ANNUAL REPORT
2009-10

भाकृअनुप
ICAR

राष्ट्रीय कृषि आर्थिकी एवम् नीति अनुसंधान केन्द्र

NATIONAL CENTRE FOR AGRICULTURAL ECONOMICS AND POLICY RESEARCH

Annual Report
2009-10

राष्ट्रीय कृषि आर्थिकी एवम् नीति अनुसंधान केन्द्र
नई दिल्ली

National Centre for Agricultural Economics and Policy Research
New Delhi

NCAP Annual Report 2009-10

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PREFACE

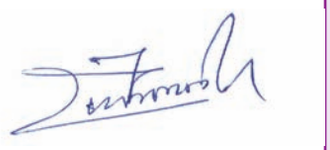
The year 2009-10 was marked by lot of changes in NCAP. In some ways the year was a test of strength of NCAP as it faced serious depletion in faculty strength at top level. Out of five Principal Scientists at the Centre in the beginning of year 2009-10, three left to take up different positions at other ICAR Institutes. Despite this setback, NCAP continued its efforts towards achieving excellence in agricultural economics and policy research in the country. The credit for this goes to Dr. P. K. Joshi, who steered the Centre through difficult time. However, Dr. Joshi also left in the middle of the year to join as Director of NAARM. This vacuum was filled by Dr. B. C. Barah who had to shoulder heavy responsibility to run this Centre with a much smaller faculty. While on one hand NCAP suffered due to the vacancies created at the top, the Centre, on the other hand, got heavy additional responsibilities. It launched a project on "Tracking Changes in Rural Poverty in Household and Village Economies in South Asia" as one of the partners along with ICRISAT and IRRI. This project, funded by Bill & Melinda Gates Foundation, is a recognition of the quality work done by NCAP scientists in the past and the NCAP image created at the global level, particularly under the leadership of Dr. P. K. Joshi.

While the Centre faced short-term shock due to the moving of senior faculty, it contributed to the strengthening of Agricultural Economics discipline in the NARS. Dr. Joshi left NCAP to take over the higher responsibility as Director, National Academy of Agricultural Research Management, Hyderabad, and Dr. Suresh Pal and Dr. K. K. Datta joined as Heads of Division in IARI, New Delhi and NDRI, Karnal, respectively. It did not take long for NCAP to stand to the challenge of reduced faculty strength. With strong support of ICAR leadership, NCAP soon started raising its scientific strentgth.

The Centre initiated three new studies during this year besides handling three large and challenging NAIP projects. Seven NCAP scientists visited abroad during the year to equip themselves with latest developments in their fields of research. NCAP organized couple of courses of various durations for capacity building in the NARS. National Professor project at NCAP has contributed significantly to research and capacity strengthening activities of the Centre. The research studies conducted by the Centre have enormously helped the Council in participating in agricultural policy debates and decisions. During the year, NCAP scientists have published a large number of papers on issues of topical interest and they participated in a large number of important national and international academic events. I wish to place on record that the achievements reported in the Annual Report 2009-10 reflect the leadership of Dr. P. K. Joshi who was Director, NCAP till 18 September, 2009 and Dr. B. C. Barah who was Director in Charge from 19 September, 2009 to 1 March, 2010.

I am highly grateful to Dr. S. Ayyappan, Director General, Indian Council of Agricultural Research, for helping this Centre to adjust to the changes that took place during this year and for guiding it to move forward.

The report has been compiled by Dr. S. S. Raju and Dr. Rajni Jain with assistance from Sh. Ajay Tanwar. Dr. Anjani Kumar prepared Hindi version of the Executive Summary of the report. The Annual Report contains valuable inputs provided by all of my colleagues at NCAP; I thank all of them.



(Ramesh Chand)
Director

LIST OF ACRONYMS

ACU	Adult Cattle Unit
ADWDRS	Agriculture Debt Waiver and Debt Relief Scheme
AERA	Agricultural Economics Research Association (India)
AERR	Agricultural Economics Research Review
AgGDP	Agricultural Gross Domestic Product
AHRP	Agriculture and Health Research Platform
AICRP	All India Coordinated Research Project
AIC	Agricultural Insurance Company
ANGRAU	Acharya N G Ranga Agricultural University
ANN	Artificial Neural Network
APMC	Agricultural Produce Market Committee
ARIS	Agricultural Research Information System
B:C Ratio	Benefit Cost Ratio
BIRD	Bankers Institute of Rural Development
BPL	Below Poverty Line
CACP	Commission for Agricultural Costs and Prices
CASA	Centre for Advancement of Sustainable Agriculture
CARP	Council for Agricultural Research Policy
CAZRI	Central Arid Zone Research Institute
CCAFS	Climate Change, Agriculture and Food Security
CESS	Centre for Economic and Social Studies
CERA	Consortium for e-Resources in Agriculture
CGIAR	Consultative Group on International Agricultural Research
CGE	Computable General Equilibrium

CIBA	Central Institute of Brackishwater Aquaculture
CIFA	Central Institute of Freshwater Aquaculture
CIFE	Central Institute of Fisheries Education
CIFRI	Central Inland Fisheries Research Institute
CIMMYT	International Maize and Wheat Improvement Centre
CIRB	Central Institute of Research on Buffaloes
CCSU	Chaudhary Charan Singh University
CRIDA	Central Research Institute for Dryland Agriculture
CSD	Council for Social Development
CSR	Consortium for Scientific Research
CSIR	Council of Scientific and Industrial Research
CSO	Central Statistical Organization
CSWB	Central Social Welfare Board
CSWCR&TI	Central Soil and Water Conservation Research and Training Institute
CVC	Central Vigilance Commission
DAC	Department of Agriculture and Cooperation
DARE	Department of Agricultural Research and Education
DBT	Department of Biotechnology
DGCIS	Directorate General of Commercial Intelligence and Statistics
DMR	Directorate of Maize Research
DOD	Department of Ocean Development
DRDA	District Rural Development Authority
DST	Department of Science and Technology
DRWA	Directorate of Research on Women in Agriculture
EPW	Economic and Political Weekly

ERNET	Education and Research Network
ESM	Economics, Statistics and Management
ETL	Economic Threshold Level
EU	European Union
FAO	Food and Agriculture Organization
FDI	Foreign Direct Investment
FFV	Fresh Fruits and Vegetables
FICCI	Federation of Indian Chambers of Commerce and Industry
FISHCOPED	National Federation of Fisherman's Cooperative Limited
FMD	Foot and Mouth Disease
FRI	Forest Research Institute
FSB	Fruit and Shoot Borer
GATT	General Agreement on Tariffs and Trade
GBPUA&T	Govind Ballabh Pant University of Agriculture and Technology
GDP	Gross Domestic Product
GECFS	Global Environmental Change and Food Systems
GM	Genetically Modified
GoI	Government of India
ha	Hectare
HSD	High Speed Diesel
HYVs	High Yielding Varieties
IARI	Indian Agricultural Research Institute
IASDS	Institute of Applied Statistics and Development Studies
IASRI	Indian Agricultural Statistics Research Institute
ICAR	Indian Council of Agricultural Research

ICARDA	International Centre for Agricultural Research in the Dry Areas
ICDL	International Conference on Digital Libraries
ICRAF	International Centre for Research on Agro Forestry
ICRIER	Indian Council for Research on International Economic Relations
ICRISAT	International Crops Research Institute for Semi-Arid Tropics
ICT	Information and Communication Technology
IDS	Institute of Development Studies
IFPRI	International Food Policy Research Institute
IGNOU	Indira Gandhi National Open University
IHC	India Habitat Centre
IIFT	Indian Institute of Foreign Trade
IIM	Indian Institute of Management
IIT	Indian Institute of Technology
IJAE	Indian Journal of Agricultural Economics
ISIP	International Seminar for Information Professionals
ILRI	International Livestock Research Institute
IMD	India Meteorological Department
IMT	Institute of Management Technology
IPM	Integrated Pest Management
IP	Internet Protocol
IPRs	Intellectual Property Rights
IRC	Institute Research Council
IRMED	Institute for Resource Management and Economic Development
IRR	Internal Rate of Return
IRRI	International Rice Research Institute

ISBD	Indian Society for Buffalo Development
ISAE	Indian Society of Agricultural Economics
ISEC	Institute for Socio Economic Change
IT	Information Technology
IVRI	Indian Veterinary Research Institute
IWMI	International Water Management Institute
JNU	Jawaharlal Nehru University
KAB	Krishi Anusandhan Bhawan
KVAFSU	Karnataka Veterinary, Animal and Fisheries Sciences University
KVK	Krishi Vigyan Kendra
LR	Logistic Regression
MC	Marketing Cost
ME&F	Ministry of Environment and Forestry
MM	Marketing Margin
MoA	Ministry of Agriculture
MoSPI	Ministry of Statistics and Programme Implementation
MSP	Minimum Support Price
Mt	Million Tonnes
NAARM	National Academy of Agricultural Research Management
NAAS	National Academy of Agricultural Sciences
NABARD	National Bank for Agriculture and Rural Development
NAE	Networking of Agricultural Economists
NAFED	National Agricultural Cooperative Marketing Federation
NAIP	National Agriculture Innovation Project
NAIS	National Agricultural Insurance Scheme

NARS	National Agricultural Research System
NARP	National Agricultural Research Project
NASC	National Agricultural Science Centre
NATP	National Agricultural Technology Project
NBFGR	National Bureau of Fish Genetic Resources
NBPGR	National Bureau of Plant Genetic Resources
NCAER	National Council of Applied Economic Research
NCDC	National Cooperative Development Corporation
NDRI	National Dairy Research Institute
NER	North-Eastern Region
NFDB	National Fisheries Development Board
NFSMEC	National Food Security Mission Executive Committee
NGOs	Non-Governmental Organizations
NIC	National Informatics Centre
NIPoR	National Institute of Policy Research
NISTADS	National Institute of Science, Technology and Development Studies
NPA	National Plan of Action
NPL	National Physical Laboratory
NPP	National Perspective Plan
NPV	Net Present Value
NP	Net Price
NRAA	National Rainfed Area Authority
NREGA	National Rural Employment Guarantee Act
NSA	Net Sown Area
NSSO	National Sample Survey Organization

ODR	Online Data Repository
O & M	Organisation and Management
OPV	Open Pollinated Variety
PAU	Punjab Agricultural University
PET	Potential Evapo Transpiration
PE	Prediction Error
PFGF	Professional Fisheries Graduates Forum
PHV	Pelagic High Value
PLV	Pelagic Low Value
PME	Prioritization, Monitoring and Evaluation
PPP	Public-Private Partnership
PRIs	Panchyati Raj Institutions
PWM	Powdery Mildew of Mango
R&D	Research and Development
RAC	Research Advisory Committee
RDT	Rough Set Based Decision Tree
RRBs	Regional Rural Banks
SAARC	South Asian Association for Regional Co-operation
SAUs	State Agricultural Universities
SCBs	Scheduled Commercial Banks
SHGs	Self-Help Groups
SKUAST-K	Sher-e-Kashmir University of Agricultural Sciences & Technology-Kashmir
SMEs	Small and Medium Enterprises
SPS	Sanitary and Phyto Sanitary

SPSS	Statistical Package for Social Sciences
SRI	System of Rice Intensification
TE	Triennium Ending
TEV	Total Economic Value
TERI	The Energy and Resources Institute
TFP	Total Factor Productivity
TIFAC	Technology Information, Forecasting and Assessment Council
TNAU	Tamil Nadu Agricultural University
TRIPS	Trade Related Aspects of Intellectual Property Rights
UAS	University of Agricultural Sciences
UNCTAD	United Nations Conference on Trade and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
USDA	United States Department of Agriculture
V-PAGe	Visioning, Policy Analysis and Gender
VCO	Value of Crop Output
WPI	Wholesale Price Index
WTO	World Trade Organization

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Executive Summary

The National Centre for Agricultural Economics and Policy Research (NCAP) worked with a team of 19 scientists (including one ICAR National Professor) and 15 other staff in the year 2009-10. The total expenditure of the Centre, including the externally funded projects, was Rs 612.81 lakh.

