his paper "*Indian Fisheries Exports : Impact of Trade Policy Reforms and Food Safety Standards*".

Dr. P S Birthal was conferred with the National Fellowship by the ICAR to work on the project 'Returns to Investment on Livestock Research and Development: Implications for Growth, Equity and Sustainability'.

Dr. Ramesh Chand was selected as a Member of Research Advisory Committee of Indian Society of Agricultural Economics, Mumbai.

Dr. Suresh Pal received the DT Doshi Award of Agricultural Economics Research Association for best research article published in *Agricultural Economics Research Review* during the year 2002.

V. NATIONAL AND INTERNATIONAL LINKAGES AND COLLABORATIONS

Name of scientist	Project	Collaborator
Anjani Kumar	Agricultural diversification in eastern India : Problems and prospects	Institute for Human Development, New Delhi
B C Barah	Socio-economic dynamics of rainfed rice production system in India	International Rice Research Institute, Manila, Philippines, AAU, Jorhat, RAU, Samastipur, NDUA&T, Faizabad, IGKVV, Raipur, JNKVV, Jabalpur, OUA&T, Bhubaneshwar, CRRI, Cuttack, CRURRS, Hazaribagh, Department of Agriculture, Govt. of West Bengal
	Rural institutional reforms for agricultural prosperity	Department of Agriculture, Govt. of Assam, Assam Field Management Committee (FMC), Guwahati
Mruthyunjaya and Anjani Kumar	Strategies and options for increasing and sustaining fisheries and aquaculture production to benefit poor households in Asia	The World Fish Centre, Malaysia IARI, New Delhi CIFRI, Barrackpore CMFRI, Cochin UAS, Bangalore GAU, Junagarh
P A Lakshmi Prasanna	Determinants of performance of SHGs in rural micro-finance	Indian Agricultural Statistics Research Institute, New Delhi
P S Birthal	India's livestock feed balance and its environmental implications	SESR, New Delhi
	Agricultural diversification in South Asia	International Food Policy Research Institute, Washington, D.C., USA
P S Birthal P Adhiguru and A K Bawa	Agricultural science and technology indicators: Survey for India	International Food Policy Research Institute, Washington, D.C., USA
Rasheed Sulaiman V	Optimizing institutional arrangements for demand-driven post-harvest research, delivery, uptake and impact of the poor through public and private sectors partnerships	International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad
	Assessing viability of new institutional arrangements	Cirrus Management Services, Bangalore

Name of scientist	Project	Collaborator
S Selvarajan and Rasheed Sulaiman V	Impact of BAIF-livestock development programme: An institutional analysis	BAIF Development Foundation, Pune
Rasheed Sulaiman V	Strategies to encourage rural female students in the agriculture education	National Academy of Agricultural Research Management (NAARM), Hyderabad
S Selvarajan, Anjani Kumar and P A Lakshmi Prasanna	Integrated national agriculture resources information system	Indian Agricultural Statistics Research Institute, New Delhi
S Selvarajan, B C Roy and Rasheed Sulaiman V	Developing decision making tools for assessment of vulnerability to climate change in India	United Nations Environment Programme (UNEP) Stockholm Environment Institute, London, Water Technology Centre for Eastern Region, Bhubaneswar, University of Agricultural Sciences, Bangalore, National Centre for Integrated Pest Management, New Delhi
S Selvarajan and B C Roy	Water-food security scenario analysis for 2025: Agro-ecological regional approach	WTC, Tamil Nadu Agricultural University (TNAU), Coimbatore WTCER, Bhubaneswar SWMP, Gajurat Agricultural, University (GAU), Navsari
Suresh Pal	Impacts of strengthened intellectual property rights regimes on the plant breeding industry in developing countries	Centre for Genetic Resources, Wageningen University (The Netherlands), Overseas Development Institute (London), CGIAR Secretariat, National Consultants of China, Colombia, Kenya

VI. PUBLICATIONS

A. NCAP Publications

Policy Briefs

No.20. Agricultural Growth during the Reforms and Liberalization : Issues and Concerns
Ramesh Chand

Proceedings

No. 13. Impact of Vegetable Research in India
Sant Kumar, P. K. Joshi and Suresh Pal

PME Notes

No.14. Impact Assessment of Agricultural Technology from Simple Efficiency Analysis to Sustainable Livelihood Framework
L. M. Pandey and Mruthyunjaya

B. Research Papers

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Barah, B. C. (2004). Analysis of some aspects of changing pattern of rice economy in India; Emerging problems and policies, *Indian Farming*, 54(8):22-35

Barah, B. C. and Sushil Pandey (2005). Synthesis paper on Socio-economic dynamcs of rice production systems in eastern India, *Indian Journal of Agricultural Economics*, 60(1):110-136

Birthal, P. S. and Anjani Kumar (2004). Impact of agricultural technology on growth, equity and sustainability of natural resources: A synthesis. *Agricultural Economics Research Review*, 17 (Conference number): 191-198.

Birthal, P. S. and P. Parthasarathy Rao (2004). Intensification of livestock production in India: Patterns, trends and determinants. *Indian Journal of Agricultural Economics,* 59(3): 555-565.

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Jha, A.K., Suresh Pal and P.K. Joshi (2004). Efficiency of public-funded crop science research in India, *Agricultural Economics Research Review*, 17: 17-28.

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Kumar, Praduman, Anjani Kumar and C. P. Shiji (2004). Total factor productivity and socio-economic impact of fisheries technology in India, *Agricultural Economics Research Review*, (Conference Issue): 131-44.

Kumar, Praduman, Anjani Kumar and Surabhi Mittal (2004). Total factor productivity of crop sector in the Indo-Gangetic Plain of India: Sustainability issues revisited, *Indian Economic Review*, 39(1):169-201.

Kumar P., and Mruthyunjaya (2005). Total factor productivity studies in Indian crop sector : Learnings and policy implications, *Indian Farming*, IARI Centenary Special Issue, (November).

Mruthyunjaya and P. Adhiguru. (2005). ICT for livelihood security: A reality check, *Mainstreaming ICTs,* 2(2):— March-April, 2005, One World South Asia, New Delhi. (In press).

Rasheed Sulaiman V., Andy Hall and N. Suresh (2005). Effectiveness of private sector extension in India and lessons for the new extension policy agenda, *Network Paper No. 141*, Agricultural Research and Extension Network, Overseas Development Institute, UK.

Taneja, V. K and P. S. Birthal. (2003). Livestock, food security and rural poverty. *Indian Farming* (Special Issue on International Alliance Against Hunger and Poverty).

Taneja, V. K. and P. S. Birthal. (2004). Role of buffalo in food security in Asia. *Asian Buffalo*, 1(1): 4-13.

C. Popular Articles

Dastagiri, M. B. (2003). Demand and supply gap for livestock products during 2020, ICAR News, 9 (2): 12.

D. Books/Policy Papers

Birthal, P. S., P. Kumar and A. Kumar (Eds) (2004). *Impact of Agricultural Technology on Growth, Equity and Sustainability of Natural Resources.* Agricultural Economics Research Association (India), New Delhi. 230 p.

Louwaars, N. P., R. Tripp, D. Eaton, V. Henson-Apollonio, R. Hu, M. Mendoza, F. Muhhuku, S. Pal and J. Wekundah (2005). *Impacts of Strengthened Intellectual Property Rights Regimes on the Plant Breeding Industry in Developing Countries: A Synthesis of Five Case Studies*, Wageningen University, The Netherlands

Parthasarathy Rao, P., P. S. Birthal, D. Kar, S. H. G. Wickramaratne and H. R. Shreshta (2004). *Increasing Livestock Productivity in Mixed Crop-Livestock Systems in South Asia,* International Crop Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, India. 163 p.

E. Reviews/Reports/Book Chapters/Workshop Proceedings

Adhiguru, P. and Vimala Devi, (2004). Strengthening Economic and Nutritional Security: Role of Vegetables, In: *Impact of Vegetable Research in India,* Eds: Sant Kumar, P. K. Joshi and Suresh Pal, Proceedings 13, National Centre for Agricultural Economics and Policy Research, New Delhi, pp 191-201.

Chand, Ramesh (2004). India's Agro Export Performance and Competitiveness in Changed International Scenario, In: *Indian Economy and Society in the Era of Globalisation and Liberalisation, Essays in Honour of A. M. Khusro,* Eds: C. H. Hanumantha Rao, B. B. Bhattacharya and N. S. Sidharathan, Academic Foundation, New Delhi, pp. 199-222.

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Natesh, B., S. Selvarajan, and B. C. Roy, (2004). Sustainability Mapping for Prioritising Water Resource Conservation Strategies. In: *Integrated Sustainable Water Resource Planning and Management,* Eds: K. Srinivasa Raju, A. K. Sarkar and Motilal Dash, Birla Institute of Technology and Science, Pilani, Rajasthan, India. pp141-148.

Pal, Suresh, A. R. Sadananda and E. Venkata Ramnayya (2004). *Agricultural Development in Marginal Areas of India: Options and Strategies,* Rapid Biotech Consultants Ltd, New Delhi.

Pal, Suresh and Dayanatha Jha (2004). Public-private Partnership in Agricultural R&D: Challenges and Opportunities, paper presented at the Silver Jubilee Symposium on *Governance in Development: Issues, Challenges and Strategies,* Institute of Rural Management (Anand), 14-19 December.

Parthasarathy Rao, P., P. S. Birthal, P. K. Joshi and D. Kar (2004). Agricultural Diversification in India: Role of Urbanization. *MTID Discussion Paper 77,* IFPRI, Washington D.C. USA.

Ramaswami, B., P. S. Birthal and P. K. Joshi (2005). Efficiency and Distribution in Contract Farming: The Case of Indian Poultry Growers. *Discussion Paper 05-01*. Indian Statistical Institute, New Delhi.

Selvarajan, S. and B. C. Roy (2004). Sustainability of Water Resources in North-West India: Current Scenarios and Future Options, paper contributed for the expert group meeting on *Sustainable Use of Groundwater in North-West India - A Discussion* Published by the Centre for Advancement of Sustainable Agriculture during 13 April, 2004, Indian National Science Academy, New Delhi, India.

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F. TV Talks

Chand, Ramesh, TV Talk on *India's Agricultural Challenge*, Late Night Edition, DD News, Delhi, February 15, 2005.

Chand, Ramesh , TV Discussion on *Budget and Agriculture,* Sahara TV, February 22, 2005.

G. Presentations in Conferences/Workshops/Symposia

Adhiguru, P., (2005). Can ICT Transform the Sustainable Agriculture Production Scenario and Bridge the Divide and Inequalities among Groups?, In: *National Workshop on Role of Information Communication Technology in Taking Scientific Knowledge/Technologies to the End Users,* organized by NAAS, TAAS, ISAS and APAARI, at Indian Agricultural Research Institute, New Delhi, 10-11 January.

Jain, Rajni, Sonajharia Minz and P. Adhiguru (2004). Rough Set-based Decision Tree for Mining Rules: Poverty Alleviation through Rural Employment, presented at *Seventh Annual Conference of Society of Statistics, Computer and Application,* organized by Department of Statistics, Sri Venkateshwara College, (University of Delhi), New Delhi, Society of Statistics, Computer and Application, New Delhi held at Sri Venkateshwara College, New Delhi, 22-24 December.

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Kumar, Anjani (2004). Trade Policy Reforms and Food Safety Standards: Implications for Indian Fisheries Exports, *National Seminar on Conservation and Sustainable Growth of Fisheries,* at College of Arts & Commerce, Zuarinagar, 4-5 October 2004.

