ANNUAL REPORT 2003-2004

National Centre for Agricultural Economics and Policy Research

राष्ट्रीय कृषि आर्थिकी एवं नीति अनुसंधान केन्द्र

ICAR

NCAP

Annual Report 2003-2004

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

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PREFACE

The year under report will be remembered for more than one reason. The Centre's cherished desire to have its own office building is becoming a reality as the construction activity has begun and progressing very well. Second, the SFC of the Centre for 10th Five Year Plan has been approved for Rs. 7.68 crore. Third, despite dwindled staff strength at senior level, the Centre was able to maintain its record of high performance for which it is known in the ICAR family. Our strengths have been an effective workplace, emotionally charged young staff, unstinted support from the Council, and continued feed back and loyalty from you all. These strengths set for us the goal that we should compete with the best in the world. We take this challenge.

The Centre again takes pride in reporting that its contribution to the PME activities under NATP is being well recognized for projecting the economic rate of returns of NATP as well as internalizing it as an institutional culture of the entire R&D system. The historic decision to constitute PME cells in all the institutes of ICAR and efforts to undertake impact studies of 72 EFC / SFC schemes of ICAR is a testimony to this claim. Other significant achievements include: assessing the impact of technologies, quantifying the magnitude of water insecurity in the coming years and rules for optimum allocation of scarce water, assessment of water policy of Rajasthan, lessons from China for improvement of Indian R&D system, importance of enhancing R&D investment in the eastern and arid and semi-arid regions of India, identification of drivers of diversification, dairy contract farming and small livestock holders, tips for revitalizing dairy industry, vulnerability and adaptation to weather induced climate change in rural households in Orissa, costs of compliance of food safety measures, principles for effective deployment of agricultural science for development, gains from rainfall insurance, ICT innovations in rural India, O&M reforms in R&D system for enhanced institutional efficiency, micro-finance through self-help groups for social empowerment of women farmers, etc.

The Centre performed extremely well in many national and international collaborative projects, consultancy assignments, publications and policy dialogue with ICAR, other departments, institutions and all concerned.

I am highly grateful to the Secretary, DARE and DG, ICAR for his blessings and unstinted support to the centre. I am equally gratefull to the Secretary, ICAR and DDG (Animal Sciences), ICAR for their help and co-operation. I am also thankful to ADG (ESM), and ESM Section of ICAR for their support and help. I am grateful to Prof. D. Jha, National Professor, for his advice and all my colleagues at the Centre for their hard work and contributions.

Dr. Anjani Kumar has ably compiled this report. Ms. Umeeta Ahuja and Mr. Ajay Tanwar have provided help in preparation of the manuscript of this report. I am thankful to them and all others who have helped in various ways.

August, 2004

(Mruthyunjaya)
Director

EXECUTIVE SUMMARY

Annual Report, 2003-2004

- The National Centre for Agricultural Economics and Policy Research (NCAP) was established in 1991 by the Indian Council of Agricultural Research to strengthen research in agricultural economics.

- The mandate of NCAP includes; conducting policy research, strengthening research and teaching in agricultural economics and enhancing ICAR participation in policy decision.

- The Centre is guided by a Research Advisory Committee (RAC), chaired by Prof. V. Rajagopalan, an eminent agricultural economist, Centre for Development and Policy Studies, Thanjavur. The members are : Dr. G. K. Chadha (VC, JNU), Prof. Abhijit Sen (Member, Planning Commission, GOI), Dr. G. S. Ram (Former Chief Economic Advisor, Min. of Labour), Dr. I. J. Singh (Former Dean, CCSHAU), 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 has 17 scientists, including 2 Principal Scientists on deputation respectively to IEG, Delhi and IFPRI, Washington D.C, USA; and Dr. D. Jha as National Professor.

- The total grant received by NCAP during the year was Rs. 141.07 lakh from ICAR and Rs 91.84 lakh from other sources. The total expenditure during the year was Rs. 232.9 lakh.

  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. The progress under NATP has been reported separately.

- Technology policy research covered agricultural R & D, investments, diversification , intensification and efficiency related issues. Agricultural R&D policy analysis compared India and China. Chinese system is outward looking and integrated with the other systems. Indian system is focused on organizational and management reforms and private investment in the development and transfer of technology. The seed sector is strong in India. Research-extension-farmer linkages are weak in both the countries.

- Research investment on agriculture is far lower in the eastern India than that for the whole country. Enhanced investment on rice research in this region is critical.

- India is spending equally on agricultural extension and research & education. But, irrigated regions received large proportion of extension resources, at the cost of arid and semi-arid regions. Strengthening of public extension system and correcting the imbalance in the deployment of extension resources is necessary.

- Resource Allocation Analysis is for Agricultural Research based on the allocation of scientific manpower in ICAR revealed the dominance of crop (66%) comprising food crops (37%) and non-food crops (29%). Under food crops, fruit and vegetables share 44% resources while under non-food crops, oilseeds are at top with 25% resources. Natural resources like water, plant nutrients, etc. received 66% of human resources while agro-chemicals got 16% share. The sub-Gangetic plains region accounted 28% of the total research resources of ICAR.

- Diversification study in the eastern India revealed that agriculture diversified rapidly since 1980s towards high-value crops. It has increased profitability as well as employment potential in the region. The study has suggested infrastructural development, better management of post-harvest, particularly through food processing and integration of production with markets to further accelerate the pace of agricultural diversification in eastern India.

- Studies in livestock sector revealed that dairy contract farming is benefiting the small holders in terms of higher income and better input supplies. In yet another study on typology of mixed crop-livestock systems in India, 15 crop-livestock zones have been delineated. Cropping activity has been found to dominate in most of the zones, but with one or the other species of livestock is always among the top two-to-four activities. Genetic enhancement, feed availability and grazing lands are critical to improve the productivity of livestock in these zones.

- Technical efficiency analysis in edible oils revealed that in India, a majority of soybean processing units suffer due to large scale import of soybean oil at cheaper rates which discourages the farmers from soybean cultivation.

- Zero-tillage technology in the rice-wheat system in Uttaranchal is more profitable than the conventional technology. The adoption of zero-tillage technology in wheat has also shown sustainability gains. This technology has the potential to enhance resource-use efficiency.

- Sustainable Agricultural System research focussed on water productivity, water-food security and rural household vulnerability related areas.

- The water-food security analysis in Agro-ecological Region 4 covering 71 districts in Punjab, Haryana, Rajasthan, Gujarat, UP and MP has revealed that the annual per capita availability of water has declined from 1850 m^3 in 1971 to 865 m^3 in 2000 (threshold level is 1000 m^3) and may decline to just 500 m^3 by 2025. The study has indicated wide spatial variations within AER4 in terms of both future food-security and water-security scenarios. Under business as usual scenario, gound water mining worsens further in 2025 and this warrants immediate attention.

- Water productivity simulation analysis for AER4 revealed that physical productivity of water is quite low and varies across different agro-ecological sub-regions and crop groups within AER4. The value of water productivity was highest in pulses followed by oilseeds. Water allocation to crops based on its economic value is advocated.

- Irrigation water productivity analysis was done for Rajasthan too, covering eight crops, viz. wheat, maize, bajra, mustard, gram, cotton, moth and guar. Mustard registered highest net benefits followed by gram and wheat. Water pricing policy analysis revealed that neither the quasi-volumetric based pricing policy is being followed nor full cost recovery of O&M costs is being pursued.

- Rural livelihood analysis for their vulnerability and adaptation to climate change in Orissa has revealed that all the livelihood groups are at risk but labour class is the most vulnerable. Diversification of food and income sources, adjustments in crop and livestock enterprises adoption of crop insurance and contract marketing are often adopted strategies to mitigate livelihood risks. However, sustaining such coping measures in the long-run still remains elusive due to ad-hoc policy environment.

- Market and Trade studies focussed on reforms in markets, institutions, shifts in consumption demand, post-harvest technology and trade liberalization impacts.

  The mandate and functions of selected agricultural marketing institutions in the country are studied to examine their role under the emerging economic scenario. Yet another study assessed the effects of economic reforms on dairy industry in terms of association between the protection level and performance indicators. Except the employment, all other indicators (gross output, net value added, capital and labour productivity, technical efficiency) are negatively correlated with protection level, implying that dismantling of protection structures would help improve the performance efficiency of dairy industry.

- In South Asia, per capita consumption of cereals has declined and that of high-value commodities such as vegetables, milk, meat, eggs and fish has increased in most of the countries. However, large inter-country differences exist in the consumption of high-value commodities, as these are driven mainly by income growth and urbanization. The demand for high-value food will increase faster than that of foodgrains and to meet it, the South Asian countries must improve productivity. The average yields of most commodities in South Asia being low, a vast potential still remains highly under-utilized. Right research priorities and production strategies will promote proper growth in agriculture and ensure sustainable food-security and nutrition-security for South Asia in general and India in particular.

- Processing of fruits and vegetables is just 2% of their production because of some serious constrains like technological backwardness, poor infrastructure, institutional bottlenecks, prices, taxation, etc. Existing infrastructural facilities are located in or around big cities that are far away from the areas of production. Demand for processed food would increase in rural India also in near future.

- The implications for fisheries sector in India are analysed with reference to trade liberalization and challenges put forward by the SPS and TBT agreements. Compliance with food safety measures is a costly proposition for the developing countries like India. It has affected the export competitiveness adversely. The net social gain to the society is negative. More efficiency may be brought in utilizing HACCP process in the country. Bringing all the small producers scattered in the rural/coastal areas of the country to HACCP processing plants will remain a major challenge.

- Six studies have been conducted in the area of Institutional Change. In one of the studies, the institutional and policy options for strengthening the Indian seed system are being examined. The preliminary results have indicated an increase in the participation of private seed agencies in the provision of even self-pollinated crops like paddy, potato, etc. However, in the development of open-pollinated varieties, their presence is not much. For development of hybrids, an intensification of private R&D, particularly by transnational seed companies is found. The increasing instances of private-public partnership are expected to grow in future

with effective implementation of the proposed changes in the regulatory prices and incentives to breeders.

- To derive lessons for the agricultural research community on the ways of more effectively deploying agricultural science and technology as a part of socio-economic development process, a set of principles have been explained and suggested. These include partnerships, multiple knowledge bases, innovation triggers, innovation champions, diversity and innovation in innovations, reworking the stock of knowledge, learning, capacity development and technology foresight.

- The evaluation of efficiency gains from rainfall insurance in India has revealed it to be a viable option for Indian Agriculture with efficiency gains of about 17 per cent over self insurance in rice. The benefits from rainfall insurance could be increased further with a proper designing of an insurance scheme. Area rainfall-index could be used as an indicator for channeling government assistance to vulnerable groups.

- A study undertaken to analyze Information and Communication Technologies (ICTs)-based initiatives in agriculture keeping in view the stakeholders involvement has revealed that apart from economic impact, these initiatives are highly useful in accessing information on weather, crop production and protection etc. These have helped the farmers to take better decisions on time in crop management. The study has outlined some obstacles to these initiatives and has suggested that for addressing these constraints, the institutions, specifically government agencies will have to play a proactive role in both networking and content development.

- A study has been done on an institution of farmers in Assam known as Pather Prichalana Samiti (PPS)-which is an excellent means for implementation of development schemes of the government and empowering of the rural people. It is found that many PPS are performing well with benefits from increased agricultural productivity. But some of the PPS are still do not have access to information and proper guidance. The study has suggested that government must adopt suitable policy measures to encourage and support these PPS as a model to sensitize others to follow.

- A study on agricultural extension has identified strategies for the creation of an improved and pluralistic extension system in India. Some of these suggested strategies are reorganization of public extension organizations, promotion of private extension initiatives, organizational management and financial review of public extension, decentralization of extension planning, enhanced funding for extension programs for dis-advantaged and remote areas, institutional mechanisms to promote interface with stakeholders, monitoring and evaluation mechanisms, development of farmers organizations, etc.

- Under the area of Agricultural Growth and Modeling, a detailed study has been made on rainfed rice in eastern India covering dimensions of poverty, deceleration of rice production, rice-rice-rice culture, disparity in rice yields and costs, low input usage, prevalence of small farmers oriented agriculture, profitability and crop diversification, and rice technology. The study has suggested various strategies and policy interventions for stabilization of rice production in the region. It has been observed that the diverse ecosystems and exposure to a variety of stresses in the region demand more ecosystem specific modern varieties.

- Under the empowerment of women program, a study has been conducted on 'Micro-finance and empowerment' using SHG model in the state of Andhra Pradesh. It has been found that contribution of micro-finance in empowerment in the arena of social empowerment by way of

network building through federations and creation of social awareness, and political empowerment through creation of knowledge regarding their rights are more prominent than economic empowerment.

- The website for NCAP, http://www.icar.org.in/ncap/ncap_index.htm has been updated and linked with ICAR website. A new feature added to this website is the NCAP publications (in PDF format). The updated website also contains the web link for important national and international policy research institutions.

- The study on impact of O&M reforms has found that NATP has been quite successful in respect of more emphasis on the need for a multi-disciplinary and multi-institutional technology development and transfer system. It has made more funds available for operational expenses in both ICAR institutes and SAUs. These have improved interaction among scientists, effective communication of results, easy access to information and initiation of research in network mode.

- The study on the impact of different mode of funding under NATP has revealed that under TOE, Mission Mode and CGP modes of funding, NATP has provided significant impetus to the efforts of HRD, upscaling of research programs and strengthening of research infrastructure. TOE has intensified research in areas of social and frontier sciences and has promoted sustainable technologies like bio-fertilizers. The Mission Mode projects like validation and promotion of IPM technology have evolved close linkages with a a number of public, private and non-governmental organizations.

- The studies under CGP project are reported to have opened up opportunities for the commercial exploitation of marine ornamental fishes. The CGP has increased awareness about the competitive grants and useful mode of funding. Special considerations have been given to women researchers under NATP projects. It has given a new momentum to the large-scale farmer participatory-on-farm research in system perspective.

- The study on early impacts of some research projects under NATP has found that a number of technologies have been refined/developed. A study on the impact of 14 selected technologies has indicated increased agricultural productivity, farm income and employment along with the promotion of sustainability of agricultural production systems.

- The Centre has undertaken a study on 'Social Science Information Repository (SSIR).' Ten SSIR studies are now progressing under networking mode in Andhra Predesh, Bihar, Haryana, Karnataka, Maharashtra, Meghalaya, Nagaland, Rajasthan, Tamil Nadu and Uttar Pradesh. A close and viable integration of SSIR with Village Level Studies (VLS) of ICRISAT has been achieved. Hands-on training was imparted to collaborators for data analysis with necessary software support for data analysis.

- Under the institutionalization of PME activities in the NARS, 32 PME Cells are now functioning They are being monitored for carrying out PME activities.

- The Centre has brought out two Policy Papers, two Policy Briefs, two Workshop Proceedings, one Working paper, one PME Note and a publication on Panel Discussion during the year under report, apart from several research papers published in reputed journals by individual 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.

- There were 20 ongoing projects in the Centre in the year 2003-2004. The Centre undertook three Consultancy projects during the year. They include (i) Impact assessment of weather forecasting, (ii) Assessing viability of new institutional arrangements, and (iii) Optimizing institutional arrangements for demand-driven post harvest research.

- Under its mandate of capacity strengthening, the Centre organized the trainings/meetings at NCAP: (i) ICAR-CARP (Sri Lanka) short-term Advanced Training Programme on Quantitative Methodology for Natural Resource Economics; (ii) Agricultural Research Prioritization and Impact Assessment; (iii) National Study Team Meet on Developing Decision Making Tools for Assessment of Vulnerability to Climate Change; (iv) Hands-on training on Policy Interactive Dialogue Model (PODIUM); and (v) Sensitization Meeting-cum-Training of the co-ordinatiors of selected PME Cells.

- The Centre has organized several workshops and seminars covering topical areas such as strategies and options for fisheries development, food security, water security, etc.

- The Centre had several distinguished visitors from the USA, the UK, Bangladesh, Malaysia, Australia, Thailand, Pakistan, and Uzbekistan besides many dignitaries from private, public and non-governmental institutions and 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 at the campus of the Indian Agricultural 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 include the Director, one National Professor, four Principal Scientists (including 2 on lien), two Senior Scientists 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. S. 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 were constituted at the Centre for decentralization of management. The Joint Staff Council of the Centre promotes healthy professional interaction and congenial work environment.

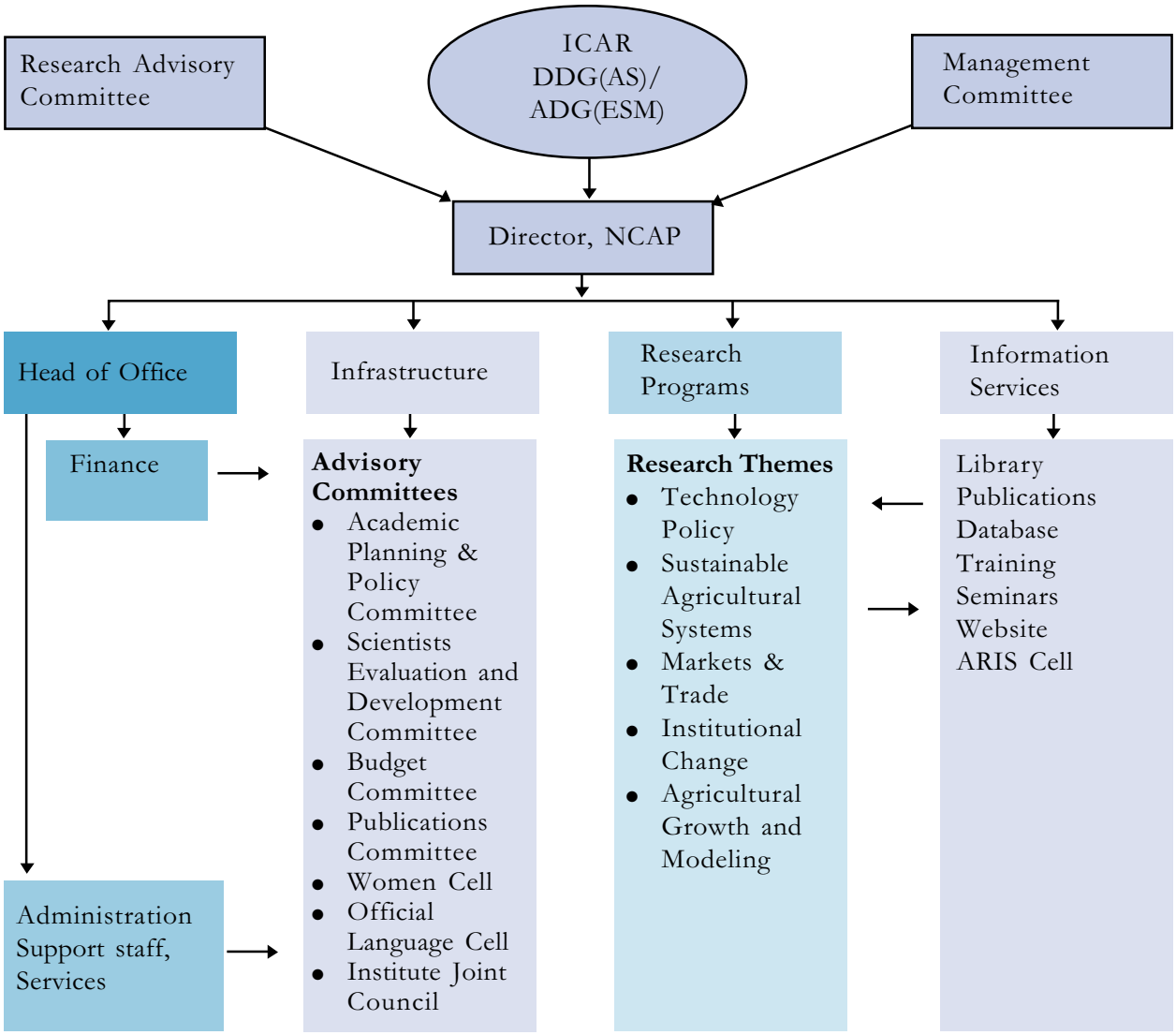


Figure 1: Organogram of NCAP

Budget

The expenditure pattern during the year 2003-2004 is presented in Table 1.

Table 1: Expenditure during 2003-2004 (in lakh Rs.)

Head of Account	Plan	Non-Plan	Total
Pay and allowance	—	70.47	70.47
OTA	—	0.25	0.25
Travelling expenses	3.42	1.00	4.42
Works	5.00	—	5.00
Other charges including equipments	39.05	21.12	60.17
HRD	0.76	—	0.76
Total	**48.23**	**92.84**	**141.07**
NATP	—	—	51.97
Other projects	—	—	39.87
Grand Total	**—**	**—**	**232.91**

Staff Position

Table 2: Staff Position (2003-04)

Designation	Numbers
Director	1
National Professor	1
Principal Scientist	4 *
Senior Scientist	3
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 Assistant (T-4)	3
Technical Assistant (T-5)	1
Driver (T-1)	1
Supporting Staff Gr. I	2

* 2 on deputation

II. RESEARCH ACHIEVEMENTS

Technology Policy

Agricultural R&D Policies

A comparison between Indian and Chinese Agricultural R&D System

This study revealed that in China the investments in agricultural research, both in terms of financial and scientific resources, were almost double of that in India. The gap, however, got reduced when the public investment was considered as percentage of agricultural gross domestic product (AgGDP). Both the countries were found spending nearly 0.3 per cent of their AgGDP on agricultural research. The Chinese R&D system has undergone several reforms during the 1980s and the 1990s. The main objective of these reforms was to revitalize and liberalize the public research system through commercialization of technologies, shifting to competitive mode of funding, and strengthening the incentive system. Although the impact of these reforms was difficult to assess at this stage, the Chinese system was found now more outward looking and integrated with the other systems. Some of the Chinese research institutions had mobilized substantial financial resources by commercialization of their technologies. The Indian system, on the other hand, has been focused mostly on organizational and management reforms in the public system and attracting private investments in the development and delivery of technologies. As a result, private-sector R&D, particularly in the seed sector, has become very strong in India. Research-extension-farmer linkage was noticed as a weak area in both the countries, as was the efficiency of the extension systems. Both these issues should continue to get even greater attention of agriculture planners and policy makers of both these countries.

Research Investment on Agriculture in Eastern India

The study on the resource allocation of agricultural research in India has shown that the growth in the research investment in the eastern India since 1960s has been far lower than that observed for the country as a whole. It has resulted into incongruence in allocation of resources for crops predominantly grown in the eastern India. For example, unfavourable rice environments, mostly concentrated in this region, received only about one-fourth of the total resources, as against slightly less than half suggested by the congruence analysis. Much of this incongruency in resource allocation could be attributed to low expenditure per researchers in the eastern India. It has been suggested that enhanced investment on rice research in this region would not only accelerate agricultural development, but would also have a significant impact on alleviation of rural poverty.

Investment for Agricultural Extension and Institutional Reforms in India

This study has shown that the country was spending almost the same amount on extension as that on research and education. The states of Assam, Maharashtra, Tamil Nadu and Uttar Pradesh depicted a higher investment intensity because of the World Bank funding under various agricultural development programs. Interestingly, the irrigated regions received much larger proportion of extension resources but, at the cost of arid and semi-arid regions. Therefore, there is a need for enhancing the investment in these marginal areas. Nevertheless, the rate of returns median to the extension investment has been in excess to 55 per cent. In terms of institutional innovations, there were several successful examples of private extension, but these were unlikely to fill the gap in near future. Therefore, strengthening of

public extension system through human capital development, modernization of the system, increasing operational funding, clients' participation, etc. deserve immediate attention

(Suresh Pal)

Allocation of Scientific Manpower in ICAR

This study reported allocation of scientific manpower resources of ICAR across major commodity groups, resources groups and agro-climatic region of the country. It was based on the 'Census of Agricultural Scientists', conducted in 2001-02, as a part of the project on ' Resource Allocation for Agricultural Research'. The study would be helpful to the ICAR in manpower planning.

The database included 4539 scientists, almost the entire scientific cadre of ICAR in 2001-02. However, on the basis of time allocation data provided by the individual scientists, this number was transformed into 3069 full time equivalents (FTE) units. The allocation pertained to these units, and was presented in three broad dimensions–commodity, resources and agro-climatic regions. It was important to note that these groups were not mutually exclusive. For instance, a *wheat* breeder uses *germplasm* resources and could have a focus on an agro-climatic zone.

Commodity Focus

The deployment of scientists, depicted in Table 3, revealed that the crop sector as a whole accounted for nearly 65 per cent of ICAR manpower resources. Food category as a group (food crops, fish and livestock) claimed more than two-thirds of ICAR scientific manpower resources. The allocation of scientists to different sub-groups of the commodity group is depicted in Figures 2-5.

Table 3: Broad allocation of scientists by broad commodity groups

Commodity group	Per cent of total FTE* units
Food crop	37.6
Non-food crop	29.6
Livestock	18.2
Fish	11.8
Others**	2.7
All commodities	100.0

* FTE = Full time equivalent = Unit per cent time allocated to research (Scientists in ICAR Headquarters and Zonal Coordination Units were not included).

** Includes forest trees and plants, and commercial trees

It was clear from Figure 2 that cereals and fruits / vegetables received the major thrust in food crops research. In the non-food crops category, oilseeds, fibres and other crops (sugarcane and tobacco) accounted for nearly four-fifths of research resources (Figure 3). The animal science research was found to have a major focus on cattle, buffalo and small ruminants (goat and sheep). Fisheries research had emphasis on inland fisheries, which shared nearly two-thirds of fisheries scientists' time (Figure 5).