Research studies of topical nature are conducted at the Centre under five broad themes, viz. technology policy, sustainable agricultural systems, markets and trade, institutional change, and agricultural growth and modelling. Each theme area is headed by a senior professional with support of a small team of scientists working under each theme. Research programmes within and across the themes are so designed as to accomplish the mandate of the Centre. During the year 2009-10, the Centre conducted 37 research studies. Five consultancy and contract research projects have also been completed during the year. The Centre not only maintained but also increased the linkages and collaborations with many institutions in India and abroad. Besides, a good number of training programmes, workshops, seminars, brainstorming sessions, and other policy advocacy programmes were also organised. The research achievements and a glimpse of activities undertaken by NCAP during 2009-10 are reported below.

Technology Policy

- A study conducted to estimate TFP for major crops at all India level, has revealed that the share of TFP growth in total output growth ranged from 24% to 59% in cereals, 10% to 26% in pulses, 6% to 27% in oilseeds and 32% to 74% in fibre crops during 1975-2005. The unit cost of production has decreased steadily in real terms at the rate of 1.0 to 2.3% for cereals, about 1% each for gram and moong, 0.8 to 2.0% for oilseeds, 1.7% for fibre crops and 0.4% for sugarcane. The lower unit cost of production is considered beneficial for both consumers and producers.

- Variation in adoption level of the selected agricultural technologies is an important factor for the variations in agricultural productivity across different states of the country. A study has been conducted to compute state-wise adoption index and identify the factors governing adoption of agricultural technology. The study has revealed that Punjab, Haryana, Tamil Nadu and Gujarat are the top-ranking states in adoption of agricultural technology. Analysis has revealed that irrigation facilities, extension, road connectivity, access to formal credit and agricultural wages are the key determinants of adoption of agricultural technologies. Hence, the study has emphasized on the need for infrastructural development to promote adoption of agricultural technologies in the country.

- Some studies in frontier areas like Artificial Neural Network (ANN), machine learning based approaches and biotechnology have also been conducted at the Centre. These studies

have revealed the unexplored potential of such recent techniques in agriculture. ANN has been used to estimate potential evapotranspiration over the Gangetic West Bengal. The results have shown that the ANN performs better than the non-linear regression approach. Machine learning based approaches have resulted in 85% accurate prediction of powdery mildew of mango (PWM). Further, the resulting model has been found easy to understand and simple to implement by the stakeholders.

- A study on brinjal has revealed that intensive use of fertilizers, HYV seeds, irrigation and pest management has resulted in significant improvement in yield of brinjal during the period 1981-2008.
- The study on impact assessment of micro and secondary nutrients in Karnataka has demonstrated large scope in raising production and farm income by correcting deficiencies of micro and secondary nutrients in Indian soils.
- A case study on organic cultivation of basmati paddy has shown that there is some yield reduction due to shift from conventional to organic paddy across all farm categories. However, yield reduction starts narrowing after the second year of conversion. It reaches around 10 per cent at the end of in-conversion period. Yield reduction during transition to organic paddy has been observed higher at large farms because small and medium farmers provide intensive care and manage field and crop better than that by large farmers. The average variable cost of in-conversion process of organic basmati paddy farming is higher than that of conventional basmati paddy farming. The transition to organic farming is very taxing for the farmers to manage without financial assistance. After transition, gross and net profits of fully "organic" produce increased rapidly and turned higher than from conventional crop because agribusiness company paid premium price on organic paddy, which was 25 per cent more than the open market price of basmati paddy.
- Impact assessment study of fishery sector has shown that science and technology is the primary contributer to the growth of over 800% growth in fishery in the past 55 years. Market has not worked as a major driver for the growth of the sector so far.

Sustainable Agricultural Systems

- A study on land-use dynamics has revealed that a large number of land shifts have taken place from undesirable part of the ecological sector to non-agricultural sector at all-India level. On an average, with increase of one person in population, the land under non-agricultural uses has increased between 0.011 hectares and to 0.027 hectares during different decades from 1950s to 2000s.
- The study on SRI, conducted in Tamil Nadu, has revealed that it can save 39% water over the normal practice. Upscaling of SRI in favourable areas can effectively address the problem of water shortage for irrigation and household food-security in the country.

- A study on "Biofuels" has revealed that development of the biofuel sector in India is very slow and blending targets of both ethanol and biodiesel look unfeasible, at least in the frame of 2017. Thus, research thrust to develop technologies of second generation biofuels needs to gain momentum. The findings of the study have suggested the use of sweet sorghum and sugar beet to substitute sugarcane-based ethanol production. Sweet sorghum is pro-poor crop in marginal and rainfed areas. Hence, government and private entrepreneurial efforts need to be fine-tuned and directed towards it.
- A study to achieve improved livelihood security through resource conservation and diversified farming systems in Mewat region (Haryana) has revealed that common problems of the area include depletion of groundwater, insufficient supply of water, lack of HYV seeds, duplicate pesticides, termite problem in growing of crops, labour shortage and destruction by *Nilgais*. Hence, demand driven interventions are needed in Mewat.
- A study on valuation of fish genetic resources has recognized economic value of aquatic genetic resources. A better understanding of the functional relationship between aquatic genetic resources and their services would allow an accurate estimation of the value of biodiversity conservation in our country.

Markets and Trade

- During the past one decade, the consumption of wheat products has shown upward trend in urban areas, particularly in the southeren states of India. The demand projections suggest that the total demand for wheat in India would reach around 78.6 Mt by 2011-12, 85.64 Mt by 2016-17 and 93.4 Mt by 2021-22.
- Large variations have been found in milk production, marketing and supply chains in India across regions. Modern milk supply chain is quite important in agriculturally developed states like Punjab, while the traditional milk marketing supply chain is still prevalent in Bihar. Landless and small farmers face few, if any, barriers in India's milk markets. Education, milk price, milk test and presence of co-operative milk collection centres in the villages have significant positive influence on farmer's decision to integrate with modern formal milk marketing supply chain.
- Exports of shrimp from India have registered positive growth during 1995-96 to 2006-07. Frozen squid and frozen cuttle fish have exhibited moderate growth rates, whereas dried items and chilled items have registered growth in double digits. The study on fish marketing has shown the need to formulate a uniform market policy for fishes so that it becomes easier in operation and regulation.

Institutional Changes

- A study on structural changes in landholdings has revealed that the number of smallholdings increased by 99 per cent in 2000-01, compared to that in 1970-71 and smallholdings, area

increased by 84%. These have implications on issues like input use, and output portfolio of Indian agriculture and food security of the country.

- Performance of agricultural credit in India has revealed that the share of scheduled commercial banks, co-operative banks and regional rural banks in the institutional agricultural credit flow during 2008-09 was 73%, 17% and 10%, respectively. Institutional agricultural credit has increased fifteen-fold in real terms during the period 1970-2008. However, the distribution of institutional credit across farm-size categories is skewed. The majority of farmers (82%) account for only 50% of the institutional credit, on the other hand, 18% of the farmers having more than 2 hectares land account for 49% of the institutional credit. Age, gender, farm size, education and occupation of the household are the significant determinants of farmers' access to institutional credit.
- Debt Waiver and Debt Relief Scheme has benefited a smallholder by Rs 27,000/- in the sample area of Haryana state. Deterioration in financial discipline to repay the loan has been observed to be a serious implication of the scheme. Farmers feel that incentives on inputs, availability of power, off-farm employment and better prices of their produce will help them to repay their loans.
- Long-term monsoon trends have shown that drought is experienced at least once in 5 years in all the Indian statess except North-East states. A multi-pronged strategy to deal with recurrent monsoon deficiency requires exploration of newer drought-tolerant and climate-conducive crop varieties, enhancing employment opportunities to non-poor households, and developing a new model that improves the efficacy of the IMD forecast.
- A decision tree has been developed in NCAP using data mining techniques to characterize ICT-empowered women farmers in India. The study has recommended that the status of education should be improved in villages, more income opportunities should be provided to farm women and appropriate technologies should be developed for providing ICT empowerment to farm women.

Agricultural Growth and Modelling

- In order to understand regional variations in agricultural performance and its correlates, district level estimates of crop productivity, including horticultural crops have been prepared for all the agricultural districts of India. The study has also compiled at one place information on important agro-economic characteristics like rainfall, irrigation, fertiliser use, poverty level, etc. for each district. District-based data indicates that 1% increase in land productivity reduces poverty by 0.65%. Further, 1% reduction in labour force in agriculture results in 0.57% decline in rural poverty. Thus, the study has highlighted the need for reducing pressure on land by shifting labour force from agriculture to non-farm activities.

- Average food inflation during the period 2006-2009 has been more than 80% higher than inflation in non-food commodities. It is because growth in food output is following a deceleration. Dependence on productivity of food growth is rising which in turn involves increase in the average cost of production. This implies that growth in food output is driven by increase in food prices. To keep food inflation at a low level, we need to take strong action to develop and disseminate improved technologies for raising food production.
- Challenges in ensuring food security through wheat has highlighted that slow down in wheat production is caused by both slow down in productivity growth and decline in area under wheat since 1986. The study has concluded that if growth rate in wheat production is not raised by more than 50%, a serious imbalance would emerge. The challenge to improve production of wheat are global warming, threat of pests and diseases, declining relative production and profitability and stress on natural resources like land and water. Meeting these challenges requires development of appropriate technologies and strong R&D support.
- A study on rural urban linkage has emphasized that 10% growth in urban consumption was associated with 4.6% growth in agriculture income and 4.9% growth in rural non-farm employment. Further, a 10% increase in rural non-farm employment has been found to result in 8.3% increase in income of an agricultural worker. Thus, there is a need to understand the impact of urban growth on rural agriculture and rural non-farm sectors and impact of growth of rural non-farm sector on farm sector.