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Mruthyunjaya and Harbir Singh (2004). Reorienting Agricultural Research for Addressing Food Security Issues through Agricultural Biotechnology, In: *Conference on Biotechnology and India's Development*, Institute for Social and Economic Change, Bangalore, 22-24 November.

Mruthyunjaya and Harbir Singh (2004). Towards a Framework for Model Guidelines for Costing, Assessing the Worth and Returns from Agricultural Technologies, In: *National Workshop on Commercialization of Agricultural Technologies*, NAARM, Hyderabad, 30 November - 3 December.

Mruthyunjaya and P. Adhiguru, (2005). ICT for Livelihood Security: A Reality Check, *One World South Asia 4th Annual Regional Meeting (ARM): Building Communities of Practice (CoP) for Achieving the Millennium Development Goals (MDGs),* India Habitat Centre, Lodhi Road, New Delhi, 3-4 March.

Mruthyunjaya, (2005). *Sustainable Agriculture for Livelihood Security : Cases of Water Food Security and Vulnerability of People to Natural Disaster*, 17 February, TERI, Lodhi Road, New Delhi

Mruthyunjaya and Harbir Singh (2004). *Agricultural Biotechnology and India's Development,* organized by Institute for Social and Economic Change (ISEC), Bangalore 22-24 November.

Mruthyunjaya and P. Adhiguru (2005). ICT for livelihood Security: A Reality Check, *Mainstreaming ICTs*, One World South Asia, New Delhi.

Mruthyunjaya, S. K. Pandey, S. V. Ramanarao, Rajashekhrappa and L. M. Pandey, (2005). *Technical Efficiency in Indian Edible Oilseed Sector: Analysis and Implications,* 16 March, IGIDR, Mumbai.

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Rasheed Sulaiman V. (2004). Extension Policy at the National Level in Asia. *Fourth International Crop Science Congress,* Brisbane, Australia, September 26-1 October 2004.

Rasheed Sulaiman V. (2004). Policies and Programmes for Farm Mechanisation and its Impact on Farm Women. *National Workshop on Role of Women in Mechanized Farming, National Research Centre for Women in Agriculture*, Bhubaneshwar, 8 January 2005.

VII. LIST OF APPROVED ON-GOING PROJECTS IN NCAP

S.No.	Projects	PI/ CCPI
1.	Innovative institutions for agricultural technology dissemination: Role of information technology	P Adhiguru
2.	India's livestock feed balance, and its environmental implications	P S Birthal
3.	Micro-level priority setting for livestock research	P S Birthal
4.	Relooking of agricultural marketing institutions in the context of trade liberalization regime in India	M B Dastagiri
5.	Resource allocation for agricultural research	Dayanatha Jha and S K Pandey
6.	Agricultural diversification in South Asia	P K Joshi, Ashok Gulati and P S Birthal
7.	Determinants of performance of self-help groups in rural micro-finance	P A Lakshmi Prasanna
8.	Institutionalization of priority setting, monitoring and evaluation in the NARS	Mruthyunjaya
9.	Household food and nutritional security of tribal, backward and hilly areas	Mruthyunjaya S K Pandey
10.	Improving technical efficiency to counter import threat of edible oils in India	Mruthyunjaya and S K Pandey
11.	Increasing productivity of livestock in mixed crop livestock system in South Asia	P Parthasarathy Rao P S Birthal
12.	Optimizing institutional arrangements for demand driven post-harvest research, delivery, uptake and impact on the livelihoods of the poor through public and private sector partnerships	Rasheed Sulaiman V
13.	Impact of BAIF-livestock developmental program : An institutional analysis	Rasheed Sulaiman V S Selvarajan
14.	Developing decision-making tools for assessment of vulnerability to climate change in India	S Selvarajan , B C Roy and Rasheed Sulaiman V
15.	Water-food security scenario analysis for 2025: Agro-ecological regional approach	S Selvarajan and B C Roy

S.No.	Projects	PI/ CCPI
16.	Integrated national agriculture resources information system	S Selvarajan and Anjani Kumar
17.	Agricultural diversification in eastern India: Problems and prospects	Anjani Kumar
18.	Agricultural science and technology indicators: Survey for India	P S Birthal, P Adhiguru and A K Bawa
19.	Rural institutional reforms and agricultural prosperity in Assam	B C Barah
20.	Subsidies and investments in livestock sector	M B Dastagiri
21.	Returns to investment on livestock research and development: Implications for growth, equity and sustainability.	P S Birthal
22.	Seed system development in India: Institutional and policy options	Suresh Pal Harbir Singh
23.	Groundnut seed system in Andhra Pradesh	Suresh Pal Harbir Singh
24.	Strategies to encourage rural female students in the agriculture education	Rasheed Sulaiman V

VIII. CONSULTANCY PROJECTS

The consultancy and contract research activities are undertaken by the Centre to complement the emerging research thrusts and to supplement its budgetary resources. Consultancy proposals are examined by the Consultancy Processing Cell of the Centre and are finalized as per guidelines of the Indian Council of Agricultural Research (ICAR). Following individual consultancy services and contract research in collaborative mode were provided by the Centre during the year:

Consultancy/Contract Research

Name of scientist	Institution to which consultancy/ contract research is provided	Areas of consultancy/ contract research
Suresh Pal Anjani Kumar Harbir Singh	Medium Range Weather Forecasting (NCMWRF), DST, Govt. of India, New Delhi	Impact assessment of weather forecasting
Rasheed Sulaiman V	International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad	Optimizing institutional arrangements for demand-driven post-harvest research, delivery, uptake and impact on the poor through public and private sectors partnerships
Rasheed Sulaiman V	Cirrus Management Services, Bangalore	Assessing viability of new institutional arrangements
B C Barah	NABARD, Mumbai	Occasional paper on Changing pattern of rice economy in India
P S Birthal.	Rallis India Ltd., Bangalore	Contribution of pesticides to agricultural production in India.
Ramesh Chand	OECD, France	Agrofood trade policies and measures
Suresh Pal	Wageningen University, Netherlands	Impacts of strengthened intellectual property rights regimes on the plant breeding industry in developing countries

IX. RAC, MC AND SRC MEETINGS

Research Advisory Committee (RAC)

Dr. V. Rajagopalan (Chairman)
Centre for Development and Policy Studies
18, Gandhi Street, Bhavani Nagar
Medical College Road, Thanjavur, Tamil Nadu

Dr. G. K. Chadha
Vice-Chancellor
Jawaharlal Nehru University
New Delhi

Dr. Abhijit Sen
Professor
Centre of Socio-Economic Planning
Jawaharlal Nehru University, New Delhi

Dr. G. S. Ram
Chief Economic Advisor and
Labour Employment Advisor
Ministry of Labour
Sharam Shakti Bhavan, New Delhi

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Basvaeshwara Nagar, Bangalore

Dr. Mruthyunjaya
Director
NCAP
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G.T. Road, Kanpur, Uttar Pradesh

Dr. D. K. Marothia
Dean
Department of Agriculture and
Natural Resource Economics
IGKV, Raipur, Jharkhand

Prof. Ram Pravesh Singh
167, North Anandpuri
West Boring Canal Road
Patna, Bihar

Dr. J.P. Mishra
ADG (Economics Statistics and Marketing)
ICAR, New Delhi

Dr. S. Selvarajan (Member Secretary)
Principal Scientist
NCAP, New Delhi

RAC Meeting

The major observations of the RAC meeting held on 10 and 11 June, 2004 were as follows :

- The Chairman appreciated the efforts of the Centre in doing useful research work covering important and diverse areas utilizing the limited manpower available and wished that the Centre would continue to improve its scientific performance.
- It was stressed to orient the research programmes in the context of ongoing changes in the economics policies with greater thrust on agriculture-led growth.
- NCAP should bring out policy briefs on contemporary issues.
- Policy interfacing activities of the Centre need to be strengthened. The Centre should plan for providing quick responses on policy-related issues to the Council as well as other relevant government departments and ministries.
- The members of RAC fully supported the need for high quality HRD programme for the scientists of NCAP.

- Members strongly supported the Centre's proposal to go for the revised cadre strength of 24 scientists (6 Principal Scientists, 9 Senior scientists and 9 Scientists) and the need to fill-up the vacant posts at the earliest.
- The Centre should try to optimize and prioritize linkages with NARS institutions and other departments for providing policy responses and strengthening policy research in NARS.
- Members visited the ongoing office building site and appreciated the progress of the construction work.
- NCAP should undertake quick studies to address topical issues.
- The committee noted that consultancy mode for undertaking research in the mandated areas of the Centre should continue as the stakeholders immediately use the outputs of such studies. It also contributes to the capacity building of the staff and resource mobilization efforts.
- The idea of networking and having Memorandum of Understanding (MOUs) with SAUs having strong foundation in micro-economic issues was highly appreciated by RAC. But collaboration with non-National Agricultural Research System (NARS) institutions and general universities also needs emphasis.
- NCAP should focus on training of agricultural economists in NARS and improving the quality of post-graduate education in SAUs.
- To strengthen these efforts, the Centre should also pursue its Xth Plan proposal of a higher cadre strength with ICAR.

Management Committee (MC)

Dr. Mruthyunjaya (Chairman)
Director
NCAP, Pusa, New Delhi.

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

Dr. J. P. Mishra
Assistant Director-General
(Economics, Statistics and Marketing)
Indian Council of Agricultural Research (ICAR)
Krishi Bhawan, New Delhi

Dr. V. K. Gupta
Joint Director
Indian Agricultural Statistics Research Institute
Pusa, New Delhi

Dr. S. Selvarajan
Principal Scientist
NCAP, Pusa, New Delhi.

Director
Directorate of Economics and Statistics
Delhi State Old Secretariat, Delhi.

Director of Horticulture
Govt. of Haryana
Sector 22, Panchkula
Chandigarh

Dr. Karam Singh
Professor & Head
Department of Economics and Sociology
Punjab Agricultural University
Ludhiana, Punjab

Finance & Accounts Officer
Indian Agricultural Statistics
Research Institute, New Delhi

Mr. Narander Kumar (Member Secretary)
Assistant Administrative Officer
NCAP, Pusa, New Delhi

Dr. A. Balaraman
Joint Director
NDRI, Karnal

Meeting of Management Committee

A meeting of the Management Committee was held on 15 January, 2005. The major observations of the Management Committee meetings were:

The committee appreciated the achievements made by the Centre in different research theme areas and in gaining recognition for training under Colombo Plan of the Government of India. It also approved the expenditure incurred by NCAP for 2003-04 and expenditure till December 2004. The Committee was happy to note that the construction of office building of NCAP was going on in full swing. They advised the Centre to expedite the construction of staff quarters on priority basis. They suggested NCAP to provide academic/professional leadership to SAUs for academic excellence and training in new tools and techniques of agricultural economics and policy analysis.

Staff Research Council (SRC)

Nine meetings of the SRC were held during the year. The SRC is composed of the Director, NCAP, all the Scientific staff of the Centre and the Assistant Director General (Economics, Statistics and Marketing) of ICAR. The SRC discusses the progress of the on-going research programmes and new research proposals. The Scientists and Research Associates of the Centre delivered seminars on new proposals and results of ongoing studies during these meetings. Presentations to share the experiences and the outcome of the foreign deputations were also made in the SRC meetings.

Other Committees

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

Academic Planning and Policy Committee

- To strengthen internal planning and policy direction functions.

Scientists Evaluation and Development Committee

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

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.

Publications 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 ICAR 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 suggest 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 organise Raj Bhasha 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.