Resource Thrust

It was found that most commodity-based research was being mediated through one or the other production resources. Crop improvement research was based on germplasm resources; production

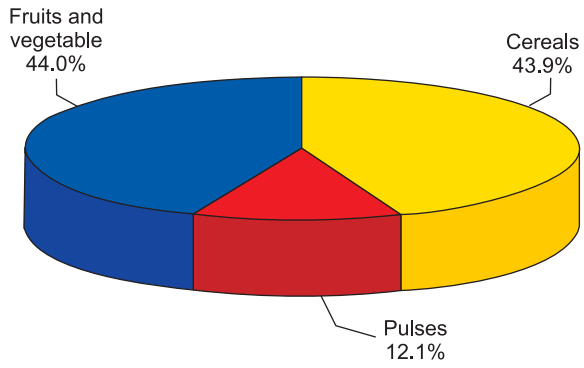


Figure 2: Allocation of Scientists : Food crops

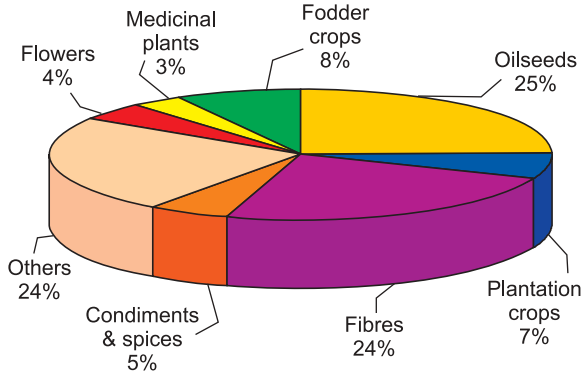


Figure 3: Allocation of Scientists : Non-Food crops

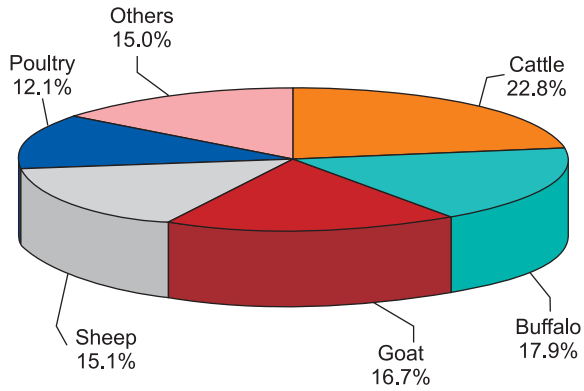


Figure 4: Allocation of Scientists : Livestock

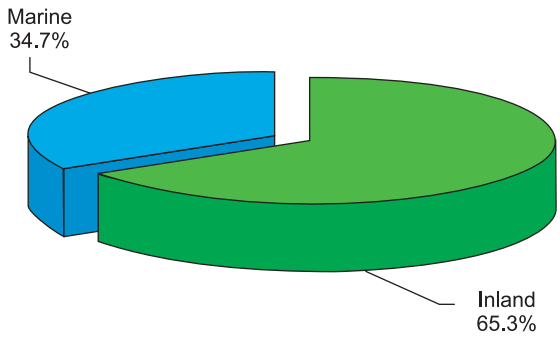


Figure 5: Allocation of Scientists : Fisheries

enhancement research for specific crops focused on resources like water, plant nutrients, etc. A part of research was however, exclusively resource-focused: soils, water, agro-chemicals, ecology, etc. being some examples. Two-thirds of all resource–based research in the Council focused on natural resources (germplasm, soil and water) (Figure 6). Agro-chemicals, the other thrust area, followed by human and institutional resources. Thus, more than 76 per cent of the effort focused on 'public goods' kind of resources. This appeared rational in view of private R&D sector's natural advantage in agrochemical and machinery research. The surprising finding was the inadequate attention on feed resources. Globally, feed research is the major thrust for livestock. This could only be explained by the nature of our livestock systems which are largely by-product based. It needs to be noted that 8 per cent of non-food crops were related to fodder crops (Figure 3).

Agro-climatic Orientation

Most ICAR institutions have a specific national mandate and it was difficult to track research resources agro-climatically. Nevertheless, a geo-climatic orientation was considered essential for improving the research efficiency. Individual scientists' responses on agro-climatic focus of their work were used to arrive at the regional profile in terms of the 15 major agro-climatic zones of the Planning Commission, summarized in Table 4.

The Gangetic plains region, covering Zones 3, 4, 5 and 6 was accounting for nearly 28 per cent of the total research resources in the Council. It was a strategic region from food security as well as poverty

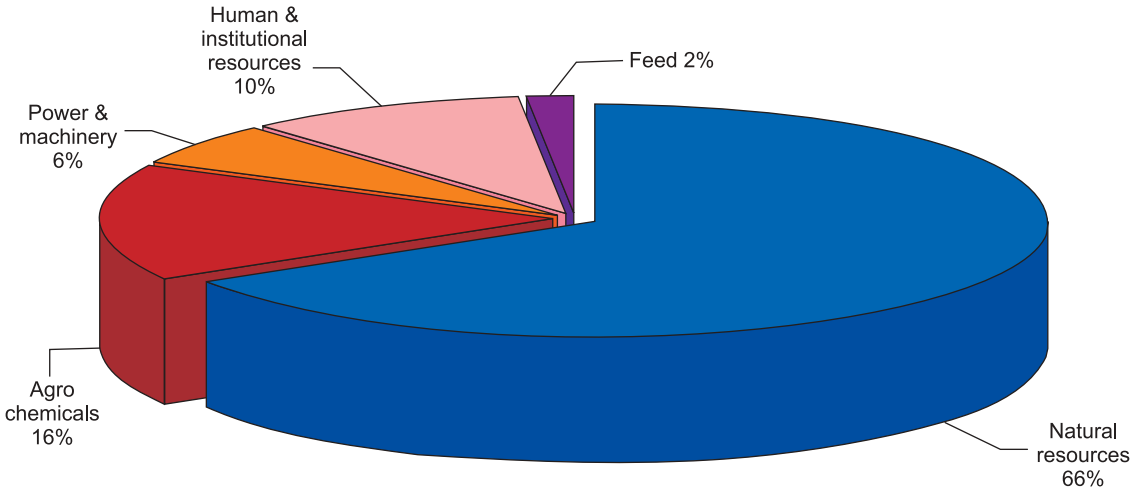


Figure 6: Distribution of Scientists : Resource group

Table 4: Distribution of scientists by agro-climatic zones

Zone groupings of Planning Commission	Per cent of total FTE Units
Himalayan region (Zones 1 and 2)	12.9
Gangetic plains region (Zones 3, 4, 5 and 6)	27.7
Plateau and Hill region (Zones 7, 8, 9, and 10)	30.8
Coast plains and Hill region (Zones 11 and 12)	19.8
Western plains, Hill and Dry region (Zones 13 and 14)	6.0
Island region (Zone 15)	2.9
Total	**100.0**

Note: Zones mentioned within the parentheses are the major zones of Planning Commission

points of view. Since 1970s, the Council was adjusting its regional orientation (mainly in Zones 7,8,9 and 10), which had claimed nearly 31 per cent of research resources; and the Himalayan region (Zones 1 and 2) accounted for 13 per cent. *Prima facie*, these data suggested a need for somewhat higher allocation for the western zone (Zones 13 and 14).

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

Agricultural Diversification in Eastern India: Patterns, Determinants and Growth Effects

Having being bypassed by the Green Revolution in the initial phase, agriculture in the eastern region witnessed a rapid growth during the 1980s due to technological change. At the same time, agricultural sector kept on diversifying towards high-value crops, but without affecting the staple food production. Diversification has occurred at the cost of coarse cereals and pulses. State level trends in agricultural diversification and growth depicted a mixed pattern. So were the trends in the land productivity and its contribution to agricultural growth. Technological change had been the main source of growth in land productivity. Inter-crop shifts and spatial shifts in cropping pattern too were emerging as important sources of growth. Further, driven by the absolute and comparative advantages, the process of diversification was found gradually becoming widespread. It has been concluded that diversification

towards high-value crops promoted agricultural growth (Table 5). The diversification-led growth appeared to be equity-oriented also, as diversification was negatively related with the size of landholding.

Table 5: OLS estimates of the effect of agricultural diversification on land productivity

	Equation 1		Equation 2	
Explanatory variables	**Co-efficient**	**t-value**	**Co-efficient**	**t-value**
Index of diversification	0.0600	1.094		
Proportion of cropped area under fruits and vegetables			0.2993	9.127 ***
Period dummies				
1980-1989 = 1, otherwise =0	0.1995	7.475 ***	0.1110	6.006 ***
1990-1998 = 1, otherwise =0	0.4022	11.612 ***	0.2664	8.893 ***
State dummies				
Bihar =1, otherwise =0	-0.6393	9.01 ***	-0.4884	9.333 ***
Jharkhand =1, otherwise =0	-0.9054	13.761 ***	-0.6961	13.398 ***
Orissa= 1, otherwise =0	0.5134	7.912 ***	-0.5701	13.029 ***
Intercept	8.6035	109.4 ***	9.4149	98.668 ***
R-squared	0.6897		0.8029	
Adjusted R-squared	0.6882		0.802	
F-ratio		480.51 ***		880.67 ***
log-likelihood	31.302		327.227	
Restricted log-likelihood	-731.71		-731.71	
D-W statistic	0.59008		0.7531	
Rho	0.70496		0.62347	
No. of observations	1304		1304	

***, ** and * denote significance at 1, 5 and 10 per cent levels, respectively.

In view of the rising domestic demand for high-value foods and the unfolding of the process of globalization, several policy implications have emerged from this study. First, cultivation of high-value crops had significant profitability and employment potential. This could offer considerable opportunities for the welfare of smallholders. Second, infrastructure played an important role in the process of diversification towards high-value commodities, markets for which were under-developed. Marketed surplus of the individual producers was small, and transportation to distant markets was cumbersome and costly due to inadequate road network and transport facilities. This study has suggested increased public investment in the development of markets and roads to accelerate the pace of diversification. Third, although high-value crops had a huge comparative advantage over staple food crops, but were prone to higher production and price risks. Insect pests and diseases caused considerable losses in crop production. The post-harvest production losses were also enormous. Most of the high-value crops were perishable and anecdotal assessments showed over 30 per cent loss in fruits and vegetables at the post-harvest stage. Their prices were volatile, and fell drastically even with a slight increase in their market arrival, while, the instruments insuring against risks were rare. Fourth, cultivation of high-value crops was capital-intensive, and smallholders were often capital-starved. These factors pointed towards a need for greater integration of production with markets through the institutions such as cooperatives,

producers' organizations and contract farming that can help minimize risks and improve capital availability. Fifth, processing infrastructure was under-developed. At present, hardly 2 percent of the production of fruits and vegetables was commercially processed, suggesting the need for policy initiatives to attract private sector investment in food processing.

(Pratap S. Birthal, Anjani Kumar and P. Parthasarathy Rao)

Harnessing the Benefits of Increasing Milk Production through Institutional Innovations

Demand-driven growth in livestock production is expected to contribute to the welfare of smallholders, who control bulk of the livestock resources. Nevertheless, there are apprehensions that smallholders may lose on the marketing front. Their scale of production is small, and is constrained by lack of capital, technology, quality inputs and information. Further, the rural markets for livestock products are thin, and sale in distant urban markets is restricted by small marketable surplus and poor road and transport infrastructure. All these add to the costs of production and transaction to the smallholders. Therefore, the issue was how to reduce transaction costs to smallholders ?

Contract farming has been recognized as an important means to reduce the costs of production and marketing. Such vertical relationships are also claimed to generate income and employment opportunities for the producers, improve their entrepreneurial skills and ease constraints of technology, capital and information. The macroeconomic benefits of these include development of agricultural produce markets and processing infrastructure, reduction in public expenditure on extension services, input subsidies, and price support and credit programmes. Nevertheless, contract farming has become a controversial issue. The major criticism against contract farming is that the contracting firm being a stronger partner in the game, often exploits the poor producers by extracting monopsonistic rent in the output market and by manipulating the inspection standard to control deliveries. Further, the contract farming may aggravate socio-economic differentiation among the peasants as the firm may favour contracts with a few large producers to avoid transaction costs of contracting with a large number of small producers.

From the preliminary results of a study on dairy contract farming, it came out that the contract farming reduced transaction costs to the participants considerably. Also, there was no difference in the prices of milk received by the contract and non-contract producers, indicating little monopsonistic tendency of contracting firm. Although, the production costs were almost similar for the contract and non-contract producers, the former realized higher net returns due to savings in transaction costs. There was a considerable involvement of smallholders in the contract programme, and they benefited the most from this, not only in terms of higher income but also in terms of input supplies and free extension services.

(Pratap S Birthal, P. K. Joshi and Ashok Gulati)

Typology of Mixed Crop-Livestock Systems in India

Improving effectiveness of R&D strategies requires micro approaches based on homogeneity in the agro-ecological and socio-economic conditions. In view of this an activity-based typology of the mixed crop-livestock systems was constructed using district level data with a focus on improving livestock productivity through technological and policy interventions. A total of 15 crop-livestock zones were delineated (Table 6). Cropping activity was found to dominate in most of the zones, with one or the other species of livestock was among the top two-to-four activities. Paddy was the dominant activity in six zones, wheat in three zones, coarse cereals (other than pearl millet and sorghum) in two zones, oilseeds

Table 6: Agricultural activity-based zones in crop-livestock typology: India

Zone	No. of districts	Location of the districts	Major agricultural activity and its share to total value of production (%)[1]
1	21	Andhra Pradesh (9), Tamil Nadu (6), Karnataka (3), Maharashtra (3)	Paddy (33), Fruits (18), Buffalo (10), Cattle (7)
2	10	Gujarat (10)	Groundnut (27), Cotton (13), Buffalo (10), Cattle (7), Pearl millet (7)
3a	10	Himachal Pradesh (10)	Coarse cereals (21), Wheat (18), Buffalo (17), Cattle (13)
3b	9	Gujarat (2), Madhya Pradesh (1), Rajasthan (6)	Coarse cereals (19), Wheat (18), Cattle (15), Buffalo (13)
4	16	Andhra Pradesh (5), Karnataka (11)	Paddy (18), Coarse cereals (12), Cattle (12), Buffalo (8)
5a	12	Madhya Pradesh (10), Maharashtra (2)	Paddy (43), Cattle (17), Pulses (7), Buffalo (7)
5b	11	Assam (10), West Bengal (1)	Paddy (36), Cattle (17), Vegetables (9), Fruits (7)
5c	11	Kerala (10), Tamil Nadu (1)	Cattle (27), Fruits (20), Paddy (14), Vegetables (7)
6	23	Madhya Pradesh (21), Rajasthan (1), Maharashtra (1)	Soyabean (31), Wheat (19), Pulses (11), Cattle (7), Buffalo (7)
7	25	Gujarat (2), Karnataka (4), Maharashtra (18), Madhya Pradesh (1)	Sugarcane (15), Sorghum (14), Cattle (11), Pulses (8)
8	16	Orissa (13), West Bengal (3)	Paddy (54), Vegetables (15), Cattle (9), Pulses (5)
9	26	Haryana (5), Punjab (11), Uttar Pradesh (10)	Wheat (34), Buffalo (18), Paddy (13), Sugarcane (5)
10	27	Gujarat (2), Haryana (1), Rajasthan (19), Madhya Pradesh (3), Uttar Pradesh (2)	Wheat (21), Rape & Mustard (16), Buffalo (13), Pearl millet (9)
11	14	Gujarat (1), Haryana (1), Karnataka (1), Maharashtra (1), Uttar Pradesh (10)	Sugarcane (32), Wheat (14), Buffalo (12), Paddy (9)
12	11	Madhya Pradesh (7), Uttar Pradesh (4)	Wheat (27), Pulses (20), Cattle (13), Buffalo (11)
13	7	Uttar Pradesh (7)	Buffalo (19), Cattle (17), Wheat (15), Vegetables (10)
14	49	Bihar (17), Uttar Pradesh (21), West Bengal (11)	Paddy (28), Wheat (17), Cattle (10), Vegetables (10)
15	10	Andhra Pradesh (6), Tamil Nadu (4)	Groundnut (19), Paddy (16), Fruits (10), Sugarcane (9), Cattle (9)

[1] Based on weighted mean value of all districts in the zone

in two zones, and buffalo and cattle in one zone each. Cattle and buffalo activities were found to be the second most important activities in three zones.

Productivity of livestock was low in the zones where landholdings were small, livestock density was high, incidence of rural poverty was high, and grazing contributed a large share to the livestock feed. A number of such interventions as genetic enhancement of animals, improvements in feed availability through larger area under fodder crops and promotion of nutritional technologies, arresting quantitative and qualitative deteriorations of common grazing lands, etc. have been suggested to improve the productivity of livestock in these zones

(Parthasarathy Rao and Pratap S. Birthal)

Characteristics and Constraints of Soybean Growers in Major Soybean Growing Regions of India

The rapid emergence of soybean since the early 1980s in Madhya Pradesh and Maharashtra, partially replacing cotton, groundnut and other kharif crops, suggest the choice of farmers in these regions towards soybean cultivation, owing to its higher profitability. As a part of the project " Improving technical efficiencies to counter import threat of edible oils in India", a survey was conducted on soybean cultivation by interviewing 150 farmers in Madhya Pradesh and 90 farmers in Maharashtra for the agriculture years 2002-03 and 2003-04.

The details about the cropping pattern in M.P. and Maharashtra revealed that the small farmers were cultivating their land more intensively than the other size groups, as revealed by 140 per cent cropping intensity in Madhya Pradesh and 160 per cent in Maharashtra. Only 15% area is irrigated in Maharashtra. It was perhaps due to availability of assured irrigation water through channel in Maharashtra. About 55 per cent of gross termswas allotted for soybean in Madhya Pradesh followed by wheat (26 %) and chickpea (7%). Besides soybean, the other major crops grown in Maharashtra were cotton, gram and wheat and these crops together shared an area of about 50 per cent. The higher crop diversification was observed on large farms in Madhya Pradesh (0.63) and Maharashtra (0.71). This may be due to the reason that large farm category wanted to utilize the vast area of land to grow more number of crops to optimize their returns.

The average soybean area under irrigation constituted just about 9 per cent in Madhya Pradesh and 16 per cent in Maharashtra, indicating the highly rainfed nature of the crop (Table 7). In both the states,

Table 7: Factors of growth in soybean cultivation across farm size groups

Particulars	Category of farms				
	Marginal	Small	Medium	Large	Overall
Madhya Pradesh					
Irrigated area (%)	-	-	5.30	12.8	9.05
Area under HYVs (% area)	100.0	100.0	100.0	100.0	100.0
Seed replacement (% area)	52.00	58.31	63.14	54.81	57.06
Maharashtra					
Irrigated area (%)	-	8.60	16.34	21.64	15.52
Area under HYVs (% area)	100.0	100.0	100.0	100.0	100.0
Seed replacement (% area)	-	69.41	62.88	64.67	65.65

farmers took up soybean cultivation with 100 per cent high-yielding varieties. But, the concern was the seed replacement, as about 43 per cent farmers in MP and 35 per cent in Maharashtra had sown the retained seeds of the previous year. A majority of the farmers who had used the retained seeds reported lower yields than those who followed yearly replacement. Like all farmers, soybean farmers also faced certain problems and the major ones are tabulated in Table 8, for both MP and Maharashtra.

Table 8: Major problems faced by soybean cultivators in MP and Maharashtra

Sl No.	Constraints	Madhya Pradesh		Maharashtra	
		No. of farmers	Rank	No. of farmers	Rank
1	Irrigation water	148	1	78	2
2	Pests and diseases	143	2	73	3
3	Marketing	61	4	14	5
4	Labour availability	112	3	82	1
5	Resistant varieties	42	5	18	4

The processing aspects of soybean were also studied for which a total of 40 soybean processing units were interviewed for the cost, returns and other relevant aspects. The initial establishment cost of a soybean processing unit, is very high, ranging from Rs 5 crores to 20-25 crores. The stipulation of the government on processing units to buy the raw material from the "*mandi*" only prevented the procurement directly from farmers leading to huge avoidable transportation cost. The frequent power failure and the higher overhead costs were also putting the processing units in disarray. The large scale import of soybean oil at cheaper rates discouraged the farmers in taking up soybean cultivation as it was leading to higher fluctuation in prices in the domestic market and in turn, was eroding the profitability of domestic soybean growers

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

Impact of Zero-tillage Technology in the Rice-Wheat System

The impact of zero-tillage was examined in terms of changes in the cost structure, returns and resource-use efficiency in foothills region of Uttaranchal state, one of the major rice-wheat belts in the Indo-Gangetic Plain. The analysis of data on cost and return for the year 2001-2002 from sample farmers indicated that zero-tillage technology was more profitable than the conventional technology. Impressive cost savings (28%) were observed under zero-tillage in wheat (Table 9).

The average cost of production of wheat on sample farms was reduced from Rs 3810 per tonne with conventional practices to Rs 2750 per tonne under zero-tillage This was due to the reduction in expenditure in cost of inputs like farm machinery, fertilizers, plant protection chemicals, and irrigation. The expenditure/ha on farm machinery and fertilizer under conventional tillage was Rs 2486 and Rs 7950, respectively, whereas under the zero-tillage the respective expenditure was Rs 1252 and Rs 5442. And, with about only 5% yield gains with zero-tillage in wheat, the net return increased from Rs 11120 to Rs 15472 per ha. Besides profitability, the adoption of zero-tillage technology in wheat improves sustainability of the rice-wheat production system.

Estimates of the technical, economic and allocative efficiencies of resource use in wheat cultivation were higher under the conventional technology than under the zero-tillage technology (Table 10). Though

Table 9: Input use, costs and returns in wheat during 2001-2002

Input	Unit	Conventional tillage		Zero-tillage technology		Change (%)	
		Per ha	Per cent of total cost	Per ha	Per cent of total cost		
Seed	kg	118.8		119.2		0.03	(1.031)
	Rs	1003	6.33	1329	11.09	32.5**	(1.395)
Fertilizers	kg(nutrient)	685		454		-33.7*	(1.792)
	Rs	7950	50.16	5442	45.4	-31.5**	(1.581)
Chemicals	Rs	2713	17.12	2545	21.23	-6.19*	(1.688)
Irrigation	Rs	591	3.73	471	3.93	-20.3**	(1.376)
Farm machinery	Rs	2486	15.68	1252	10.44	-49.6*	(1.941)
Labour	Days	19.9		18.2		-8.54	(1.077)
	Rs	1107	6.98	948	7.91	-14.36**	(1.362)
Total cost	Rs	15850	100	11987	100	-24.37*	(1.879)
Yield	tonnes/ha	4.16		4.36		4.8*	(1.895)
Gross return	Rs/ha	26969		27495		1.82**	(1.392)
Net return	Rs/ha	11120		15472		42.7*	(1.722)
Average cost	Rs/tonne	3810		2750		-27.8*	(1.943)

Figures within the parentheses are t-value; *p = 0.05; **p = 0.1

Table 10: Technical, economic and allocative efficiencies of resource use in wheat

(in per cent)

Particular	Measure	Conventional-tillage	Zero-tillage
Technical efficiency	Average	84.13	77.59
	Minimum	76.56	66.01
	Maximum	93.44	90.66
	Std Deviation	0.0466	0.0651
Economic efficiency	Average	68.97	58.16
	Minimum	58.17	40.54
	Maximum	83.20	79.45
	Std Deviation	0.0789	0.1035
Allocative efficeincy	Average	81.98	74.96
	Minimum	75.98	61.42
	Maximum	96.50	87.64
	Std Deviation	0.0537	0.0713

both the technologies showed considerable variability in the economic efficiency, the degree of variability in resource-use efficiencies as measured in terms of standard deviations was higher under zero-tillage technology than conventional tillage. The zero-tillage technology is relatively new, but with the time and experience, resource-use efficiency would be enhanced to the level that exists under the conventional technology. At higher level of resource-use efficiencies, the gains from zero-tillage technologies would be much more significant.

(L.M. Pandey, Suresh Pal and Mruthyunjaya)

Sustainable Agricultural Systems

Water Productivity Analysis for Agro-ecological Region 4

The Agro-ecological Region 4 (AER 4) in India has been enduring a serious water crisis. With the present share in total withdrawal being more than 93%, agriculture is and will remain the dominant user of water in this AER. However, intense competition from non-agricultural users–domestic, industry, livestock and environment sectors would leave lesser water available for agriculture, thereby putting a break on future food-security. Growing water scarcity has led to food-security concerns, and has necessitated the optimum allocation of water resources across sectors and uses based on their utility/productivity. And agriculture being the dominant water-using sector, assessing productivity of water across crops is necessary for sustainable integrated water resource management. Water productivity based decisions will ensure that water is supplied for its most valuable uses while promoting water and food security.

(a) Productivity Model

Water productivity analysis was carried out for major crop groups by Agro-ecological sub-regions (AESRs) in the AER 4. Water productivity is defined as crop production per unit of water consumption including both green (effective rainfall) and blue (irrigation) water. Using crop specific daily actual evapotranspiration as a measure for the quantity of water used by the crops, the productivity model estimated physical and value productivity of water for cereals, pulses and oilseeds in AESRs 4.1, 4.2, 4.3 and 4.4.

Physical and Value Productivity of Water

The results of this study depicted in Figure 7 revealed as follows:

- The physical productivity of water was quite low (ranging between 0.27 and 0.64 kg/m^3) in this AER.
- Productivity of water varied considerably across AESRs as well as across crop groups.
- The value productivity of water was highest in the case of pulses (1.96 to 4.67) followed by oilseeds (1.68 to 2.58) in all the AESRs.

Despite the increasing scarcity of water, the productivity of water was dismally low, particularly in cereal cultivation. It was partly due to low irrigation efficiency in decayed canal infrastructure, but more importantly due to distorted price structure for both agricultural inputs (including water) and outputs. In spite of being the most inefficient user of water, rice-wheat crop sequence was found dominating in this region, which received very less amount of rainfall that would not sustain rice cultivation in the long-run. Rice is a highly water-consuming crop but its share in the gross cropped area has been increasing at the cost of declining area under pulses, an efficient user of water. Therefore, allocation of water based on its economic value, would not only increase the area under pulses but would have a significant impact on sustainable use of water resources in this region.

(B. C. Roy and S. Selvarajan)

Water-Food Security Scenario Analysis for Agro-ecological Region 4

The water-food security scenario analysis was conducted for Agro-ecological Region 4 covering 71 districts from six major Indian states, viz. Punjab (6), Haryana (10), Rajasthan (14), Gujarat (5), Uttar

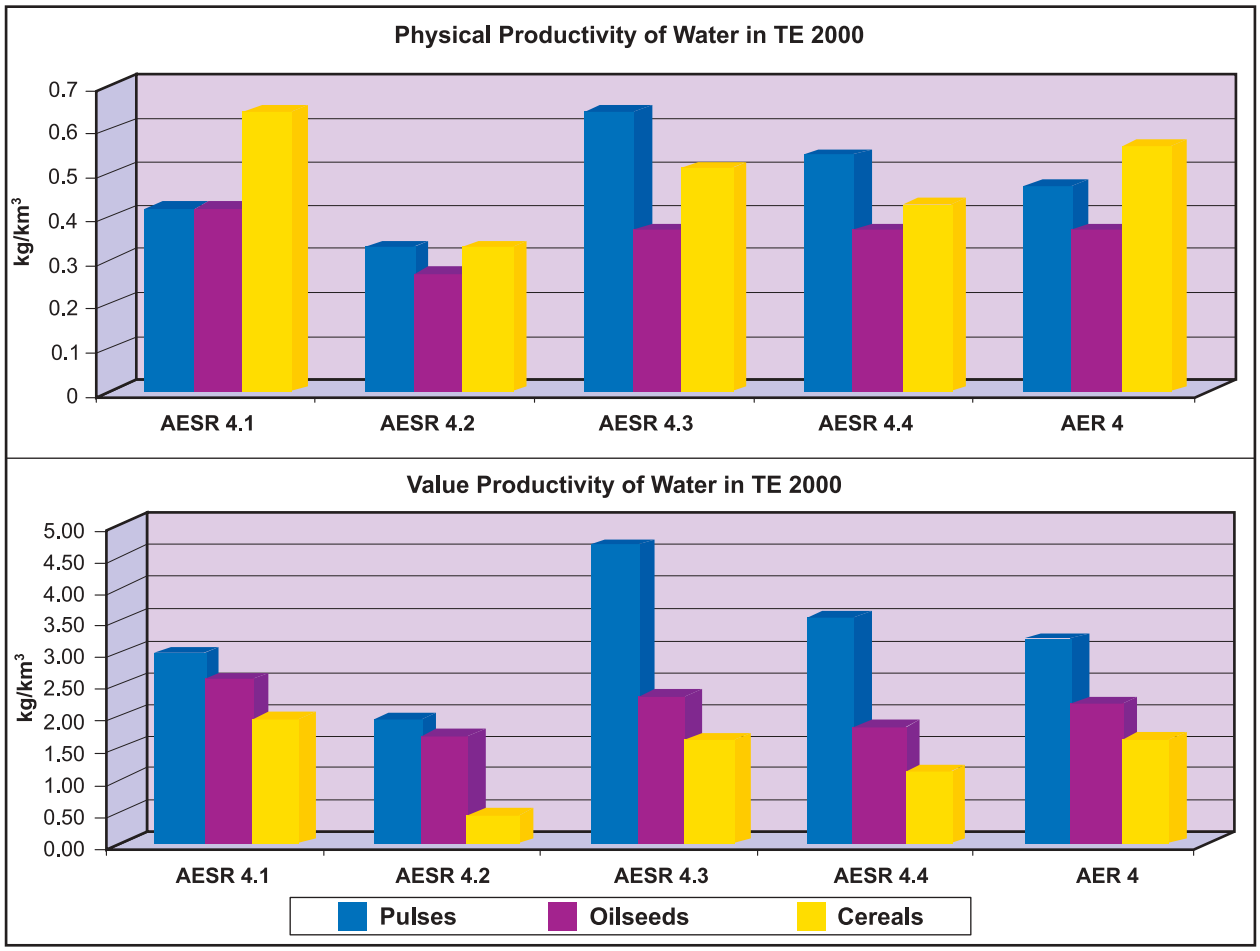


Figure 7: Estimated water productivity in major crop groups in AER 4, TE 2000

Pradesh (31) and Madhya Pradesh (5). The region with an area of 34.9 M ha represents 10.6 % of the total area of the country. Home to 16 % of India's population, the AER 4 claims only 9.7% of the country's water resources. If per capita availability of utilizable freshwater is any indication, the region has already entered into the 'absolute water scarce' group. The annual per capita availability has declined from 1850 m^3 in 1971 to just 865 m^3 in 2000, i.e. below the threshold level of 1000 m^3. This means that the water availability has already started hampering health, economic development and human well-being in a serious way. And if the present trend in population growth is to continue, then by 2025 the per capita availability would be further reduced to around 500 m^3 per annum, i.e. under 'critically water scarce situation', where water availability would become a primary constraint to life.