The NCAP website available at http://www.ncap.res.in is regularly updated during the year. Recent NCAP publications were made available in the PDF format for downloading from the website. Data has revealed that policy briefs, workshop proceedings and policy papers were frequently referred by the visitors on the NCAP website.

The ARIS facility at the Centre has been equipped with 2 MBPS leased line from ERNET to strengthen the existing E-mail and Internet facilities to NCAP staff. The Centre has its independent email server which is being used to its potential.

As a part of the dissemination of research output, the Centre has published two policy briefs, one policy paper, one book, thirty-two journal articles and thirty-one book chapters/popular articles during the year. The Centre's staff was involved in a number of professional and policy interactions and projects. The Centre organized one winter school, six training programmes and several meetings at NCAP and outside. These activities could facilitate achieving of greater impact and wider visibility of the Centre during the year.

I. PROFILE OF NCAP

The National Centre for Agricultural Economics and Policy Research (NCAP) was established to strengthen agricultural economics and policy research in the national agricultural research system (NARS) of the country. The Centre acts as eyes and ears of the Council and helps the ICAR through credible research to actively participate in policy dialogue and decision in the country. The Centre serves as the nodal agency of the ICAR in monitoring and interpreting the research implications of changes in ground realities, and macroeconomic environment of the country as well as international developments in the agricultural sector.

Location

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

Vision

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

Mission

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

Mandate

The mandate of the Centre includes:

(1) To conduct policy-oriented research in network mode on

(i) Technology generation, diffusion and impact assessment,

(ii) Sustainable agricultural production systems,

(iii) Interaction between technology and other policy instruments like incentives, investments, Institutions, trade, etc.

(iv) Agricultural growth and modelling with focus on the role of technology;

(2) To strengthen agricultural economics and policy research in the NARS, and

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

Research Activities

Research activities of NCAP are covered under five major themes: technology policy, sustainable agricultural systems, markets and trade, institutional change and agricultural growth and modelling. The significant study areas of the Centre include research investment, research resource allocation, food policy and food security, WTO and trade in agriculture, private sector participation in agricultural extension, monitoring and evaluation of agricultural research and O&M reforms, impact assessment, institutional aspects, risk and insurance, food systems, viz. livestock, fishery, and horticulture. The centre is also having prestigious ICAR National Professor Project on "Analyzing impact of agricultural policy, technology, institutions and trade on agricultural growth, farm income, sustainability and rural poverty".

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

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

Management

A high-powered Research Advisory Committee (RAC) comprising eminent professionals, mostly from outside the ICAR system, guides the Centre on its research policies. Prof. Y.K. Alagh, the former Minister of State for Power and Science and Technology, Government of India, was the first Chairman of RAC. Dr P.V. Shenoi, former Special Secretary, Department of Agriculture and Cooperation, Government of India, is the Chairman of present RAC of constituted joinltly for NCAP and IASRI. The RAC provides guidance to the Centre in planning research thrusts and strategies. Initiatives in human resource development, approaches towards improving

policy dialogues and evaluation are some other areas in which Centre receives guidance from the RAC.

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

Infrastructural Facilities

NCAP Website

NCAP posts all important information about activities of the Centre, particularly about its staff, infrastructure, research projects, publications and linkages on its Website (http://www.ncap.res.in). The Centre's website is hosted through ERNET, New Delhi and is being updated at regular intervals. All NCAP publications like policy papers, policy briefs, working papers, PME notes, workshop proceedings, etc. have been uploaded on the website and are available in the form of PDF files. Data on access to NCAP publications have revealed increasing popularity of the publications (Figure 1). Among the publications, workshop proceedings, policy papers and policy briefs were the most referred one. These observations reveal wider acceptance and visibility of the Centre across the world. NCAP website was regularly updated in terms of data as well as coding in the year 2009-10. There have been more than 100 major updates during the year. Constant and regular efforts were made in terms of programming of website as well as correspondence with many other website administrators at national as well as international level to maintain the appearance of the website among top 5 while using the relevant keywords.

During the year, traffic to NCAP website increased significantly. Data revealed that the visitors from USA is more than visitors from India during the year 2009-10. About 83 per cent of the visitors who accessed NCAP website were from India and USA with their respective share as 38% and 45%. Centre's website was also accessed in Australia (5%), China (2%), United Kingdom (1%) and other countries (9%). Overall, the website was accessed by users of 150 countries as compared to 147 countries in the previous year (Figure 2). Also there has been considerable increase in some other important performance parameters of the NCAP website like total number of sessions, total number of hits, total number of files downloaded, total number of pages viewed, total number of unique visitors as identified by the IP addresses, number of countries and access to announcements (Table 1).

Figure 1: Access to NCAP publications

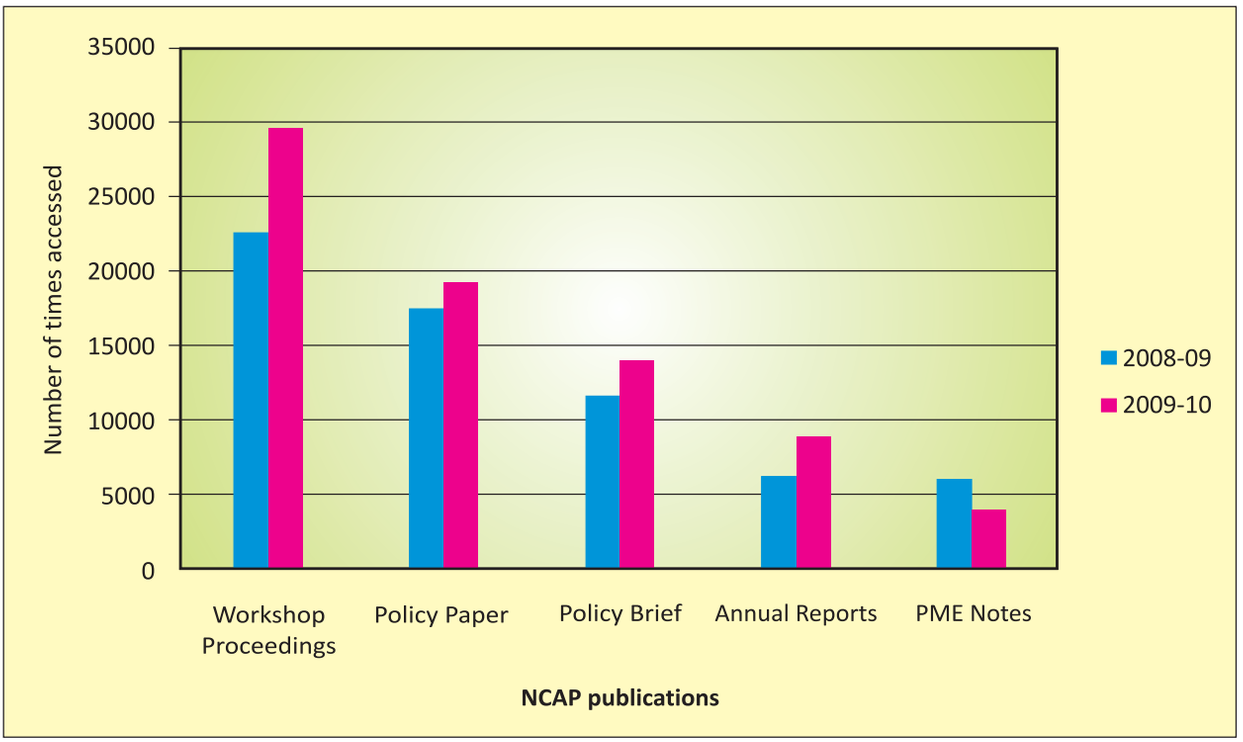


Figure 2: Access to NCAP website across countries

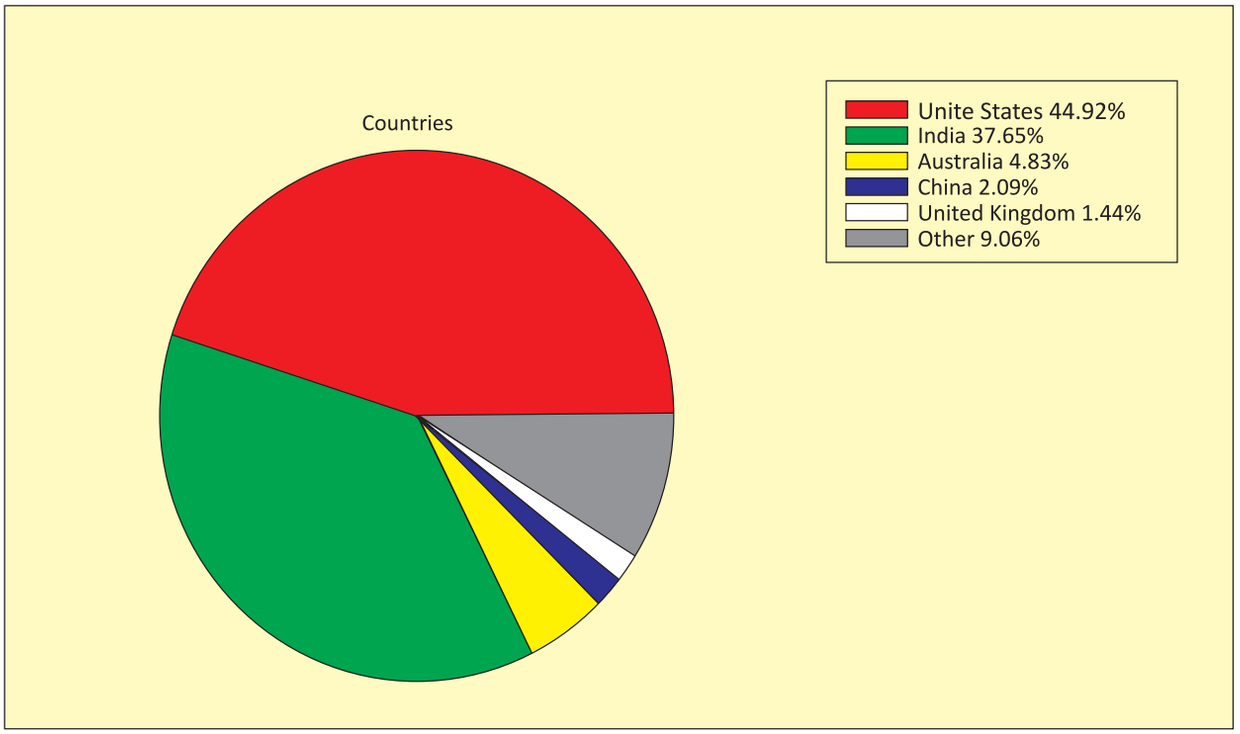


Table 1 : Annual growth (%) of some important performance parameters regarding access to NCAP website