PME/NATP Cell

- To plan, promote and monitor PME activities of the NATP.
- To report the progress to the NATP authorities/ Council about the progress from time to time.

Institute Joint Staff Council

Mruthyunjaya	Chairman
M S Chauhan	Secretary
Narander Kumar	Member
Mahesh Kumar	Member
Naresh Kumar	Member
Gordhan Singh	Member
M S Vashisht	Member

X. PARTICIPATION OF SCIENTISTS IN CONFERENCES, MEETINGS, WORKSHOPS, SYMPOSIA, ETC IN INDIA AND ABROAD

Name	Theme and date(s)	Place
Anjani Kumar	ADRF-IFPRI final meeting on Food Security in India, 10-11 September, 2004	The Cladriges Hotel, New Delhi
	National Workshop on Conservation and Sustainable growth of fisheries, 4-5 October, 2004	College of Arts and Commerce Zuari Nagar, Goa
	12th Annual Conference of Agricultural Economics Research Association, 2-3 November, 2004	RAU, Pusa, Bihar
	South Asia Regional Conference on Globalization of Agro-culture in South Asia : Has it made a difference to rural livelihoods, organized by International Association of Agricultural Economics, International Food Policy Research Institute, Indian Society of Agricultural Marketing, 23-25 March, 2005	CESS, Hyderabad
B C Barah	Food Security in Asia, 10-11 September, 2004	Asian Development Research Forum/IFPRI, New Delhi
	Treatise on Aromatic Rice in India, 23 April, 2004	Remote Sensing Agency, Lucknow, UP
	International Symposium on Rainfed Rice Ecosystems: Perspectives and Potential, 11-13 October, 2004	IGAU, Raipur
	International Workshop on Risk Coping Mechanism in Rainfed Rice, 10-13 January, 2005	IRRI, Manila
Harbir Singh	Conference on Biotechnology and Development: Ensuring Access, Cooperation and Capacity Building in the Asian Region, 7-8 April, 2004	RIS, New Delhi
	Seminar on Agro and Rural Industrialization: A solution towards sustainable Rural Employment, 15-16 July, 2004	FICCI, New Delhi
	International Conference on Agricultural Biotechnology: Ushering in the Second Green Revolution, 10-12 August, 2004	FICCI, New Delhi

Name	Theme and date(s)	Place
	Directors' National Workshop on Commercialization of Agricultural Technologies, 30 November - 3 December, 2004	NAARM, Hyderabad
	Workshop on Maintenance of Personnel Management System Networks in ICAR (PERMISnet), 9 March, 2005	IASRI, New Delhi
Mruthyunjaya	Workshop on Rural Development: Indexing Various Dimensions of Development at Village Level, 6 April, 2004	Yojana Bhawan
	Brainstorming Session for Phase – II of NATP, 22-23 April, 2004	NASC Auditorium
	Planning Meeting on Rice-Wheat Consortium for the Indo-Gangetic Plains, 12 May, 2004	NASC, New Delhi
	The Review Workshop on Social Science Repository Project at ICRISAT, Hyderabad 26-30 May, 2004	ICRISAT, Hyderabad
	XXII Group Meeting of All Indian Coordinated Research Project on Vegetable Crops at Acharya NG Ranga Agricultural University, Hyderabad, 30 May, 2004	ANGRAU, Hyderabad
	First Meeting of the SAARC Technical Committee on Agriculture and Rural Development (TCARD), 22-23 June, 2004	NASC, New Delhi
	SSIR-VLS Workshop, 21 July, 2004	ICRISAT, Hyderabad
	First Meeting on the Commission on Farmers Welfare, 20 September, 2004	Agriculture and Co-operation Ltd of AP
	Governing Body meeting, 3-4 October, 2004	SAIC, Dhaka
	Workshop on Research Need Assessment, 7-8 October, 2004	ICRISAT, Hyderabad
	Review Workshop of SSIR Studies under PME Project of NATP and 12th Annual Conference of AERA, 1- 4 November, 2004	RAU, Pusa, Bihar
	First National Horticulture Congress, organized by Horticultural Society of India, 9 November, 2004	NPL Auditorium, Pusa Campus, New Delhi
	Conference on Biotechnology and India's Development, 22 November, 2004	ISEC, Bangalore

Name	Theme and date(s)	Place
	Workshop on Sharing of Success and Failure under ITD component of NATP, 28 November, 2004	DOE, New Delhi
	National Workshop on Role of Information and Communication Technologies in taking Scientific Knowledge/Technologies to the End User 10 January, 2005	IARI, Auditorium
	NAAS Symposium on Emerging Issues in Water Management: Who should Own It (State, Private Sector or Community), 15 January, 2005	Jaipur
	TAC Meeting to discuss review of Agro-economic Research Centers of MOA, GOI, 25 January, 2005	Yojana Bhawan, New Delhi
	NATP workshop on Brainstorming Session to Finalize the Project Concept Note for NATP, Phase – II, 28-29 January, 2005	NASC Complex, New Delhi
	Brainstorming Session on Guidelines for Assessing Costs and the Commercial Worth of (Agricultural) Technologies, 2 February, 2005	NCAP, New Delhi
	ICAR-IFPRI Meeting on Vision for Policy Research and Capacity Strengthening in South Asia, 8 March, 2005	NASC Complex, New Delhi
M B Dastagiri	SARC Conference on Globalization of Agriculture: Has it Made any Difference in Rural Livelihood, 23-25 March, 2005	CESS, Hyderabad
P Adhiguru	IFPRI-CII-NCAER Symposium on Towards High-value Agriculture and Vertical Coordination — Implications for Agri-business and Smallholders, 7 March, 2005	National Agricultural Science Centre, Pusa, New Delhi.
	ICT for Livelihood Security: A Reality Check, One World South Asia 4th Annual Regional Meeting (ARM): Building Communities of Practice (CoP) for Achieving the Millennium Development Goals (MDGs), 3-4 March, 2005	India Habitat Centre, Lodhi Road, New Delhi
	Second meeting on Developing a Bottom up Governance Barometer for South Asia, 5 March, 2005	One World South Asia Office, Qutab Institutional Area, New Delhi
	ADRF-IFPRI Final meeting on Food Security in Asia, 10-11 September, 2004	The Claridges Hotel, New Delhi

Name	Theme and date(s)	Place
	National Workshop on Role of Information Communication Technology in Taking Scientific Knowledge/Technologies to the End Users, 10-11 January, 2005	Indian Agricultural Research Institute, New Delhi
Rajni Jain	7th annual conference of Society of Statistics, Computer and Applications, 20-24 December, 2004	Shri Venkateshwara College, New Delhi
	National Workshop on the Role of ICT in Taking Scientific Knowledge to the End Users, 10-11 January, 2004	IARI, New Delhi
	Seminar on Latest Trends in IT and Management, 30 October, 2004	Bharti Vidya Peeth's Institute of Computer Applications
Ramesh Chand	Role of State in Agricultural Prices in a Liberalized Era, in the Silver Jubilee Symposium on Governance in Development, Issues, Challenges and Strategies, 19-24 December, 2004	Institute of Rural Management, Anand
	Trade Liberalization and Food Security in South Asia, in WIDER -ICSSR Workshop on Food Security, 4-6 March, 2005	Institute for Development Studies, Jaipur
	Trade Liberalization and Its Impact on Agriculture Sector in South Asia, in the South Asia Regional Conference, organized by International Association of Agricultural Economics, IFPRI, Indian Society of Ag. Econ and Indian Society of Agricultural Marketing, 23-25 March, 2005, Hyderabad	CESS, Hyderabad
Rasheed Sulaiman V	Fourth International Crop Science Congress, 26 September-1 October, 2004	Brisbane, Australia
	National Workshop on Role of Women in Mechanized Farming, 8 January, 2005	NRC for Women in Agriculture, Bhubaneshwar
Sant Kumar	Developing Decision-making Tools for Assessment of Vulnerability to Climate Change in India, 13 May, 2004	NCAP, New Delhi
	ADRF-IFPRI Final Meeting on Food Security in India, 10-11 September, 2004	The Claridges Hotel, New Delhi
	ADB-MOF project on Policy Research Networking to Strengthen Policy Reform, 16-17 September, 2004	NCAP, New Delhi

Name	Theme and date(s)	Place
	Meeting of 43rd All India Wheat Workers, 27-30 September, 2004	IARI, New Delhi
	Improving Productivity, Quality, Post-harvest Management and Trade in Horticultural Crops, 6-9 November, 2004	IARI, New Delhi
	Role of Information, Communication Technology in Taking Scientific Knowledge to the End Users, 10-11 January, 2005	IARI, New Delhi
S Selvarajan	Second National Workshop on Developing Decision Making Tools for Assessment of Vulnerability to Climate Change in India, ICAR-UNEP Project, 13 May, 2004	NCAP, New Delhi
	ICAR-UNEP Project Steering Committee Meeting for Developing Decision Making Tools for Assessment of Vulnerability to Climate Change in India, 14 May, 2004	NCAP, New Delhi
	ICAR Short-Term training programme on Quantitative Methodology for Agricultural Policy Research, 20-29 December, 2004	NCAP, New Delhi
	National Workshop on Dams and Development 2 March, 2005	Institute of Development Studies, Jaipur, Rajasthan
Suresh Pal	Brainstorming Session for Preparation of Phase II of the National Agricultural Technology Project, 22-23 April, 2004	NASC Complex, New Delhi
	Workshop on Accelerating Impacts of RCTs, organized by the Rice-Wheat Consortium, CIMMYT, New Delhi, 12 May, 2004	CIMMYT, New Delhi
	International Conference on Agricultural Biotechnology: Ushering in the Second Green Revolution, 10-12 August, 2004	FICCI, ISAAA and MSSRF
	Workshop on Impact of IPR on Seed Industry in Developing Countries, 16-21, November 2004	The World Bank Washington, DC
	Silver Jubilee Symposium of Institute of Rural Management (Anand) on Governance in Development: Issues, Challenges and Strategies, 14-19 December, 2004	Institute of Rural Management, Anand

XI. VISITS ABROAD

Name of the Scientist	Purpose/Workshop/ Conference	Place	Duration
B C Barah	Report finalization of the project on Socio-economic Dynamics of Rainfed Rice Production Systems in India	IRRI, Manila	28 October, 2004 to 11 February, 2005
Mruthyunjaya	Expert Consultation on Post-Harvest Technology for Ensuring Food Safety and Value-addition for Enhanced Income and the Eighth General Assembly of APAARI	Bangkok, Thailand	1-3 December, 2004
	G B Meeting of SAIC	Dhaka, Bangladesh	3-4 October, 2004
P S Birthal	Annual programme meeting of the International Livestock Research Institute	Addis Ababa, Ethiopia	14-19 November, 2004
Ramesh Chand	Joint Meeting of the OECD Committee for Agriculture and Meeting of Global Forum on Agriculture	Paris, France	2-3 December, 2004
Rasheed Sulaiman V	Fourth International Crop Science Congress	Brisbane, Australia	26 September to 1 October, 2004
Suresh Pal	Workshop on Impact of IPR on Seed Industry in Developing Countries	The World Bank, Washington, DC	16-21 November, 2004

XII. WORKSHOPS/SEMINARS/TRAININGS/MEETINGS ORGANISED

First meeting of SAARC Technical Committee on Agriculture and Rural Development

The Centre organized the first meeting of SAARC Technical Committee on Agriculture and Rural Development during June 22-23, 2004. The meeting was attended by delegates from SAARC countries and SAARC secretariat. From India the meeting was attended by the Delegation nominated by Director General, ICAR and Secretary, DARE. The two days meeting was inaugurated by Dr. Mangala Rai, Secretary DARE and DG ICAR. The meeting discussed important issues relating to agriculture and rural development concerning SAARC region. Major issues deliberated in the meeting were:

a) Water resources management for agriculture in SAARC countries.
b) Establishment of SAARC quadrangle milk grid
c) Exchange of rural development volunteers in the SAARC countries.
d) Concept paper on regional food bank and
e) Workshop on role of livestock and poultry for poverty alleviation and rural development

Sensitization-cum-Training Workshop for the PME Cells in the ICAR Institutes

The Centre organized a sensitization workshop-cum-training for the newly established PME Cells in the ICAR institutes during 17-18 March 2005. The objective was to sensitize the new PME Cells about the concept and need of improved PME in the National Agricultural Research System (NARS) and introduce them with the new and improved PME methodologies. About 65 participants attended the workshop.