Alternative Water-food Security Scenarios

Alternative water-food security scenarios were generated for this region for 2025. The business as usual scenario (BAU) assumes a continuation of current trends in water and food demand-supply drivers. It also represents the best estimate of future water and food supply and demand outcomes and is used as a benchmark against which other alternative scenarios are analyzed. The sustainable groundwater use scenario (GWS) postulates no groundwater mining and maximizing food security by 2025. Similarly, a large number of alternative scenarios can be generated with specific set of interventions. The salient features for AER 4 under BAU and GWS are depicted in Figures 8 and 9.

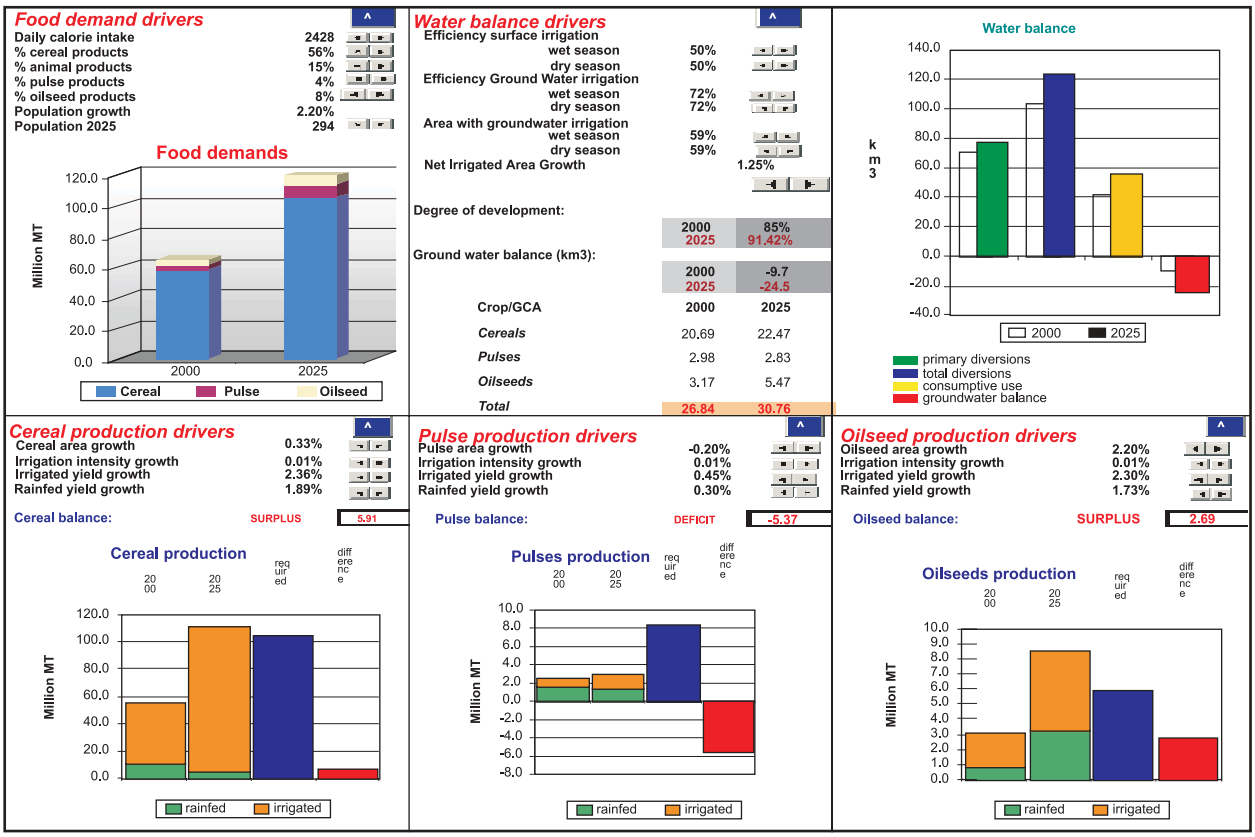


Figure 8: Business as usual (BAU) scenario for AER 4

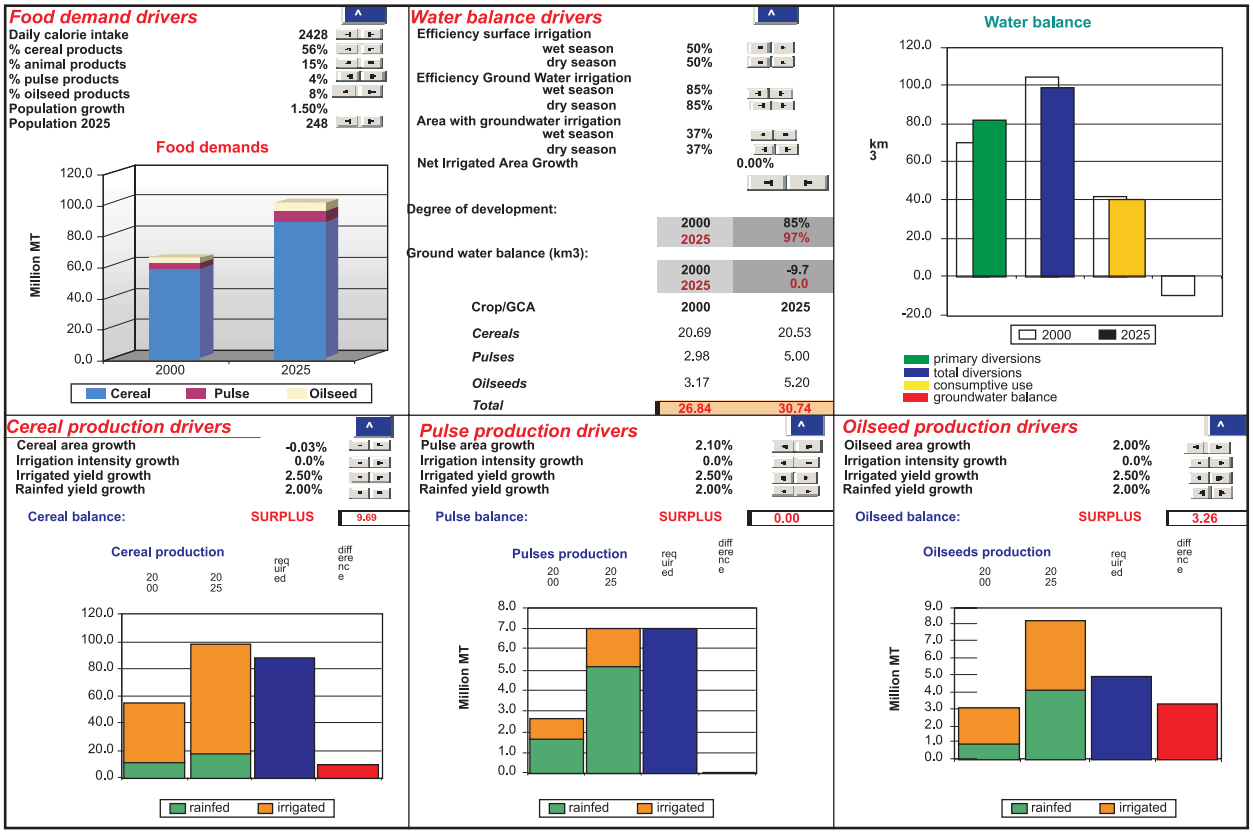


Figure 9: Sustainable groundwater use scenario (GWS) for AER4

(i) BAU Scenario by 2025

This scenario is characterized with high population growth (2.2% per annum); improved daily per capita calorie intake (from 2182 to 2428 kcal) and changing food habit in favour of animal proteins. Under this scenario, the region will continue to be surplus in cereals (5.9 Mt) and oilseeds (2.7 Mt) production but there will be a huge deficit of pulses (5.4 Mt). Agriculture is and will remain the dominant user of water but its share has been projected to decline marginally from 93.1% in TE 2000 to 89.7% by 2025. There would be a rapid increase in demand for domestic water consumption; from 2.0% to 4.1% during this period. As the high population growth and rapid urbanization would demand more water for domestic and industrial consumptions, the changing cropping pattern in favour of water- consuming crops like paddy and cotton would result into large-scale groundwater mining (-24.5 km^3).

(ii) GWS Scenario by 2025

No single intervention can solve the problems of groundwater mining and huge pulse-deficit, and a combination of several interventions would be needed to produce the desired outcome. A reduced population growth (from 2.2% to 1.5%); achieving across the board of 2.5% irrigated yield growth and 2.0% rainfed yield growth; and shifting of around 2 million hectares cereal area towards pulses would ensure food security. While reduced population growth would have lower domestic and industrial demand for water, the shift in cropping pattern would reduce demand for irrigation water in agriculture. However, to make water security goals realizable, the suggested measures include no more expansion of net irrigated area; less dependence on groundwater for irrigation (from 59% to 37%); and improvement (8-10%) in use-efficiency of groundwater in agriculture.

These analyses have suggested a concerted effort to face the challenge of future water and food-security in this AER. The analysis has also indicated wide spatial variations across AESRs in terms of both future water-security and food-security scenarios, thereby stressing the need for disaggregated analysis as statistics in the form of aggregated information at national level can mask issues of local water-scarcity and food-insecurit.

(B. C. Roy and S. Selvarajan)

Productivity-based Water Allocation for Irrigation in Rajasthan

Rajasthan comprises 10.4% of India's landmass and 5.5% of the total population with only one per cent of the national water resources. Per capita availability of water in the state (857 m^3) is far below the national average (2384 m^3) and this too is declining continuously. Ninety per cent of the water resources developed in the state are used in agriculture; 9% by domestic sector and the remaining by other sectors. The total surface water availability in the state is 1605 MCM and groundwater resource comprises 740 MCM. The irrigation potential created up to 2000 by major, medium and minor irrigation projects is 2.81 Mha and the potential utilized up to 1998 is 2.43 Mha. The productivity of water in agriculture has been assessed as inter and/or intra-sectoral water allocation decisions would have to be guided by the economic value of water in its various uses.

Productivity Model

Three cereal crops, namely wheat, maize and bajra; one oilseed crop (mustard); one pulse crop (gram) and other crops like cotton, moth and guar were considered for evaluating the value of water in Rajasthan (Figures 10 and 11).

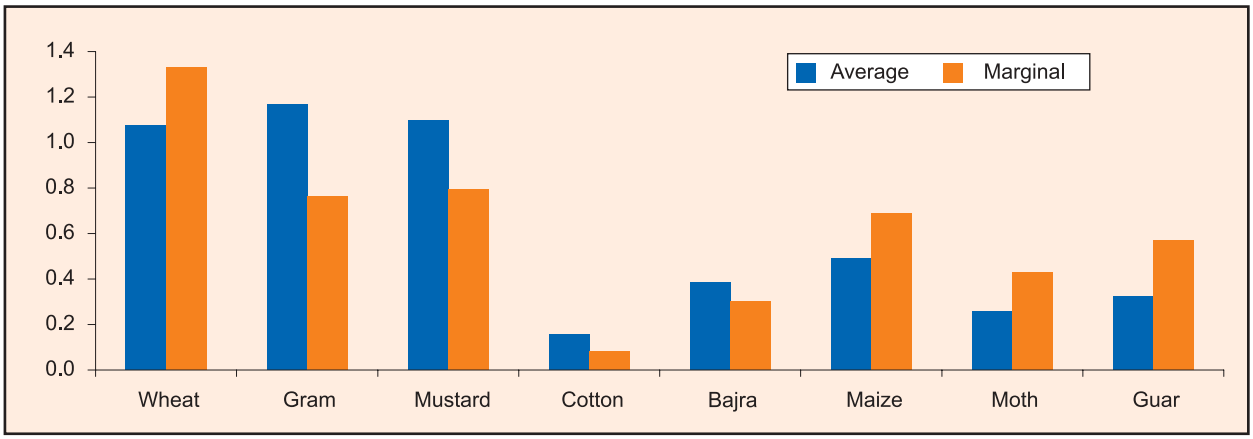


Figure10: Physical productivity of water, kg/m³

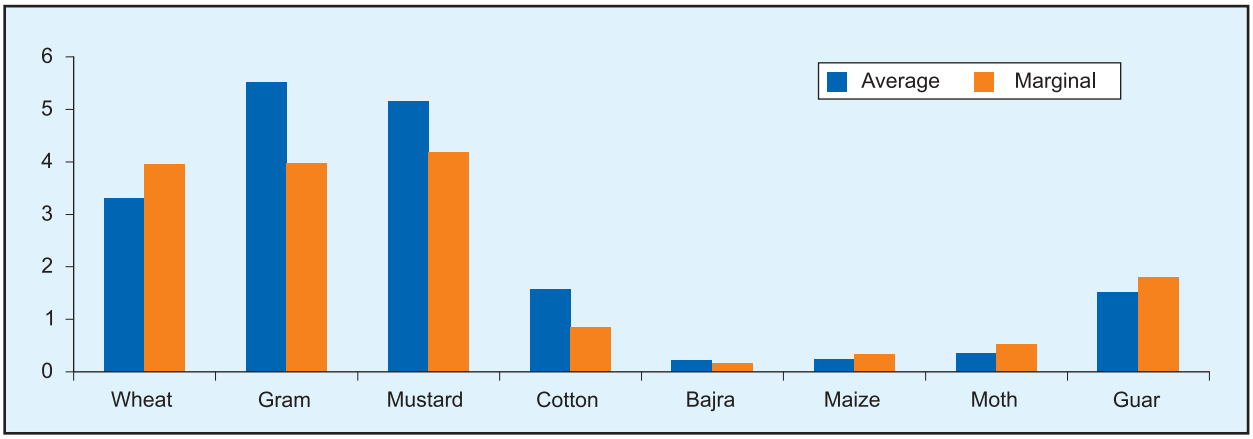


Figure 11: Value of water as net benefits, Rs/m³

Physical Productivity of Water

Considering the physical productivity of water expressed as kg per m^3 of water, following inferences could be made:

- The average productivity of water was high for rabi crops like wheat, gram and mustard (all more than 1.00 kg/m^3) while it was low (less than 0.50 kg/m^3) for kharif crops. Least physical return per unit of water applied was realized by cotton crop (0.16 kg/m^3).
- Wheat witnessed maximum marginal productivity of water (1.33 kg/m^3) followed by mustard and gram, while bajra (0.30 kg/m^3) followed by cotton (0.08 kg/m^3) registered least marginal productivities of water. All other crops recorded marginal productivity in the range of 0.4 to 0.7 kg/m^3.

Value Productivity of Water

Considering the productivity of water expressed in terms of net benefits (Rs per m^3), excluding all operational costs, it was found that:

- Mustard, gram, cotton and wheat were the crops in the same sequence to witness high average net benefits (above Rs 3 per m^3) of water consumed. Guar and cotton crops recorded net benefits

of around Rs 1.55/m^3, while all other crops registered less than Re 1/m^3 of evapotranspiration water used. Bajra recorded the least average benefits amongst all the crops.

- In terms of marginal net benefits of evaporation water, bajra, maize and moth gave low marginal net benefits of less than Re 0.5/m^3 of water used. Mustard registered the highest marginal net benefits of Rs 4.19/m^3. Wheat and gram showed marginal net benefits, above Rs 3.96/m^3 of water used.

Irrigation Water Pricing Policy

The policy intention as expressed in the National Water Policy as well as Rajasthan State Water Policy was to increase the tariff for irrigation water so as to achieve full cost recovery of O&M. Currently, the rates of irrigation water are charged on per hectare basis. Diverse crops grown in the state under irrigation coverage widely differ in their water requirements. While volumetric based rates have been advocated by the National and State Water Policy documents, but till these were realized, at least quasi-volumetric based rates need to be adopted. Two aspects on the current irrigation water pricing policy of the Rajasthan were investigated.

(i) Is the current water pricing policy in line with the quasi-volumetric based policy to promote less water-consuming high-value crops under irrigated agriculture?

For this, area-based water rates in respect of major crops were converted to rates per unit of water applied by using the estimated evapotranspiration water requirements for major crops and the converted rates are depicted in Figure 12. Since we were interested in the relative water pricing for crops vis-à-vis their water needs, such an approach based on ET requirements was adequate to capture this.

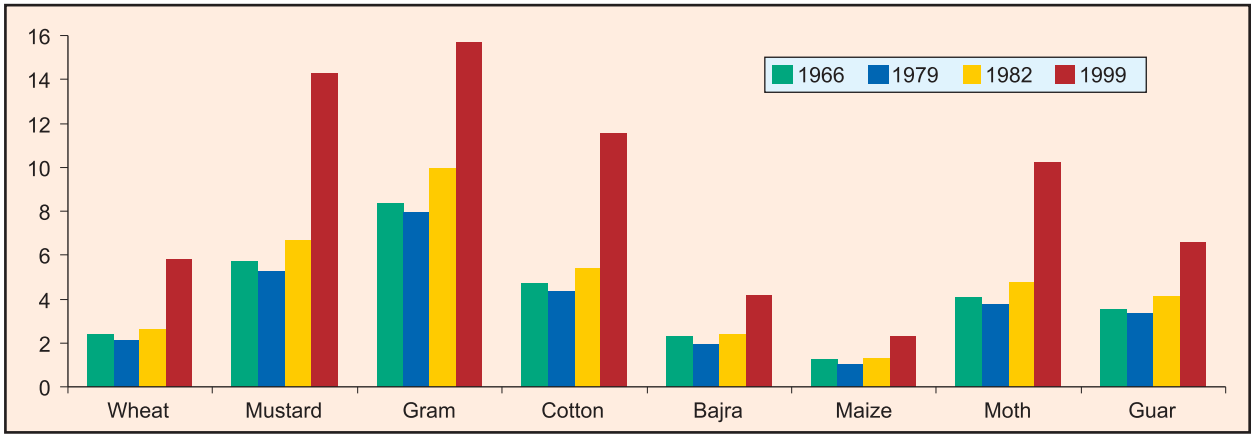


Figure 12: Converted water rates for different crops, Rs per 100 m^3

The area-based water rates did not favour high-value low water-using crops like, mustard and gram. The rates per unit of water were high in case of mustard and gram as compared to that for wheat. But in terms of productivity expressed as net benefits per unit of water, mustard and gram proved to be far superior to wheat and other crops. This imbalance in the relative pricing of water for different crops showed that quasi-volumetric based pricing policy was not being followed. Whatever revisions in water tariffs attempted in the recent years have not addressed this imbalance, sending wrong signals to the irrigation water users.

(ii) Is it in line with the stated policy of realizing full cost recovery ?

For assessing this, the weighted water charge was worked out using the irrigated area under different crops as the weight. Based on the current water charges, weighted water rate were found to be around Rs 125 per ha. For comparison with the need-based O&M costs, no estimates were available. GoI committee on Pricing of Irrigation Water in India had estimated in 1990, that around Rs 350 per ha were appropriate O&M costs, which could be doubled at current prices in 2004, considering the annual compound growth rate of over 5% in the wholesale price index. At this level, the current water charges would cover less than one-fifth of the O&M costs, which meant that the current gap between water charges and O&M costs would continue to persist. This did not support the stated goals of moving towards full cost recovery of O&M costs for ensuring physical and financial sustainability of water infrastructur.

(S. Selvarajan, Purushottam Sharma and Sanjay Kumar)

Vulnerability and Adaptation to Climate Change in Orissa: A Livelihood Analysis

The International Panel on Climate Change has predicted an increase in extreme weather events such as drought, flood, cyclone and heat wave, with adverse impacts on rural livelihoods. The impact of such climate-induced natural disasters (CIND) like cyclones, floods, droughts and heat-waves may vary from location to location depending on its agro-climatic, geo-physical and socio-economic conditions. The capacity to cope with them also differs from place to place and individual to individual depending upon the endowments and entitlements. It was, thus, important to assess the consequences of such events on different livelihood groups at the disaggregated level. The present study aimed at applying the concept of vulnerability assessment in rural livelihood sector in Orissa, which is prone to climate change induced natural disasters. The coping strategies were assessed through household survey. Livelihood analysis framework was used to study the vulnerability profile of different livelihood groups and their coping strategies. The selection of study district was based on 10 indicators representing various types of vulnerability, as depicted in Figure 13. The Kendrapara district was selected based on the composite vulnerability index as well as its proneness to natural disasters. Following this approach, two villages from Mahakalpara block of Kendrapara district were selected. All the households from the selected villages were surveyed.

Vulnerability Profile

Any change rarely affects all households equally. All households were classified into six 'livelihood groups' based on sources of incomes, asset positions, and trajectories. The major livelihood groups were: Cultivators, Labourers, Rural artisans, Fishermen, Livestock keepers (dairying & poultry); and Salaried group. The vulnerability profile of the major livelihood groups in the study area showed that all the major livelihoods were at risk, with labour class being the most vulnerable (Table 11).

Cyclone and flood were found to cause maximum damage to all the livelihood activities. Not only their impact was severe, they also struk the study area with alarming regularity. The matrix revealed about the livelihoods risk and the climatic hazards that were more difficult to be managed by the households. The impact values on each cell (ranking on 1 to 5 scale) were obtained from 220 households in the study villages. The value 5 was taken as equivalent to the highest impact and 1, for the lowest.

Recurring droughts, floods, and cyclones in the study area have made the rural population extremely vulnerable. The frequency of climatic disasters in Orissa was noted so high that people did not get sufficient

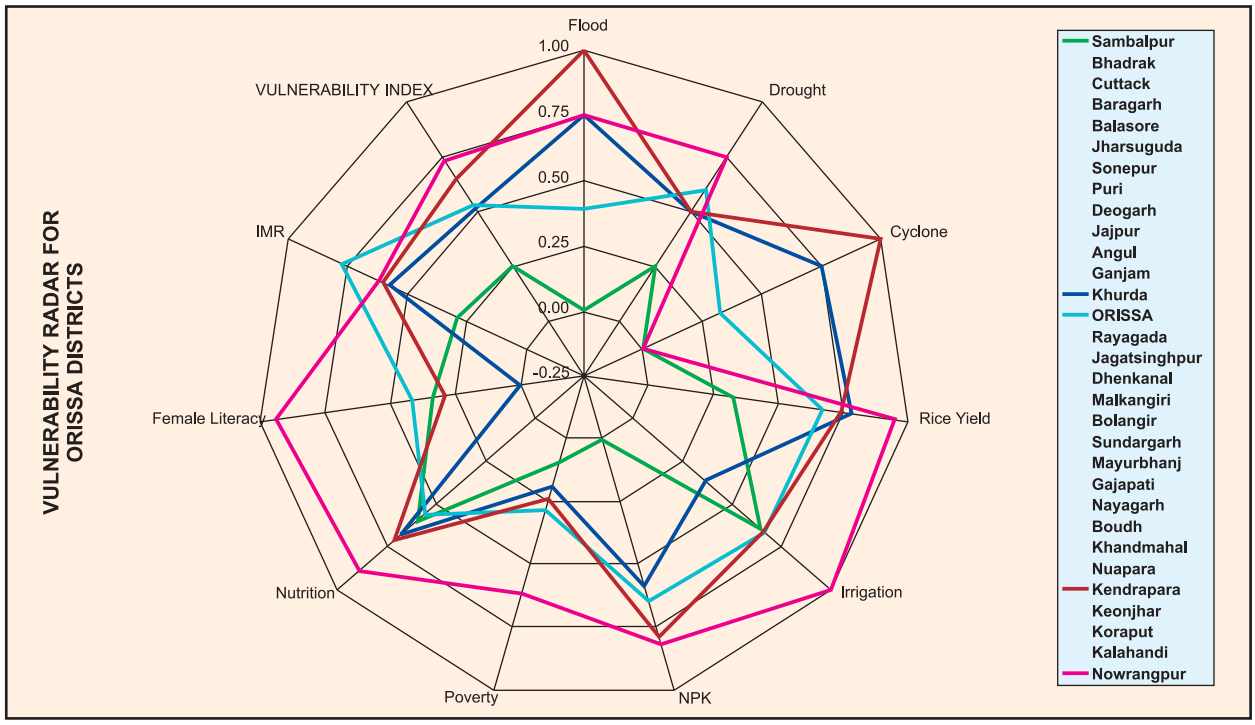


Figure 13: Relative vulnerability of different districts in Orissa

Table 11: Livelihood vulnerability matrix for Mahakalpara block, Kendrapara, Orissa

Livelihoods	Prevalence Frequency	Climatic Hazards				Exposure index
		Cyclone	Flood	Drought	Heat wave	
Prevalence frequency		23.6	36.2	10.4	9.8	
Cultivators	31.8	5.00	5.00	2.26	1.66	4.23
Labourers	39.5	5.00	4.90	2.31	2.22	4.26
Salaried jobs	12.3	5.00	4.81	2.22	1.59	4.13
Artisans/crafts	10.5	5.00	5.00	2.04	1.39	4.17
Livestock	3.6	5.00	5.00	2.38	1.75	4.26
Fisheries	2.3	5.00	4.57	2.00	1.47	3.98
Impact index		5.00	4.93	2.25	1.84	

opportunity to recover from one disaster before the next struk. Therefore, disaster preparedness was found very important in this area. Possibilities of any large-scale adaptation programme by governments were few because of resource scarcity. Majority of the households are forced to cope themselves with the increasing levels of vulnerability. The common strategies adopted by them were: diversifying food and income sources; adjustment in crop practices; adjusting livestock-keeping practices; risk minimization through crop insurance and contract marketing, borrowing and building up stocks and inventories; seeking institutional support like demanding relief and infrastructure; managing scarce water resources through pond making, etc. In spite of high degree of climatic, social, economic and technological vulnerability, the various coping/adaptation strategies adopted by the rural households themselves also included support from government/NGOs/SHGs and others. Non-agricultural fallback options were indeed becoming important source for vocational diversification. Rural artisans as a group was also found emerging as another

vulnerable livelihood group in the study area. However, sustaining such coping measures in the long-run still remains elusive in the present socio-economic adhoc policy setting.