Parameters	Total Sessions	Total hits	Downloaded files	Total Pages viewed	IP Addresses	Countries	Announ-cements
Annual Growth (%)	30	18	75	25	5	2	136

Agricultural Research Information System Lab

The advent of information age has thrown open new challenges and opportunities for Indian Agriculture. The new World Economic Order and Globalization of markets has put lot of pressure to improve competitiveness of agricultural production and marketing. Agricultural Information is vital to fulfil these dictates of time. Quick access to information at global level through electronic media thus provides the way to tackle future challenges of Indian Agriculture. The Agricultural Research Information System (ARIS) came into being in the terminal years of the VIII plan using funds from the National Agricultural Research Project (NARP). The goal of the ARIS is to strengthen Information Management Culture using modern tools within the National Agricultural Research System (NARS) so that agricultural research becomes more efficient and effective. The major objectives are:

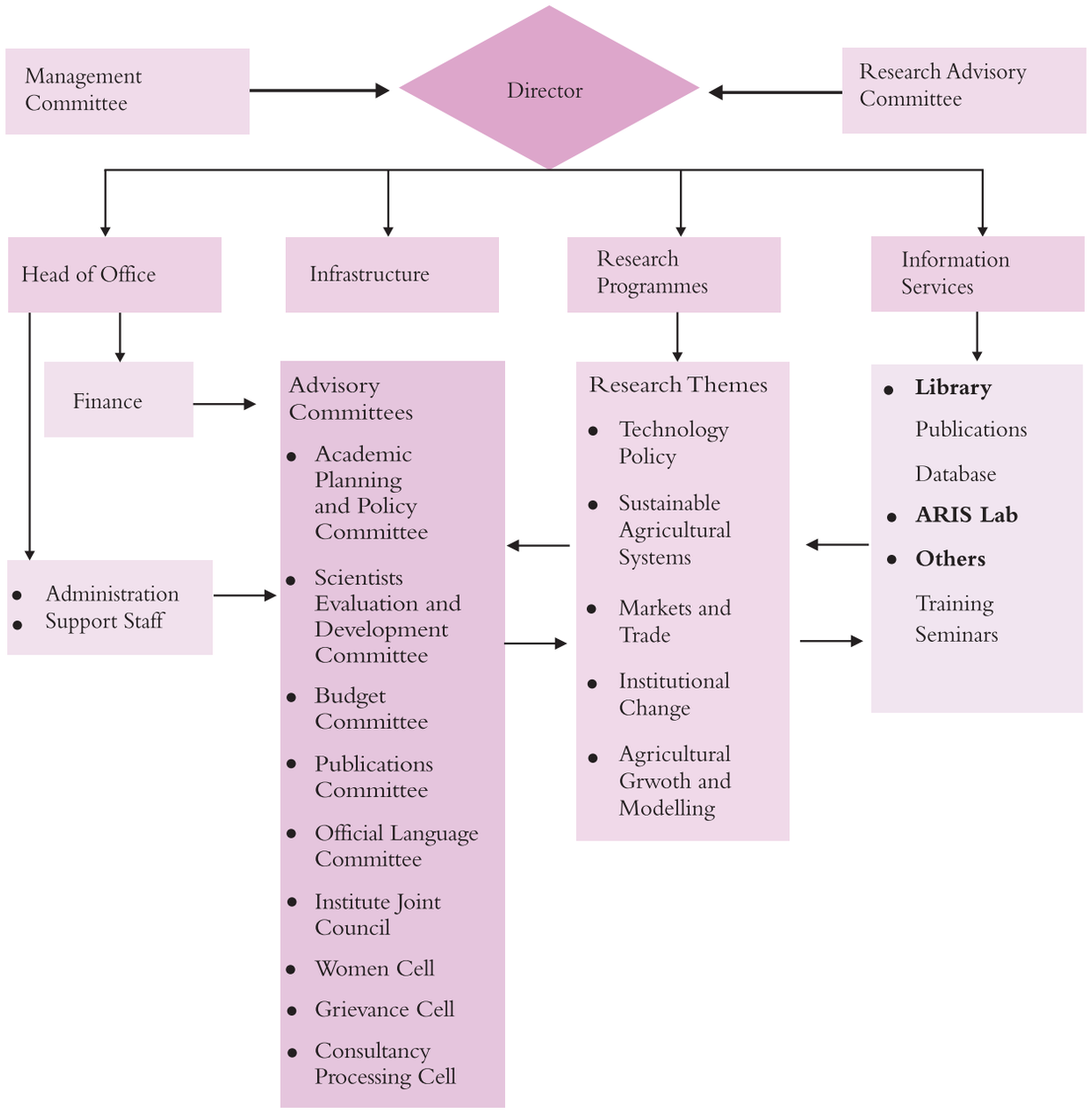
1. To put information close to managers and scientists
2. To build the capacity to organize, store, retrieve and use the relevant information into the agricultural research infrastructure
3. To share the information over NARS using NCAP website
4. To improve the capacity to plan, execute, monitor and evaluate research programs

To cater to these objectives ARIS cell at NCAP is presently well equipped with latest computers for visitors, servers, switches, 2 MBPS dedicated leased lines, e-mail server, security software's like firewall and centralized antivirus server and analytical software's like SPSS, EVIEWS, LIMDEP, GIS, GAMS, Stella, Strata. For data management and development of in-house software, NCAP has SQL server 2005, Visual Studio. Net and windows server 2005 have been procured. Adobe software has been procured to facilitate creation of PDF files. ARIS has created LAN capacity for connecting more than 100 computers. Besides, each NCAP employee is provided with individual e-mail account, latest desktop computing facility along with latest windows software and bilingual Microsoft office. ARIS has been instrumental in providing access to NCAP researchers as well as publications throughout globe via e-mail and NCAP website.

Library

NCAP has a rich collection of print, electronic databases like Statistical Abstracts, Economic Survey, Agricultural census, Input surveys, Livestock census, NSS CD ROM, CSO, other Government of India publications and some state Government Publications also. The library facility of the Centre is being developed as an efficient information service unit. NCAP Library houses a total of 4952 publications, 2821 reference books, 64 CD ROM's, 1890 database publications, 127 reports, 50 SAARC publications and other references materials. Library references are computerized using library software package with quick search facility. The library has subscription to 13 national journals, 18 international journals and online subscription to CMIE database services and EPW archives. It also has a depository of FAO, CGPRT, and CGIAR data bases. Library has separate section of Hindi books. NCAP has access to many journals through CeRA (Consortium for e-Resources in Agriculture) website created by IARI under NAIP project. Two computers, one printer and one scanner are placed in the library with connectivity to internet for Library user's convenience.

Figure 3: Organogram of NCAP



Budget

The expenditure of NCAP for the year 2009-10 is presented in Table 2 and its staff position in Table 3.

Table 2: Expenditure during 2009-10

(in lakh Rs)

Head of Account	Plan	Non-Plan	Total
Pay and allowances	—	238.18	238.18
Pension/Retirement benefits	—	14.67	14.67
Over Time Allowance (OTA)	—	0.17	0.17
Travelling expenses	12.48	0.19	12.67
Works	3.62	—	3.62
Other charges including equipments	132.76	—	132.76
Human resource development (HRD)	1.12	—	1.12
Sub-Total	**149.98**	**253.21**	**403.19**
National Agricultural Innovation Projects	113.31	—	113.31
National Professor Project	—	31.04	31.04
National Fellow Project	—	—	—
Other projects	—	65.27	65.27
Grand Total	263.29	349.52	612.81

Staff Position

Table 3: Staff position during 2009-10

Designation	Number
Director	1
ICAR National Professor	1
Principal Scientists	4*
Senior Scientists	11
Scientist (Sr. Scale)	-
Scientist	2
Technical Officer (T-6)	1
Technical Officers (T-5)	3
Driver (T-3)	1
Assistant Administrative Officer	1
Assistant Finance and Accounts Officer	1
Assistant	1
Stenographer	1
Junior Stenographer	1**
Upper Division Clerk	1
Lower Division Clerks	2
Supporting Staff Gr. I	2

*includes one on deputation with ICRISAT, Hyderabad
**on deputation to DMR, New Delhi

II. RESEARCH ACHIEVEMENTS

TECHNOLOGY POLICY

Total Factor Productivity and Change in Real Cost of Production for Major Crops in India

NAIP Project on V-Page

Growth of crop sector has shown deceleration in the recent past and it has been a cause of serious concern. This study has looked at the growth picture of crop sector at the disaggregate level by estimating TFP for major crops and major states growing the selected crops. The study has used Cost of Cultivation Data published by Commission for Agricultural Costs and Prices, for the period 1975-2005. It has also examined changes in real cost of production of selected crops since 1975.

Total Factor Productivity

The estimates of average annual TFP growth for the major crops at all-India level for the period 1975-2005 are shown in Table 4. Among cereals, the highest TFP growth has been recorded by wheat (1.9%) during the above period, followed by maize and barley (1.4% each), bajra (1%), rice (0.7%), and jowar (0.6%). The decadal performance (data not reported here) revealed that TFP growth weakened in the two decades over the base period 1975-85, with a few exceptions. The productivity growth of bajra accelerated after the base period, mainly due to adoption of its hybrid varieties.

Annual TFP growth for oilseed crops ranged between 0.7% and 0.8% during 1975-2005. The growth has declined in recent years (1996-05) as compared to that achieved during 1986-95. With the existing trend in domestic production, it will be quite challenging to meet the domestic demand of edible oils for the country. The TFP growth in pulse crops has been low for moong and gram, and negative for arhar and urad during 1975-2005. Among fibre crops, TFP has increased annually by 1.4% for cotton, and 1.3% for jute. The TFP growth for sugarcane has been found negative. The negative trend of TFP growth has been adversely affecting the regular and sufficient supply of sugar.

The declining and low growth in TFP of major crops over the years has important implications for agricultural research in the country. It indicates that challenges to research in the agriculture sector are increasing and high growth experienced in the past years may not be sustained in the future, if technological improvement does not occur.

The share of TFP growth in total output growth ranged between 24% and 59% in cereals, 10% and 26 % in pulses, 6% and 27% in oilseeds, and 32% and 74% in fibre crops during 1975-2005. The share of TFP growth in output growth was higher for wheat among cereals, gram among pulses, groundnut among oilseeds, and jute among fibre crops.