The lectures by resource persons covered wide range of issues in PME including conceptual and theoretical aspects of PME methodologies, macro and micro aspects of research priority setting, agro-ecoregional planning, Strategic Research and Extension Plan (SREP), a case study of priorities in the livestock sector, economic surplus approach for research prioritization, networking of social scientists, monitoring and concurrent evaluation through PIMSNET and PME in CGIAR system. Each lecture was followed by lively discussions by the workshop participants.

A Workshop on Emerging Trends in Bio-informatics at NCAP

Bio-informatics use information technology to manage and analyze information generated by life sciences. A one-day workshop on Emerging Trends in Bio-informatics was jointly organized by the Computer Society of India and National Centre for Agricultural Economics and Policy Research (NCAP) at NCAP on 6 November, 2004. Dr. Mruthyunjaya, Director, NCAP, delivered the inaugural address. He informed the group about the facilitating role of the bio-informatics workshop in enhancing the knowledge between computational biologists and computer professionals. Thirty participants from the disciplines of computer applications, statistics and bio-informatics attended the workshop.

Dr. J. R. Arora, Professor and Head (IT), New Delhi Institute of Management, G.G.S.I.P. University, pointed out that bio-informatics not only offer applications in areas like molecular medicine, microbial genomes, risk assessment, DNA forensics but also in agriculture, livestock breeding and bio-processing. Understanding plant and animal genomes will allow us to create stronger, more disease-resistant plants and animals- reducing the costs of agriculture and providing consumers with more nutritious, pesticide-free foods by using bio-pesticides, producing edible vaccines incorporating into food products. He also stressed on formation of special interest group on bio-informatics and informed the participants about availability of funds with Department of Biotechnology (Govt. of India) to support research in Bio-informatics. The key address was followed by a number of presentations. The following recommendations emerged during the deliberations.

1. Bio-informatics at molecular level and its direction to application in breeding strategy.
2. Agri-informatics for land-use planning, farmers window, early warning system, impact assessment and environmental applications.

Recommendations

- Increased interaction among scientists from the biosciences and information sciences for a better understanding of each other's strengths and requirements. Agricultural scientists in biosciences should come forward and acquaint their counterparts in information technology with their problems in information requirements and processing of biological datasets.

- Need for the formation of special interest groups in Bioinformatics was stressed, which could help in identifying the resource personnel, organize seminars and workshops to identify research issues and create awareness. A special interest group was formulated with members from NCAP, CSI, NRCPB, IASRI and USI.
- Post-graduate and PhD level courses in bio-informatics have to be designed and developed for inclusion in the syllabus of agricultural students. This would be strengthening the human resource of the country and would benefit in the long-run.
- Assessment of human resource development needs, particularly for the scientists and the research managers should be done on priority basis.
- Detailed project reports and documentation of the existing bio-informatics projects and funding departments should be made available on ICAR website to increase awareness among the agricultural scientists and to strengthen the budding bio-informatics scientists.

Workshop on Assessing Costs and Commercial Worth of Agricultural Technologies

Decisions about research investments, mergers and acquisitions, etc. are increasingly being led by valuation of intellectual assets of organizations. At the same time, the legal framework of IPRs too has been in a state of dynamic change to accommodate the developments resulting from convergence of technologies, their commercialization and sharing of profits from the commercialized products. Therefore, optimum value realization from IP portfolio demands innovation in the IPR management process. This requires a well-structured technology policy and clear guidelines on commercialization of technologies, especially in the agriculture sector. In this context, a one-day brainstorming session on 'Guidelines for Assessing Costs and the Commercial Worth of (Agricultural) Technologies' was organized. A select group of experts of multi-disciplinary areas, both from public and private institutions participated in it. Dr. S. Ayyappan, Deputy Director General (Fisheries), ICAR chaired the session. Welcoming the NCAP initiative as a major step in commercialization of technologies, he emphasized the need for detailed discussions on the subject and concerted efforts for systematizing the mechanisms and processes of commercialization of research products. The distinguished panelists presented their views on the issues highlighted in the base paper which was presented by Dr. Mruthyunjaya. These issues covering a broader spectrum were discussed in detail in the open session. The salient points of the discussions are summarized below.

To begin with, the methodology for determining economic worth of technology for trading should take into account not only the costs involved in technology development but other factors also. For example, costing of externalities (even on a limited scale), research maintenance, servicing of technology, basic research (which provides input for technology development) and IP filing should be considered. Judgments of scientists and science administrators are crucial in deciding these parametric values. Development costs plus some profit margin may form the initial base (lowest limit) for pricing of technology. But the net present value (NPV) would yield the optimum returns. The pricing may be done differently for exogenously-sponsored and endogenously- developed technologies. Sometimes, pricing may be done for a cluster of technologies (e.g., hybrids, biofertilizers, machinery, etc.) with a provision for different methodologies for different clusters. Prioritization of technologies should be done keeping in view the market demand, scarcity of resources and scale neutrality of technology. Market assessment surveys would be crucial for forecasting demand for technologies. It may be noted that

commercialization also leads to extension of technologies to the end-users which is also one of the objectives of public research system.

There is a need to strengthen our capacity to negotiate with the prospective technology buyers. A small group of (2-3) people in each institute should be trained in negotiation skills. The group should also be trained in asset evaluation. This capacity is presently lacking in the Council. Till acquiring such skills, Institutes may be permitted to outsource this service. Business development cells/ committees at the Institute level may be formed and provided with some discretionary powers within the broad guidelines. The salient components of an IPR policy may consist of the following:

a. Classify all the technologies of the ICAR system

b. Prioritize them from the point of view of scope for commercialization

c. Technologies catering specifically to social good may be excluded from the ambit of commercialization.

d. There can be no rigid formula for pricing. Decision-making process at the unit (institute) needs to be strengthened, and

e. Sharing of research resources (e.g. germplasm) needs to be ensured under proper material transfer agreement (MTA) covering all the aspects of utilization of the given research resource.

Developing Decision Making Tools for Assessment of Vulnerability to Climate Change in India

The Centre is implementing ICAR-UNEP project on Developing Decision Making tools for assessment of vulnerability to climate change in India. The second National Workshop of this project was held on 13 May, 2004 in which the multi-disciplinary study team members consisting of ten scientists from the NARS along with National Expert Team members in the field of agriculture, natural resources, livestock and agricultural meteorology and professional experts participated. During the one day deliberations, progress of the project was presented in two technical sessions. An overview of the Resilience of Orissa Agriculture and the results of field studies conducted through focus group discussions; thematic studies; institutional analysis; and sector analysis in the focused project areas representing vulnerable and control villages/gram panchayats/blocks/districts were presented. Based on the discussions the workshop recommended several follow-up actions for the National Study Team. These included; projecting the representativeness of the selected study area; capturing watershed -related interventions; focusing more on the linkages between agriculture and rural livelihood options; assessing the impacts of alternate livelihood options; and strengthening the sector and thematic analyses to ensure the convergence of project activities towards the project goals.

Steering Committee Meeting for ICAR-UNEP Project on Developing Decision Making Tools for Assessment of Vulnerability to Climate Change in India

The Steering Committee constituted for this project met on 14 May, 2004 to review the project work. The progress of the project and the recommendations of the Second National Workshop were presented by the National Coordinator of the project to the members of the Steering Committee. While appreciating the project goals, activities and progress achieved so far the members recommended the following actions:

- The project being a new initiative in the area of assessing vulnerability status and its dynamics, the framework may be of developing and testing a prototype methodology for its wider application, with evaluation of its robustness and validity before actual use.

- For effective capacity building within the National Study Team, it is strongly recommended that methodology training programme needs to be organized by the Stockholm Environment Institute in India, which is a partner in the implementation of this project and possesses the needed expertise in up-scaling the findings of the project to regional and country level assessments.

Quantitative Methodology for Agricultural Policy Research

One of the mandates of NCAP is to strengthen the social science capacity in NARS in conducting policy research and teaching in the new emerging areas. Under this mandate, an advanced training programme was organized during 20 to 29 December, 2004 at NCAP, covering empirical analysis with practical applications of quantitative methodology in agricultural economics and policy research. A total of 25 Agricultural Economists from Indian NARS and Nepal Agricultural Research Council participated in this training programme.

The training module for this programme was designed to enhance the skill and understanding about various concepts, methods, tools and techniques, which are widely used in agricultural economics and policy research. The programme was started with an orientation lecture about the evolution of Priority Setting, Monitoring and Evaluation in the Indian NARS. During the main programme, comprehensive coverage of important topics with theoretical background, empirical modeling, illustrative real world applications and hands on experiences in practical applications were provided. The topics covered included latest analytical approaches like scenario analysis for natural resource management, economic surplus approach, policy matrix analysis, demand-supply analysis, agricultural marketing research, macro level research prioritization, IPM impact assessment and vulnerability assessment to climate induced natural disasters.

Rural Innovations with Special Emphasis on Post Harvest Sector

This programme was organised by NCAP in collaboration with the Centre for Research on Innovations and Science Policy (CRISP), Hyderabad; National Institute for Science Technology and Development Studies (NISTADS), New Delhi; and International Livestock Research Institute, South Asia Region, Hyderabad during 22-29 November 2004 at ICRISAT, Hyderabad.

The programme had two main components as described below:

(a) *Concepts and Principles* (3 days): This component had an interactive approach whereby key concepts and principles were introduced through case studies and group discussions followed by conceptual sessions. The main thrust of these sessions was on explaining the importance of institutional arrangements, partnerships and learning and bringing together analytical approaches and tools used in the innovation systems framework.

(b) Case Studies as Diagnostic Tools (5 days): This component of the programme focussed on the application of this approach. These sessions concentrated on the use of case studies as a diagnostic

tool for defining more effective innovation arrangements. It included sessions on constructing a case study, involving a classroom case study exercise. For the classroom case study, candidates presented an intervention which their organisation is currently tackling. It also included a live case study exercise whereby small groups of candidates visited five organisations in and around Hyderabad. Each group developed a case study on the innovation system around that organisation and it was presented back to the rest of the course for discussion. Twenty participants representing various organisations attended this workshop.

Market Skills on Rural Value-added Products

This programme was organised by NCAP at CPCRI, Kasaragod on 27-28 October, 2004 in collaboration with Central Plantation Crops Research Institute, Kasaragode; Technology Informatics Design Endeavour (TIDE), Bangalore; State Poverty Eradication Mission, Kerala (Kudumbasree); and Institute of Small Enterprise Development, (ISED), Kochi.