(B. C. Roy, S. Selvarajan and Chinmayee Mohanty)

Markets and Trade

Food Safety Measures: Implications for Fisheries Sector in India

The fisheries sector plays an important role in the Indian economy. The share of fisheries in agricultural GDP has been consistently increasing and has risen from 0.84 per cent in 1950-51 to 4.19 per cent in 1999-00. It is also contributing about 3 per cent in total export and 20 per cent in the total agricultural export of India. Shrimps and prawns are major export species and together contribute about 65 per cent in total export earning from fisheries. Trade liberalization has reduced distortions in the international fish market and has created a favourable environment to increase fish-export. However, the benefits of trade liberalization could be negated with introduction of regulatory barriers such as food safety regulations, quality and composition standards, and labeling requirements. The Technical Barriers to Trade (TBT), and Sanitary and Phytosanitary (SPS) measures have adversely affected the exports from developing countries. The European Union (EU) import ban on fish and fish products from several countries on the pretext of outbreak of cholera, Australia's ban on the import of salmon, EU import ban on shrimp from Bangladesh and India are some examples of setbacks arising from the application of food safety measures. Nearly 15 per cent of Indias total fisheries export in 1996-97 to the USA was lost because of automatic detention on the ground of poor sanitary conditions. Thus, the gain of market access under WTO negotiations may be eroded as a result of non-tariff measures.

The study explored the opportunities of trade liberalization and challenges put forward by the SPS and TBT agreements with special reference to India's fisheries' exports. The impact of compliance with food safety measures has been influenced by factors such as compliance costs and change in consumer preferences associated with improved product information and quality.

Cost of Compliance with the Food Safety Standards

Compliance with stringent hygiene and sanitary requirements in the developed countries, particularly the provisions concerning the use of Hazard Analysis Critical Control Points (HACCP), requires significant investments. Many developing countries including India are facing difficulties in complying with these measures. The investment requirements for HACCP plants are large varying from Rs 10 million to Rs 25 million. Also, there is a recurring expenditure of about Rs 2 million per year on maintenance of a HACCP plant. The Seafood Exporters Association of India claims to have spent about Rs 1250 million on up-gradation of their facilities to meet these regulations. All these led to substantial increase in pre-export processing and handling cost (Table 12). The small firms have been the worst sufferers and may lose market competitiveness. It has a bearing on government revenue, consumer and producer surplus also.

The question who should bear the additional cost of compliance is an important issue in the policy debate on fish trade. Shifting this extra burden to the domestic consumers may be one proposition; but its economic and political impacts have to be examined. Alternatively, developed countries can offset a part of this additional burden by funding aid programs to train and create an adequate processing infrastructure in the developing countries like India. However, it is also argued that if a product is of

Table 12: Cost of pre-export processing with and without HACCP compliance

(Rs /kg)

Categories	Without HACCP	With HACCP	Additional cost due to HACCP
Small (< 10 t day)	7.84	18.21	10.37
Medium (10-15 t day)	5.23	12.41	7.18
Large (> 15 t day)	3.98	9.19	5.20
Overall	5.10	11.89	6.79

good quality and hygienic, consumers generally pay more. Therefore, consistent compliance for the regulatory barriers may bring "good name" to the exporting countries and thus fetch a higher price from the importing countries.

Impact on export competitiveness

The fisheries sector in India has been quite competitive. The nominal protection coefficients (NPCs) without compliance with SPS measures varried from 0.46 for Sardines to 0.72 for Tuna. India enjoyed substantial competitiveness in the export of shrimps and prawns also. Even after compliance with SPS measures, the fisheries export remained competitive, but fisheries sector had a decline in competitiveness of about 14 per cent at the aggregate level. The magnitude of erosion in export competitiveness was found to vary from as high as 24 per cent in Ribbon fish to 10 per cent in the case of cuttlefish. Shrimps and prawn were the major export items and suffered a serious setback in their export competitiveness.

Table 13: Nominal protection coefficients of selected fishery products

S. No.	Species/ Categories	NPC (without compliance of food safety measures compliance)	(NPC with compliance food safety measures)	Erosion in competitiveness (%)
1.	Crab	0.67	0.75	10.91
2.	Cuttlefish	0.67	0.74	10.08
3.	Shrimps and prawn	0.54	0.63	16.70
4.	Octopus	0.52	0.62	20.30
5.	Ribbon fish	0.48	0.59	23.71
6.	Sardines	0.46	0.57	22.20
7.	Squid	0.66	0.75	12.79
8.	Tuna	0.72	0.81	12.11
9.	Weighted NPC	0.61	0.70	13.82

Economic Impact of Food Safety Measures

The estimates of producers' and consumers' surplus conform with the conventional theory that there is producers surplus loss and consumers surplus gain with the additional cost of compliance with food safety measures for export'. With the additional cost of compliance with food safety measures, the country was losing foreign exchange equivalent to Rs 9.6 billion. The net efficiency loss in the consumption turned out to be Rs 2.5 billion. The efficiency in production did not decline as the supply

Table 14: Implications of compliance of SPS measures

Particulars	Value (Rs in million)
Change in foreign exchange	-9638
Change in efficiency in consumption	-2558
Change in efficiency in production	3923
Change in consumers surplus	10260
Change in producers surplus	-12234
Net change in efficiency	-2165
Net change in social gain	-1974

of fish was observed to be inelastic. The consumers surplus increased by about Rs 10.2 billion and producers surplus declined by Rs 12.2 billion, leaving a negative net social gain of about Rs 2 billion. The net loss in efficiency in consumption was explained by the fact that though consumers gain in surplus, their increased consumption implied a loss in efficiency. Consumers were found switching their expenditures away from other consumption items, from which they would have derived greater utility if the commodity in question were priced at its true opportunity cost.

The compliance with food safety measures was a costly proposition for the developing countries like India and had affected their export competitiveness adversely. The net social gain to the society was found in negative. It was suggested that efforts should be made to bring down the compliance costs by bringing more efficiency in utilizing HACCP process in the country. Further, maintaining high quality food and fish should be propagated as a strategy to stay ahead of other competing countries in the world market. However, to bring all the small producers scattered throughout the rural/coastal areas to HACCP processing plants would remain a major challenge for a developing country like India.

(Anjani Kumar and Praduman Kumar)

Relooking Agricultural Marketing Institutions in the Context of Trade Liberalization Regime in India

The relevance of existing mandate and functions of agricultural marketing institutions in the context of trade liberalization regime in India was examined. India has a long history of regulating the agricultural markets. The regulated model is in vogue for more than a century and may remain for many more years. In the liberalized era, the paradigm of agricultural marketing has been changing and hence the emphasis should be on the better performance of all marketing institutions. The emphasis should now shift from collection of fees and associated policing to promotional marketing activities.

The studies on agricultural market reforms have shown that the liberalization programs adopted by many developing countries during the last two decades had limited success in developing private, efficient, and competitive agricultural markets. The institutional and structural issues which are limiting the impact of past reforms have not been addressed properly.

WTO agreements and its implications on agriculture sector of developing countries were reviewed in this study. The agreements on agriculture with respect to market access, domestic support and export subsidies were found to have adverse effect on agriculture sector of the developing countries. TRIPS agreements were feared to lead to the formation of monopoly power and could affect the domestic companies, especially the medium and small size firms. Agreement on SPS is one of the potential non-

Table 15: Functions and mandate of agricultural marketing institutions

S.No.	Mandate	Functions	Name
1	Regulation of primary agricultural produce, market structure, conduct, performance	Storage, transportation, packing, processing, buying/selling and quality specification	SAMB, SDAM, APMC, DMI, Health departments, and Civil supplies departments of Centre and States
2	Development of market infrastructure	Development & maintenance of yards, roads, cold storage, telecommunications, market information	SAMB, APMC, PWD, FCI, CWC, SWC, Cooperatives
3	Body of administered prices	Price stabilization	FCI, NAFED, CCI, JCI, CACP, FPS and state agencies
4	Marketing agricultural produce directly	Direct marketing	Producer and consumer cooperatives
5	Promotion of foreign trade	Export and import promotions through offering consultancy, market information and market research	APEDA, MPEDA, Foreign agencies promoting their products in India NCTP, ITPO

tariff barriers to the export of developing countries. Agreement on Technical Barriers to Trade (TBT) was also reported to affect the export potentiality of developing countries since most of them are unaware of the technical issues related to this agreement.

The mandate and functions of some selected agricultural marketing institutions in the country were scanned and are shown in Tables 15. These institutions are being studied in detail.

(M.B. Dastagiri and Mruthyunjaya)

Trade Liberalization and Indian Dairy Industry

India is the largest producer of milk in the world. Over the last two decades the milk output has increased considerably making India self-sufficient in milk production. Concomitantly the demand for milk and milk products has also increased. Notwithstanding these achievements, processing of milk remains a matter of concern, with only about 13 per cent of it undergoing commercial processing. There are apprehensions that cheap import of dairy products from the European countries who provide heavy protection to their industry, would adversely affect the primary as well as the secondary dairy industries in India. Evidences indicate lack of export competitiveness of Indian dairy products. And, it is often attributed to inefficiency in the processing industry. In order to improve the efficiency, a number of reforms have been underway since early 1990s. This study has examined the growth and efficiency of dairy industry in the context of trade liberalization.

The performance of dairy industry was found marked with fluctuations over the last two decades. The number of manufacturing units in the organized sector had increased considerably. The net value added per factory had registered a negative growth after the initiation of reforms. The number of employees per factory did not show any trend, however, it did show a marked decline during the 1990s. The labour–

capital ratio was found declining since 1980, implying capital intensive nature of the industry. During 1980s, technical efficiency did not show any definite trend; however, during 1990s, it did show an improving trend.

The effects of economic reforms on dairy industry were measured in terms of association between the protection level and performance indicators of the industry. Except the employment, other indicators such as gross output, net value added, capital and labour productivity and technical and scale efficiencies were all negatively correlated with the protection level. It indicated that dismantling the protection structures would help improve the performance of the dairy industry.

(Pratap S. Birthal, K. Elumalai and Gaurav Tripathi)

Changing Food Consumption Pattern in South Asia

Food consumption pattern in South Asia has been changing with a wider availability of food choices, sustained economic growth and increasing urban population. In 1990s, the per capita consumption of cereals was found to have declined, mainly owing to fall in the consumption of coarse cereals, while the consumption of high-value commodities such as fruits, vegetables, milk, meat, eggs and fish had increased in most of the countries (Table 16).

Large inter-country differences were found in the level of per capita consumption of high value commodities and changes therein owing to the differences in level of economic development, agricultural production conditions, socio-cultural influences, income growth, urbanization, etc. Notwithstanding the differences in structural factors, recent changes in consumption pattern in most of the South Asian countries were noted to be driven by income growth and urbanization. Response of cereal consumption to income change was little if any, but the consumption of high-value commodities was found much more responsive to income changes. However, this response was almost similar across countries. Further,

Table 16: Changes in per capita consumption of different food items in South Asia

Food item	Per capita consumption change %				
	1980	1990	2000	1980-1990	1990-2000
Wheat	49.2	57.3	59.4	16.5	3.7
Rice	71.4	80.3	76.4	12.5	-4.9
Other cereals	30.2	26.5	22.0	-12.3	-17
Total cereals	150.8	164.1	157.8	8.8	-3.8
Pulses	11.2	12.1	10.1	8	-16.5
Roots and tubers (dry equivalent)	4.5	4.2	4.7	-6.7	11.9
Edible oils	5.1	6.4	7.6	25.5	18.8
Sugar	19.6	21.7	23.2	10.7	6.9
Vegetables	41.7	46.2	51.9	10.8	12.3
Fruits	26	26.9	35	3.5	30.1
Milk	42.5	55.8	69.1	31.3	23.9
Meat	4.2	5.2	5.3	24	1.9
Eggs	0.8	1.2	1.5	57.9	25
Fish	3.5	4.2	5.8	19	37.4

calorie and protein intakes were found increasing steadily, and most of the increases had resulted due to increased consumption of non-foodgrains. Such changes in the consumption pattern were likely to influence the crop choice, production, productivity, prices, international trade and environment. This calls for an examination of the changes in the consumption pattern, and future food needs.

It was found that demand for high-value food commodities was likely to increase much faster than that of food-grains (Table 17). The additional demand for foodgrains as well as non-foodgrains was projected to come from productivity improvements, as the possibilities of area and livestock population expansion were extremely restricted. To meet the future demand for food and maintain self-sufficiency, the South Asian region must attain a per hectare average yield of 2.4 tonnes for rice, 3.4 tonnes for wheat, 1.4 tonnes for coarse cereals and 1.02 tonnes for pulses by the year 2025. The productivity needs were projected to be doubled for horticultural crops, livestock and fisheries. The growth target for productivity was suggested to be fixed at about 1 per cent for cereals, 2 per cent for pulses, 2.5 per cent for edible oils, 3.5 per cent for vegetables, fruits, and milk, and 4 per cent for meat, eggs and fish. It was argued that the required improvement in productivity needs serious efforts by the National Agricultural Research System (NARS), policy makers and farmers in these countries. The average yields of most of the commodities in South Asia were low, and a vast agricultural potential still remains highly under-realized.

Table 17: Projected domestic demand for food in South Asia

(million tonnes)

Item	Low income growth				High income growth		
	2000	2005	2015	2025	2005	2015	2025
Rice	109.8	118.2	133.6	147.0	117.8	132.7	145.4
Wheat	90.4	97.4	110.6	122.4	96.5	107.8	117.7
Other cereals	36.4	38.2	42.6	45.8	38.2	41.3	43.7
Total cereals	236.6	254.2	286.8	315.2	252.5	281.8	306.8
Pulses	15.8	17.6	21.0	24.0	17.9	21.9	25.6
Foodgrains	252.4	271.8	307.8	339.1	270.4	303.7	332.4
Roots and tubers	7.9	8.9	10.8	12.6	9.1	11.6	14.0
Edible oils	11.1	12.3	14.7	16.9	12.5	15.3	17.9
Vegetables	75.8	89.2	116.8	144.1	93.7	133.5	171.1
Fruits	52.9	62.6	82.8	102.9	66.2	95.9	128.6
Sweeteners	32.1	35.4	41.4	46.9	35.7	42.4	48.3
Milk	109.1	127.8	166.5	205.4	134.3	190.6	252.0
Meat	7.1	8.6	11.8	15.1	9.2	14.2	20.1
Eggs	2.3	2.8	3.8	4.8	2.9	4.5	6.3
Fish	8.2	9.8	13.3	16.9	10.5	16.1	22.4

In the past, the major sources of growth in production were area and yield. But in the future growth has to be essentially driven by increase in yields. The yield improvement therefore must be accorded the top priority. A rapid growth in public investment in the past in irrigation and other infrastructure, research and extension along with crop production strategy and policy support helped to expand agricultural production. The slackness in investment on agricultural research and technology development as seen during early 1990s, is a matter of concern in the context of continued increase in population, diminishing land and fresh water resources, expanding biotic and biotic stresses, increasing

soil salinity and waterlogging problems, and decelerating productivity growth. On account of these, South Asian countries may experience a deficit in production to match their domestic needs for most of the food commodities. It has been observed that India is the major producer and consumer of food in South Asian region and has huge potential that remains highly under-realized. Therefore, India has to play a major role not only in maintaining its own self-sufficiency in food production but also in meeting the additional requirements of its neighbouring countries. The right research priorities and production strategies would promote future growth in agriculture and ensure sustainable food-security and nutrition-security.

Inter-regional trade would also play an important role. Currently the depression in domestic prices combined with or caused by low level of international prices has been opposing the trade integration. It was argued that the South Asian countries would have to counteract the challenge thrown by low international prices through improving their agricultural efficiency. Although, Intra-Asia trade was growing faster, it had not been followed by regional integration in the form of trade blocks. This was depriving Asia of vast potential benefits and opportunities emerging in the process of globalization.

(P. Kumar, Mruthyunjaya and Pratap S. Birthal)

Fruit and Vegetable Processing in India: A Review of Current Status and Policy

The study revealed that the growth potential in India's food-processing industry was enormous. The food industry was found to have a very high multiplier effect (2.4) which was greater than that of even the power or telecom sector. Beside the revenue generation potential, food processing had the largest employment generating potential too. With investment of every one crore rupees, it could generate employment for 54 persons, the highest among all major industry groups. The export potential as well as the domestic demand for convenience foods was also found growing rapidly. Rapid urbanization, changing food habits, emergence of smaller nuclear family set-ups with working women devoting less time to kitchen, and rising income levels are bringing about tangible changes in the food habits.

(a) Potentials and Constraints

It has been recognized that development of fruit and vegetable processing is critically important to the expansion and diversification of the agricultural sector in India. While there exists a vast potential for this sector, there are some serious impediments like technological backwardness, poor infrastructure, institutional bottlenecks and problems related to prices and taxation. In spite of being the second largest producer of vegetables and fruits in the world, the present level of their processing in India is just 2%, far below the levels prevailing in competing countries like Malaysia (83%), Philippines (78%) and Brazil (70%). Further, despite production of a variety of fruits and vegetables, their poor quality and irregular supply is still the most limiting factor. The thinking continues to be that it is the surplus from the fresh fruit and vegetable market that would be fed into the agro-processing sector. And the reality is that such surpluses are not best suited for processing. The tax burden on processed foods in India is also one of the highest in the world and India is the only country to levy excise duty on its machinery and equipments. Further, unlike elsewhere in the world, the branded food products attract a higher rate of sales tax and excise duty than the unbranded ones, though it is reasonable to expect that any meaningful level of investment in this sector necessitates branding of the product.

(b) Drivers

Infrastructure, urbanization and income growth were found to be the major drivers for growth in fruit and vegetable processing in India (Table 18). According to one estimate nearly 70 to 75% of the processed food in India was being consumed in metro-cities and towns only. However, the spread of electronic media and strategy to capture rural markets by the processing firms has been projected to increase the consumption of processed food in the rural India. Further with an income elasticity of demand ranging between 1.0 and 3.0, the growth in per capita income was expected to significantly increase the demand for processed foods.

Table 18: Determinants of level of fruit and vegetable processing in India

Variables	Co-efficients
Level of processing (% of total fruit & vegetable production processed)	
Intercept	-4.82*
Relative Infrastructure Index (India = 100)	+0.02**
% Share of urban population in total	+0.09**
Per capita income (00 rupees at 1980-81 price)	+0.85***
Adjusted R^2 value	0.9287

*, ** and *** indicate, the levels of significance at 1%, 5% and 10%, levels respectively

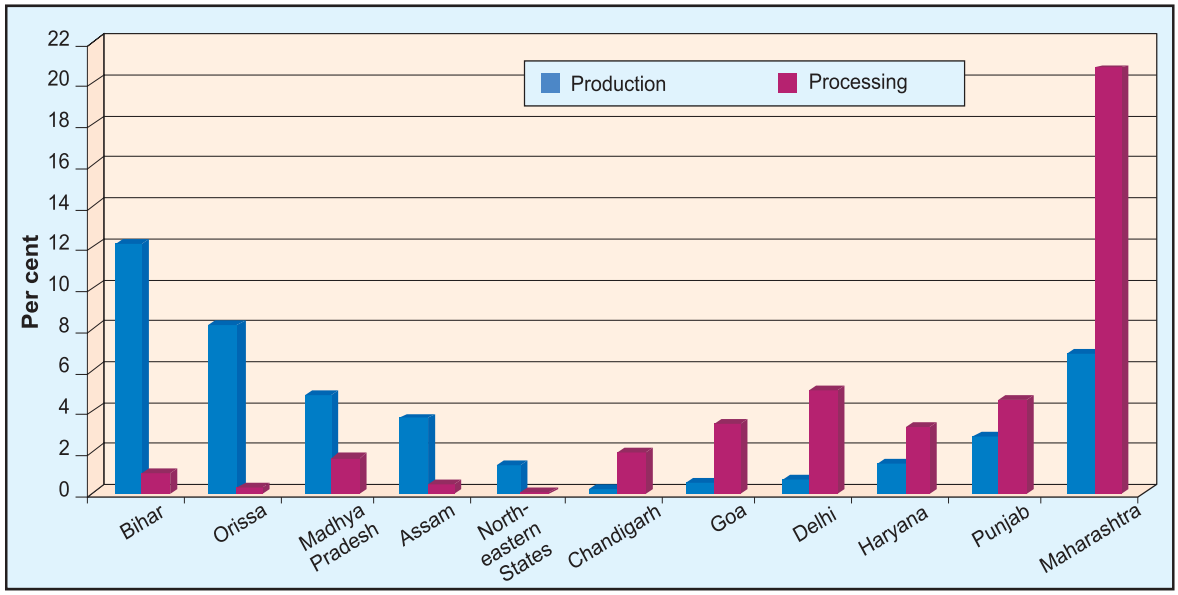


Figure 14: Share in production and processing of fruits and vegetables by states

The existing infrastructural facilities were also concentrated near big cities/metropolitans that were far away from the areas producing fruits and vegetables. This was why processing units were found concentrated in the areas with better infrastructural facilities rather than the area of production (Figure 14).

(B.C. Roy)

Institutional Change

Innovations in Innovation: Reflections on Partnerships, Institutions and Learnings

There is an increasing realisation that while agricultural science continues to be an important policy instrument in rural development and poverty reduction, research efforts need to be less isolated and more closely linked to social, economic and policy domains in which they seek to bring about a change. Several cases of innovation processes associated with socio-economic change in rural areas were analysed, using an innovation systems analytical framework, with a view to derive lessons for the agricultural research community on the ways of more effectively deploying agricultural science and technology as a part of the socio-economic development process. The set of principles emerged in this study emphasize on;

(a) Partnerships
(b) Multiple knowledge bases
(c) Innovation triggers
(d) Innovation champions
(e) Diversity and innovations in innovation
(f) Reworking the stock of knowledge
(g) Learning
(h) Institutional learning and capacity development
(i) Technology foresight

(Andy Hall, B. Yoganand, Rasheed Sulaiman V., Rajeswari Raina, Shambu Prasad and Norman Clark)

Seed System Development

This study examined the institutional and policy options for strengthening the Indian seed system. Field visits were made to study the functioning of seed system for the case study crops, viz. paddy, cotton, potato, vegetables, and groundnut. Secondary data were also collected. A plan for collection of data on the acquisition and management of seed by farmers was finalized. The preliminary trends have indicated increase in the participation of private seed agencies in the provision of seeds of even self-pollinated crops like paddy, pea, potato, etc. provided there was enough seed demand. However, there were only a few instances of private R&D in development of open pollinated varieties. For development of hybrids, there was further intensification of private R&D, particularly by transnational seed companies. Also, there were increasing instances of partnerships and contractual arrangements between the seed agencies and research institutions. Several examples were noted of private delivery of public and private varieties, as well as public delivery of private seed/varieties. It is expected that such partnerships would grow in future with effective implementation of the proposed changes in the regulatory policies and breeder's incentives.

(Suresh Pal and Harbir Singh)

Agricultural Extension - Involvement of Private Sector

The last two decades have witnessed an increasing diversity of private sector extension provision in India. The presence of these private extension providers is generally skewed towards well-endowed regions and high-value crops. Crop/commodity focussed extension of private sector though very useful,

is narrow in one sense, it is not engaged with other related issues such as development of farmers' organisation or sustainability of resource use. Remote areas and low producers (especially those growing low-value crops and having little marketable surplus) are poorly served by the private as well as public sector extension systems. Special efforts to target these areas and groups have to be planned by deploying public funds.

Private initiatives in agriculture extension need to be promoted, facilitated and monitored. While public funding would remain important, the delivery of all kinds of services need not necessarily be through the public sector. Several opportunities exist to contract these services to private extension providers and for joint funding and implementation by public and private agencies. Public funds also could be utilized to fund farmer organisations to help them contract services from other service providers, including the public sector. However, efforts should be made to strengthen the capacity of farmers' organisations to prioritize, demand, contract and monitor services. Private extension is not a substitute for public extension and there is a need for significant funding for extension in the coming years. However, the public sector extension need to undergo considerable institutional reform to respond quickly to the wide range of demands for information, technology and other support needs of its farming community and also to work in partnership with the private sector. The following strategies have been identified for the creation of an improved and pluralistic extension system for India:

1. Extension-Plus: Reorganisation of public extension organisations to play an expanded role
2. Partnerships
3. Promoting private extension initiatives
4. Facilitation
5. O & M Review
6. Decentralization and operational autonomy
7. Governance
8. Cultural change: Extension reforms to address the limitations of the prevailing organisational culture in public extension
9. Manpower: A core group of specialists with diverse skills to be placed at the district and regional levels, with adequate operational funds
10. Extension for dis-advantaged regions: Enhanced public funding for implementation of special extension programs for dis-advantaged and remote areas that are weakly integrated with markets
11. Interface with stakeholders: Institutionalize mechanisms to promote interface with various stakeholders
12. Institutional analysis: Special attention for institutional analysis of earlier programs to draw out generic principles that govern success
13. Enhanced funding for extension
14. Financial participation: Primarily to cover operational expenditure and enhance accountability to clients
15. Monitoring and evaluation
16. Development of farmers organization: Developing strong, articulate and viable farmers organisations to be a priority for public extension
17. Human Resource Development : Extension staff for various operations.
18. Facilitate Change management process

(Rasheed Sulaiman V.)

Viability of Rainfall Insurance in India

The efficiency gains from rainfall insurance in India were evaluated in this study. It used district level time series data on rice yield for different production zones of Uttar Pradesh, Bihar, Orissa, West Bengal, and Madhya Pradesh. In a framework of portfolio-based insurance model, parameters critical for the financial viability and efficiency gains from an insurance scheme were estimated. Rainfall insurance was found to be a viable option for Indian agriculture with efficiency gains of about 17 per cent over self-insurance in rice (Table 19). The benefits from the rainfall insurance could be increased further with research into suitable designing of an insurance scheme based upon local needs, causes of vulnerability, and relationship between rainfall and other meteorological variables with household enterprises and income. The rainfall insurance schemes might require active support from large assets holders like government, multinational corporations, etc. (Table 20).

Table 19: Proportion of risk insured and efficiency gains from insurance

Parameters	Value
Standard deviation of rice yield	0.12
Correlation of insurer's risk	0.7
Administrative and information costs (Rs)	0
Proportion of risk insured	0.65
Efficiency gains from insurance (%)	17

Table 20: Sensitivity analysis: Efficiency gains

(in per cent)

Relative size of the outside assets	Correlation between indemnity paid and drought loss			
1	0.6	0.7	0.8	0.9
2	0.2	1.9	6	14
3	0.7	3	7.9	17
4	1.8	5	11	21

In addition, farmers should be explained about the concept of insurance and an insurance pool could be built gradually through measures such as reinsurance. Since all risk crop insurance schemes have not been successful in India, particularly from the financial viability point of view and beneficiary participation, specific peril schemes such as rainfall insurance could be viable options. Area rainfall-index based insurance could be used as a vehicle for channeling government assistance to vulnerable groups. And, given a societal commitment to drought assistance, subsidized rainfall insurance schemes could be useful for effective implementation of government drought policies

(L.M. Pandey, Mruthyunjaya and Suresh Pal)

ICTs-based Initiatives in Agriculture : Some Experiences

In the changing agricultural scenario, there is a greater demand for information for making crucial farm management decisions on time. But, inadequate access to information is being felt as one of the major constraints at the grass root level. Realizing this fact, various public, private and social

organizations have taken up Information and Communication Technologies (ICTs)-based initiatives to help the farmers. Because of the novelty in approach, both organizations and farmers are undergoing unique experiences.