Real Cost of Production

In spite of growth in yield, the nominal cost per unit of crop output is showing an upward trend because prices of farm inputs have been rising simultaneously. This could also happen due to increase in input use. Thus, to examine whether increasing nominal unit cost of production has come largely due to increase in prices of farm inputs at a higher rate than the rise in productivity or due to use of higher inputs per unit of output to obtain higher yield, the cost of production was studied at constant prices using input price index (base 2005-06).

The unit cost of production has decreased steadily in real terms, at the rate of 1.0 to 2.3% for cereals, about 1% each for gram and moong, 0.8 to 2.0% for oilseeds, 1.7% for fibre crops, and marginally (0.4%) for sugarcane (Table 4). The cost of production for arhar and urad has shown an increasing trend after 1996. Adoption of modern varieties, investment in irrigation, infrastructure, and agri-research, and favourable input pricing policies, appear to have lowered the unit cost of production for major crops at the national level. The lower unit cost of production at constant prices is considered beneficial for both consumers and producers.

Table 4: Annual TFP growth, its share in total output, and growth in real cost of production for major crops in India: 1975-2005

Crops	TFP growth (%)	Share of TFP in output growth (%)	Growth in real cost (at 2005-06 prices) (%)
Cereals			
Rice	0.67	24.6	-1.01
Wheat	1.92	58.9	-2.28
Maize	1.39	16.5	-1.30
Jowar	0.63	23.7	-2.06
Bajra	1.04	27.6	-1.86
Barley	1.38	29.4	-2.07
Pulses			
Gram	0.16	26.1	-1.01
Moong	0.53	10.0	-1.11
Arhar	-0.69	(-)	0.90
Urad	-0.47	(-)	0.14
Oilseeds			
Soybean	0.71	5.5	-0.84
Groundnut	0.77	27.1	-1.11
Rapeseed & mustard	0.79	10.1	-1.99
Commercial crops			
Sugarcane	-0.41	(-)	-0.36
Cotton	1.41	31.6	-1.62
Jute	1.28	74.1	-1.73

Returns to Research Investment in Indian Agriculture

NAIP Project on V-Page

Like any other investment activity, resource allocation to agricultural research needs to be justified. Objective assessment of research investment helps in making decision and allocating resources to high return research portfolio. In the research investment paradigm shift, the donors are seeking evidence on the impact of past funding as a basis for future financial support.

Many earlier studies have empirically examined the impact of agricultural research in India by estimating internal rate of return (IRR) to investments. The present study has provided the recent estimates of IRR for major crops at all-India level (Table 5).

The overall internal rates of return to public agricultural research investment have been estimated high, 25% for rice, 37% for wheat, 26% for maize, 35% for jowar, 27% for bajra, 34% for gram, 55% for arhar, 17% for groundnut, 16% for R&M, and 34% for cotton. The results suggest that further investments on agricultural research would generate higher returns and provide clear signals for deciding a broad policy on research investment.

Table 5: Estimated marginal internal rate of returns to research investment in India

(per cent)

Crops	1975-85	1986-95	1996-05	1975-05
Rice	29	28	31	25
Wheat	34	44	36	37
Maize	27	25	32	26
Jowar	37	34	44	35
Bajra	34	19	35	27
Gram	9	20	48	34
Arhar	58	54	59	55
Groundnut	18	19	17	17
Rapeseed & mustard	27	17	13	16
Cotton	43	33	38	34

Measurement of Research Productivity in Fisheries Research Institutions in India

B. Ganesh Kumar

The measurement of scientific productivity and technical efficiency is a complex task. The most fundamental question is related to the identification of indicators of research productivity and efficiency. It includes construction of a combined research output index by assigning appropriate weights to various output indicators, such as research papers, papers presented/published in

proceedings, authorship of books/bulletins/manuals and popular articles/technical articles/book chapters. This approach has been used to assess the research impact, research productivity and efficiency of fisheries research under the ICAR system in India.

The average expenditure per scientist has been found to be highest in CIFE at Rs 33.31 lakh per scientist, which is almost triple of that in CIBA (Rs 10.78 lakh). It is interesting to note that CIFE holds the first position in research productivity index (Table 6). It is evident from the table that when the average expenditure per scientist increases, the research output of many institutes gets raised. The expenditure incurred on producing a unit of research output revealed that DCFR was most efficient among all institutes. It has spent only Rs 7 lakh to produce a research output, while CIFA has spent around Rs 21 lakh, which is almost thrice of DCFR. CIFRI and CIBA were also relatively more efficient in utilizing financial resources to produce research outputs.

Table 6: Research productivity index and expenditure incurred on research output

Institutes	Research productivity index		Average expenditure per scientist (in lakh Rs)	Expenditure per unit of research output(in lakh Rs)
	Overall average	Per scientist average		
CIBA	110.05	2.26	10.78	7.99
CIFA	109.64	1.99	15.12	21.20
CIFE	200.10	4.30	33.31	11.23
CIFRI	153.00	2.27	14.62	7.65
CIFT	132.84	1.92	15.27	10.37
CMFRI	218.23	1.82	16.19	14.15
DCFR	30.89	3.06	20.10	6.54
NBFGR	63.45	2.77	19.07	12.07

Note: CMFRI – Central Marine Fisheries Research Institute; CIFRI – Central Inland Fisheries Research Institute; CIFA – Central Institute of Freshwater Aquaculture; CIBA – Central Institute of Brackishwater Aquaculture; DCFR – Directorate of Coldwater Fisheries Research; CIFT – Central Institute of Fisheries Technology; NBFGR – National Bureau of Fish Genetic Resources; CIFE – Central Institute of Fisheries Education

It has been concluded that restructuring the institutes with adequate financial support and appropriate composition of scientists would enhance research productivity and efficiency.

Statewise Adoption Index of Improved Agricultural Technologies and its Linkage with Agricultural Productivity

Rajni Jain, Alka Arora and S.S. Raju

Variation in the adoption level of agricultural technologies is an important factor for the variations in agricultural productivity across different states in the country. The present study has used multiple variables of agricultural technologies like high-yielding varieties of seeds, chemical fertilizers,

pesticides, use of machinery, etc. to construct the Adoption Index. The pattern of adoption has been examined across the country based on the 54th round of NSSO dataset on "Situation Assessment Survey", which refers to the year 2002-03.

Table 7: Per cent gross cropped area under improved practices, computed adoption index, agricultural productivity and correlation of adoption index with agricultural productivity

States	Improved practice					Adoption Index	Productivity (1997-98) Rs/ha of NSA
	Improved seeds	Fertilizer	Pesticides	Weedicides	Tractor-use		
Andhra Pradesh	65	94	22	82	51	0.543	25475
Assam	43	48	13	30	11	0.118	26777
Bihar	49	84	18	48	48	0.393	27324
Gujarat	84	95	31	76	67	0.653	18127
Haryana	78	89	61	59	94	0.771	35121
Karnataka	65	82	23	55	27	0.437	20862
Madhya Pradesh	40	73	20	38	36	0.290	12421
Maharashtra	69	79	13	49	16	0.356	14056
Orissa	40	65	15	35	12	0.194	17539
Punjab	84	99	79	88	97	1.000	40950
Rajasthan	68	61	10	26	89	0.319	11775
Tamil Nadu	68	88	51	84	59	0.698	36041
Uttar Pradesh	52	92	17	28	76	0.390	28108
West Bengal	72	94	26	84	47	0.574	46385
Correlation between adoption index and agricultural productivity : 0.64							

The data pertains to the per cent gross cropped area under improved seeds, fertilizer, pesticides, weedicides and tractor-cultivation for five major crops sown in major states, excluding states like Himachal Pradesh, Jammu and Kashmir and Kerala. The productivity refers to the crop output in Rs/ha of NSA. The quantification of adoption has been carried out for each state in the form of adoption index (Table 7).

The Adoption Index reveals that Punjab, Haryana, Tami Nadu and Gujarat are the top ranking agricultural technology adopting states, while Assam has the lowest rank. Correlation analysis between state-wise adoption index and the state-wise agricultural productivity has shown a highly significant and positive correlation.

Factors Affecting Adoption of Agricultural Technologies

Rajni Jain, Alka Arora and S.S. Raju

To identify the factors that could be easily influenced through policy and have potential to increase the adoption of agricultural technologies, correlation coefficient was estimated between adoption

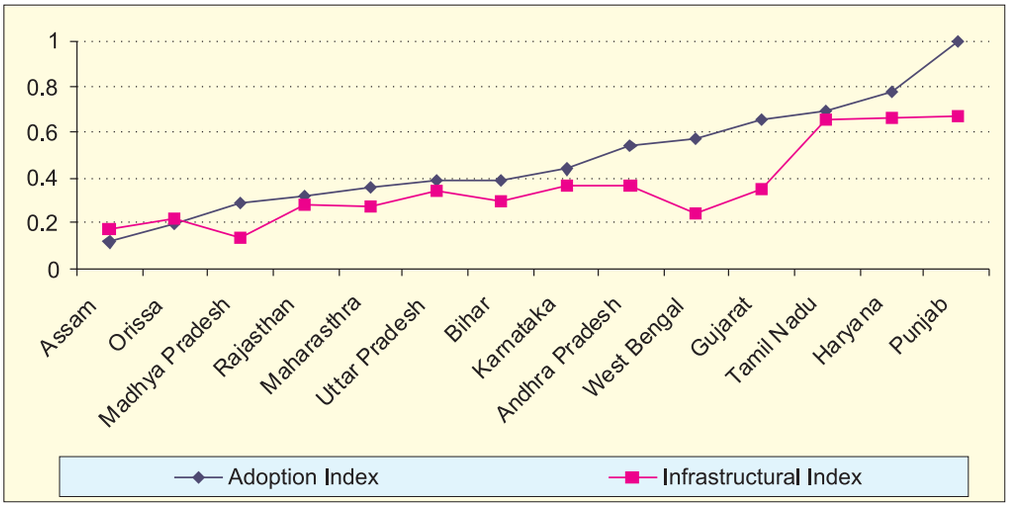
index and infrastructural variables like irrigation, credit, power, marketing, road, extension services and communication at the state level. Table 8 shows that factors like irrigation, credit, electricity supply, availability of services of research and extension organisations, roads, and agricultural wages are correlated positively with the adoption index. Poverty is significantly negatively correlated with the adoption index. Figure 4 shows that the infrastructural index and adoption index are also significantly positively correlated (correlation >0.9). This indicates the need for development of infrastructure for increasing the adoption of agricultural technology.