The idea was to use this workshop as a platform for developing partnerships (mainly between CPCRI, TIDE and Kudumabsree) and also strengthen the capacity of different individuals and organizations involved in marketing of rural value-added products. More specifically, it focused on capacity strengthening of the Krishi Vigyan Kendra (KVK-CPCRI) with skills for marketing of rural value added products. This workshop focussed on experience sharing and learning about marketing and entrepreneurship development. As facilitators of rural entrepreneurship in Kerala, both TIDE, Kudumbasree and ISED have hands-on experience with exploring rural markets and finding new markets for products produced by their trained rural women entrepreneurs. For TIDE in particular, and also for ISED, this turned out to be an opportunity for joining hands with an organization like CPCRI, which has rich scientific skills for technology development. Groups of women entrepreneurs also presented their perceptions and experiences on post-harvest technology development, transfer and utilization, as well as processes that enabled them to successfully market these value-added products. The participants included CPCRI scientists and KVK faculty, Kudumbasree officers, and rural women entrepreneurs.

XIV. LECTURES DELIVERED BY NCAP SCIENTISTS

Speaker	Title and Date	Venue
Anjani Kumar	Fishery Sector in India: Status, Issues and Challenges, Planning and Management of Agribusiness in India 21 June –11 July, 2004.	College of Agribusiness Management, GBPUAT, Pantnagar, Uttaranchal
	Cost of Production of Freshwater Aquaculture and Shrimp, Sampling Techniques, Sample Surveys and Methodological Aspects Relating to Cost of Cultivation Studies for senior officers of Tariff Commission 16-21 August, 2004	Sample Survey Division, IASRI, New Delhi
	Fisheries and Aquaculture Sector Analysis, Quantitative Methodology for Agricultural Policy Research, for the participants from Sri Lanka/Nepal/India 15 - 24 September, 2004	NCAP, New Delhi
	Technological Change in Livestock Sector in India, Measurement of Technological Change in Indian Agriculture 7 December, 2004	Division of Agricultural Economics, IARI, New Delhi
Harbir Singh	IPRs Protection in NARS — The Case of Copyrights and Valuation of ICAR Technologies' 25 September, 2004	NCAP, New Delhi
Mruthyunjaya	Indian Agricultural Contributions : Constraints and Opportunities. 22 September, 2004	Arthshastra, Economics Society,
	National Training Course on IPM in Important Field Crops, Inaugural Address at the Training Course. 24 September, 2004	University of Delhi NCIPM, New Delhi
	Economic Analysis of Cropping Systems Research : Experimental Results. 18 October, 2004	PDCSR, Modipuram, Meerut
	Role of QT in Policy Research ICAR Training Programme. 7 December, 2004	IARI, New Delhi
	NARS in India : Agenda for the Future ICAR Short-course 20 December , 2004	NCAP, New Delhi
	PME in Retrospect and Prospect : ICAR Short-course 23 December , 2004	NCAP, New Delhi

Speaker	Title and Date	Venue
P Adhiguru	Can ICT Transform the Sustainable Agriculture Production Scenario and Bridge the Divide and the Inequalities among Groups?, 10 January, 2005	IARI, New Delhi
P S Birthal	Costing Livestock Production. Lecture delivered to the participants of a training programme on Sampling Techniques, Sample Surveys and Methodological Aspects relating to Cost of Cultivation Studies 16-21 August, 2004	IASRI, New Delhi
	Sustainable Livestock Production in India. 10 December, 2004.	NDRI, Karnal
	Priorities for Livestock Research under Colombo Plan Economics of Integrated Pest Management under Colombo Plan	NCAP, New Delhi NCAP, New Delhi
Ramesh Chand	Liberalization and Food Security, in the training programme for NABARD Officers 10 March, 2005.	Institute of Economic Growth, Delhi
	Indian Agriculture and Multilateral Negotiations, to French Leaders of Big Farm Associations, Agricultural Cooperatives and Agro Food Firms, 10 March, 2005.	Club DEMETER Paris and HIPA Gurgaon, New Delhi
	Challenges in Indian Agriculture and Their Implications for North-West India, during the National Seminar on Future of Rural Development in North West India 24-25 February, 2005	Department of Sociology, Panjab University, Chandigarh
Rasheed Sulaiman V	Innovation Systems and Agricultural Development, during the UGC Orientation Course on Science and Economics for University Teachers, 14 December, 2004	Jawaharlal Nehru University, New Delhi
	Innovation Systems — Applying the Systems Concept to Agricultural Innovation, NCAP training programme on Quantitative Techniques for Agricultural Policy Research, 21 December, 2004	NCAP, New Delhi
	Case Study of Lac at, Capacity Development Workshop on Rural Innovations, 22 November, 2004	ICRISAT, Patancheru.

Speaker	Title and Date	Venue
	Agricultural Research and Extension at Capacity Development Workshop on Rural Innovations, 23 November, 2004	ICRISAT, Patancheru.
Suresh Pal	Indian Seed Industry: Opportunities and Challenges 29 June, 2004.	College of Agri-business Management, GB Pant University Pantnagar, Uttaranchal
	Agricultural Biotechnology in Developing Countries 9 October, 2004	National Research Centre for Plant Biotechnology, IARI, New Delhi
	Economic Evaluation of Agricultural Technologies 18 October, 2004	PDCSR, Modipuram,
	Assessment of Performance of Seed Industry 7 December, 2004.	Division of Agricultural Economics, IARI, New Delhi,
	Investment and Returns in Agricultural Research 16 December, 2004.	Division of Agricultural Extension, IARI, New Delhi
	Research Planning and Technology Management in an Era of Globalization 27 December, 2004	National Research Centre for Rapeseed & Mustard, Bharatpur

XIV. DISTINGUISHED VISITORS TO NCAP

Samar K. Datta, Professor, Centre for Management in Agriculture (CMA), Indian Institute of Management, Vastrapur, Ahmedabad – 380 015

Sivramiah (Shanthu) Shantharam, Biologistics International, 9800 Old Willow Way, Ellicott City, MD 21042, USA

Suresh Prasad, Agricultural Economist, Economic Research Service, U.S. Department of Agriculture (USDA), 1800 M Street, N.W., Room 5142, Washington, DC 20036-5831, USA

Wais Kabir, Chief Scientific Officer, Bangladesh Agricultural Research Council (BARC), Farmgate, Dhaka-1215, Bangladesh

William (Bill) Thorpe, Regional Representative, Asia, International Livestock Research Institute, (ILRI), C/o ICRISAT, 1st Floor, CG Centre Block, National Agriculture Science Centre, DPS Marg, New Delhi – 110 012

Michael Ryan, Economist, Division of Non-Member Economies, Directorate of Agriculture and Fisheries, OECD, Paris, France

Koichi Fujita, Centre for South and South East Asia, Kyoto University, Kyoto, Japan

N.P. Louwaars, Senior Biopolicies Specialist, Centre for Genetic Resources, Wageningen University, Netherlands.

XV. NCAP PERSONNEL AND THEIR AREA OF SPECIALIZATION

Scientific

Name	Designation	Area of Specialization
Mruthyunjaya	Director (till 29th March 2005)	Technology Policy, Institutional Change
Ramesh Chand	Acting Director	Market and Trade, Agriculture Growth and Modeling
Dayanatha Jha	National Professor (Till 9th March 2005)	Technology Policy
P K Joshi	Principal Scientist (on deputation to IFPRI)	Technology Policy, Sustainable Agricultural Systems
S Selvarajan	Principal Scientist	Sustainable Agricultural Systems, Institutional Change
B C Barah	Principal Scientist	Agricultural Growth and Modeling, Sustainable Agricultural Systems
Suresh Pal	Principal Scientist	Technology Policy, Institutional Change
P S Birthal	National Fellow	Technology Policy Agricultural Growth and Modeling
Rasheed Sulaiman V	Sr. Scientist	Institutional Change, Technology Policy
Aldas Janaiah	Scientist (Sr. Scale)	Technology Policy, Agricultural Growth and Modeling
P Adhiguru	Scientist (Sr. Scale)	Technology Policy, Institutional Change
B C Roy	Scientist (Sr. Scale) (Till 18th Sept 2004)	Sustainable Agricultural Systems, Institutional Change
Anjani Kumar	Scientist (Sr. Scale)	Technology Policy, Market and Trade
S K Pandey	Scientist (Sr. Scale)	Technology Policy
Harbir Singh	Scientist (Sr. Scale)	Technology Policy, Institutional Change
M B Dastagiri	Scientist (Sr. Scale)	Market and Trade, Institutional Change
P A Lakshmi Prasanna	Scientist (on study leave)	Institutional Change
Rajni Jain	Scientist	Technology Policy

Administrative

Name	Designation
Narander Kumar	Assistant Administrative Officer
Naresh Arora	Assistant Finance & Accounts Officer
M S Vashisht	Assistant
Umeeta Ahuja	Stenographer
Seema Khatter	Junior Stenographer
S K Yadav	Upper Division Clerk
Inderjeet Sachdeva	Lower Division Clerk
Sanjay Kumar	Lower Division Clerk

Technical

Prem Narayan	T-6
Khyali Ram Chaudhary	T-5
Mangal Singh Chauhan	T-5
Sonia Chauhan	T-5
Satender Singh Kataria	T-2

Supporting

Mahesh Kumar	S.S.Gr II
Mahesh Pal	S.S.Gr I

XVI. TRAININGS ATTENDED BY NCAP STAFF

Scientific (Scientists)

Name of the official	Theme	Duration	Place of Training
Adhiguru P	A Training Course on Motivation and Empowerment for Professional Excellence among Agricultural Scientists	4–24 March, 2005	Centre of Advanced Studies, Division of Agricultural Extension, Indian Agricultural Research Institute, New Delhi-110 012
Adhiguru P	Program on Information Technology for Effective Management Realizing Business Value from IT	11-15 October, 2004	Administrative Staff College of India (ASCI), Hyderabad

Administrative

Name of the official	Theme	Duration	Place of Training
M S Chauhan	Hindi Training Workshop	25-27 April, 2004	Shimla, Himachal Pradesh
Sonia Chauhan	Hindi Training Workshop	3-5 November, 2004	Ooty, Tamil Nadu
Umeeta Ahuja	Hindi Training Workshop	3-5 November, 2004	Ooty, Tamil Nadu

XVII. PROMOTION OF OFFICIAL LANGUAGE

To promote the use of Hindi in the Centre, competitions were organized for poem recitation, essay writing, and debate. The participation in this activity was overwhelming. Dr. R. C. Gautam, Joint Director, IARI, was the Chief Guest. Dr. V.K. Gupta, Joint Director, IASRI and Dr. R. P. Singh, Lucknow served as the judges for the events. The prizes were distributed to the winners. The details of the events and prize winners are as follows :

S. No.	Items	Prize winners
1.	Essay	Khyali Ram Chaudhary A. K. Jha
2.	Poem	Sonia Chauhan Sushil Kumar Yadav
3.	Debate	Sonia Chauhan Sushil Kumar Yadav

A motivational lecture to increase the use of Hindi in research and administration was delivered by Dr Devendra Tyagi, Former Head, Department of Hindi, Delhi University on 3rd July 2004 at the Centre. Shri M S Chauhan participated in the Hindi Training Workshop held during 25-27 April, 2004 in Shimla. Mrs. Sonia Chauhan and Mrs. Umeeta Ahuja participation in 7th Hindi Sammelan and Workshop in Ooty, Tamil Nadu during 3-5th November, 2004.

XVIII. PARTICIPATION IN ICAR SPORTS COMPETITION

NCAP team comprising, Narander Kumar, M S Vashisht, Prem Narayan, Khyali Ram Chaudhary, M S Chauhan, Sonia Chauhan, Seema Khattar, Satender Singh Kataria, Inderjeet Sachdeva, Sanjay Kumar and Mahesh Kumar participated in ICAR Zonal Tournament at I.A.R.I, Pusa, New Delhi during 15-18 December, 2004.