A study was undertaken to analyze some ICTs-based initiatives in agriculture keeping in view all the stakeholders. Initiatives have been taken up mostly in the form of projects, which varied in purpose, sponsorship and method of implementation. For this study, seven important projects were selected and results were presented under the broad categories of public, private and social sectors (Table 21). Data related to project were collected from both institutions and beneficiaries separately.

The analysis indicated a decreased cost of cultivation of crops and increased sale value due to easy access to better market intelligence on time. And transaction cost for getting information was also reduced considerably. The beneficiaries opined that apart from economic impact, the initiatives were highly useful in accessing information on weather, crop production and protection, etc, which had helped them to take better decisions on time in crop management.

Table 21: Selected projects with their important features

Project	Organization	Important features
Public sector		
Cyber extension project	National Institute of Agricultural Extension Management (MANAGE), Hyderabad	Rural information kiosks, call centres, portal, institutional support to other ICTs projects
Helpline services	Chandra Shekar Azad University of Agriculture and Technology (CSAUAT), Kanpur, Uttar Pradesh	Helpline service through telephone, researcher-farmer linkage
Gyan Doot Project	Grama Panchayat, Community, Dhar district, Madhya Pradesh	Soochanalayas, portals, partial recovery, Panchayat-community partnership
Private sector		
Soya-Choupals	ITC, Madhya Pradesh	E-Choupals, crop/enterprise specific intranet
I-Kisan Limited	Nagarjuna group, Andhra Pradesh	Portal, information in many regional languages, supports portals of NGOs (private-NGOs partnership) display of other company products (private-private partnership)
Social sector		
Village Knowledge Centres	MS Swaminathan Research Foundation (MSSRF), Chennai	Information shops, portal, pro-poor, pro-nature, pro-women, community ownership
Computer on wheels	Pingali Rajeswari-enrepreneur, Andhra Pradesh	Internet on motor bikes, portals, remote area, resource poor coverage

Some of the important obstacles to these initiatives were lack / non-availability of global content in the regional language, physical (e.g. electricity) and financial problems in establishment and maintenance of village level kiosks, lack of organizational and institutional structures and insufficient network between the institutions in information management. It was suggested that policies/strategies should be formulated with a roadmap for harnessing such ICTs initiatives for addressing the constraints the institutions, specifically government agencies would have to play a proactive role in both networking and content development.

(Adhiguru, P., Mruthyunjaya and Pratap S. Birthal)

Samridh Kisan: An Untold Story of Farmers' Institution

An institution of farmers, locally known as *Pather Parichalana Samiti* (PPS), is the field management committee (FMC) in Assam. This grass root farmers' organization, as a means of implementation of developmental schemes from time to time, is presently having 26000 units in Assam, covering 52000 villages and 1.8 million farmer members. The goal of this unique institution is to provide entitlement and take public benefits to the farmers, which otherwise fail to reach to the target groups. Designed by following the theory of collective action, the government's recognition and promotion of the PPS was a bold step in reaching out to the farmers. However, the basic foundation of the PPS has not yet been understood and thus is an untold story of mushrooming of these institutions in rural Assam. This study was initiated to understand the status of the PPS as a delivery mechanism and its reach to the farmers, examine the problems and prospects of efficient functioning of the large network of this rural institution in Assam.

It was found that PPS was working well on the expected lines. However, such a giant organization seemed to be confronting with the problem of sustainability. The sign of laxity on continuation of the cooperation to the PPS was found to be a discouraging factor. It had happened due to policy shift. In a quick succession during a couple of decades, the rapid serial transition of policy from PPS to T&V, PRI, PPS again and currently SHGs seemed to be the root cause. While many PPSs were found performing extremely well, reaping the benefits of increasing agricultural productivity, changing the mind set of the members to do better, taking advantages of modern technology and improving their standard of living, yet some of the PPS were still in darkness, direction less and seemed to be starving of access to information, lack of proper guidance and marketing infrastructure. These retrograde factors were frustrating the adopters and acting as disincentives to others. A tremendous interest was found towards improved agriculture among the member farmers, despite the retrograde factors. Therefore, the government must identify and adopt suitable policy on long-term basis.

The size of the PPS was found to be large enough to manage properly, enforce accountability and impart extension services. It was argued that the constitution and by laws, if found hampering the functioning of the PPS be revised. While the PPS poised to kick off, under the backdrop of the departmental encouragement, newer policy emphasis on promoting activity-based concept of self-help groups (SHGs) was found adversely affecting the initial enthusiasm in many cases. This may create more conflict among the disgruntled members within the PPS. The fear of participating in the market institutions to derive the income benefit in the prevailing market structure and resistance from vested interest groups were also adversely affecting the growth and spread of these PPS. Therefore, the public developmental bodies need to insulate the market against the commission-agent-like intermediaries as an integral part of

implementing various schemes at the PPS level. There was a need to encourage, support and promote the performing of PPS as a model PPS in some particular areas and to sensitize others to follow and create awareness.

(B.C. Barah)

Agricultural Growth and Modeling

Rainfed Rice in Eastern India

The eastern India has one-fourth of the geographical area of the country but it has to support half of the India's population with agricultural productivity lower than that of national average. The region accounts for more than 66 per cent of the total rice area in the country, but is contributing less than 56 per cent of total production. It is feared that the productivity of rice, which is already being low, may decline further in the years to come. In this backdrop, a study was carried out to capture the socio-economic dynamics of the changes, characterize the rice-sustems and develop vision of rainfed rice in the eastern India. The study used (i) macro level data of 141 districts to capture the diversity and dynamics of changes in the rice production systems, and (ii) information derived from a large sample of primary household survey in 152 villages to characterize the rice-based production systems at farmers' field.

Based on the finding of the study, following strategies and interventions for sustainable growth of rainfed rice production in eastern India have been suggested.

(i) "Tailor-made" approach to developing suitable rice technologies for the diverse ecosystems requires a paradigm shift in research and development. Interventions for these systems may often be needed at the level of watershed than just at the farm level. A higher level of funding for a long period of time would be needed as the unit cost of such research and technology development would be higher than those conducted in the more homogeneous environments.
(ii) A guaranteed access to technology (existing and/or new) and information to farmers is essential to accelerate adoption, even with the existing technologies.
(iii) Farmers though are more production efficient but fail at the marketing front and hence lose in income sphere. Therefore interventions on efficient market mechanism is necessary, and
(iv) Public Investment in rural infrastructure is critical.

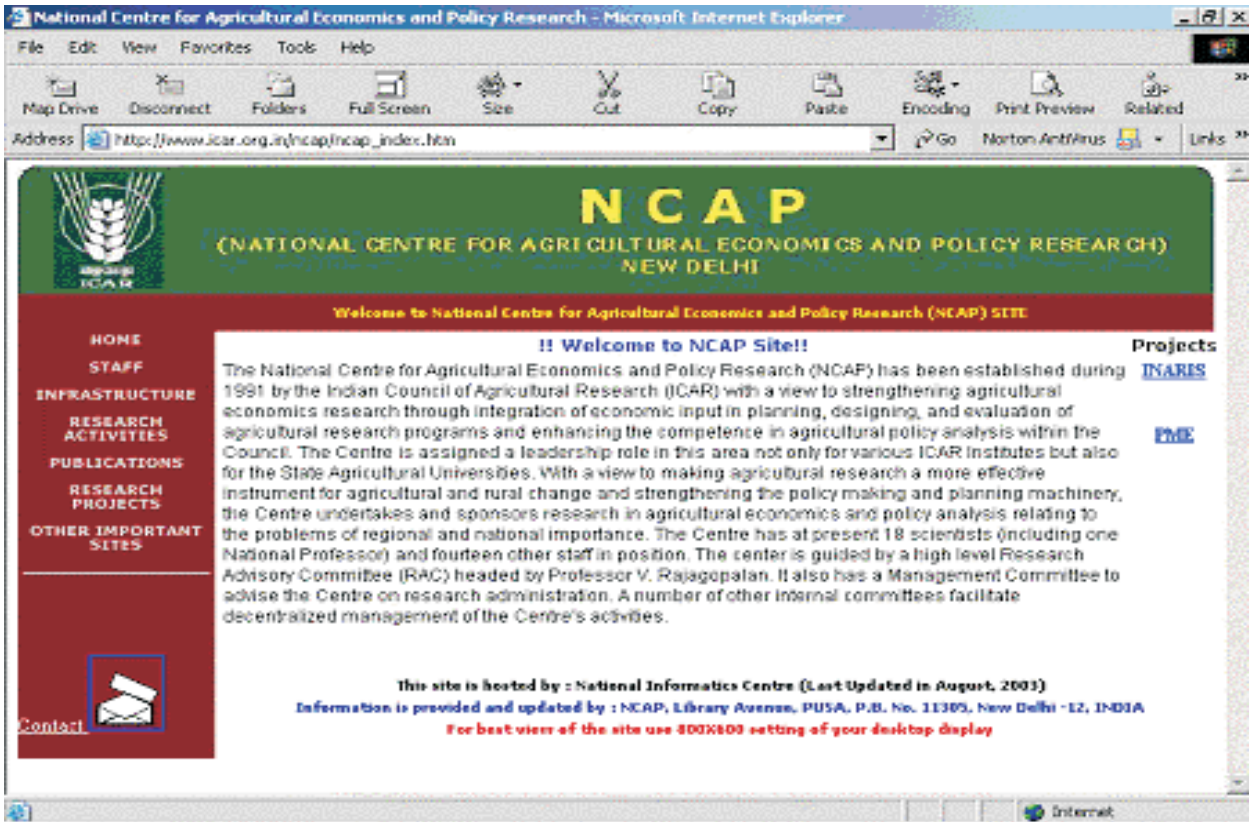
(B. C. Barah, Sushil Pandey, B. C. Bhowmick, Jawahar Thakur, A. K. Koshta, R. K. Singh, M. G. Nema, P. Samal, B.V.S. Sisodia, D. Naik and N. K. Saha)

Progress Under NATP

Institutionalization of Research Priority Setting, Monitoring, Evaluation and Networking of Social Scientists in National Agricultural Research System.

NCAP Website

The website for National Centre for Agricultural Economics and Policy Research *(http://www.icar.org.in/ncap/ncap_index.htm)* was updated in August 2003 and linked with ICAR website. The website contains updated information about the Centre particularly on staffs, infrastructure, research



activities, research projects and publications. A new feature of this revised website is that the NCAP publications are now made available (in PDF format) within the site for reference and downloading by the users. The revised website also contains the web link for important national and international policy research institutes and organizations. Linkages can also established with two NATP- Mission Mode Project PME & INARIS. The web site is now being updated annually.

(B.C.Roy and Mruthyunjaya)

Impact of O&M Reforms

NATP intended to change the process of doing business of technology generation, assessment and refinement in the NARS through initiatives such as improved planning, targeting and funding of research, development of information system and achievements in establishing improved farmer-research and extension linkages. The NATP has been quite successful in respect of more emphasis on the need for a multi-disciplinary and multi-institutional technology development and transfer system and sponsored key projects mainly in PSR/TAR modes (Table 22).

It has contributed about 6 per cent of the annual expenditure in both ICAR institutes and SAUs and made more funds available for operating expenses such as travelling, recurring contingencies, and research equipments (Table 23). These items are crucial for undertaking research activities. Development of information system included AIRS, upgradation of library facilities, office automation and establishment of ATIC. These have improved interaction among scientists, effective presentation/communication of results, easy access to information, and initiation of research in the network mode.

(Mruthyunjaya, Suresh Pal, LM Pandey and AK Jha)

Table 22: Research projects undertaken during NATP (triennium average ending 2002-03)

(Number of projects per institute per year)

S. No	Particulars	ICAR Institutes	SAUs
1.	University/ institute-funded	23 (35)	1 (2)
2.	Outside-funded	42 (65)	39 (98)
(i)	ICAR	4 (6)	7 (17)
(ii)	Others	14 (22)	11 (29)
(iii)	NATP	24 (37)	21 (53)
a.	PSR/TAR	11 (17)	13 (33)
b.	MM	6 (9)	3(8)
c.	TOE	4 (6)	1 (2)
d.	CGP	3 (5)	4 (10)
Research projects (Total)		65	40

Figures within the parentheses are per cent to the total number of projects.

Table 23: Financial management in ICAR institutes/SAUs

(per institute per annum, average for triennium ending 2002-03)

Sl. No.	Particulars	ICAR Institutes		SAUs	
		Expenditure (Rs million)	NATP contribution (%)	Expenditure (Rs million)	NATP contribution (%)
1.	Establishment including leave salary pension & wages	243.20 (42.5)	0	234.80 (46.4)	0
2.	Travelling	7.96 (1.4)	29.8	5.31 (1.0)	20.8
3.	Other charges	304.25 (53.1)	19.3	231.97 (45.1)	18.6
a.	Equipment/ vehicle	51.83 (9.1)	43.5	30.87 (6.0)	32.7
b.	Recurring contingencies	232.30 (40.6)	11.8	164.68 (32.0)	9.3
4.	Works	17.03 (3.0)	4.6	42.05 (8.2)	6.9
	Total	572.44	6.54	514.13	5.58

* Figures within the parentheses are per cent to total.

Impact of Different Modes of Funding under NATP

To assess the impact of various modes of funding under NATP, 4 TOE, 3 Mission Mode and 3 CGP projects were studied. Some pertinent impact indicators on research output, publications, HRD, linkages and incremental contributions of NATP were developed and information on those indicators was elicited from the PIs and other associated scientists of the projects.

It was observed that NATP, under TOE, Mission Mode and CGP modes of funding, had provided significant impetus to the efforts in HRD, upscaling of research programs and strengthening of research infrastructure. It had also promoted competitiveness in research funding, strengthened the areas of frontier and social science research and helped in establishing linkages among various national and international research institutions, public and private organizations, and NGOs. TOE had strengthened research in the areas of social and frontier sciences and had developed human resources in these areas. Promotion of sustainable technologies like biofertilizers was found another example of the impact of TOE. The personnel from within and outside the national agricultural research system were trained under the TOE projects (Table 24). It was also instrumental in establishing effective and viable linkages with several national, international, private sector and non-governmental organizations.

Table 24: Number of persons trained in selected TOE projects

Title of the sub-project	Number of trainings	Number of participants			
		SAUs	ICAR institutes	Others	Total
Crop Modeling	3	27	80	1	108
HRD in Biofertilizers	9	68	31	95	194
Natural Resource Economics	2	47	33	5	85
Total	15	142	144	101	387

The mission mode projects like validation and promotion of IPM Technology in the crops like cabbage, tomato, cotton, chickpea, pigeonpea, etc. evolved close linkages with a number of public, private and non-government organizations. It helped in reducing the use of chemical pesticides (between 7 to 100 per cent), depending upon the species and genotypes followed by substantial increases in their yields (5 % in chickpea to 222 % in rainfed cotton) (Table 25).

The mechanization of rice-wheat production system had helped in intensification and expansion of this technology and helped the farmers in reducing their cost of production (up to 40%), accompanied by the enhanced yield (5 - 10%). The study indicated that mission mode projects had strengthened research-extension-farmers linkages through large scale on-farm research and demonstrations. Interface of scientists, extension workers and farmers helped in a better promotion, large-scale validation and dissemination of location -specific technologies like IPM package, hybrid varieties and mechanization of production

Table 25: Impact of IPM technology tested under mission mode project

(in percent)

Indicator	Cotton		Ground nut	Chick pea	Pigeon pea	Cabbage	Tomato
	Irrigated	Rainfed					
Decrease in use of chemical pesticides	7 to 38	-	75 to 80	100	-	65	76
Decrease in cost of plant protection	7 to 40	5	-	8	30	-	4 to 33
Yield increase	40 to 88	90 to 222	25 to 89	5	13 to 104	Up to 51	-
Environmental impact	Increase in population of useful soil organisms like paracitoid *Cotesia plutella* in cabbage field, etc.						

operations. These projects were able to increase multidisciplinary research output and interface with research management. They had also strengthened linkages and participation of private sector in research and input delivery system. Beside reducing the use of chemicals and offering saving in irrigation water, these technologies had improved structure and fertility of soil. Also, there had been increased number of useful publications in the form of bulletins and folders. However, there was a need to monitor long-term impact of NATP technologies on pest dynamics, soil health and environmental consequences.

The aquaculture breeding and hatchery production technology under CGP project had opened up opportunities for the commercial exploitation of marine ornamental fishes from the wild, conditioning of the marine ornamental fishes for marketing, popularization of marine aquaculture, and development of marine ornamental fish trade. For popularization of the technologies, demonstrations were conducted at 20 different commercial production units.

The CGP under NATP had increased awareness about competitive grants and NATP as a useful mode of funding. Special considerations were noted to be given to women researchers in NATP projects. Due to the introduction of such change processes in the research system, there had been an increased number of publications, particularly international publications, and an increased pace of technology generation. It had given a new momentum to the large-scale farmer participatory-on-farm research in system perspective.

(Mruthyunjaya, Suresh Pal, LM Pandey and AK Jha)

Early Impacts of Selected Research Projects under NATP

A number of promising technologies had been refined/developed, and were being disseminated for their wider adoption under NATP. A study on impact of 14 selected technologies developed and refined under NATP indicated increased agricultural productivity, farm income and employment along with promotion of sustainability of agricultural production systems (Table 26).

(Mruthyunjaya, Suresh Pal, LM Pandey and AK Jha)

Social Science Information Repository (SSIR)

The SSIR, initiated in the year 2000 under PME sub-project has been widely acclaimed by various fora of the scientists. In addition to 7 ongoing SSIR studies, three new SSIR studies were initiated under networking mode in Bihar, Rajasthan and North-Eastern Region. A close and viable integration of SSIR with Village Level Studies (VLS) of ICRISAT had been achieved. During the year, two review meetings were organized where the progress was discussed. A hands-on training was also imparted to collaborators for data analysis, wherein the software for analyzing the data was also distributed. A synthesis report of all the collaborating centres is being prepared.

(Anjani Kumar, Mruthyunjaya, Suresh Pal and A. K. Jha)

Institutionalization of PME Activities in the NARS

PME cells are currently engaged in impact assessment of selected PSR projects, besides O&M processes introduced in the NARS under NATP. Major responsibilities of PME cells include sensitization of policy makers, managers, scientists and others about the need for research priority assessment,

Table 26: Estimated socio-economic impacts of selected technologies

(per ha or per animal)

Sl No.	Technology	Yield advantage (%)	Change in cost of cultivation (%)	Change in net return (Rs)
1	Management of cultivars in oilseeds	14 - 26	4 - 11	1500 - 5700
2	Cultivation of high-value plant/shrubs	20 - 44	11 - 74	6000- 90000
3	Veterinary diagnostics for prevalent and emerging diseases	2	-30	1200-2000
4	Post-harvest management in mushrooms	Loss minimization (%): 25 Value addition (Rs/kg): 10-15		4000 - 5000
5	Moisture conservation and runoff management in oilseeds and pulses	12-21	8-13	1475-3582
6	IPM in vegetables	7	11	4600
7	Rainwater management in cotton	6	-14	6500
8	Bed planting in wheat	3.7	8.5	2079
9	Post-harvest management in fruits and vegetables	Reduced losses (%): 10-15		15000
10	Manipulation of rumen microbial ecosystem	3-4	8-10	1200
11	Homestead farming	30	20	5000
12	Post-harvest management of mango and sapota	Loss minimization (%):6-10 Value addition (Rs/kg):5-15		5000-6000
13	Feeding, breeding, and immunization of migratory buffaloes	12	30	2745
14	Improved cultivation of rice	7	20	3000-4000
15	Storage pulse beetle management	Reduced damage (%): 84 to 93		3000-4500
16	Brackish-water fish management	12	25	100000
17	Complete economic ration for buffaloes and sheep	6.9	22	7000-8000
18	Cultivation of HYVs of wheat and maize	7	11	12500
19	Commercialization of medicinal plants	5	14	6000-7000
20	ATIC (at IISR, Calicut)	Reduced farmers visiting time (%): 25; Increased (HYV) adoption (%): 8; Increased net farm income (Rs/ha): 6000 to 9000		

prioritization of institution's programs, tracking of current resource allocations, interface with ARIS, SREP, ATMA, IVLP/TAR and KVK for research, facilitate monitoring and evaluation of research projects of the institutes/SAUs, participation in monitoring and evaluation (site level) activities of NATP and impact analysis.

The activities of PME cells are being recognised. This year seven PME Cells were added to the existing 25. The new PME Cells are located at NIRJAFT, Kolkata, West Bengal; RAU, Pusa, Bihar; UBKV, Koochbehar, West Bengal; College of Fisheries, Tripura; SKUAST, Srinaga, J&K;

TNVASU, Chennai, Tamil Nadu; and UAS, GKVK, Bangalore, Karnataka. They are being monitored for their PME activities.

(Mruthyunjaya, Suresh Pal, A. K. Jha and L. M. Pandey)

Trainings Organised

- Short–term training on 'Quantitative Methodology for Natural Resource Economics: Empirical Analysis with Practical Applications'
- Training on 'Agricultural Research Prioritization, Monitoring and Impact
- Sensitization meeting-cum–training of the Coordinators of Selected PME Cells.

III EMPOWERMENT OF WOMEN

Micro-finance and Empowerment: A Look into SHG Model

The micro-finance was conceptualized initially as a process of integrating a range of micro-financial services for poverty alleviation, but now, it is being realized that there are several development purposes for which it can be put to use like empowerment, risk management, livelihood promotion, building peoples' organizations , prevention of debt bondage, etc.

Andhra Pradesh is in the forefront of microfinance movement in India. In the state, the SHG movement is diverse with involvement of many agencies. Two districts in the state were covered under the project for evaluating the level of performance and determinants of performance of micro-finance. The determinants of empowerment through microfinance were broadly categorized under (i) socio-cultural context, (ii) group dynamics, (iii) credit program design, and (iv) macro-policy environment (nature of state intervention, extent of state intervention, arenas of state intervention, private sector participation, mode of operation of private sector etc). Group-dynamics was measured by means of number of dropouts and reasons for dropouts. The extent and reasons for dropouts observed in women SHGs in selected districts are presented in Tables 27 and 28.

Table 27: Details of dropouts and reasons for dropouts in the Medak district (AP)

Reasons for dropouts	Number of dropouts	Percentage to total dropouts
Self-dropouts due to financial problems	17	37.8
Migrations	9	20.1
Excluded due to problems in meeting financial commitments	7	15.6
Self-dropouts due to dissatisfaction of not getting LPG connections under Deepam Program	5	11.1
Self-dropouts to join other groups	1	2.2
Excluded due to irregularity in attending meetings	1	2.2
Self-dropout due to suspicion and non-satisfaction	2	4.4
Excluded due to not being married	2	4.4
Excluded due to higher age	1	2.2
Percentage of number of groups faced dropouts	33.3	
Number of groups studied	51	

In the Medak district, out of the total dropouts in the sampled SHGs, the percentage of dropouts due to financial problems were 54, in which 38 per cent were self-dropouts and 16 per cent were forced-dropouts. In the East Godavri district, the dropouts due to financial problems were 40 per cent of total dropouts, out of which self dropouts comprised 31 per cent. In Medak, 4 per cent forced-dropouts as they were unmarried, while in the East Godavari, 3 per cent were self-dropouts after marriage. Given the limitations of the sample size, these reasons for dropouts make one to question about empowerment effect of microfinance under the present SHG model . More specifically it necessitated a re-look into the credit program design and also externalities created by linking other developmental programs implemented by the government to microfinance program. Migration which had been identified as one

Table 28: Details of dropouts and reasons for dropouts in the East Godavari district (AP)

Reasons for dropouts	Number of dropouts	Percentage to total dropouts
Migrations	12	34.3
Self-dropouts due to repayment problems	11	31.4
Dropped due to older age	4	11.4
Excluded due to repayment problems	3	8.6
Self-dropouts as they did not like the economic activity of agarbatti making	3	8.6
Self-dropouts to join some other group due to distance factor	1	2.9
Self-dropouts after marriage	1	2.9
Percentage of number of groups in which dropouts observed to total number of groups surveyed	43.24	
Number of groups studied	37	

of threats to sustained collective action, accounted to the extent of 19 and 34 per cent of dropouts in case of SHGs of Medak and East Godavari, respectively. The contribution of microfinance in empowerment in the arena of social empowerment by way of network building through federations and creation of social awareness and political empowerment through creation of knowledge regarding their rights are more prominent than economic empowerment.

(Laxmi Prasanna P. A.)

IV. POLICY INTERACTION

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

Anjani Kumar served as a resource person for Bihar Development Report on Agriculture and Allied Activities, being prepared by the Institute of Human Development, on behalf of Planning Commission, Govt. of India.

B C Roy served as a member of the Research Degree Committee of Dr. B. R. Ambedkar University, Agra, U. P.

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; Review Team for Rice-Wheat Consortium; Dr. Jha also served as the Editor, Agricultural Economics Research Review; Scientific Panel on Crop Sciences, QRT, Central Institute of Fisheries Education, Mumbai

Mruthyunjaya has served as the Chairman, PME Task Force, NATP Site Committee and SAARC coordinator at ICAR. He also served as a member of: SAARC Agricultural Information Centre (SAIC) GB; 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; Site Committee, NATP, 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 also the nodal officer and TAC member of CGPRT Centre of ESCAP, Bogor, Indonesia and the Secretary of the AERA, Nodal Officer of Indo French Seminar, Convener of International Conference on Sustainable Management of Sodic Lands, Indian Institute of Sugarcane Research, Lucknow, U.P.

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.

Suresh Pal has served as 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.

V AWARD(S) AND RECOGNITIONS

B. C. Roy and Suresh Pal received *D K Desai Award* of the *Indian Society of Agricultural Economics* for their paper '*Investment, Agricultural Productivity and Rural Poverty in India: A State-Level Analysis*' which was adjudged as the best paper published in *Indian Journal of Agricultural Economics* during the year 2002 from the agricultural stream.