Table 8: Correlation between adoption index and individual infrastructural and developmental parameters for major states, excluding HP, J&K and Kerala

Infrastructural and developmental parameters	Correlation coefficient
Area under irrigation, %	0.725***
Research and extension organisations per '0000 ha of NSA	0.490*
Road length (km) per 100 sq km of geographical area	0.113
Villages connected by road, %	0.513*
Villages having Postal and Telegraph (P&T) facility, %	0.432
Annual credit, Rs/ha of NSA	0.668***
Per capita electricity consumption (kWh)	0.696***
Electricity consumption per hectare of NSA	0.828***
Banks per lakh hectares of NSA, No.	0.059
Markets per '000 hectares of geographical area, No.	0.065
Rural literacy, %	0.301
Agricultural wages, Rs/day/person	0.542*
Rural population "Below Poverty Line", %	-.719***

*Note: *, ** and *** refer to a significant correlation at 10%, 5% and 1% levels (2-tailed), respectively*

Figure 4: Adoption index vis-à-vis infrastructural index

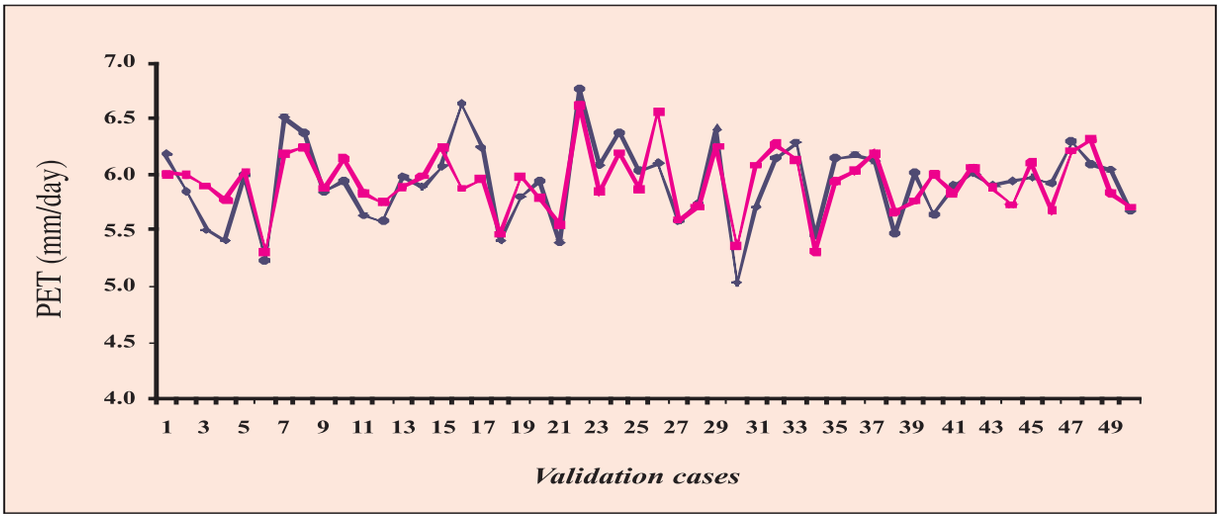


Estimating Potential Evapotranspiration from Limited Weather Data over Gangetic West Bengal, India: A Neurocomputing Approach

Surajit Chattopadhyay, Rajni Jain and Goutami Chattopadhyay

A neurocomputing-based model has been developed for estimating the potential evapotranspiration over the Gangetic West Bengal, India, during the summer monsoon months of June, July and August. An Artificial Neural Network (ANN) has been implemented in the form of multilayer perceptron to generate the model based on 50-year data (1951-2000) (Figure 5) available at the website: http://www.indiawaterportal.org/. Three weather variables, namely surface temperature, vapour pressure, and rainfall have been used as the independent variables in generating the model. The performance of the model has been judged statistically against non-linear regression in the form of asymptotic regression. It has been recognized that an artificial neural network in general, is more efficient than the regression approach in estimating the Potential Evapo-Transpiration (PET) in the summer monsoon months. It has also been revealed that artificial neural network and non-linear regression have almost equal efficiency in the aforesaid estimation. But, in July and August, artificial neural network is more reliable than regression approach. Since evapotranspiration is one of the basic components of the hydrological cycle and is essential for estimating irrigation water requirement, an efficient estimation procedure may help in agro-meteorological modelling, and irrigation scheduling in the summer monsoon months, which are of high importance for agricultural practices in the study zone. Figure 5 shows the observed and expected PET over the study zone during the test years for June using ANN. A close association between the actual and estimated values of PET has been observed which shows that ANN is suitable for estimating PET from weather parameters as predictor. A separate model has been generated for each of the three months and the correlation coefficients, prediction errors, and Willmott's indices have been computed for each of them. Asymptotic regression equations were fitted to the same data as used in the neural network models. Based on a statistical comparison it has been proved that the

Figure 5: The observed (bold) and estimated (thin) PET (mm/day) over the study zone during the test years for June



artificial neural network performs better than the non-linear regression approach adopted in the form of asymptotic regression.

Four statistical measures, namely Correlation (CORREL), Prediction Error (PE), Willmott's Index of order 1 (WI1), and Willmott's Index of order 2 (WI2) have been compared to find the suitability of proposed models in estimating the monthly potential evapotranspiration (Table 9).

Table 9: A comparison of computed statistical measures for ANN and NLR models in the months of June, July and August

Statistical measures	June		July		August	
	ANN	NLR	ANN	NLR	ANN	NLR
Correlation	0.768	0.674	0.585	0.393	0.381	0.294
Prediction Error	0.029	0.025	0.030	0.031	0.040	0.079
Wilmott's Index 1	0.652	0.632	0.498	0.426	0.353	0.304
Wilmott's Index 2	0.873	0.868	0.683	0.576	0.567	0.424

*ANN = Artificial neural network and NLR= Nonlinear regression

Machine Learning for Forewarning Crop Diseases

Rajni Jain, Sonajharia Minz and V. Rama Subramanian

With advances in computer science, the development of accurate forewarning systems for incidence of crop diseases is being increasingly emphasized. Timely forewarning of crop diseases will not only reduce the yield losses but would also alert the stakeholders to take effective preventive measures. Traditionally, logistic regression and discriminant analysis methods have been in use in the forewarning systems. Rough Sets and Decision Trees (RDT) offer mathematical tools to discover hidden patterns in the data and therefore, their application in forewarning models was investigated by using a case study of powdery mildew of mango (PWM) disease. The PWM dataset for the study was taken from the project, "Epidemiology and Forecasting of PWM" undertaken at the Central Institute for Subtropical Horticulture, Lucknow, Uttar Pradesh. From the original data, the attributes relative humidity and maximum temperature were selected because of the availability of information about the contribution of these factors to the occurrence of PWM from the literature. Prediction models for forewarning PWM disease using variables, viz. temperature and humidity were developed for a mango district in Uttar Pradesh (Table 10).

Table 10: Parameters of logistic regression model developed for prediction of PWM incidence

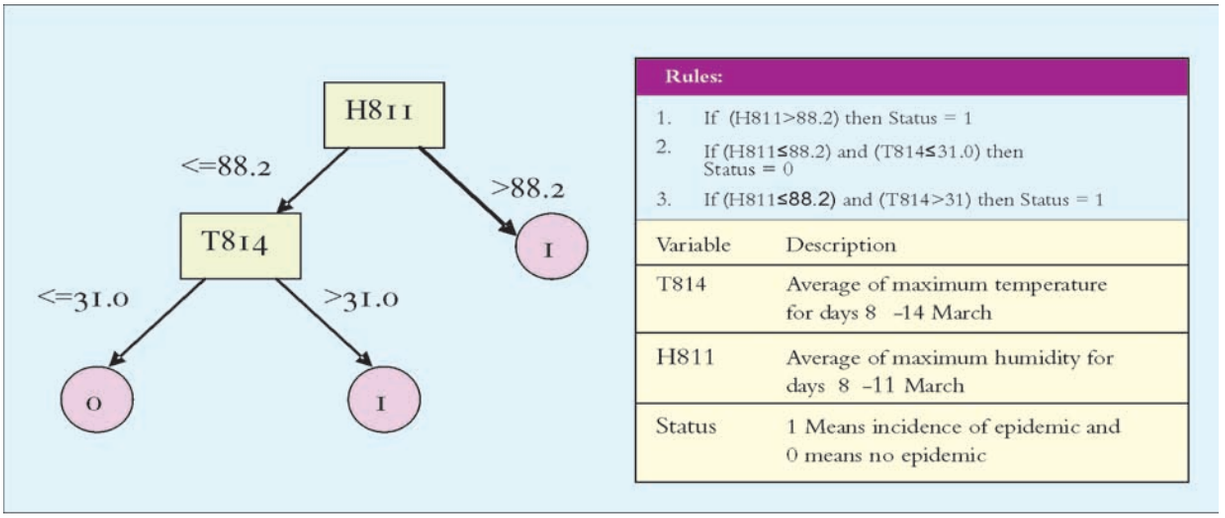
Period	8th to 11th Day			8th to 12th Day			8th to 13th Day			8th to 14th Day		
	a	b	c	a	b	c	a	b	c	a	b	c
1987-97	-10.79	0.19	0.06	-13.97	0.3	0.06	-36.95	0.88	0.13	-70.43	1.73	0.24

Note: a= intercept, b=regression coefficient of temperature and c= regression coefficient of humidity

The results obtained from machine learning techniques based on RDT were compared with the conventional prediction model developed using logistic regression technique. RDT showed 85 per

cent accuracy in prediction, while LR predicted with 75 per cent accuracy. The LR-based approach provided a model in terms of coefficients of a mathematical equation, while model from RDT was in the form of a decision tree and decision rules (Figure 6). Thus, machine learning based approach is easy to understand and simple to implement for the prediction of a disease-incidence by stakeholders.

Figure 6: The prediction model for PWM epidemic as obtained using rough sets and decision tree based algorithm



Production Scenario of Brinjal

Sant Kumar and P.A. Lakshmi Prasanna

The global production of vegetables including melons is estimated to be around 909 million tonnes (Mt) during TE 2008. India is the second largest producer of both vegetables and brinjal in the world, next to China. India contributes 94.7 lakh tonnes (29.9%) to world production of 323.8 lakh tonnes brinjal.

Significant progress in the production of brinjal has been made at the global level during the past 28 years (1981-2008). It increased 4-fold, from 8.2 Mt in 1981 to 32.4 Mt in 2008. The increased production came firstly from improvement in yield, from about 12 t/ha in TE 1981 to above 17 t/ha in TE 2008, which can be attributed to the use of quality hybrid seeds, plant protection chemicals, fertilizers and irrigation. Secondly, it came from increase in brinjal area globally which increased from 0.73 Mha in TE 1981 to 1.96 Mha in TE 2008.