XIX. INFRASTRUCTURAL DEVELOPMENT

The Centre got approval for construction of office building and staff quarters in the IX Plan and the first instalment, of Rs 1.23 crore for this work was deposited with CPWD in the year 2000-01. Construction work of the office building is going on in full swing. The office is expected to be shifted in the new building by December 2005. However, the construction of quarters would be started only after getting the Master Plan of Pusa campus approved from civic authorities. Efforts are being made to get this approval.

NCAP Website

The website of NCAP, available at http://www.ncap.res.in has been redesigned and updated to provide the latest information about the Centre, particularly on research activities, research projects, publications, staff, infrastructure, linkages with two NATP-Mission Mode Projects, PME and INARIS. Some new features have been included like information about employment, tender and events; national and international links; feedback form; photo gallery; and site map of the website. The News section would provide relevant details about employment opportunities, latest tender information and recent or forthcoming events. The website also has facilities to accept feedback comments. The Centre's publications namely annual reports, policy papers, policy briefs, workshop proceedings, PME notes, etc. are now available in corresponding downloadable PDF files. The website is being updated regularly.

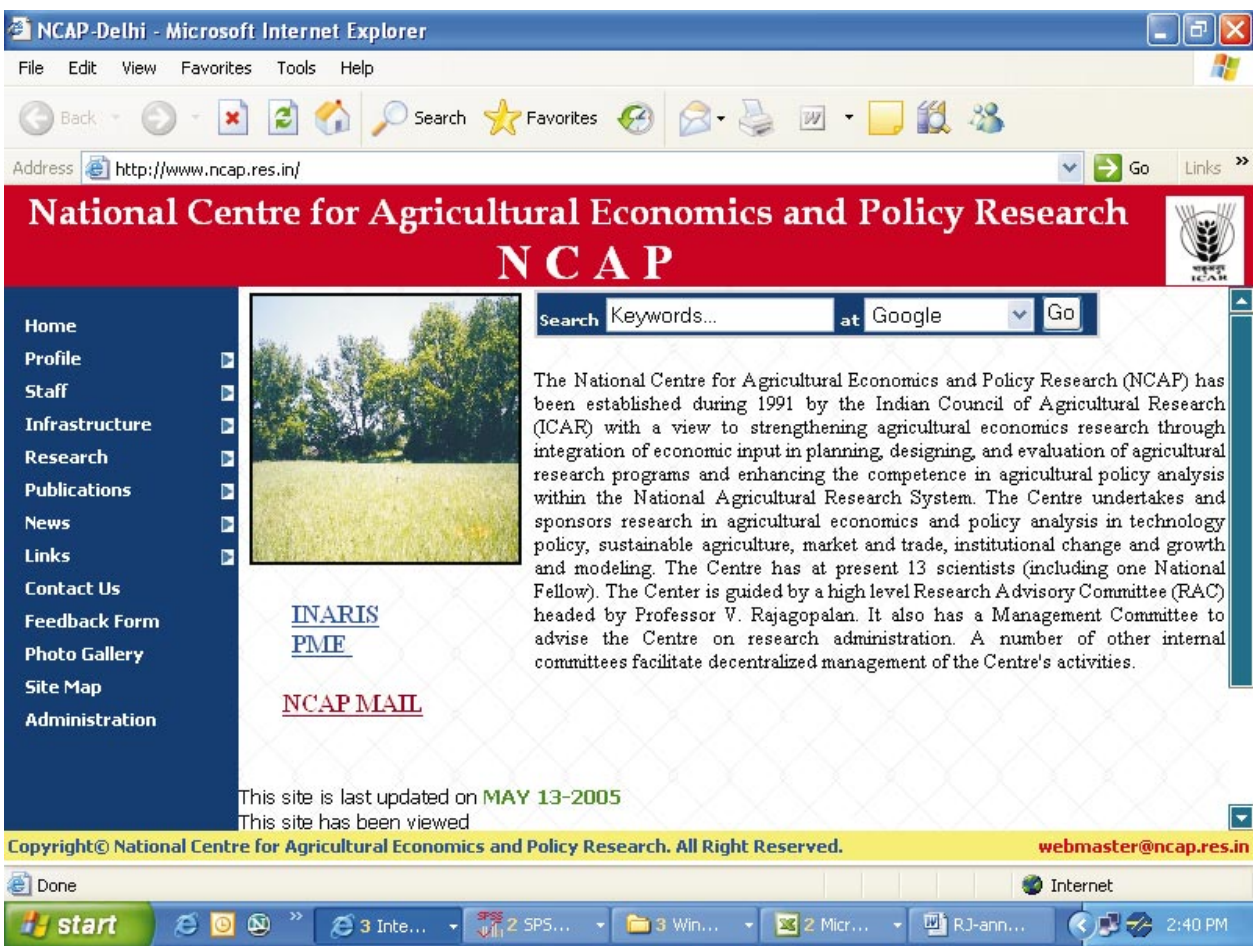

Figure 7. A glimpse of NCAP website

The Website for Networking of Social Scientists

The website for Networking of Social Scientists has been facilitating research information exchange, resource sharing and optimization of the response time for addressing methodology- related problems. The website *http://www.agrieconet.nic.in* is hosted through NIC web servers and is being updated on annual basis since December 2000. Beside details about the departments of agricultural economics of 29 ICAR institutes and 27 SAUs, the site provides research-oriented data of around 530 projects, 660 publications, 580 scientists, 650 courses and 1000 theses. The data is classified under 12 theme areas for each category. This year, the focus is on the issues regarding data management system and future updating. The Centre is following centralized approach for data updation and management for safety reasons.

ARIS

The ARIS at the Centre is equipped with 128 KBPS Leased Line from ERNET to cater to the Email and Internet requirement of researchers and administration. To utilize the full potential of ERNET, the Centre has got its independent mail server configured. To handle this additional facility effectively, the Centre designed complete security planning that addresses security at all layers to help in creating a more reliable and safe network. The essential components of the network include a gateway for Internet services, file server for file sharing, email server for communication and database server for management of data, desktops and laptops. To build complete computer security many systems were added to face multiple threats of various types.

A centralized antivirus system has been designed and implemented in the network of the Centre with the help of a newly installed anti-virus server system. Any system which is on the network is examined for latest version of the anti-virus software to safeguard the individual machine as well as the network. Secondly, hardware firewalls have been included in the network as a first line of defence. The firewalls have been integrated with Intrusion Detection System (IDS) and Prevention System (IPS). These firewalls would provide gateway level virus protection and web content filtering features.

(Rajni Jain)

विशिष्ट सारांश
वार्षिक प्रतिवेदन : 2004–05

राष्ट्रीय कृषि आर्थिकी एवम् नीति अनुसंधान केन्द्र की स्थापना वर्ष 1991 में भारतीय कृषि अनुसंधान परिषद् द्वारा कृषि नीतियों से संबंधित अनुसंधान को समृद्ध करने हेतु की गई। केन्द्र की अनिवार्यताओं में नीतिगत शोध के साथ कृषि अर्थशास्त्र से संबंधित शोध एवं प्रशिक्षण को मजबूती प्रदान करना और नीतिगत संवादों में परिषद् की भागीदारी को बढ़ाना है। वर्तमान में केन्द्र में कुल 17 वैज्ञानिक कार्यरत हैं; जिनमें एक राष्ट्रीय प्राध्यापक, एक राष्ट्रीय अध्येता तथा एक प्रधान वैज्ञानिक, जो कि अन्तर्राष्ट्रीय खाद्य नीति अनुसंधान संस्थान में प्रतिनियुक्ति पर हैं, शामिल हैं। केन्द्र का वर्ष 2004–05 का बजट परिव्यय 381.66 लाख रूपये था जो कि प्रमुख रूप से परिषद् (307.75 लाख रूपये) से प्राप्त हुआ।

केन्द्र में शोध कार्यो का निर्धारण एक उच्च स्तरीय अनुसंधान सलाहकार समिति (आर.ए.सी.) करती है जिसके अध्यक्ष प्रसिद्ध कृषि अर्थशास्त्री प्रोफेसर एस. राजगोपालन् हैं। समिति के अन्य सदस्य डा. जी.के. चड्ढ़ा (भूतपूर्व कुलपति, जवाहरलाल नेहरू विश्वविद्यालय), प्रोफेसर अभिजीत सेन (सदस्य, योजना आयोग, भारत सरकार), डा. जी.एस. राम (पूर्व प्रमुख आर्थिक सलाहकार, श्रम मंत्रालय), डा. आई. जे. सिंह (भूतपूर्व संकाय प्रमुख, चौ. चरण सिंह हरियाणा कृषि विश्वविद्यालय), डा. दिनेश के. मारोठिया (प्रोफेसर एवं अध्यक्ष, कृषि एवं प्राकृतिक संसाधन अर्थशास्त्र विभाग, इन्दिरा गाँधी कृषि विश्वविद्यालय), डा. जे.पी. मिश्र (सहायक महानिदेशक, भारतीय कृषि अनुसंधान परिषद्), एवं डा. मृत्युजंय, (केन्द्र निदेशक, वर्तमान में राष्ट्रीय निदेशक, एन.ए.आई.पी.) हैं। कृषक प्रतिनिधि के रूप में दो अन्य सदस्य श्री डी.एस. अनंत तथा प्रोफेसर राम प्रवेश सिंह, अनुसंधान सलाहकार समिति के सदस्य हैं। केन्द्र के कार्यो का निर्धारण परिषद् द्वारा गठित 'प्रबंध समिति' करती है जिसके अध्यक्ष केन्द्र के निदेशक हैं। केन्द्र के विकेन्द्रीकृत प्रशासन प्रबंधन हेतु कई आंतरिक समितियाँ भी कार्यरत हैं।

केन्द्र ने वर्ष 2004–05 के दौरान 25 परियोजनाओं (अधिकांशतः बाह्य वित्त पोषित) एवं सात परामर्शदायी परियोजनाओं पर कार्य किया। वर्ष के दौरान केन्द्र ने देश एवं विदेशों में विभिन्न संस्थाओं के साथ संबंध कायम् किये एवं इसे बढ़ाया भी। वर्ष 2004–05 की अवधि में केन्द्र ने महत्वपूर्ण विषयों जैसे जैवमिति, कृषि तकनीकों के व्यवसायीकरण की लागत निर्धारण, नीतिगत कृषि शोध में गणितीय प्रणालियाँ एवं ग्रामीण विकास आदि पर अनेक कार्यशालाओं, प्रशिक्षणों, बैठकों का आयोजन किया।

केन्द्र ने इस वर्ष भी कृषि अर्थशास्त्र एवं नीतिगत शोध में उत्कृष्ट कार्य एवं सराहनीय प्रयास किये हैं। केन्द्र में शोध कार्य मुख्यतया पाँच क्षेत्रों– तकनीकी नीति, टिकाऊ कृषि प्रणाली, विपणन एवं व्यापार, संस्थागत बदलाव और कृषि वृद्धि एवं मॉडलीकरण, में वरिष्ठ स्तर के वैज्ञानिकों की देख–रेख में किये जाते हैं। वर्ष के दौरान केन्द्र की प्रमुख शोध उपलब्धियाँ एवं जारी शोध कार्य का सारांश निम्नलिखित है :