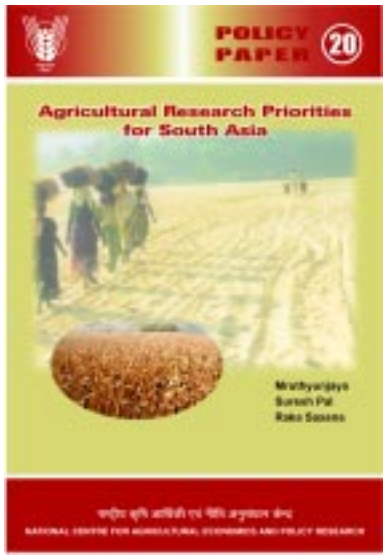
VI NATIONAL AND INTERNATIONAL LINKAGES AND COLLABORATIONS

Name of scientist	Project	Collaborator
Anjani Kumar	Agricultural diversification in eastern India : Problems and prospects	Institute for Human Development, New Delhi
P S Birthal	India's livestock feed balance and its environmental implications	SESR, New Delhi
P S Birthal	Agricultural diversification in South Asia	International Food Policy Research Institute, Washington, D.C., USA
P A Lakshmi Prasanna	Determinants of performance of SHGs in rural micro-finance	Indian Agricultural Statistics Research Institute, New Delhi
Rasheed Sulaiman V	Optimizing institutional arrangements for demand-driven post-harvest research, delivery, uptake and impact of the poor through public and private sector partnerships	International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad
Rasheed Sulaiman V	Assessing viability of new institutional arrangements	Cirrus Management Services, Bangalore
Rasheed Sulaiman V	Impact of BAIF-livestock development programme: An institutional analysis	BAIF Development Foundation, Pune
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 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
Mruthyunjaya 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

VII. PUBLICATIONS

A. NCAP Publications

Policy Papers



Policy Paper 20: Agricultural Research Priorities for South Asia
Policy Paper 21: Demand and Supply Projections for Livestock Products in India

Policy Briefs

Policy Brief 17: Towards Extension-Plus: Opportunities and Challenges
Policy Brief 18: Institutional Innovations for Use of Information and Communication Technologies (ICTs) in Agriculture
Policy Brief 19: Irrigation Equity : Impacts, Sources and Strategies

Working Papers

Workshop Paper 5: Medicinal Plants Sector in India: Current Status, Opportunities and Constraints

Workshop Proceedings

Workshop Proceedings No. 11: Integrated Pest Management in Indian Agriculture
Workshop Proceedings No. 12: Resource Analysis for Sustaining Water-Food Security

PME Notes

PME Note 13 : Convergence of the Macro- and Micro-Level Priorities for Agricultural Research

Others

Discussion Series 1: Panel Discussion on Role and Functions of the Commission for Agricultural Costs and Prices (CACP) in the Changed Scenario

B. Research Papers

Chand, Ramesh, Dayanatha Jha and Surabhi Mittal (2004), WTO and Oilseeds Sector: Challenges of Trade Liberalisation. *Economic and Political Weekly*, (49) : 533-537.

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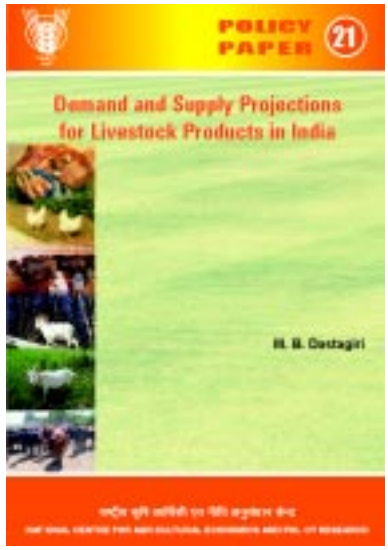

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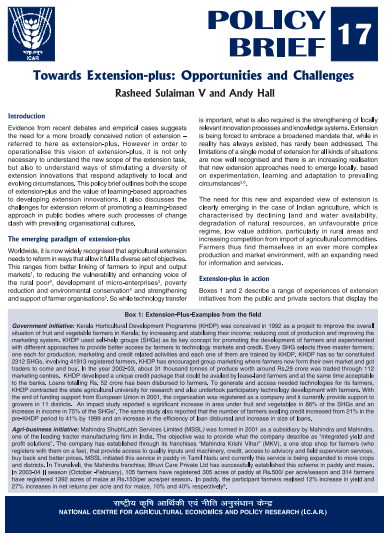
POLICY BRIEF 17

Towards Extension-plus: Opportunities and Challenges

Rasheed Sulaiman V and Andy Hall

Introduction

Evidence from recent debates and empirical cases suggests the need for a more broadly conceived notion of extension – referred to here as extension-plus. However in order to operationalise this vision of extension-plus, it is not only necessary to understand the new scope of the extension task, but also to understand ways of stimulating a diversity of extension innovations that respond adaptively to local and evolving circumstances. This policy brief outlines both the scope of extension-plus and the value of learning-based approaches to developing extension innovations. It also discusses the challenges for extension reform of promoting a learning-based approach in public bodies where such processes of change clash with prevailing organisational cultures.

The emerging paradigm of extension-plus

Worldwide, it is now widely recognised that agricultural extension needs to reform in ways that allow it fulfil a diverse set of objectives. This ranges from better linking of farmers to input and output markets[1], to reducing the vulnerability and enhancing voice of the rural poor[2], development of micro-enterprises[3], poverty reduction and environmental conservation[4] and strengthening and support of farmer organisations[5]. So while technology transfer is important, what is also required is the strengthening of locally relevant innovation processes and knowledge systems. Extension is being forced to embrace a broadened mandate that, while in reality has always existed, has rarely been addressed. The limitations of a single model of extension for all kinds of situations are now well recognised and there is an increasing realisation that new extension approaches need to emerge locally, based on experimentation, learning and adaptation to prevailing circumstances[6].

The need for this new and expanded view of extension is clearly emerging in the case of Indian agriculture, which is characterised by declining land and water availability, degradation of natural resources, an unfavourable price regime, low value addition, particularly in rural areas and increasing competition from import of agricultural commodities. Farmers thus find themselves in an ever more complex production and market environment, with an expanding need for information and services.

Extension-plus in action

Boxes 1 and 2 describe a range of experiences of extension initiatives from the public and private sectors that display the

Box 1: Extension-Plus-Examples from the field

राष्ट्रीय कृषि आर्थिकी एवं नीति अनुसंधान केन्द्र
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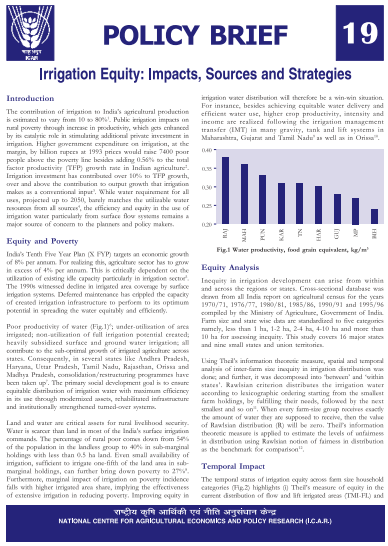
POLICY BRIEF 19

Irrigation Equity: Impacts, Sources and Strategies

Introduction

The contribution of irrigation to India's agricultural production is estimated to vary from 10 to 80%[1]. Public irrigation impacts on rural poverty through increase in productivity, which gets enhanced by its catalytic role in stimulating additional private investment in irrigation. Higher government expenditure on irrigation, at the margin, by billion rupees at 1993 prices would raise 7400 poor people above the poverty line besides adding 0.56% to the total factor productivity (TFP) growth rate in Indian agriculture[2]. Irrigation investment has contributed over 10% to TFP growth, over and above the contribution to output growth that irrigation makes as a conventional input[3]. While water requirement for all uses, projected up to 2050, barely matches the utilizable water resources from all sources[4], the efficiency and equity in the use of irrigation water particularly from surface flow systems remains a major source of concern to the planners and policy makers.

Equity and Poverty

India's Tenth Five Year Plan (X FYP) targets an economic growth of 8% per annum. For realizing this, agriculture sector has to grow in excess of 4% per annum. This is critically dependent on the utilization of existing idle capacity particularly in irrigation sector[5]. The 1990s witnessed decline in irrigated area coverage by surface irrigation systems. Deferred maintenance has crippled the capacity of created irrigation infrastructure to perform to its optimum potential in spreading the water equitably and efficiently.

Poor productivity of water (Fig.1)[6]; under-utilization of area irrigated; non-utilization of full irrigation potential created; heavily subsidized surface and ground water irrigation; all contribute to the sub-optimal growth of irrigated agriculture across states. Consequently, in several states like Andhra Pradesh, Haryana, Uttar Pradesh, Tamil Nadu, Rajasthan, Orissa and Madhya Pradesh, consolidation/restructuring programmes have been taken up[7]. The primary social development goal is to ensure equitable distribution of irrigation water with maximum efficiency in its use through modernized assets, rehabilitated infrastructure and institutionally strengthened turned-over systems.

Land and water are critical assets for rural livelihood security. Water is scarcer than land in most of the India's surface irrigation commands. The percentage of rural poor comes down from 54% of the population in the landless group to 40% in sub-marginal holdings with less than 0.5 ha land. Even small availability of irrigation, sufficient to irrigate one-fifth of the land area in sub-marginal holdings, can further bring down poverty to 27%[8]. Furthermore, marginal impact of irrigation on poverty incidence falls with higher irrigated area share, implying the effectiveness of extensive irrigation in reducing poverty. Improving equity in irrigation water distribution will therefore be a win-win situation. For instance, besides achieving equitable water delivery and efficient water use, higher crop productivity, intensity and income are realized following the irrigation management transfer (IMT) in many gravity, tank and lift systems in Maharashtra, Gujarat and Tamil Nadu[9] as well as in Orissa[10].

Fig.1 Water productivity, food grain equivalent, kg/m³

Equity Analysis

Inequity in irrigation development can arise from within and across the regions or states. Cross-sectional database was drawn from all India report on agricultural census for the years 1970/71, 1976/77, 1980/81, 1985/86, 1990/91 and 1995/96 compiled by the Ministry of Agriculture, Government of India. Farm size and state wise data are standardized to five categories namely, less than 1 ha, 1-2 ha, 2-4 ha, 4-10 ha and more than 10 ha for assessing inequity. This study covers 16 major states and nine small states and union territories.

Using Theil's information theoretic measure, spatial and temporal analysis of inter-farm size inequity in irrigation distribution was done; and further, it was decomposed into 'between' and 'within states'. Rawlsian criterion distributes the irrigation water according to lexicographic ordering starting from the smallest farm holdings, by fulfilling their needs, followed by the next smallest and so on[11]. When every farm-size group receives exactly the amount of water they are supposed to receive, then the value of Rawlsian distribution (R) will be zero. Theil's information theoretic measure is applied to estimate the levels of unfairness in distribution using Rawlsian notion of fairness in distribution as the benchmark for comparison[12].

Temporal Impact

The temporal status of irrigation equity across farm size household categories (Fig.2) highlights (i) Theil's measure of equity in the current distribution of flow and 3(ii irrigated areas (TMI-FL) and

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Adhiguru, P., Rajeswari R. Pingali and Shyamal Chowdhury (2004), Information and Communication Technologies for Agricultural Diversification by Smallholders in India and Bangladesh. Paper presented in the *FICCI-ICRISAT-IFPRI International Workshop on Agricultural Diversification and Vertical Integration in South Asia*, held at FICCI, New Delhi, 5-7 November.

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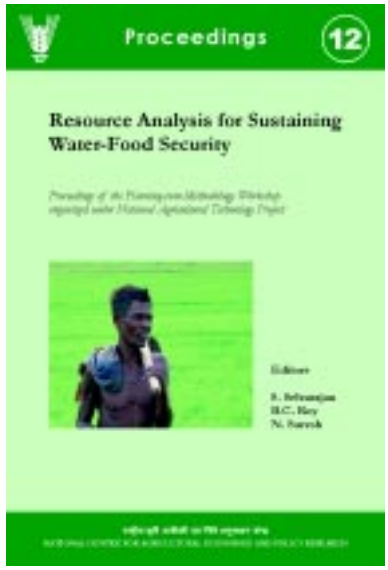

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NATP *PME* notes **13**

Task Force on Prioritization, Monitoring & Evaluation

ICAR

Convergence of the Macro- and Micro-Level Priorities for Agricultural Research

Mruthyunjaya, Suresh Pal, Raka Saxena and A. K. Jha[1]

May 2003

Context

Macro-level agricultural research priority setting deals with research resource allocation across regions (states, agro-ecosystems, production systems and commodities), whereas micro-level priority setting deals with resource allocation across research programs and projects for a region, commodity, or research institution. The research prioritization, as a systematic, scientific and objective exercise, is undertaken by a multi-disciplinary team in close interaction with all stakeholders like farmers, extension and development workers, industry, NGOs etc. Ideally, the macro priorities should be based on the micro priorities. But it is generally felt that the micro priorities are not systematically and transparently integrated into the macro-level priorities (which are largely commodity and discipline oriented), and thus a disconnect exists between the two. Therefore, there is a need for convergence between the micro and macro priorities to have a proper alignment and continuous linkage from strategic to applied research.

The Model

ICAR is the central co-ordinating body for agricultural research in India. It lays out broad national priorities taking into account national needs, development objectives and also perceived scientific opportunities. It identifies the priorities of production systems, commodities, ecoregions to achieve national objectives based on the considerations like efficiency, sustainability, equity, and exports. Once the broad priorities are identified, decisions are taken regarding major strategies to be adopted for various commodities/locations. The strategies may depend upon technological opportunities and resource availability. An essential activity at this level should be scientific analysis of various constraints, opportunities, gaps and judgment regarding priorities. If we move one level down, there are ICAR institutes, All India Coordinated Research Projects (AICRPs), State Agricultural Universities (SAUs), Zonal Research Stations (ZRSs), and *Krishi Vigyan Kendras* (KVKs). While SAUs have research and education mandates for their respective state, ICAR institutes, including AICRPs though located in a state, have the national mandate for research (also education in some cases). All these institutions have to follow a similar scientific approach mentioned above to set their research priorities. ZRSs, KVKs and ICAR institutes/AICRPs working with Agricultural Technology Management Agency (ATMA) at the district level can be the most suitable agencies for identification of production constraints, growth possibilities, research and extension gaps and convey them to the research managers and policy makers at AICRPs, SAUs and ICAR institutes. The final decision on research gaps will be pursued as research projects in these institutions are developed, depending upon their mandate and availability of resources. For the macro-level priority setting, ICAR will form a continuum with the SAUs, ICAR institutes and AICRPs.

Practice

Till the recent past, owing to absence of adequate data on location-specific priorities and lack of quantitative knowledge of field-level constraints and opportunities, research prioritization has been done by harmonizing the micro and macro priorities on the basis of experience, perceptions and collective wisdom. The approach is basically commodity/discipline oriented. However, with change of time, the emphasis is shifting towards location-specific farming system research based on priorities of farmers. With this shift, research prioritization should follow the "bottom-up" approach with the micro-level and macro-level priorities forming a circular continuum. We need to have a mechanism to ensure this continuum to avoid the disconnect between the micro and macro priorities.

Strategy

- There is a need for participatory and bottom up approach for research priority assessment involving various stakeholders like farmers, extension workers, private sector and other agencies, and its implementation across the regions. At present, ATMAs as a model under National Agricultural Technology Project (NATP), have taken up such assessment and are engaged in determination of the micro priorities in various districts through Strategic Research and Extension Plan (SREP) in collaboration with National Academy of Agricultural Research Management (NAARM), National Institute of Agricultural Extension Management (MANAGE) and SAUs. Twenty eight districts have been selected for pilot implementation of this model. The linkages among ATMAs, ICAR institutes, KVKs and SAUs become very important at this stage in undertaking the identified research priority areas. The priorities decided through SREP can be delineated into strategic and applied research. The strategic research priorities in general can be addressed by ICAR institutions, whereas SAUs can deal with regional applied research.
- Research priorities (micro) are to be based on location and system-specific constraints and opportunities identified using objective scientific methods. Participatory Rural Appraisal and other suitable techniques can be used for identifying the production constraints. These constraints after prioritization should be matched with the research agenda of the institutions for the region to find out the research gaps. A constant and periodic evaluation and mid-course correction have to be made in the research agenda and activities of the institutions to see whether the identified research gaps are addressed or not.
- To promote the researcher and stakeholder linkages, particularly in applied research, reward system for the scientists should also consider the success in establishing interaction with farmers and other clientele, besides publication and technology development.
- Various institutions like ICAR (HQ), ICAR Regional Committees (RCs), ICAR institutes, KVKs, ATMAs and AICRPs, have to promote the linkages between the micro and macro priorities. There is a need to look into the roles and functions performed by these institutions. Inter-institutional linkages among ICAR (HQ), ICAR institutes, SAUs, ZRSs, KVKs, ATMA, farmers' interest groups (FIGs) and private sector will have to be taken up in a planned manner to forge the convergence.

[1] National Centre for Agricultural Economics and Policy Research, New Delhi 110 012. Thanks are due to members of the PME Taskforce, Dr. S. L. Mehta, National Director and Dr. A. Bandyopadhyay, National Coordinator, NATP and Dr. P. K. Joshi, Principal Scientist, NCAP for useful comments and suggestions.

PME is a major theme of NATP. PME Notes are meant to disseminate concepts and information regarding this activity. Please address comments, questions and contributions to Director, NCAP.

Singh, Harbir (2003), IPRs in Horticulture: An Indian Scenario with Particular Reference to Medicinal Plants, in *7th International Symposium on Temperate Zone Fruits in the Tropics and Subtropics*, Dr. Y.S. Parmar University of Horticulture and Forestry, Solan, 14-18 October.

Singh, Harbir (2003), Harnessing the Potential of Medicinal Plants in India: An Overview of Constraints and Opportunities, *in Agro Vision 2003*, Rajkot (Gujarat), 30 May.

VIII. 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
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 S K Pandey
11.	Strategies and options for increasing and sustaining fisheries and aquaculture production to benefit poor households in Asia	Mruthyunjaya Anjani Kumar
12.	Increasing productivity of livestock in mixed crop livestock system in South Asia	P Parthasarathy Rao P S Birthal
13.	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	V Rasheed Sulaiman
14.	Impact of BAIF-livestock developmental program : An institutional analysis	V Rasheed Sulaiman S Selvarajan
15.	Fruit and vegetable processing in India: Technological, institutional and policy dimensions	B C Roy
16.	Developing decision making tools for assessment of vulnerability to climate change in India	S Selvarajan B C Roy V Rasheed Sulaiman
17.	Water-food security scenario analysis for 2025: Agro-ecological regional approach	S Selvarajan B C Roy
18.	Integrated national agriculture resources information system	S Selvarajan Anjani Kumar P A Lakshmi Prasanna
19.	Indian seed system development – Policy and institutional options	Suresh Pal
20.	Agricultural diversification in Eastern India:Problems and prospects	Anjani Kumar

IX. CONSULTANCY PROJECTS

The consultancy and contract research activities are undertaken by the Centre to complement the emerging research thrusts and to supplement the budgetary resources of the Centre. Consultancy proposals are examined by the Consultancy Processing Cell of the Centre and are finalised as per the Indian Council of Agricultural Research (ICAR) guidelines. 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 of the poor through public and private sector partnerships
Rasheed Sulaiman V.	Cirrus Management Services, Bangalore	Assessing viability of new institutional arrangements

X. 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. Mruthyunjaya Director NCAP New Delhi
Dr. G. K. Chadha Vice-Chancellor Jawaharlal Nehru University New Delhi	Dr. I. J. Singh 101, Pushpi Apartements Sharadha Nagar, Gumti No. 9 G.T. Road, Kanpur, Uttar Pradesh
Dr. Abhijit Sen Professor Centre of Socio-Economic Planning Jawaharlal Nehru University, New Delhi	Dr. D. K. Marothia Dean Department of Agriculture and Natural Resource Economics IGKV, Raipur, Jharkhand
Dr. G. S. Ram Chief Economic Advisor and Labour Employment Advisor Ministry of Labour Sharam Shakti Bhavan, New Delhi	Prof. Ram Pravesh Singh 167, North Anandpuri West Boring Canal Road Patna, Bihar
Sh. D. S Ananth No.697/A, First Block, III[rd] Stage Basvaeshwara Nagar Bangalore	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 2 May, 2003 were as follows :

- Keeping in view the changing nature of Indian agriculture from a subsistence mode to a surplus mode, research programme needs to look at how institutional, social and political factors interact with technology.
- 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 mobilisation efforts.
- The idea of networking and having Memorandum of Understanding (MOUs) with SAUs having strong foundation in micro-economic issues was highly appreciated. 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 quality of post-graduate education in SAUs.
- To strengthen these efforts, the Centre should also pursue its X 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.	The Director Directorate of Economics and Statistics Delhi State Old Secretariat, Delhi.
Director of Horticulture Govt. of Haryana Sec 22, Panchkula Chandigarh	Dr. Karam Singh Professor & Head Department of Economics and Sociology Punjab Agricultural University Ludhiana, Punjab
The Finance & Accounts Officer Indian Agricultural Statistics Research Institute New Delhi	Mr. Narender 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 November 14, 2003. 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 2001-02 and expenditure till August 2003. 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.

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 programs and new research proposals. The Scientists and Research Associates delivered seminars on new proposals and results of ongoing studies in 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. Such committees and their terms of reference are as follows:

Academic Planning and Policy Committee

- To strengthen internal planning and policy direction functions.

Scientist 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 the income, including those for the sponsored projects.
- To ensure compliance of proper procedures.

Purchase Committee

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

Publication Committee

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

Consultancy Processing Cell

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

Computer Committee

- To plan and monitor compute 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.
- 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 Vashist	Member

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

Name	Theme and date(s)	Place
Adhiguru P.	FICCI-ICRISAT-IFPRI International Workshop on Agricultural Diversification and Vertical Integration in South Asia, 5-6 November 2003.	FICCI, New Delhi.
	Regional Conference on Poverty Monitoring in Asia, 24-26 March 2004.	ADB Headquarters, Manila, Philippines.
Anjani Kumar	FICCI – ICRISAT - IFPRI International Workshop on Agricultural Diversification and Vertical Integration in South Asia, 5-7 November 2003.	FICCI, New Delhi
	The National Workshop on Methodologies for Prioritization of Fisheries Research in India, 10 November 2003.	NAARM, Hyderabad
	National Symposium on Socio-Economic Dynamics of Rice Production Systems in Eastern India, 11-12 November 2003.	NCAP, New Delhi
	Review Workshop of Social Science Information Repository, 11 December 2003.	PJNC of Agriculture and Research Institute, Karaikal, Pondicherry
	Annual Conference of Agricultural Economics Research Association, 12-13 December 2003.	PJNC of Agriculture and Research Institute, Karaikal, Pondicherry
	National Workshop on Strategies and Options for Increasing and Sustaining Fisheries and Aquaculture Production to Benefit Poor Household in Asia, 29-30 January 2004.	NCAP, New Delhi
	Final Workshop of Fish Demand-Supply Project 16-20, March 2004.	ADB Headquaters, Manila, Philippines
B C Barah	PIU NATP Workshop on Rainfed Production System, 24-25 April 2003.	CRIDA, Hyderabad
	Promoting Cultivation & Trade of Scented Rice in UP and Uttaranchal, 24-25 May 2003	UP/UPRSC, Lucknow
	Annual Conference of the Indian Association of Agricultural Economics, Bhubaneswar, 29 December 2003	OUA& T, Bhubaneshwar
B C Roy	Emergence of Self Employment Opportunities in Agro-Based Industry, 26 June 2003	IIC, New Delhi

Name	Theme and date(s)	Place
	Adaptation Research Workshop 9-12 November 2003	Ashoka Hotel, New Delhi
	63rd Annual Conference of Indian Society of Agricultural Economics, 19-21 December 2003	OUAT, Bhubaneswar
	Adaptation to Climate Change: Current Research Efforts in India, 31st March 2004	TERI, New Delhi
Dayanatha Jha	An Indo-French Seminar on Agricultural Research and Education, 16-17 April 2003.	Ashoka Hotel, New Delhi
	Fourth Meeting of the Working Group on NSS 59th Round, 4 June 2003.	Kolkata
	Madhya Pradesh :Economic Challenges, 5-6 August 2003.	ORF, Bhopal
	Implications of WTO on Indian Agriculture, 23 August 2003.	UPCAR, Lucknow
	Fifth Meeting of Inter-Academy Committee on Responsibility and Ethics in Science 11 September 2003.	INSA, New Delhi
	Agricultural Diversification and Vertical Integration in South Asia, 5-6 November 2003.	FICCI House, New Delhi
	National Symposium on Socio-Economic Dynamics of Rice Production Systems in Eastern India, 11-12 November 2003.	NCAP, New Delhi
	First Meeting of the Reconstituted Coordinating Committee for Organization of Research Studies in the Field of Agricultural Economics, 22 January 2004.	Krishi Bhavan, New Delhi
	National Workshop on Strategies and Options for Increasing and Sustaining Fisheries and Aquaculture Production to Benefit Poor Households in India, 29-30 January 2004.	NCAP, New Delhi
Harbir Singh	The Role of Biotechnology in Agriculture, 27 October 2003.	FICCI, New Delhi
	National Symposium on Relevance of GM Technology to Indian Agriculture & Food Security, 26-27 November 2003.	India Habitat Centre, New Delhi
Mruthyunjaya	Workshop for Reviewing the Progress of Monitoring and Evaluation activities being carried out by PMEs under ITD component of NATP, 19 June 2003.	Indian Institute of Management, Lucknow

Name	Theme and date(s)	Place
	Prioritization, Monitoring and Impact Assessment in Agricultural Research Institutions & Agricultural Economics and Policy Research: Present Status and Future Needs as a part of PME Social Science Networking Project of NATP, 2-5 July 2003.	S. V. Agricultural College, Tirupati
	The Guest of Honour on the Eve of inauguration of the Training on Agri-clinics & Agri-Business Centres Scheme, 5 August 2003.	NRCAF, Jhansi.
	CGPRT Governing Board Meeting, 20-21 August, 2003.	Bogor, Indonesia
	Competitive Agricultural Research Programme (CARP) Grant Committee (CGC) Meeting of the U.P. Council of Agricultural Research, Lucknow, 29 August 2003.	UP Council of Agricultural Research, Lucknow
	National Workshop on Reforms in Land Policy for Accelerated Agricultural Growth and Rural Development, 1 September 2003.	NASC, New Delhi
	Policy Research Networking to Strengthen Policy Reforms, Inception Meeting, 2-3 September 2003.	The Oberoi Hotel, New Delhi
	To Evaluate the Worth of the Research Work Carried out by the Institutes of DARE/ICAR Recommendation of the Parliamentary Standing Committee on Agriculture 19 September 2003.	NCAP, New Delhi
	The GB Meeting and ICT Workshop at SAIC, 19-23 October 2003.	Dhaka
	FICCI-ICRISAT-IFPRI Internatioal Workshop on Agricultural Diversification and Vertical Integration, 5-6 November 2003.	FICCI, New Delhi.
	Seminar on International Agriculture Trade Negotiations: Perspective after Cancun, 7 November 2003.	French Embassy, New Delhi. Co-host
	The National Workshop on Methodologies for Prioritization of Fisheries Research in India, 10 November 2003.	NAARM, Hyderabad.
	National Symposium on Socio-Economic Dynamics of Rice Production Systems in Eastern India, 11-12 November 2003.	NCAP, New Delhi.