Brinjal Production in India

Brinjal adapts well to almost all agro-climatic conditions in India and it is grown throughout the year. During the past 28 years area under brinjal more than doubled, from 2.53 lakh ha to 5.65 lakh ha, production increased more than 4-fold, from 23 lakh tonnes to 96 lakh tonnes, and the yield

increased from 8.6 t/ha to 17.0 t/ha. Thus, the rise in production was due to both increase in area and improvement in yield.

Brinjal is grown in almost all parts of India. There are 8 major states of India which together shared 86% of the area and more than 87% of the brinjal production of the country during TE 2008 (Table 11). These states were: West Bengal, Orissa, Bihar, Gujarat, Maharashtra, Andhra Pradesh, Karnataka, and Madhya Pradesh. Across states, West Bengal had the lion share in brinjal production (29.1%); together with Orissa and Bihar, it moved to 61%. The western states comprising Maharashtra and Gujarat, and southern states encompassing Andhra Pradesh and Karnataka, shared about 15% and 10% of brinjal production, respectively. On the yield front, both Bihar and Karnataka produced > 20 t/ha, while West Bengal, Gujarat, Maharashtra and Andhra Pradesh were at par with the national average. With bringing of yield level to the national average in the remaining states and to the average level of Bihar and Karnataka, additional production of about 4.5 t can be obtained from the existing area under brinjal in the country. This may be achieved by providing quality seeds, irrigation facilities and other inputs to growers in time, and controlling pest losses, mainly from the fruit and shoot borer.

Table 11: Area, production and yield of brinjal in major states of India during TE 2008

States	Area (lakh ha)	Production (lakh tonnes)	Yield (t/ha)	Share in all-India (per cent)	
				Area	Production
West Bengal	1.53	27.30	17.83	27.2	29.1
Orissa	1.29	19.00	14.77	22.9	20.2
Bihar	0.54	11.03	20.38	9.6	11.7
Gujarat	0.59	9.68	16.47	10.5	10.3
Maharashtra	0.30	4.86	16.30	5.3	5.2
Andhra Pradesh	0.28	4.79	16.84	5.0	5.1
Karnataka	0.17	3.39	20.56	3.0	3.6
Madhya Pradesh	0.15	2.21	14.98	2.7	2.4
Others	0.77	11.69	15.18	13.7	12.4
All-India	**5.65**	**94.71**	**16.80**	**100.0**	**100.00**

Impact Assessment of Micronutrients and Secondary Nutrients on Crops in Karnataka

S. Diana

The green revolution technology, which resulted into an impressive growth in agriculture and food security, was heavily input-intensive and it promoted inappropriate use of soil, water, and nutrients by the farmers. This in many cases, has resulted in mining of not only macronutrients but also the secondary and micronutrients from soils. Imbalanced uses of fertilizers and inadequate organic

supplementation have led to inefficient use of macronutrients. A sharp decline in the available micronutrients and secondary nutrients with continuous cropping has been widely observed.

The present study has estimated the effect of micronutrient (boron, zinc) and secondary nutrient (sulphur) in production of groundnut, finger millet and maize in Karnataka. During 2005 to 2008, an average increase of 45%, 47% and 51% has been observed in yield of maize, finger millet and groundnut, respectively due to the application of micronutrients.

Though there is additional cost with the use of micronutrients and secondary nutrients, the incremental returns is more than incremental costs, as shown in Table 12.

Table 12: Incremental cost and returns in various crops in Karnataka with micronutrient treatment

(per cent)

Crops	2005		2006		2007		2008	
	Cost	Return	Cost	Return	Cost	Return	Cost	Return
Maize	25.53	52.28	23.96	33.44	23.54	53.72	24.47	39.24
Groundnut	22.68	53.32	22.50	33.86	25.15	65.57	22.16	51.69
Fingermillet	22.47	56.56	16.97	27.97	25.73	46.15	30.54	57.13

Addressing the nutrient issues will help in ensuring sustainable agriculture as well as food security in the state. There is still a need for further studies on the status of nutrients and response of various other crops to micronutrients and secondary nutrients in different parts of the state. Such studies in other parts of the country will also help in formulating suitable policies regarding the nutrient usage in the farming system of the country.

Yield Dynamics in Transition from Conventional to Organics: A Case Study of Basmati Paddy

Shiv Kumar

This study conducted in the Kaithal district of Haryana state in the year 2008-09 comprising 180 sample contract farmers has revealed that the shift from conventional to organic cultivation of basmati paddy provides lower yields in the initial years. The reduction in yield was between 10% and 23% across different farm categories and it was found statistically significant. Yield reduction was more than 20% in the initial two years of conversion, after which the yield gap started narrowing. After second year of conversion, organic cultivation of basmati paddy reached 90% yield level of the paddy grown with conventional practice as a result of improvement in soil health through organic means.

Across farm categories, the yields of organic basmati were higher on small and medium farms than large farms. Correspondingly, the yield gaps were lower on small and medium farms than large farms. Yield gap and farm size were directly related to better management and intensive care of crop which was much better at the small and medium farms than large farms.

Incentive Price Structure

Price premiums are inducement for farmers to convert to organic agriculture. In general, a conversion from conventional to certified organic production is perceived and promoted as a viable opportunity to differentiate products and to achieve substantially higher prices because the conscious consumers are willing to pay more for the "organic" product. The comparative gross return and net profit on conversion from conventional to organic paddy production have shown that gross return and net profit from basmati cultivation declined drastically in the initial two years. This was due to three reasons: first: decline in yield after discarding synthetic inputs; second, cost of operations involved in converting conventional system to organic production; and third, absence or very small premium on the sale of product during the conversion stage. Because of these factors, the transition to organic farming becomes difficult for a farmer to manage without financial compensation, especially on small and medium farms. After the transition, the gross and net profits of completely organic produce turn out to be much higher. It is due to two main reasons: one, yields after full conversion to organic increase moderately and require less external costly inputs; second, prevalence of premium price on organic label product, paid by the Agribusiness Company, which encouraged farmers to shift to organic production, was about 25% than the open market price of basmati paddy. The study has shown that shift to organic production of basmati paddy involves some income loss in initial two years of conversion but the gain from niche market after attaining full organic status is much higher. The study has concluded that contract farming for organic product is beneficial for the farmers and it is driven more by market than by technology.

Impact of Science and Technology on Indian Fisheries Sector

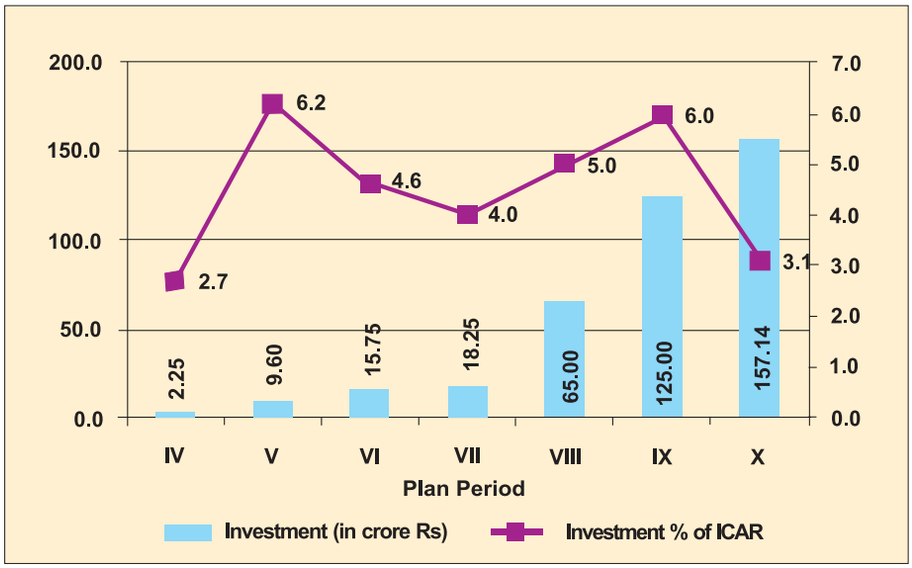
B. Ganesh Kumar and K.K. Datta

The fisheries sector has witnessed a spectacular growth of over 800% during the past five and a half decades of planning and development. Technologies have been the main drivers of this growth. At present, fisheries research is carried out by a large network of institutes under different organizations, viz. ICAR, SAUs, CSIR, DOD, DST, DBT, UGC, IITs, IIMs, Ministry of Agriculture, Ministry of Commerce, Ministry of Food Processing Industries, several voluntary agencies/private industries, etc. Most of the productivity enhancing technologies have largely come from the research investments made by the ICAR, which is the main agency responsible for developing technologies for the development of agricultural and allied sectors, including fisheries in our country. The outlay for fisheries research in total agricultural research has grown from 2.7% in IVth Five-Year Plan to 6 % in IXth Five-Year Plan, though it dropped to 3.1% in the Xth Plan (Figure 7). However, this shows the increasing importance accorded to this sector to exploit the still under-exploited areas.

It has been found that the importance accorded to research is more than to development over different plan periods. The share of research allocation rose from 3% in the IVth Plan to about 7%

in Xth Plan. Increasing importance accorded to research over development programmes by the Government, shows that the planners are convinced that technologies are driving the growth in this sector, which needs to be nurtured to achieve the desired 4% growth in agriculture in the XIth Plan.

Figure 7: Investment on fisheries research by ICAR during different Five-Year Plans (in crore Rs)



To sustain the growth of fisheries sector in general, technology, infrastructure and market would play a major role apart from enhanced investment in research and development. Technology has been the main factor behind the phenomenal growth of aquaculture, particularly after the advent of carp poly-culture and composite fish culture in the late-1970s. Similarly, major investments on infrastructure such as construction of mini harbours, jetties, landing centres, introduction of trawlers and mechanized vessels, supply of nets, etc. could lead to increased catch and higher contribution from the capture fisheries sector. However, market has not been able to play a major driver for the growth of the sector so far. To un-tap the potential of the sector, market may take the lead in furthering the growth, especially in the emergence of aquaculture sector.