कृषि अनुसंधान एवं विकास, बीज क्षेत्र, बौद्धिक सम्पदा अधिकार, संसाधनों की उपयोग क्षमता तथा कृषि विविधीकरण एवं खाद्य सुरक्षा संबंधी मुद्दे तकनीकी नीति शोध क्षेत्र के प्रमुख बिन्दु रहे।

- भारतीय बीज उद्योग में निजीकरण का प्रचलन बढ़ रहा है। अधिकतर किसान बीजों को गुणवत्ता के आधार पर व्यावसायिक स्रोतों से खरीद रहे हैं। अध्ययन से स्पष्ट होता है कि वर्तमान समय में बीज क्षेत्र में विक्रय इकाईयों एवं अनुसंधान संस्थानों के बीच सहभागिता और अनुबंध आधारित पद्धतियाँ विकसित हो रही हैं।

- कृषि क्षेत्र में अल्प मजदूर ग्राह्यता को देखते हुए गरीबी–उन्मूलन हेतु यह आवश्यक है कि गैर कृषि क्षेत्रों में ग्रामीण स्तर पर रोजगार के अवसर पैदा किये जाये। पशुपालन, बागवानी एवं मत्स्यकी जैसे क्षेत्रों का विकास और कृषि प्रसंस्करण पर अधिक जोर प्रत्यक्ष रोजगार के अवसर पैदा करने में सहायक होगा। इसके अतिरिक्त, ग्रामीण क्षेत्रों में गरीबों के सशक्तीकरण; विशेषकर महिलाओं के शिक्षा स्तर में बढ़ोत्तरी के साथ–साथ ऋण एवं आधुनिक तकनीकों की पहुँच सुनिश्चित करने के प्रयास किए जाने चाहिए।

- भारतीय कृषि अनुसंधान एवं विकास में अभी भी सार्वजनिक क्षेत्र का वर्चस्व कायम् है तथा इसमें निजी क्षेत्र की भागीदारी तीव्र गति से बढ़ रही है। अध्ययन से स्पष्ट होता है कि कृषि शोध एवं विकास में सार्वजनिक एवं निजी क्षेत्रों की सहभागिता एक–दूसरे के लिए लाभदायक हो सकती हैं। दोनों ही क्षेत्रों को अनुभवों से सीख लेकर परस्पर निष्ठा एवं विश्वास कायम् करना चाहिए। विषेशतः सार्वजनिक क्षेत्र को तकनीकों के आदान–प्रदान में नेतृत्व करना चाहिए एवं जहाँ भी आवश्यक हो आधारीय स्तर पर तकनीकी अनुकूलन के लिए क्षमता विकसित करना चाहिए।

- राष्ट्रीय कृषि अनुसंधान तंत्र (NARS) में कृषि अनुसंधान के लिए संसाधनों के वितरण का विश्लेषण दर्शाता है कि 95 प्रतिशत वैज्ञानिक सार्वजनिक क्षेत्र में कार्यरत हैं जिनमें से 56 प्रतिशत वैज्ञानिक राज्य कृषि विश्वविद्यालयों में हैं। विश्लेषण दर्शाता है कि भारतीय कृषि अनुसंधान परिषद् के वैज्ञानिक दूसरी संस्थाओं के कृषि वैज्ञानिकों की अपेक्षा शोध कार्यो पर अधिक समय देते हैं। अध्ययन से पता चलता है कि कृषि शोध कार्यो में अभी भी देश में खाद्यान्न फसलों पर अधिक ध्यान दिया जाता है। हालाँकि, पिछले दशक में परिषद् ने पशुपालन और मत्स्य–उत्पादन से संबंधित शोध कार्यो पर अधिक बल दिया है। निजी क्षेत्र, पशुपालन और मत्स्यकी के क्षेत्रों में शोध कार्यो पर बहुत कम ध्यान देते हैं। यह अध्ययन कार्यक्षमता, समानता, स्थिरता, व्यापार एवं मूल्य–संवर्द्धन के आधार पर संसाधनों के आबंटन तथा पुनर्समायोजन की सलाह देता है। इस तरह के विश्लेषण, सूचना आधार को सुदृढ़ करने एवं निर्णय लेने की क्षमता को बढ़ाने में सहायक हो सकते हैं।

- भारत में तिलहन उत्पादन से संबंधित अध्ययन दर्शाता है कि तकनीकी कार्यक्षमता का पूर्ण दोहन कर उत्पादन में 25 से 40 प्रतिशत वृद्धि की जा सकती है। प्रसंस्करण स्तर पर भी कार्य क्षमता में औसतन 20 से 30 प्रतिशत तक की कमी पाई गई। सही समय पर उत्तम बीजों की उपलब्धता, कृषकों के ज्ञान स्तर में सुधार, तकनीकी ज्ञान का अंगीकरण तथा उत्पादन की तकनीकी दक्षता में सुधार आवश्यक हैं। प्रसंस्करण–स्तर पर भी कार्य क्षमता में सुधार के लिए बीज से तेल निकालने की मशीन में सुधार के साथ–साथ, कच्चे माल की निरंतर आपूर्ति के लिए अनुबंध आधारित संस्थागत बदलाव आवश्यक हैं।

- आदिवासी, पिछड़े एवं पर्वतीय क्षेत्रों में तकनीकी हस्तक्षेप एवं फसल–विविधीकरण से खाद्य पदार्थो के उपभोग में सुधार आया है एवं वास्तविक तथा अनुशंसित खाद्य पदार्थो के उपभोग के अन्तर में

कमी हुई है। साथ ही में इससे आमदनी में वृद्धि एवं अतिरिक्त रोजगार पैदा करने में मदद मिली है।

- भारत में पशुपालन क्रमशः सघन हो रहा है। सघन पशुपालन छोटे किसानों की आय बढ़ाने में विशेष रूप से सहायक होने के साथ शहरी क्षेत्रों में कुछ सीमा तक पर्यावरणीय प्रदूषण एवं नागरिक सुविधाओं पर ऋणात्मक प्रभाव डाल रहा है। वर्तमान समय में पशुओं की कम उत्पादकता, प्राकृतिक संसाधनों पर कम दबाब के साथ उत्पादकता आधारित विकास के उच्च लक्ष्य की ओर इशारा करते हैं। भविष्य में इस क्षेत्र में विकास, उत्पादकता वृद्धि पर आधारित होना चाहिए, न कि पशुओं की सख्या के आधार पर।

- कृषि में अधिक आय प्रदान करने वाले उद्योग एक महत्त्वपूर्ण वृद्धि के स्रोत्र के रूप में उभर कर सामने आ रहे हैं और ऐसी सम्भावना है कि ये कृषि क्षेत्रों में समानता बढ़ानें में सहायक होंगे क्योंकि, छोटे किसानों में कृषि विविधीकरण को अपनाने की प्रवृति कहीं अधिक पाई गई है। परन्तु इसका समुचित प्रभाव, उचित तकनीकों, आवश्यक बुनियादी ढ़ाँचे एवं नीतिगत सहायता की कमी के कारण प्रभावित हो रहा है। 'अधिक आय प्रदान करने वाली' कृषि जिन्सों के अधिक उत्पादन से बाजार में जोखिम की स्थिति पैदा हो जाती है जिससे इनके उत्पादकों को संरक्षण प्रदान करने की आवश्यकता होती है। ऐसी स्थिति से बचने के लिए तकनीकों में सुधार, गुणवत्ता पूर्ण उत्पादन कारक, सही लागत, बीमा–तंत्र एवं वित्तीय संसाधनों की भागीदारी अधिक आवश्यक हैं जो कि अभी बहुत ही कमजोर है तथा उत्पादकों, विशेष रूप से छोटी जोत के किसानों, को आसानी से उपलब्ध नहीं हैं।

- झींगा तथा ताजा पानी की मछलियों के उत्पादन की तकनीकी क्षमता के अध्ययन से ज्ञात होता है कि उत्पादन कारकों के वर्तमान स्तर पर उचित तकनीक के प्रयोग से मछली उत्पादन को बढ़ाने की काफी संभावनाएं हैं। विभिन्न मत्स्य उत्पादकों की तकनीकी दक्षता स्तर में काफी अंतर है, साथ ही विभिन्न राज्यों में भी उत्पादन पद्धति तथा क्षमता में काफी अंतर है। यह अन्तर मछली उत्पादन के स्तर को बढ़ाने एवं सुधारने के लिए अनुभव एवं योग्यता के आदान–प्रदान की तरफ ध्यान आकृष्ट करते हैं। अतः उचित एवं उन्नत तकनीकों का हस्तांतरण मत्स्य–उत्पादन कार्य प्रणाली को सुधारने एवं मजबूती प्रदान करने में सहायक होगा। यह अध्ययन छोटे किसानों के लिए सहायक तंत्र विकसित करने, कुशल एवं लाभकारी पट्टा नीति बनाने तथा सम्वन्वित अनुसंधान एवं प्रसार नीति विकसित करने के महत्व पर प्रकाश डालता है।

- भारत में मत्स्य क्षेत्र के विकास में तकनीकी परिवर्तन का व्यापक योगदान रहा है तथा इससे उत्पादक एवं उपभोक्ता के सामाजिक–आर्थिक स्तर में काफी सुधार हुआ है। मत्स्य शोध एवं विकास में विभिन्न पूर्ण कारक उत्पादकता आधारित स्थितियों में आतंरिक लाभ दर का आंकलन 42 से 55 प्रतिशत तक किया गया है।

टिकाऊ–कृषि प्रणाली के अंतर्गत किये जा रहे शोध कार्य प्रमुख रूप से जुताई–रहित (जीरो–टिलेज) तकनीक, समन्वित नाशीजीव प्रबंध, कृषि–उत्पादकता प्रभाव में तात्कालिक एवं तुलनात्मक अंतर, टिकाऊ जीवन स्तर तथा कृषि परिस्थितकीय क्षेत्रों के विभिन्न आयामों में हो रहे परिवर्तन पर आधारित रहे।

- पंजाब, हरियाणा, उत्तरांचल, उत्तर प्रदेश और बिहार के सिन्धु–गंगा के मैदानी भागों में गेहूँ में जुताई–रहित पद्धति आर्थिक और पर्यावरणीय दोनों ही दृष्टिकोण से लाभदायक पायी गयी है। जुताई–रहित तकनीक के प्रयोग से भूमि तैयार करने में कम लागत और भूगर्भ जल के कम उपयोग से प्रति हैक्टेयर 33 लीटर डीजल की बचत होती है, जिसे अगर कार्बन डाइ आक्साइड (CO_2) के उत्सर्जन में कमी के रूप में देखा जाय तो यह प्रति हेक्टेयर 88 किलोग्राम आती है। जुताई–रहित तकनीक के वर्ष 2010 तक 30 लाख हेक्टेयर क्षेत्रफल में फैलने की संभावना है जिससे इस क्षेत्र में प्रचुर आर्थिक एवं पर्यावरणीय लाभ की संभावना प्रबल होती है।

- समन्वित नाशीजीव प्रबंध के आर्थिक लाभ का आंकलन पत्ता गोभी, टमाटर, अरहर, कपास, मूंगफली एवं चना के फसलोत्पादन में किया गया। इस तकनीक के प्रयोग से खेती की लागत में प्रति हेक्टेयर 259 रू. की कमी आती है तथा फसल की उपज में प्रति हेक्टेयर 267 किलोग्राम की वृद्धि होती है। समन्वित नाशीजीव प्रबंध तकनीक के अपनाने से शुद्ध लाभ में 4272 रू. प्रति हेक्टेयर तक की बढ़ोत्तरी सभंव है।