Name	Theme and date(s)	Place
	To evaluate the worth of the research work carried out by the Institutes of DARE/ICAR Recommendation of the Parliamentary Standing Committee on Agriculture, 15 November 2003.	NCAP, New Delhi
	Review Workshop on Social Science Information Repository (SSIR) under PME Project of NATP 11 December 2003	PJNC of Agriculture and Research Institute, Karaikal (Pondicherry)
	11th Annual Conference of Agricultural Economics Research Association, 12-13 December 2003	PJNC of Agriculture and Research Institute, Karaikal (Pondicherry)
	COSOP Stakeholder Consultation Workshop (IFAD meeting), 8-9 January 2004	India Habitat Centre
	22nd Session of Technical Advisory Committee (TAC), 13-14 January 2004 and 22nd session of Governing Board Meeting, 15-17 January 2004.	CGPRT Centre, Bogor, Indonesia
	National Workshop on Strategies and Options for Increasing and Sustaining Fisheries and Aquaculture Production to Benefit Poor Household in Asia, 29-30 January, 2004.	NCAP, New Delhi
	International Conference on Sustainable Management of Sodic Lands, 12 February 2004.	UPCAR, Lucknow
	To evaluate the worth of the research work carried out by the Institutes of DARE/ICAR Recommendation of the Parliamentary Standing Committee on Agriculture, 27-28 February 2004.	NCAP, New Delhi
	Sensitization Meeting-cum-training of Co-ordinators of Selected PME Cells, 10 March 2004.	NCAP, New Delhi
P A Lakshmi Prasanna	Micro-finance and Empowerment, 7-8 January 2004.	French Institute of Pondicherry
	Medicinal Herbs & Herbal Products- Livelihoods and Trade Options, 26-27 March 2004	India Habitat Centre New Delhi
P S Birthal	FICCI – ICRISAT – IFPRI International Workshop on Agricultural Diversification and Vertical Integration in South Asia, 5-7 November 2003.	FICCI, New Delhi
	Workshop on Chickpea Production and Productivity Constraints 21-22 November 2003.	NCIPM, New Delhi
Rasheed Sulaiman V	Workshop on Post Harvest Innovations: Partnerships, Learning and Institutional Change, 15-16 April 2003.	Timber Trails Resorts, Himachal Pradesh

Name	Theme and date(s)	Place
	South Asia Regional Workshop on Operationalizing Reforms in Agricultural Extension in South Asia, May 6-8, 2003.	New Delhi, India
	Experience Sharing Workshop on Improved Biomass Utilisation Technologies, 10 February, 2004	India Habitat Centre, New Delhi
	Workshop on Developing Institutional Outputs, 11-12 March, 2004	ICRISAT, Hyderabad
S K Pandey	Annual Workshop of Household Food and Nutritional Security of Tribal, Backward and Hilly Areas, 2-3 April 2003	NBPGR, New Delhi
	FICCI-ICRISAT-IFPRI International Workshop on Agricultural Diversification and Vertical Integration in South Asia, 5-6 November 2003	FICCI House, New Delhi
	National Seminar on Socio-economic Dynamics of Rice Production System in Eastern India, 11-12 November 2003.	NCAP, New Delhi
	Third Annual Workshop of Household Food and Nutritional Security of Tribal, Backward and Hilly Areas, 23-24 March 2004.	NBPGR, New Delhi
S Selvarajan	Challenge Programme on Water and Food: Full Project Proposal Planning Workshop for the Indo-Gangetic Basin, 27-29 August 2003	NASC Complex, New Delhi
	NCAP-UNEP Project Team Meeting for Developing Decision Making Tools for Assessment of Vulnerability to Climate Change in India , 3 September 2003.	NCAP, New Delhi.
	Inception and Planning Workshop on Water Scarcity and Food Security in Tropical Rainfed Water Scarcity Systems: A Multi-level Assessment of Existing Conditions, Response Options and Future Potentials, 11-12 September 2003.	ICRISAT, Hyderabad
	First Meeting of Inter-Ministerial Committee to Examine the Structure and Functioning of Comprehensive Scheme for Studying the Cost of Cultivation of Principal Crops in India, 13 January 2004.	Ministry of Agriculture, GOI, New Delhi
Suresh Pal	25th International Conference of Agricultural Economists on Reshaping Agriculture's Contribution to Society, 16-22 August 2003.	Durban, South Africa

Name	Theme and date(s)	Place
	Workshop on Impact of Strengthened IPR Regime on Plant Breeding Industry in the Developing Countries, 6-9 October 2003	Wageningen University, The Netherlands.
	IFPRI-FICCI International Workshop on Agricultural Diversification in South Asia, 5-7 November 2003	FICCI, New Delhi
	World Bank-ICRISAT Workshop on Strategies for Rural Development and Poverty Alleviation, 22 January 2004.	ICRISAT, Hyderabad

XII. VISITS ABROAD

Name of the Scientist	Purpose/Workshop/ Conference	Place	Duration
Adhiguru A	Regional Conference on Poverty Monitoring in Asia	ADB Headquarters, Manila, Philippines	23-26 March 2004
Anjani Kumar	International Training Workshop on Analysis and Projections of Fish Demand and Supply in Asia	Penang, Malaysia	22 July to 12 August 2003
	Final Workshop of ADB Sponsored Project on Strategies and Options for Increasing and Sustaining Fisheries and Aquaculture Production to Benefit Poor Households in Asia	Manila Philippines	16-20 March 2004
B C Barah	Socio-economic Dynamics of Rice Economy	IRRI, Manila Philippines	18 March to 18 April 2003.
Harbir Singh	Workshop on Analysis of Trade Liberalization for Poverty Alleviation	Colombo, Sri Lanka	21-25 April 2003
Mruthyunjaya	CGPRT Governing Board Meeting	Bogor, Indonesia	20-21 August 2003
	GB Meeting and ICT Workshop at SAIC	Dhaka	19-23, October 2003
	22nd Session of Technical Advisory Committee (TAC) and 22nd Session of Governing Board Meeting	Bogor, Indonesia	13-17 January 2004
	Final Workshop of ADB Sponsored Project on Strategies and Options for Increasing and Sustaining Fisheries and Aquaculture Production to Benefit Poor Households in Asia	Manila Philippines	16-20 March 2004
P S Birthal	Agricultural Diversification in South Asia	International Food Policy Research Institute, Washington DC	5-31 July 2003
Suresh Pal	25th International Conference of Agricultural Economists on Reshaping Agriculture's Contribution to Society	Durban, South Africa	16-22 August 2003
	Workshop on Impact of Strengthened IPR Regime on Plant Breeding Industry in the Developing Countries	Wageningen University, The Netherlands	6-9 October 2003

XIII. WORKSHOPS/SEMINARS/TRAININGS/MEETINGS ORGANISED

National Workshop on Strategies and Options for Increasing and Sustaining Fisheries and Aquaculture Production to Benefit Poor Households in India

NCAP, New Delhi, January 29-30, 2004.

The objective of this workshop was to examine critically the findings of a research project on above issue and to develop a framework for suitable national action plan for fisheries development in the coming years in India. The project is being carried out in nine developing Asian countries by the World Fish Centre, Penang, Malaysia in collaboration with National Agricultural Research Systems in respective countries. In India NCAP is leading this activity in collaboration with Division of Agricultural Economics, IARI, New Delhi, CMFRI (Cochin), CIFRI (Barrackpore), College of Fisheries, Mangalore and Department of Agricultural Economics, GAU (Junagarh).

The project comprises four components: (i) Profile of technologies in fisheries sector in India, (ii) Policies, institutions and support systems, (iii) Socio-economic profile of stakeholders in fisheries sector, and (iv) Analysis of demand and supply projections of fisheries sector. The workshop was attended by 60 participants, comprising research managers, policy makers, planners, scientists, academicians, government officials, personnel from NGOs, co-operatives, private sector, etc.

The workshop was inaugurated by Dr R. Chidambaram, who was the former Chairman of Atomic Energy Commission and was the Principal Scientific Advisor to the Government of India at the time of inauguration. The inaugural session of the workshop was chaired by Dr SAH Abidi, Member, Agricultural Scientists Recruitment Board.

The following strategies were suggested for accelerated fishery development with focus on poverty alleviation of poor fishers:

- Follow people-centered not commodity centered approach
- follow a system approach
- Prioritize technology for the poor at national, regional and micro level
- Innovate and strengthen institutions and policies
- Upgrade skills of poor fishers
- Enhance investment and reorient policies to facilitate percolation of benefits from trade to all sections of society, particularly poor and the women
- Follow ecological principles
- Emphasize domestic market which is a sleeping giant
- Strictly monitor the development programs, make on-course corrections and assess the impact of all revitalized programs
- Strengthen database and share it for a better planning and policy making in the sector

The detailed workshop proceedings were published in Fishing Chimes [Vol 24(1):152-9] and ICAR Reporter for a wider circulation.

National Study Team Meeting on Developing Decision Making Tools for Assessment of Vulnerability to Climate Change

NCAP, Pusa, New Delhi, 17-18 November, 2003

The objective of this meeting was to discuss the common framework of the study and to finalize individual/sectoral workplan order to accomplish various activities of the project within the timeframe. All the 12 members of the team, representing each of the collaborating Centres attended the meeting: SEI, London; WTCER, Bhubaneswar; UAS (B), Banglore; NCIPM, New Delhi; and NCAP, New Delhi.

An overview of the project was followed by a detailed presentation on methodologies for assessing vulnerability to climate change in agriculture. The major activities performed and decisions taken were as follows:

- Vulnerability profiles need to be developed for the study area for different livelihood groups (crop farmers, labourers, traders, etc.) and eco-systems/sectors (water, soil, fisheries, etc.) against major climatic hazards (cyclone, flood, drought, heat wave, etc.). The purpose of developing vulnerability profiles was to rank the vulnerability events taking into consideration their impacts on major livelihood groups and/or ecosystems.
- The coping/adaptation strategies should be identified for different livelihoods/ecosystems against major climatic hazards.
- It was important to understand the adaptation mechanisms (both individual & institutional), their costs, efficiency and effectiveness, i.e. implementation barriers in the study area.
- There is a need to examine the resilience of Orissa agriculture.
- A set of vulnerability indicators should be identified for assessing the vulnerability profile of the study area.
- An exposure to the Multi-Agent Model known as 'Knowledge Elicitation Tool' was also provided to understand individual coping/adaptation responses.

The entire methodology for developing vulnerability profiles was demonstrated by taking two examples, one for coastal Orissa and the other for rainfed regions of Karnataka. Each member presented his individual work plan to address the project activities. After detailed discussions, an output oriented and time-based work plan was finalized assigning specific responsibilities to each member of the team.

Hands-on Training on Policy Interactive Dialogue Model (PODIUM)

NCAP, New Delhi, 9-13 June, 2003

The objective of this workshop was to provide an intensive hands-on training on Policy Interactive Dialogue Model (PODIUM) developed by the International Water Management Institute (IWMI), Colombo, and its adaptation for Agro-Ecological Region 4. The week-long training programme was attended by 2 delegates from Gujarat Agricultural University and the staff working under the project at NCAP.

Water-Food Security Scenario Analysis for 2025: An Agro-ecological Region Approach.

An overview of different methodologies for assessing water and food security at various levels was presented. The PODIUM was discussed in details along with necessary refinements to address the future water-food security related issues at AER level. The functioning of various modules of the original model as well as adapted version for AER 2 was demonstrated using past data.

ICAR-CARP (Sri Lanka) Short-Term Advanced Training Programme on Quantitative Methodology for Natural Resource Economics: Empirical Analysis with Practical Applications, 27 October to 7 November, 2003

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 at NCAP during Oct.27 - Nov. 7, 2003 covering empirical analysis with practical applications of quantitative methodology in natural resource economics research. Funding support for this programme was provided by Ministry of Agriculture under the existing MOU between ICAR and CARP for the participation of two Sri Lankan nationals and by the NATP under the PME Sub–project on Institutionalization of Research Priority Setting, Monitoring and Evaluation and Networking of Social Scientists in ICAR–SAU System for the participation of nine social scientists from NARS. The training provided an excellent opportunity of upgrading the knowledge and skills of the participating scientists and teaching faculty in the area of natural resource economics methodology. The group also identified common topics for developing collaborative research and one such area identified for future research relates to quantifying externalities due to natural resource degradation. All the lecture notes, practical modules, models and solutions were provided in a soft copy to the participants to encourage them to use it as teaching and training material in their institutions. The course was inaugurated by Dr V.K. Taneja, Deputy Director General (Animal Science), ICAR. Eighteen topics of emerging areas related to natural resource management were covered in this training programme.

XIV. LECTURES DELIVERED BY NCAP SCIENTISTS

Speaker	Title and Date	Venue
Anjani Kumar	Total Factor Productivity in Crops Sector, 5 November 2003	NCAP, New Delhi
	Food Safety Measures and Fisheries Sector in India, 28 February 2004	Division of Econometrics, IASRI, New Delhi
	Measurement of Competitiveness in Agriculture, 10 March 2004	NCAP, New Delhi
	Technological Change in Livestock Sector, 12 March 2004	Division of Agricultural Economics, IARI New Delhi
B C Roy	PODIUM : Concept, Structure, Functioning and Adaptation, (lecture series) 9-13 June 2003	NCAP, New Delhi
	Policy Interactive Dialogue Model: Scenario Analysis on Water Food Security Issues, 3 November 2003	NCAP, New Delhi
	Prioritizing Production Constraints and Implication for Future Research, 5 November 2003	NCAP, New Delhi
	Climate Change Vulnerability and Adaptation Strategies, 7 November 2003	NCAP, New Delhi
	Measurement of Yield Gap and Research Priority Setting: Prioritizing Production Constraints, 28 February 2004	IARI, New Delhi
	Research Priority Setting: Identification and Prioritizing Production Constraints, 11 March 2004	NCAP, New Delhi
	Adaptation to Climate Change : Current Research Efforts at NCAP, 31 March 2004	TERI, New Delhi
Dayanatha Jha	A Critical Review of Agricultural Policy in India, 30 October 2003	NCAP, New Delhi
	Crisis in Agricultural R&D in India : The Road Ahead, 29 November 2003	ISEC, Bangalore
Harbir Singh	Impact of PVP Legislations: Experiences from Selected Countries, 8 September 2003	NCAP, New Delhi
	Intellectual Property Rights in Agriculture, 9 February 2004	NCAP, New Delhi
Mruthyunjaya	Priorities for Strengthening Indian Agriculture 21 July 2003	National Academy of Agricultural Research Management, Hyderabad

Speaker	Title and Date	Venue
	Impact Evaluation of Agricultural Technology 18 November 2003	Division of Agricultural Economics, IARI, New Delhi
	Impact Assessment of Prevailing Technologies for Sustainable Agriculture via Econometric Empiricism, 21 February 2004	IASRI, Pusa, New Delhi
	Change in Public Sector and Private Sector Roles in Agricultural Technology Development, 10 March 2004	Division of Agricultural Economics, IARI, New Delhi
Rasheed Sulaiman V	Innovation System – Applying the Systems Concept to Agricultural Innovation, 11 February 2004	NCAP, New Delhi
S Selvarajan	Sustainability, Policy & Technology Interactions: A Case Study of Wheat in Northern India at the training programme under ICAR-CARP (Sri Lanka) on Quantitative Methodology for Natural Resource Economics: Empirical Analysis with Practical Applications, October 27 – November 3, 2003	NCAP, New Delhi.
	Systems Approach for Evaluating Minimum Rehabilitation of Minor Irrigation Tank Infrastructure, October 27–November 3, 2003	NCAP, New Delhi
S Selvarajan and B C Roy	Sustainability of Water Resources in North-West India: Current Scenarios and Future Options, 13 April 2004	Indian National Science Academy, New Delhi, India.
Suresh Pal	Agricultural Research Prioritization and Impact Assessment, Research Planning, Monitoring and Evaluation, 6 January 2004	GB Pant University of Agriculture and Technology, Pantnagar
	Impact Assessment of Agricultural Research 26 February 2004	Division of Agricultural Econometrics, IASRI, New Delhi
	Eco-regional Approach of Agricultural Research 27 February 2004	Division of Agricultural Economics, IARI, New Delhi

XV. DISTINGUISHED VISITORS TO NCAP

Acad. Rasulmat Khusanov, Director General and Ex-Minister of Agriculture, Uzbekistan and Dr. Zakir Khalikulav, CAC, Uzbekistan

Ashok Gulati, Director, Markets and Structural Studies Division, International Food Policy Research Institute (IFPRI), 2033 K Street, N.W., Washington, D. C. 20006-1002, USA

Benjamin Demiere, Scientific Officer, Embassy of France in India, 2, Aurangzeb Road, New Delhi–110 011

C. Prasad, President, VARDAN, Ex. Dy. Director General (Ag. Ext.) ICAR, Voluntary Action For Research Development And Networking (VARDAN), EB-106, Maya Enclave, New Delhi–110 0064

D. P. Chaudhri, Professorial Fellow, Department of Economics, University of Wollongong , NSW 2522, Australia

G. R. Bhatia, Additional Agricultural Marketing Adviser, Govt. of India, Ministry of Agriculture, Directorate of Marketing & Inspection, C.G.O Building, NH-4, N.I.T., Faridabad – 121 001, Haryana

Gajendra Singh, Dean, Asian Institute of Technology, AIT Extension, PO Box 4, Klong Luang, Pathum Thani 12120, Thailand

K. Pradhan, Vice-Chancellor (Retd.), C-24, HIG, Housing Board Colony, Baramunda, Bhubaneswar – 751 003

M. Mahadevappa, Ex-Chairman, ASRB, GOI, New Delhi, Ex.-Vice Chancellor, UAS Dharwad, Fellow, NAAS, President, Indian Society of Genetics and Plant Breeding 7, I C Main Road, Vijayanagar II Stage, Bangalore – 560 040, India

M. Zahangir Kabir, Director (Acting), SAARC Human Resource Development Centre (SHRDC), Park Road, Chak Shehzad, Islamabad, Pakistan

Madan Mohan Dey, Project Leader – Economist, ICLARM, P O Box 500, GPO, 10670, Penang, Malaysia

Mark Prein, Program Leader – Freshwater, Resources Research Program, ICLARM, P O Box 500, GPO, 10670, Penang, Malaysia

Md. Nurul Alam, Executive Chairman, Bangladesh Agricultural Research Council (BARC), New Airport Road, Farmgate, Dhaka – 1215, Bangladesh

Mohd. Anwarul Quader Shaikh, Member, Agricultural Research Initiative Design Team Supported by DFID/SDC/USAID/FAO, ARI Bangaladesh, UGC Bhaban, ISI (2nd floor), Room – 306, Agargaon, Dhaka – 1207, Bangaladesh

Mrs. M. S. Bhattacharya, Art of Living Teacher, Regional Manager, CMC, limited, New Delhi on Calm the Mind through Breathing and Meditation Techniques 25 March, 2003.

Nienke M. Beintema, Coordinator, IFPRI/INSAR Agricultural Science & Technology Indicators (ASTI) Initiative, International Food Policy Research Institute (IFPRI), 2033 K Street, N.W., Washington, D. C. 20006-1002, USA

P. G. Chengappa, Visiting Consultant, IPGRI for South Asia, New Delhi on Economic Perspectives of Plant Genetic Resources, 3 February, 2003.

Ray Trewin, Research Program Manager, Agricultural Development Policy, ACIAR House, Traeger Court, Fern Hill Park, Bruce ACT 2617, GPO Box 1571, Canberra ACT 2601, Australia

Robert Paarlberg, Weatherhead Centre, Harvard University, Cambridge, MA 02138

S. Santaram, Biologistics International, Ellicatt City, USA 31st May, 2003

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

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

XVI. NCAP PERSONNEL AND THEN AREA OF SPECIALIZATION

Scientific

Name	Designation	Area of Specialization
Mruthyunjaya	Director	Technology Policy, Institutional Change
Dayanatha Jha	National Professor	Technology Policy
P K Joshi	Principal Scientist (deputation to IFPRI)	Technology Policy Sustainable Agricultural System
S Selvarajan	Principal Scientist	Sustainable Agricultural System, Institutional Change
Ramesh Chand	Principal Scientist (deputation to IEG)	Market and Trade
BC Barah	Principal Scientist	Agricultural Growth and Modeling, Sustainable Agricultural System
Gordhan Singh	Principal Scientist	Retired on 31st July, 2003
Suresh Pal	Senior Scientist	Technology Policy, Institutional Change
P S Birthal	Senior Scientist	Technology Policy Agricultural Growth and Modeling
Rasheed Sulaiman V	Scientist (Sr. Scale)	Institutional Change, Technology Policy
P Adhiguru	Scientist (Sr. Scale)	Technology Policy, Institutional Change
B C Roy	Scientist (Sr. Scale)	Sustainable Agricultural System Institutional Change
Anjani Kumar	Scientist (Sr. Scale)	Technology Policy, Market and Trade
S K Pandey	Scientist (Sr. Scale)	Technology Policy Sustainable Agricultural System
Harbir Singh	Scientist (Sr. Scale)	Technology Policy Sustainable Agricultural System
M B Dastagiri	Scientist (Sr. Scale)	Market and Trade, Institutional Change
P A Lakshmi Prasanna	Scientist	Institutional Change, Sustainable Agricultural System
Rajani Jain	Scientist (on study leave)	Technology Policy

Administrative

Name	Designation
Narander Kumar	Assistant Administrative Officer
Naresh Arora	Assistant Finance & Accounts Officer
M S Vasisht	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-4
Mangal Singh Chauhan	T-4
Sonia Chauhan	T-4
Satender Kataria	T-2

Supporting

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

XVII. TRAININGS ATTENDED BY NCAP STAFF

Scientific (Scientists)

Name of the official	Theme	Duration	Place of Training
Harbir Singh	Harnessing Intellectual Property for Strategic Competitive Advantage	3-5 July, 2003	Indian Institute of Management, Ahmedabad
Sant Kumar Pandey	Quantitative Methodology for Natural Resource Economics: Empirical Analysis with Practical Applications	October 27 - November 7, 2003	NCAP, New Delhi

Administrative

Name of the official	Theme	Duration	Place of Training
Khyali Ram Chaudhary	Database Creation	November 24-27, 2003	DIPA KAB-I, Pusa, New Delhi
	Hindi Training Workshop	April 25-27, 2004	Shimla, HP
Narander Kumar	New Format of Accounts	January 4-5, 2004	NIFM, Faridabad
Sonia Chauhan	Web Technologies	August 21- September 10, 2003	IASRI, New Delhi
	Official Language Implementation, Information Technology and Computerization	October 15-17, 2003	Dalhousie, HP
Inderjeet Sachdeva	Official Language Implementation, Information Technology and Computerization	October 15-17, 2003	Dalhousie, HP
M. S. Chauhan	Official Language Implementation, Information Technology and Computerization	October 15-17, 2003	Dalhousie, HP
	Hindi Training Workshop	April 25-27, 2004	Shimla, HP

XVIII. 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. S.D. Sharma, Director, IASRI, was the Chief Guest. Dr. R.C. Gautam, Joint Director, IARI, Dr. V.K. Gupta, Joint Director, IASRI and Dr. Anil Kumar Dubey, Director Official Language, ICAR 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	A.K. Jha (First) Khyali Ram Chaudhary (Second) Purushottam Sharma (Third)
2.	Poem	Sonia Chauhan (First) M.S. Vasisht (Second) Khyali Ram Chaudhary (Third)
3.	Debate	Sonia Chauhan (First) Praveen Gulia (Second) Surabhi Mittal (Third)

Shri Khyali Ram Chaudhary, Shri M.S. Chauhan and Shri Inderjeet Sachdeva participated in the Hindi Training Workshop held during 25-27 April, 2003 in Shimla. Shri M.S. Chauhan and Smt. Sonia Chauhan attended training on Official Language Implementation, Information Technology and Computerization held during 15-17 October, 2003 at Dalhausie (HP). Shri Khyali Ram Chaudhary and Shri M.S. Vasisht, attended Hindi Workshop held at Ooty, during November, 2003.

XIX. PARTICIPATION IN ICAR SPORTS COMPETITION

NCAP team comprising, Narander Kumar, 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 C.C.S.R.I, Karnal, Haryana during December 15-18, 2003.

XX. INFRASTRUCTURAL DEVELOPMENT

The Centre got approval for construction of office building and staff quarters in the IX Plan and the first installment for this work, Rs 1.23 crore was deposited with CPWD in the year 2000-01. For construction of the office building, all necessary approvals from Delhi Urban Arts Commission, Municipal Corporation of Delhi and Delhi Vidhyut Board have been obtained. The construction work is going on in full swing. 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.

विशिष्ट सारांश

वार्षिक प्रतिवेदन : 2003–2004

राष्ट्रीय कृषि आर्थिकी एवं नीति अनुसंधान केन्द्र की स्थापना वर्ष 1991 में भारतीय कृषि अनुसंधान परिषद् द्वारा कृषि आर्थिकी के क्षेत्र में अनुसंधान को शक्तिशाली बनाने के लिए की गई थी। केन्द्र कृषि संबंधी नीतिगत विषयों पर अनुसंधान के अतिरिक्त भारतीय कृषि अनुसंधान परिषद के अन्य संस्थानों एवं राज्य कृषि विश्वविद्यालयों के मानव संसाधन विकास के कार्यों में भी संलग्न है। केन्द्र में वर्तमान में 17 वैज्ञानिक (एक राष्ट्रीय प्राध्यापक सहित) और 15 अन्य कार्मिक कार्यरत हैं। केन्द्र का वर्ष 2003–04 का बजट परिव्यय 232.9 लाख रुपये था। केन्द्र ने वर्ष 2003–04 में अनेक संस्थाओं के साथ अपने अनुसंधान एवं सम्पर्क क्षेत्र का विस्तार किया है।

केन्द्र की शोध नीतियों

अनुसंधान नीति–निर्धारणों में केन्द्र का मार्गदर्शन एक उच्चस्तरीय अनुसंधान सलाहकार समिति (आर ए सी) करती है। इसके वर्तमान अध्यक्ष प्रोफेसर एस. राजगोपालन् हैं जो एक विख्यात कृषि अर्थशास्त्री हैं। समिति के अन्य सदस्य डॉ. जी. के. चड्ढा (कुलपति, जे एन यू), प्रोफेसर अभिजीत सेन (सदस्य, योजना आयोग, भारत सरकार), डॉ. जी. एस. राम (भूतपूर्व प्रमुख आर्थिक सलाहकार, श्रम मंत्रालय), डॉ. आई. जे. सिंह (भूतपूर्व डीन, चौ. चरण सिंह हरियाणा कृषि विश्वविद्यालय), डॉ. डी.के. मरोठिया (प्रोफेसर तथा अध्यक्ष, कृषि आर्थिकी विभाग, इन्दिरा गांधी कृषि विश्वविद्यालय, रायपुर), डॉ. जे.पी. मिश्रा (ए डी जी, आई सी ए आर), डॉ. मृत्युंजय (निदेशक, एनकैप)। श्री डी.एस. अनंत तथा प्रोफेसर राम प्रवेश सिंह किसानों के प्रतिनिधि के रूप में इसके सदस्य हैं। एक 'प्रबन्ध समिति' केन्द्र के नियमित क्रियाकलापों का निर्धारण करती है। केन्द्र के विकेन्द्रीकृत प्रशासन प्रबंध हेतु अनेक आंतरिक समितियाँ कार्यरत हैं।

केन्द्र में अनुसंधान कार्य मुख्यतया पाँच क्षेत्रों – तकनीकी नीति, सतत् कृषि प्रणाली, विपणन एवं व्यापार, संस्थागत बदलाव और कृषि वृद्धि एवं माडलीकरण में होता है। उपर्युक्त वर्णित अनुसंधान क्षेत्रों में शोध कार्य वरिष्ठ स्तर के वैज्ञानिकों की देख–रेख में किये जाते हैं। कृषि आर्थिकी तथा नीति अनुसंधान के क्षेत्र में अपनी उत्कृष्टता बनाये रखने के लिए केन्द्र इस वर्ष भी प्रयासरत रहा। केन्द्र की शोध उपलब्धियाँ उपर्युक्त पांच क्षेत्रों के अन्तर्गत वर्णित की गई हैं। राष्ट्रीय कृषि प्रौद्योगिकी परियोजना (एन ए टी पी) के अन्तर्गत प्रगति का उल्लेख अलग से है। वर्ष के दौरान प्रमुख अनुसंधान उपलब्धियों एवं जारी शोध कार्य का सारांश निम्नवत है :

प्रौद्योगिकी नीति पर किये गए शोधकार्यों का वर्णन 7 विभिन्न विषयों के अन्तर्गत किया गया है।