- कृषि शोध एवं विकास से पिछले दशकों में विभिन्न फसलों की उत्पादकता स्तर में वृद्धि, जिले स्तर पर परिलक्षित होती है। परन्तु, मध्य प्रदेश, बिहार तथा उड़ीसा राज्यों में धान की प्रति हेक्टेयर उत्पादकता वृद्धि अन्य राज्यों की अपेक्षा कम हैं। यहाँ तक कि तमिलनाडु, आंध्रप्रदेश और पंजाब जैसे विकसित राज्यों में भी क्षेत्रीय तथा जिला स्तरों पर उत्पादन क्षमता में अन्तर का प्रसार 2.5 से 4.3 के बीच है जो कि इन राज्यों में व्यापक उत्पादन क्षमता में संभावित वृद्धि की ओर इशारा करते हैं।

- टिकाऊ कृषि–विकास का उद्देश्य विभिन्न कृषि परिस्थितकीय क्षेत्रों में प्राकृतिक संसाधनों को बिना क्षति पहुँचाये भविष्य में उत्पादन वृद्धि को कायम् रखना है। सतत् जीविका–सुरक्षा हेतु किए गए एक अध्ययन के विश्लेषण से ज्ञात होता है कि नब्बे के दशक में 52 कृषि परिस्थितकीय उपक्षेत्रों में से 10 कृषि परिस्थितकीय उपक्षेत्रों में सतत् जीविका स्तर में ह्रास और 11 में सुधार हुआ है जबकि शेष 29 कृषि परिस्थितकीय उपक्षेत्रों ने अपने 1990 के टिकाऊ विकास के स्तर को यथावत कायम् रखा है।

विपणन एवं व्यापार से संबंधित अध्ययनों में केन्द्र ने कृषि वस्तुओं के विपणन में संस्थागत सुधार, विश्व व्यापार संगठन से संबंधित मुद्दे, व्यापार उदारीकरण के प्रभाव और खाद्य सुरक्षा जैसे पहलुओं पर ध्यान दिया है।

- कृषि–बाजार के क्रियाकलापों का मूल्यांकन यह प्रदर्शित करता है कि अधिकांश वस्तुओं के बाजार उन्हीं जगहों पर प्रतिस्पर्धी है जहाँ कृषि विपणन व्यावसायिक इकाईयों में होता है। परन्तु जब व्यापारिक इकाईयाँ उत्पादकों एवं उपभोक्ताओं से लेन–देन करती हैं, तब बाजार कम प्रतियोगी होते हैं। यह खुदरा स्तर पर क्रेता एवं विक्रेता के गुप्त सामंजस्य एवं उपस्थित व्यापारिक त्रुटियों के कारण है। खुदरा स्तर पर बाजार को अधिक प्रतियोगी बनाने तथा उत्पादक एवं उपभोक्ता को उचित लाभ दिलाने हेतु उन्नत बाजार पद्धतियों यथा 'अपनी मंडी' और 'उत्पादक बिक्री केन्द्र' आदि को विकसित किया जाना चाहिए।

- मत्स्य निर्यात में वृद्धि– व्यापारिक प्रतिस्पर्धा का स्तर, मत्स्य निर्यात के भूमंडलीकरण तथा व्यापार उदारीकरण से प्रभावित हुई है। विश्व बाजार में मछली निर्यात की माँग बढ़ने से भारत के मत्स्य–निर्यात में 71 प्रतिशत की वृद्धि हुई। व्यापार उदारीकरण मत्स्य निर्यात को बढ़ाने में दूसरा महत्वपूर्ण कारक साबित हुआ है तथा इसका योगदान 24 प्रतिशत है। भविष्य में भारत से मछली का निर्यात इस बात पर निर्भर करेगा कि भारत किस तरह खाद्य–सुरक्षा मानकों पर खरा उतरता है। उचित संस्थागत पद्धतियों को विकसित करके लघु मत्स्य उत्पादकों तथा मत्स्य प्रसंस्करण उद्योग से जुड़े लोगों को एकत्र कर एक ऐसी उचित कार्यप्रणाली एवं संस्थागत तंत्र के विकास की आवश्यकता है जो कि बढ़ते विश्व मत्स्य व्यापार में अधिक से अधिक भागीदार बन सके एवं लाभ उठा सकें।

- देश में कृषि–विपणन के प्रमुख क्षेत्रों में सुधार विश्व व्यापार संगठन की जरूरतों के अनुरूप किये जाने चाहिए। कुछ विपणन इकाईयों ने सुधारों की शुरूआत की हैं एवं इसमें सूचना तकनीक का प्रयोग कर व्यवसायीकरण की ओर अग्रसर हैं। तथापि इन विपणन संस्थाओं में सुधार–प्रक्रिया की गति बहुत धीमी एवं स्तर काफी सीमित है। अतः सुधार–परिदृश्य को और भी ज्यादा विस्तार एवं गति प्रदान करने की आवश्यकता है।

संस्थागत बदलाव के क्षेत्र में इस वर्ष कृषि अनुसंधान से जुड़े निम्न प्रमुख मुद्दों को काफी बल मिला, जैसे खाद्य सुरक्षा एवं कृषि जैव तकनीक, सूचना संचार तकनीक आधारित सार्वजनिक, निजी एवं स्वयं सेवी संस्थाओं का प्रयास, कृषि विस्तार नीति तथा सामूहिक संगठनों की सफलताएं एवं विफलताएं।

- सूचना संचार तकनीक पर आधारित परियोजना को सार्वजनिक, निजी क्षेत्रों एवं स्वयंसेवी संस्थाओं द्वारा लागू करने से संबंधित प्रयासों के प्रभाव का अध्ययन दर्शाता है कि सूचना संचार तकनीक का प्रत्येक मॉडल अपने आप में विभिन्न गुण–दोषों से युक्त है। कृषि क्षेत्र में प्रयोग के लिए एक उचित मॉडल की आवश्यकता है जो कि अधिक उपयोगी साबित हो सके। कुछ निजी कम्पनियों के द्वारा देश के विभिन्न भागों में एक ही जगह पर कृषि संबंधित समस्याओं का समाधान केन्द्र स्थापित किया गया है। इन प्रयासों के मूल्यांकन का निष्कर्ष यह है कि निजी संगठनों का लाभ सामान्यतः मध्यम एवं बड़े किसानों तक ही सीमित है तथा गरीब किसान इसका समुचित लाभ नहीं उठा पा रहे हैं। गरीब किसानों के लिए सार्वजनिक इकाईयाँ ही एक उचित एवं उपयोगी विकल्प हैं।

- कुछ चयनित एशियाई देशों की राष्ट्रीय प्रसार नीति का अध्ययन दर्शाता है कि कृषि विस्तार संगठनों की वर्तमान स्थिति एवं प्रवृत्ति सीख पर आधारित उपायों एवं प्रसार पद्धति को पुर्नपरिभाषित करने में बाधक हैं। विस्तार संगठनों की वर्तमान स्थिति में परिवर्तन इन एशियाई देशों में प्रसार को पुर्नपरिभाषित करने में बड़ी चुनौती बनी हुई है।

कृषि–वृद्धि एवं मॉडलीकरण के अन्तर्गत आर्थिक सुधार की अवधि के दौरान कृषि में वृद्धि, पूँजी निर्माण एवं अनुबंध आधारित कृषि से संबंधित विभिन्न पहलुओं पर अनुसंधान किये गये।

- कृषि में वृद्धि दर का विश्लेषण बताता है कि आर्थिक सुधारों के प्रारंभिक वर्षों में कृषि वृद्धि दर सराहनीय थी परन्तु विश्व व्यापार संगठन के लागू होने के बाद की अवधि में अधिकांश कृषि वस्तुओं की वृद्धि–दर में गिरावट देखी गयी। कृषि में वर्तमान वृद्धि दर इतनी कम है कि राष्ट्रीय कृषि नीति में निर्धारित 4 प्रतिशत वृद्धि दर का लक्ष्य प्राप्त करना मुश्किल प्रतीत होता है।

- कृषि से प्राप्त सकल घरेलू उत्पाद प्रमुख रूप से पूँजी निर्माण, अनुदान तथा व्यापार की स्थिति पर निर्भर करता है। यद्यपि अनुदान के रूप में खर्च किया गया एक रूपया शीघ्र ही सार्वजनिक क्षेत्र में पूँजी निर्माण से अधिक प्रतिदान देता है तथापि दीर्घावधि में पूँजी निर्माण में किया गया निवेश, अनुदान से दो गुणा लाभ देता है। अतः अनुदान में लगे संसाधनों का सार्वजनिक क्षेत्र में पूँजी निर्माण के उपयोग से कृषि से प्राप्त सकल घरेलू उत्पाद के विकास दर को बढ़ाने में सहायक होगा।

- भारत में अनुबंध आधारित मुर्गी पालन का विश्लेषण दर्शाता है कि अनुबंधित उत्पादक, निजी उत्पादकों द्वारा उत्पादन कार्य में अधिक दक्ष थे और साथ ही में उनके द्वारा अर्जित लाभ भी काफी अधिक था। अध्ययन से निष्कर्ष निकलता है कि अनुबंध आधारित कृषि प्रणाली– कृषि ऋणों की आपूर्ति, बीमा करवाने और किसानों को नई तकनीक उपलब्ध कराने में एक उपयोगी संस्थागत व्यवस्था बनकर उभरी हैं।

- केन्द्र की वेबसाइट (http://www.ncap.res.in) को अद्यतन एवं पुनर्व्यवस्थित कर दिया गया है। साथ ही इसे राष्ट्रीय कृषि उन्नयन परियोजना (एन.ए.आई.पी.) के अन्तर्गत पोषित पी.एम.ई. तथा आई.एन.ए.आर.आई.एस. से संबद्ध कर दिया गया है। केन्द्र के प्रकाशन अब पी.डी.एफ. पारूपों में उपलब्ध हैं। इस केन्द्र के द्वारा संचालित **"समाज विज्ञानियों के सूचनाजाल"** वेबसाइट (http://www.agrieconet.nic.in) पर अनुसंधानों से संबंधित सूचनाओं का विनिमय, संसाधनों का आदान–प्रदान एवं शोध पद्धति से संबंधित समस्याओं के समाधान सुझाये जाते हैं।

- केन्द्र ने वर्ष के दौरान एक नीति सार (Policy Brief), एक कार्यवृत्ति (Workshop Proceedings) तथा एक पी.एम.ई. टिप्पणी (PME Note) प्रकाशित किए। केन्द्र के वैज्ञानिकों ने प्रतिष्ठित शोध पत्रिकाओं में 20 से अधिक शोध पत्र प्रकाशित किये हैं साथ ही में विभिन्न राष्ट्रीय, अन्तर्राष्ट्रीय कार्यशालाओं, बैठकों एवं व्याख्यानों में पर्याप्त संख्या में शोध पत्र प्रस्तुत किये। केन्द्र के वैज्ञानिक अनेक व्यावसायिक, पारस्परिक और नीतिगत परामर्श परियोजनाओं में शामिल रहे हैं।

- केन्द्र का इस वर्ष विभिन्न देशों जैसे संयुक्त राज्य अमेरिका, इंग्लैंड, दक्षिण एशियाई देशों, नीदरलैण्ड, आस्ट्रेलिया, जापान आदि तथा भारत के विभिन्न सरकारी, सार्वजनिक, निजी एवं गैर–सरकारी संगठनों से आगन्तुकों, प्रसिद्ध कृषि अर्थशास्त्रियों, और वैज्ञानिकों ने दौरा किया।

राष्ट्रीय कृषि आर्थिकी एवम् नीति अनुसंधान केन्द्र

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