भारत तथा चीन द्वारा कृषि के क्षेत्र में अनुसंधान एवं विकास में किये गये सुधारों की तुलनात्मक समीक्षा में यह पाया गया है कि चीनी पद्धति अधिक बाह्य विकासोन्मुख होने के साथ–साथ अन्य प्रणालियों के साथ समाकलनीय भी है जबकि भारतीय पद्धति संस्थागत एवं प्रबन्धन सुधारों पर और प्रौद्योगिकी के विकास तथा हस्तांतरण में निजी क्षेत्रों को आकर्षित करने पर ज्यादा केन्द्रित है। भारत में बीज क्षेत्र काफी सशक्त है। दोनों ही देशों में अनुसंधान–विस्तार–कृषक संयोजकता कमजोर है और नीति निर्धारणकर्त्ताओं को इस ओर विशेष ध्यान देना चाहिए।

पूर्वी भारत में कृषि अनुसंधान पर निवेश समग्र भारत में किये गये निवेश की तुलना में काफी कम पाया गया है। अध्ययन द्वारा इस क्षेत्र में कृषि अनुसंधान पर, विशेषकर चावल अनुसंधान पर, अधिक निवेश करने की सलाह दी गई है।

भारत में कृषि विस्तार तथा कृषि अनुसंधान एवं शिक्षा पर निवेश लगभग बराबर है। परन्तु सिंचित क्षेत्रों को विस्तार परियोजनाओं का अधिक लाभ मिल रहा है और ऐसा शुष्क तथा अर्द्ध–शुष्क क्षेत्रों की उपेक्षा करके किया जा रहा है। अतः इन उपेक्षित क्षेत्रों में अधिक निवेश की आवश्यकता है। सार्वजनिक कृषि विस्तार प्रणाली को अधिक सशक्त बनाने का सुझाव दिया गया है।

'कृषि अनुसंधान हेतु संसाधन निर्धारण' नामक प्रोजैक्ट के अन्तर्गत आई सी ए आर में मानवशक्ति के आबंटन पर एक अध्ययन कृषि–जिन्स समूहों, संसाधनों तथा कृषि–जलवायवी अनुक्षेत्रों के आधार पर किया गया है। इस अध्ययन में पाया गया कि फसल क्षेत्रों को सर्वाधिक (लगभग 66 प्रतिशत) मानवशक्ति आबंटित हुई जिसमें 37 प्रतिशत खाद्य फसलों को तथा 29 प्रतिशत अ–खाद्य फसलों को दी गई थी। खाद्य फसलों में फल तथा सब्जियों को सर्वाधिक मानव संसाधन 44 प्रतिशत मिला जबकि अ–खाद्य फसलों में तिलहन अपने 25 प्रतिशत हिस्से के कारण सर्वोच्च स्थान पर थी। यह देखा गया है कि प्राकृतिक संसाधनों जैसे कि जल, पादप–पोषकों, आदि को 66 प्रतिशत मानवशक्ति आबंटित की गई जबकि कृषि–रसायनों को 16 प्रतिशत ही मिला। यह भी पाया गया कि गंगा के मैदानों के निचले क्षेत्रों में कृषि अनुसंधान के लिए आई सी ए आर ने लगभग 28 प्रतिशत संसाधन उपलब्ध कराए।

1980 के दशक से पूर्वी भारत में मंहगी फसलों की ओर कृषि विविधता ने काफी जोर पकड़ा है। इससे इस क्षेत्र में कृषि लाभ तथा रोजगार संभावनाएं दोनों ही बढ़े हैं। इस अध्ययन में बुनियादी ढांचे में विकास तथा फसलोपरान्त बेहतर प्रबन्धन विशेषकर खाद्य प्रसंस्करण करने का सुझाव दिया गया है। साथ ही, पूर्वी भारत में कृषि विविधीकरण को और अधिक गतिशील बनाने के लिए उपज प्रबन्धन को बाजार के साथ समाकलित करने का भी सुझाव दिया गया है।

भारत में प्रचलित मिश्रित फसल–पशुधन प्रणाली पर किये गए एक अध्ययन में कुल 15 फसल–पशुधन क्षेत्र रेखांकित किये गये हैं। हालांकि अधिकांश क्षेत्रों में खेती–बाड़ी ही मुख्य व्यवसाय पाया गया है परन्तु कोई–न–कोई पशु पालन भी प्रमुख दो–चार कार्यों में ही शामिल है। इन क्षेत्रों में पशुओं की उत्पादकता में सुधार लाने के लिए प्रजातियों की बढ़ोतरी, चारे की उपलब्धता में सुधार तथा चरागाहों का बेहतर प्रबन्धन, आदि उपाय सुझाए गए हैं। एक अन्य अध्ययन के प्रारम्भिक परिणामों से ज्ञात हुआ है कि डेरी अनुबन्ध कृषि अधिक आर्थिक लाभ तथा बेहतर निवेश संभरणों के कारण ज्यादा फायदेमन्द सिद्ध हो रहा है।

मध्य प्रदेश और महाराष्ट्र में सोयाबीन उत्पादन, इसमें आने वाली कठिनाइयों तथा सोयाबीन के प्रसंस्करण पर अध्ययन किया गया। सोयाबीन प्रसंस्करण करने वाली अधिकांश इकाइयों का मानना है कि सस्ती दरों पर सोयाबीन के तेल का आयात देश में सोयाबीन की खेती करने वाले किसानों को हतोत्साहित कर रहा है।

उत्तरांचल राज्य में धान–गेहूँ पद्धति में 'जुताई–विहीन प्रौद्योगिकी' पारम्परिक तकनीक से अधिक लाभदायक है। अधिक आर्थिक लाभ के साथ–साथ, गेहूँ उत्पादन में जुताई–विहीन प्रौद्योगिकी से कृषि पर्यावरण पर भी सकारात्मक प्रभाव पड़ता है। समय और अधिक अनुभव के साथ यह प्रौद्योगिकी बेहतर संसाधन–उपयोग दक्षता लाने में सहायक होगी।

सतत् कृषि प्रणाली के अन्तर्गत चार अध्ययन किये गये हैं जिनमें तीन जल से सम्बन्धित हैं और एक जलवायु परिवर्तन से।

कृषि–पारिस्थितिकीय क्षेत्र 4 (AER 4) में जल उत्पादकता विश्लेषण पर उत्पादकता मॉडल द्वारा किये गये अध्ययन से ज्ञात हुआ है इस क्षेत्र में जल की वास्तविक उत्पादकता बहुत कम है और यह विभिन्न कृषि पारिस्थितिकीय उपक्षेत्रों (AESRs) तथा फसल समूहों में अलग–अलग है। जल उत्पादकता दलहनी फसलों में सर्वोच्च पाया गया। इसके बाद

तिलहनी फसलों का स्थान देखा गया। विभिन्न फसलों को जल का आबंटन उनके आर्थिक मूल्य के अनुरूप किया जाना चाहिये।

कृषि–पारिस्थितिकीय क्षेत्र 4 (AER 4) के अन्तर्गत छः राज्यों– पंजाब, हरियाणा राजस्थान, गुजरात, उत्तर प्रदेश व मध्य प्रदेश– के 71 जिलों में जल–खाद्य सुरक्षा के विश्लेषण से ज्ञात हुआ है कि यहाँ जल की उपलब्धता में कमी आई है। जल की प्रति–व्यक्ति वार्षिक उपलब्धता वर्ष 1971 में 1850 क्यूबिक मीटर थी, वर्ष 2000 में यह घट कर 865 क्यूबिट मीटर ही रह गई है (न्यूनतम सीमा 1000 क्यूबिक मीटर है)। ऐसा अनुमान है कि यह उपलब्धता वर्ष 2025 तक मात्र 500 क्यूबिक मीटर ही रह जायेगी। अध्ययन में विभिन्न कृषि पारिस्थितिकीय क्षेत्रों में खाद्य–सुरक्षा तथा जल सुरक्षा के परिदृश्यों में भविषय में काफी भौगोलिक विषमताएं होने की सम्भावना व्यक्त की गई है। अध्ययन में जल–जनित खाद्य–असुरक्षा आपदा की ओर तुरन्त ध्यान देने का सुझाव दिया गया है।

राजस्थान में सिंचाई के लिए जल का आबंटन उत्पादकता के आधार पर करने के लिए आठ फसलों– गेहूँ, मक्का, बाजरा, सरसों, चना, कपास, मोठ और ग्वार– पर जल की वास्तविक उत्पादकता और मूल्य उत्पादकता का अध्ययन किया गया है। राज्य में जल की मूल्य–निर्धारण नीति का अध्ययन दो पहलुओं पर किया गया है: (क) क्या वर्तमान जल मूल्य–निर्धारण नीति अर्ध–आयतनमितीय आधारित नीति के अनुरूप है जो कि सिंचित कृषि के अन्तर्गत कम जल–खपत और अधिक–मूल्य वाली फसलों को प्रोत्साहन देती है? तथा (ख) क्या इससे निर्धारित नीति के अनुरूप खर्च की पूरी वसूली हो पाती है? अध्ययन में यह देखा गया है कि न तो अर्ध–आयतनमितीय आधारित मूल्य नीति का अनुसरण हो रहा है और न ही देखभाल पर होने वाले खर्चों की पूरी वसूली की नीति का पालन किया जा रहा है।

उड़ीसा राज्य के ग्रामीण आजीविकों पर जलवायु परिवर्तन के आघात तथा अनुकूलन पर किये गये अध्ययन से ज्ञात हुआ है कि आजीविकों के सभी समुदाय ही इस परिवर्तन से संकटग्रस्त हो जाते हैं। परन्तु सर्वाधिक दुष्प्रभाव मजदूर वर्ग पर पड़ता है। अधिकांश आजीविकों को इस लगातार बढ़ती आपदा से स्वयं ही जूझना पड़ता है क्योंकि धन–संसाधनों की कमी के कारण पर्याप्त सरकारी सहायता मिलने की सम्भावना क्षीण है। इन आजीविकों द्वारा अपनाई जाने वाली कुछ रणनीतियाँ: खाद्य और आय के स्रोतों में विविधता लाना, फसल अनुक्रिया में बेहतर सामंजस्य स्थापित करना, पशु–पालन की परम्परा को बनाए रखना, फसल बीमा योजना को अपनाना, अनुबन्ध मार्केटिंग को अपनाना, कम होते जल संसाधनों का तालाब आदि बनाकर बेहतर प्रबन्धन करना, इत्यादि है। तथापि वर्तमान सामाजिक आर्थिक तदर्थ नीति निर्धारण परिदृश्य में दीर्घ काल में इन उपायों द्वारा आपदाओं को झेल पाना कठिन है।

विपणन तथा व्यापार विषय से सम्बन्धित अध्ययन आशा के अनुरूप भारत में उभरती व्यापार उदारीकरण व्यवस्था की ओर उन्मुख थे। कृषि विपणन संस्थानों के अधिदेशों तथा गतिविधियों को वर्तमान तथा उभरते आर्थिक परिदृश्यों के परिपेक्ष्य में अध्ययन किया जा रहा है। भारतीय डेयरी उद्योग पर आर्थिक सुधारों के प्रभाव को संरक्षण स्तर तथा कार्यकुशलता सूचकों के मध्य बने सम्बन्ध के आधार पर आकलन किया गया। इस अध्ययन में रोजगार के अतिरिक्त, सभी सूचकों (सकल उत्पाद, कुल मूल्य वर्धन, पूंजी तथा श्रम उत्पादकता, तकनीकी कार्यकुशलता) का संरक्षण स्तर से सम्बन्ध ऋणात्मक पाया गया है। अतः संरक्षण संरचना के ह्रास से डेयरी उद्योग की कार्यक्षमता में बढ़ोतरी होगी।

मत्स्य क्षेत्र पर व्यापार उदारीकरण तथा एस पी एस और टी बी टी अनुबन्धों द्वारा प्रतिस्थापित चुनौतियों के प्रभावों का अध्ययन करने से ज्ञात हुआ है विकासशील देशों जैसेकि भारत के लिए अंतराष्ट्रीय खाद्य–सुरक्षा उपायों का अनुपालन करना एक मंहगा सौदा है। इससे इन देशों की निर्यात प्रतिस्पर्धता पर विपरीत प्रभाव पड़ा हैं तथा वास्तविक सामाजिक लाभ ऋणात्मक ही हुआ है। देश में एच ए सी सी पी प्रक्रम के इस्तेमाल में अधिक कार्यकुशलता लाने का सुझाव दिया गया है।

दक्षिणी एशिया में खाद्य–पदार्थों के उपभोग के बदलते स्वरूप पर किये गये अध्ययन से ज्ञात हुआ है कि प्रति व्यक्ति अनाजों के उपभोग में कमी आई है और अधिक–मूल्य वाले पदार्थों जैसे फल, सब्जियाँ, दूध, माँस, अण्डे और मछली, आदि के उपभोग में बढ़ोतरी हुई है। हालांकि विभिन्न देशों में इन अधिक–मूल्य वाले पदार्थों के उपभोग में काफी विषमताएं पाई गई हैं क्योंकि यह मुख्य रूप से आय में बढ़ोतरी तथा शहरीकरण से संचालित होती हैं। अध्ययन में यह दर्शाया गया है कि अधिक–मूल्य वाले पदार्थों की मांग अनाजों की मांग की अपेक्षा तेजी से बढ़ेगी और इसकी आपूर्ति के लिए दक्षिणी एशिया के देशों को अपनी उत्पादकता बढ़ानी होगी। भावी परिदृश्य में भारत की भूमिका की ओर इशारा करते हुए इस अध्ययन में यह दर्शाया गया है कि समुचित अनुसंधान प्राथमिकताएं तथा उत्पादन रणनीतियाँ कृषि में विकास को उचित बढ़ावा देंगी तथा सतत् खाद्य–सुरक्षा और पोषण–सुरक्षा सुनिश्चित करेंगी।

भारत में फलों और सब्जियों का प्रसंस्करण उनके कुल उत्पादन का मात्र 2 प्रतिशत ही किया जाता है, क्योंकि इसमें कुछ विषम बाधाएं जैसेकि प्रौद्योगिकी का पिछड़ापन, कमजोर आधारीय ढ़ाँचा, संस्थागत अवरोध, कीमतें, टैक्स, आदि उपस्थित हैं। जो प्रसंस्करण सुविधाएं उपलब्ध हैं वे भी बड़े शहरों के आस–पास ही स्थापित हैं और ये फलों और सब्जियों के उत्पादन क्षेत्रों से काफी दूर पड़ते हैं। अध्ययन में यह मत व्यक्त किया गया है कि निकट भविष्य में ग्रामीण भारत में भी संसाधित खाद्य–पदार्थों की मांग में बढ़ोतरी होगी।

संस्थागत परिवर्तन के क्षेत्र में छः अध्ययन किये गये हैं। इन अध्ययनों में से एक में भारतीय बीज प्रणाली को सशक्त बनाने के लिए विभिन्न संस्थागत तथा नीतिगत विकल्पों की समीक्षा की जा रही है। अध्ययन से प्राप्त आरम्भिक परिणाम कि इस क्षेत्र में निजी बीज कम्पनियों की बढ़ती भागीदारी को प्रदर्शित करती है, हालांकि अमानवी–परागण (ओपन–पोलिनेटिड) किस्मों के विकास में इन कम्पनियों की उपस्थिति नगण्य है। संकर किस्मों के विकास में निजी क्षेत्र विशेषकर बहुराष्ट्रीय बीज कम्पनियों के अनुसंधान एवं विकास कार्यक्रम में काफी गहनता पाई गई है। बीज क्षेत्र में निजी एवं सार्वजनिक क्षेत्रों की सहभागिता बढ़ी है। नियामक कीमतों एवं प्रजनकों के प्रोत्साहन संबंधी प्रस्तावित परिवर्तनों के कार्यान्वयन से भविष्य में यह सहभागिता और सुदृढ़ होने की संभावना है।

एक अध्ययन में कृषि अनुसंधान से जुड़े वैज्ञानिक समुदाय को कृषि विज्ञान एवं प्रौद्योगिकी को समाज के आर्थिक विकास प्रक्रम का एक हिस्सा बनाने के लिए कुछ नियमों के अनुपालन का सुझाव दिया गया है और उन्हें बारीकी से समझाया गया है। इन में भागीदारी, बहुमुखी ज्ञान आधार, नवीनता प्रवर्तक, नवीनता चैम्पीयन, ज्ञान–प्राप्ति, सामर्थ्य विकास तथा भावी प्रौद्योगिकी का पूर्वानुमान पर जोर दिया गया है।

वर्षा बीमा के क्षमता–लाभों का मूल्यांकन करने पर पता चला है कि भारतीय कृषि क्षेत्र के लिए यह एक वहनीय विकल्प है। उदाहरण के लिए धान में इसकी दक्षता स्व–बीमा योजना से 1 7 प्रतिशत अधिक पायी गयी। एक नियोजित बीमा योजना बनाकर वर्षा बीमा के लाभों को और अधिक बढ़ाया जा सकता है। इसके लिए क्षेत्रीय वर्षा–तालिका को आधारीय–सूचक के रूप में प्रयुक्त किया जा सकता है।

कृषि के क्षेत्र में सूचना एवं संचार प्रौद्योगिकियों (आइ सी टीज़) पर आधारित कार्यक्रमों का न केवल आर्थिक प्रभाव ही होता है वरन् ये मौसम, फसल उत्पादन, फसल रक्षण, आदि पहलुओं पर भी लाभकारी सूचना प्रदान करते हैं। यह फसल प्रबन्धन में किसानों द्वारा सही समय पर समुचित निर्णय लेने में सहायक है। अध्ययन में इसके प्रसारण के मार्ग में विद्यमान बाधाओं का भी उल्लेख किया गया है। इन बाधाओं से निपटने के लिए संस्थानों, विशेषकर सरकारी संस्थानों, को नैटवर्किंग तथा विषय विकास दोनों ही क्षेत्रों में अग्र–सक्रिय भूमिका निभानी होगी।

असम में किसानों की एक संस्था, 'पाथेर परिचालन समिति' (पी पी एस) पर भी एक अध्ययन किया गया है। यह समिति सरकारी विकास कार्यक्रमों को लागू करवाने तथा ग्रामीण लोगों को सशक्त बनाने का एक उत्तम माध्यम है। यह ज्ञात हुआ है कि इनमें बहुत सी समितियाँ तो सुचारू रूप से कार्य कर रही हैं और कृषि उत्पादकता में बढ़ोतरी का लाभ किसानों तक पहुंचा रही हैं, परन्तु कुछ समितियों को पर्याप्त सूचना एवं उचित मार्गदर्शन नहीं मिल रहे हैं। अतः सरकार को ऐसी नीतियाँ बनानी चाहियें जिनसे इन समितियों को समुचित प्रोत्साहन और सहायता मिल सकें।

कृषि विस्तार के क्षेत्र में किए गए एक अध्ययन में उन रणनीतियों का समाकलन है जिनसे भारत में एक उन्नत तथा बहुआयामी विस्तार तन्त्र स्थापित किया जा सकता है। सार्वजनिक विस्तार संस्थानों का पुनर्गठन, निजी विस्तार कार्यक्रमों को प्रोत्साहन, सार्वजनिक विस्तार क्षेत्र की संस्थात्मक, प्रबन्धनात्मक तथा आर्थिक समीक्षा, विस्तार योजना का विकेन्द्रीकरण, पिछड़े हुए तथा दूर–दराज के क्षेत्रों के विस्तार कार्यक्रमों को अधिक धन उपलब्धता, भागीदारों के क्षेत्रों के विस्तार कार्यक्रमों को अधिक धन उपलब्धता, भागीदारों के साथ ताल–मेल बढ़ाने के लिए संस्थागत उपाय, किसानों के संगठनों को बढ़ावा देना, आदि रणनीतियों को अपनाने का सुझाव दिया गया है।

कृषि वृद्धि एवं मॉडलिंग थीम के अन्तर्गत अध्ययन पूर्वी भारत से जुड़े हैं। पूर्वी भारत में वर्षा–सिंचित चावल की खेती पर एक विस्तृत अध्ययन किया गया है। इस क्षेत्र में चावल के उत्पादन में स्थिरता लाने के लिए अध्ययन में कुछ रणनीतियाँ बनाने और नीतिगत हस्तक्षेप करने के सुझाव दिये गए हैं। इस क्षेत्र में विषय पारिस्थितिकियों की विद्यमानता तथा फसल पर पड़ने वाले विभिन्न आघातों को देखते हुए अध्ययन में आधुनिक तथा पारिस्थितिक–विशिष्ट किस्मों के विकास की आवश्यकता पर बल दिया गया है।

राष्ट्रीय कृषि प्रौद्योगिकी परियोजना (एन ए टी पी) के अंतर्गत प्रगति का ब्यौरा इस प्रकार है।

एनकैप की वेबसाइट, (http://www.icar.org.in/ncapindex.htm) को अद्यतन कर दिया गया है ओर इसे आई सी ए आर की वेबसाइट से जोड़ दिया गया है। इस वेबसाइट में एक नया फीचर, ''एनकैप पब्लिकेशन्ज'' जोड़ा गया है जो पीडीएफ फारमेट में उपलब्ध हैं। इस अद्यतित वेबसाइट में देश और विदेशों के महत्त्वपूर्ण नीति अनुसंधान संस्थानों के वेब लिंक भी उपलब्ध कराये गये हैं।

एन ए टी पी बहु –विषयी एवं अंतर–संस्थानीय प्रौद्योगिकी विकास तथा हस्तान्तरण प्रणाली की आवश्यकता पर अधिक बल दिये जाने की दिशा में काफी सफल रहा है। इसने आई सी ए आर के विभिन्न संस्थानों तथा राज्य कृषि विश्वविद्यालयों को परिचालन व्यय हेतु अधिक धन उपलब्ध कराया है। इनसे वैज्ञानिकों के पारस्परिक समन्वय तथा परिणामों के आदान–प्रदान में काफी सुधार हुआ है; सूचना का आदान प्रदान सरल हुआ है, और नेटवर्क मोड में अनुसंधान करने की नींव पड़ी है।

टी ओ ई, मिशन मोड तथा सी जी पी फंडिंग माध्यमों द्वारा एन ए टी पी ने मानव संसाधन विकास (एच आर डी), अनुसंधान कार्यक्रमों तथा अनुसंधान ढ़ांचे के सशक्तीकरण के लिए किए जा रहे प्रयासों को काफी प्रोत्साहन दिया है। टी ओ ई ने सामाजिक विज्ञान तथा अग्रणी विज्ञान जैसे क्षेत्रों में अनुसंधान की गहनता को बढ़ाया है और जैव–उर्वरक (बायो–फर्टिलाइजर) जैसी संपोषणीय प्रौद्योगिकियों को प्रोत्साहित किया है। मिशन मोड प्रोजैक्टों जैसेकि समन्वित नाशीकीट प्रबन्धन (आई पी एम), प्रौद्योगिकी की प्रामाणिकता तथा प्रचार–प्रसार के माध्यम से बहुत–सी सार्वजनिक, निजी तथा गैर–सरकारी संस्थानों के मध्य मजबूत कड़ियाँ बनी हैं।

सी जी पी प्रौजेक्टों के अन्तर्गत किये गये अध्ययनों ने समुद्री सजावटी मछलियों के व्यापार के लिए कई संभावनाएं सुझाई हैं। सी जी पी ने कम्पीटिटिव ग्रान्टों तथा फंडिंग के उपयोगी माध्यम के विषय में जानकारी बढ़ाई है। एन ए टी पी प्रौजेक्टों

में महिला अनुसंधानकर्त्ताओं का विशेष ध्यान रखा गया है। इसने खेत–पर–ही–अनुसंधान में किसानों की बड़े पैमाने पर भागीदारी को एक नई गति दी है।

एन ए टी पी के अन्तर्गत कुछ अनुसंधान प्रौजेक्टों के आरम्भिक प्रभावों पर किए गए अध्ययन से ज्ञात हुआ है कि इनके माध्यम से बहुत सी प्रौद्योगिकियाँ परिष्कृत/विकसित हुई। इनमें से 14 चयनित प्रौद्योगिकियों के कारण न केवल कृषि उत्पादकता, फार्म–आय तथा रोजगारों में बढ़ोतरी हुई वरन् कृषि उत्पादन प्रणालियों की संपोषणता में भी वृद्धि हुई।

केन्द्र ने 'सामाजिक विज्ञान सूचना संग्रह' (एस एस आइ आर) में भी संलग्न है। पी एम ई प्रौजेक्ट के अन्तर्गत वर्ष 2000 में आरम्भ की गई इस गतिविधी की वैज्ञानिकों के विभिन्न दलों ने सराहना की है। सूचना संग्रह का कार्य 10 राज्यों में चल रहा है। इसे और सार्थक बनाने के लिए अंतर्राष्ट्रीय अर्धशुष्क उपोषण फसल अनुसंधान संस्थान (ICRISAT) हैदराबाद के साथ भी सहभागिता स्थापित की गई है। इस वर्ष इस सूचना संग्रह के कार्यों में संलग्न विभिन्न केन्द्रों के प्रमुख अन्वेषकों एवं अनुसंधान सहायकों को आँकड़ा विश्लेषण के लिए विशेष प्रशिक्षण दिया गया। राष्ट्रीय कृषि अनुसंधान तंत्र में पी एम ई की गतिविधियों को संस्थान स्तर पर सार्थक बनाने के लिए भारतीय कृषि अनुसंधान परिषद् की विभिन्न संस्थाओं तथा राज्य कृषि विश्वविद्यालयों में पी एम ई प्रकोष्ठों की स्थापना की गई है। इस वर्ष सात नए प्रकोष्ठों की स्थापना की गयी। वर्तमान में कुल 32 प्रकोष्ठ कार्यरत हैं।

'महिला सशक्तिकरण कार्यक्रम' के अन्तर्गत महिला सशक्तिकरण में स्व सहायता समूह (माइक्रोफाइनान्स) के योगदान पर किये गये अध्ययन में पाया गया कि स्व सहायता समूह का प्रभाव आर्थिक सशक्तिकरण की अपेक्षा अधिकार–सम्बन्धी जागरूकता बढ़ा कर राजनीतिक सशक्तिकरण में अधिक प्रभावोत्पादक है।

केन्द्र इस वर्ष 2 नीतिगत शोधपत्र, 2 नीतिगत सूक्ष्मलेख, 2 कार्यशालाओं के कार्यवृत्त, 1 कार्यशाला लेख, 1 पी एम ई टिप्पणी, तथा 1 पैनल चर्चा प्रकाशित किये। केन्द्र के वैज्ञानिकों ने प्रतिष्ठित राष्ट्रीय एवं अंतराष्ट्रीय जर्नलों में शोधपत्र प्रकाशित करने के साथ–साथ अनेकों राष्ट्रीय तथा अन्तर्राष्ट्रीय सेमिनारों, कान्फ्रेंसों, कार्यशालाओं, आदि में प्रतिभागिता की और अपने शोधपत्र प्रस्तुत किये। केन्द्र ने अनेक राष्ट्रीय और अंतराष्ट्रीय संगठनों के साथ भी सहयोग किया। केन्द्र के वैज्ञानिक अनेक व्यावसायिक और नीतिगत परस्पर संबंधों और परामर्श परियोजनाओं में शामिल रहे हैं।

अपने उपरोक्त क्रियाकलापों, योगदानों तथा उपलब्धियों के आधार पर केन्द्र वर्ष 2003–04 में भी अपनी उत्कृष्ठ प्रतिष्ठा एवं ख्याति वृद्धि में सफल रहा।

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