Gender Sensitive Impact Indicators

Usha Ahuja

Rural women make a significant contribution to food production and there is a steady feminization of agriculture. About 4/5th of the economically active women in the country are engaged with agriculture as their main occupation. Despite their predominant role in agriculture, women are not technologically empowered because technological innovations affect the male and female farmers in different ways. Keeping this in view an attempt has been made to identify the Gender Sensitive Impact Indicators for improved agricultural technologies on the basis of earlier studies and brainstorming sessions and discussions with the experts working on these issues. Following are the broad categories of Gender Sensitive Impact Indicators of Technological Interventions in agriculture:

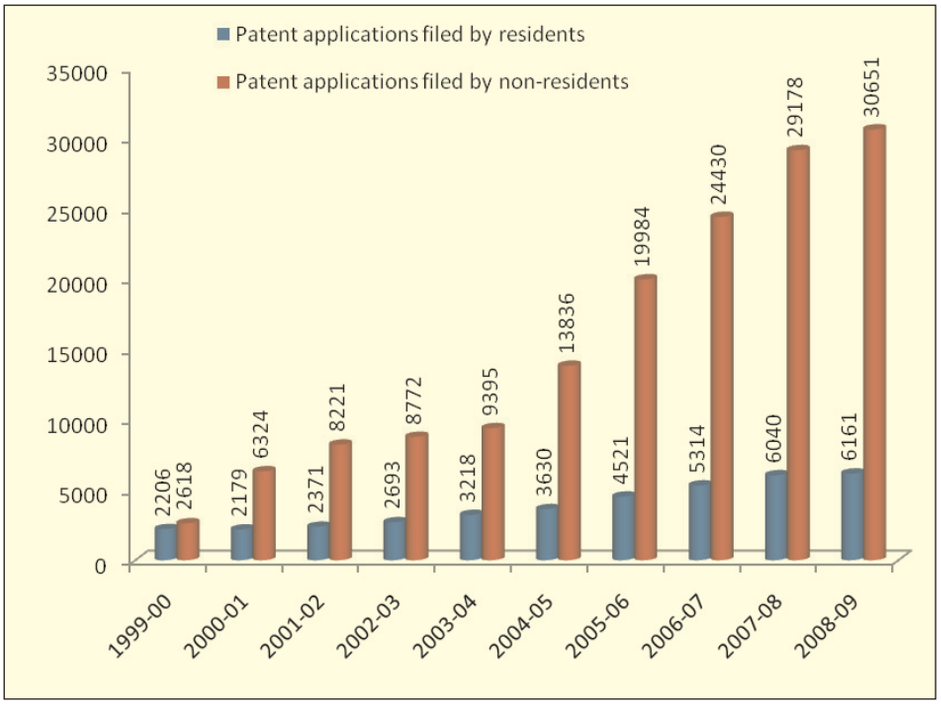
- Extent of economic independence
- Changes in women's role
- Access to resources and benefits
- Family welfare environment
- Changes in decision-making
- Mobility, and
- Socio-political participation

Changing Scenario of Patent Filings in India

Harbir Singh

Policy environment related to the protection of intellectual property rights (IPRs) in India has witnessed significant changes in the post-WTO era. The trend in filing of patent applications has revealed (a) the rising awareness about protection of intellectual property, and (b) the speed of R&D innovations. The ten-year data, taken from the annual reports of the Controller General of Patents, Designs and Trademarks, has shown that the number of patent applications did not exceed ten thousand till the year 2000-01. In the next three years, the number of patents filed in India has shown a small increase, from 10.5 thousand in 2001-02 to 12.6 thousand in 2003-04. But, after this, patents filings increased at an exponential rate and crossed 30 thousand mark by 2008-09 (Figure 8).

Figure 8: Patent applications filed by residents and non-residents in India: 1999-00 to 2008-09



This increase in the number of patent filings may be attributed mainly to the policy changes related to India's Patent Act, 1970. While only process patent was allowed under the Patent Act, 1970, the amended Act permits product patents also and has become fully compatible with the Trade Related Aspects of Intellectual Property Rights (TRIPS). The increasing share of non-resident patent filings points towards the emerging opportunities for IPRs generation in the economy.

The composition of total patent filings in terms of those filed by residents and non-residents has revealed an interesting picture. Most of the increase in patent filings in the country is by non residents. Out of total increase of 663% in patent filings, more than four-fifth was by non-residents. As a result of much faster growth in patents filed by non residents, share of Indian residents has plummeted to 17 % in 2008-09, whereas residents constituted 46% share a decade ago.

The study found that the patent filing has diversified towards new fields of invention in which patenting did not exist earlier in the country. For example, patenting activity in the fields of biotechnology, computer/electronics and other fields including agriculture has witnessed a spurt after 2004-05; patents were not filed in the areas of biotechnology and computer/electronics before 2000-01 (Table 13). It is a matter of serious concern that fields of invention categorized under "Agriculture" have attracted very few patent filings; it is below 100 in 2008-09, which is just 0.2% of the total patent filings. Further, 75% of the patent filings in the filed of agriculture was by non-residents.

Table 13: Patent applications filed under various fields of invention in India: 1999-00 to 2008-09

Year	Fields of invention								Total*
	Chemical	Drug	Food	Electrical	Mechanical	Computer/ Electronics	Bio technology	Other fields@	
1999-00	840	1000	107	877	1187			544	4824
2000-01	787	883	96	921	1106		4	546	8503
2001-02	778	879	110	731	1174		2	569	10592
2002-03	776	966	119	690	1257		46	562	11465
2003-04	2952	2525	123	2125	2717		23	2148	12613
2004-05	3916	2316	190	1079	3304	2787	1214	2659	17465
2005-06	5810	2211	101	1274	4734	5700	1525	3150	24505
2006-07	6354	3239	1223	2371	5536	5822	2774	1621	28940
2007-08	6375	4267	233	2210	6424	4842	1950	7110	33411
2008-09	5884	3672	340	2319	6360	7063	1844	9330	36812

@ includes agriculture
* includes all patent filings
Source: Various Annual Reports of Controller General of Patents, Designs and Trademark

SUSTAINABLE AGRICULTURAL SYSTEMS

Land Use Dynamics in India

P.A.Lakshmi Prasanna, Sunetra Ghatak, P. Ramasundaram and Sant Kumar Pandey

With the increase in population, pressure on land for meeting food demand and other needs is increasing. Therefore, it has become important to track changes in the land-use pattern. The study has shown that the share of forest lands increased from 17.62% to 22.86% during the period 1951-61 to 2001-2007. During the same period, the share of area under non-agricultural uses increased from 4.72% to 8.10% and the share of net cultivated area increased from 43.86% to 45.81%. The underlying growth rates of different land-use categories which had led to these changes in shares are presented in Table 14. The areas under non-agricultural uses, forests, net cultivated area and current fallows in India have recorded annual compound growth rates of 1.26%, 0.58%, 0.18% and 0.52%, respectively, while areas under pasture and grazing lands, miscellaneous trees and hedges, usar and unculturable land, other fallows and culturable waste have shown a negative growth rate during the period 1951-52 to 2006 -2007.

Table 14: Annual compound growth rate (CGR) and annual change (AC) of different land-use categories in India between 1951-52 and 2006-2007

Land-use category	Annual compound growth rate (%)	Annual change ('000 ha)
Non-agricultural uses	1.26	230.75
Forests	0.58	349.80
Pastures and grazing lands	-0.32	-40.97
Misc. trees and hedges	-1.04	-49.06
Usar and unculturable lands	-1.61	-412.92
Net cultivated area	0.18	239.52
Current fallows	0.52	71.91
Other fallows	-0.27	-32.77
Culturable wastes	-0.91	-156.78

Inter-sectoral land-use dynamics worked out using annual rate of change of different categories of land (estimated by fitting linear trend) has revealed that a large quantity of land has shifted from undesirable part of the ecological sector, i.e. usar and unculturable lands, to non-agricultural sector at all-India level. Land has shifted from other sectors also to the non-agricultural sector. Further, the land conversion rates captured through estimating land-use coefficients have indicated that with increase in population by one person, the land under non-agricultural uses increased between 0.011 ha and 0.027 ha in different decades between 1951 and 2001.

Biofuels in India: Prospects and Challenges

S. S. Raju, P. Shinoj and P. K. Joshi

Bioenergy is becoming increasingly relevant as a potential alternative to fossil fuels. However, with many developed countries pursuing aggressive policies for encouraging the production and use of biofuels, there are strong apprehensions that bringing more land under biofuel crops would increase food prices substantially, affecting consumers, particularly those from low-income net food importing countries. Keeping in view these facts, the study has presented a brief overview of the current state of affairs of biofuels at the global level, with emphasis on the ongoing efforts of biofuel expansion in India. It throws light on various policies at the national and regional levels and also on the implications of biofuels for changes in land utilization, food security, social welfare and the environment.

In India, ethanol produced by the fermentation of molasses and biodiesel produced from the tree-borne oilseeds like jatropha and pongamia are used as biofuels. The bioethanol and biodiesel are blended with the conventional petrol and diesel, respectively and are used in vehicles. In December 2009, India announced a national biofuel policy which outlines the modalities for a gradual shift from fossil fuels to biofuels over a period of time. The policy envisages a national indicative target of 5% blending by 2012, 10% by 2017 and 20% by after 2017. The availability of land is an important requirement for the large-scale national biofuel programme. An exercise was carried out to assess the required area under jatropha plantations for meeting the blending requirements of 5% and 10% set out by the Planning Commission, Government of India. Since the yield of jatropha is highly variable, area estimates for the yield range of 1 t/ha to 5 t/ha have been arrived at to achieve 5% and 10% biodiesel blending (Table 15).

Table 15: Area required for jatropha plantations to meet biodiesel blending targets

Jatropha seed yield (t/ha)	Biodiesel yield (t/ha)	Jatropha area required for blending, Mha			
		5%		10%	
		2011-12	2016-17	2011-12	2016-17
1	0.31	10.99	13.71	21.94	27.42
2	0.61	5.49	6.86	10.97	13.71
3	0.92	3.66	4.57	7.31	9.14
4	1.22	2.75	3.43	5.49	6.86
5	1.53	2.20	2.74	4.39	5.48

Source: Authors' estimations

The results have shown that the current progress in jatropha plantations is far behind the requirement to meet the blending targets set by the National Biofuel Policy. The study has concluded that even

though, the country has ambitious plans to expand the biofuel sector, the development of the sector has been rather slow due to various reasons. For the sector to pick up momentum, it is important to encourage the producers with adequate stimulus packages and proper price and procurement policies. The focus on research has to be sustained to explore the feasibility of environment-friendly and economically-sustainable feed stocks. Research thrust on developing technologies for commercial production of second generation biofuels from cellulose-rich biomass should also go hand in hand.

India's Biofuels Production Programme: Need for Prioritizing the Alternative Options

P. Shinoj, S.S. Raju and P.K. Joshi

India had started its own biofuel production programme in the year 2003, primarily with a view to explore its potential as a cleaner source of energy and to partially offset the growing burden of crude oil import bill. The global debate on the diversion of food crops for biofuel production is largely inapplicable to the Indian biofuel programme, as the country gives considerable emphasis on using of only non-edible feed-stocks for bioenergy production. The programme heavily depends on the conventional feed-stocks like sugarcane molasses for ethanol production and jatropha and other tree-borne oilseeds for biodiesel production. However, there is a widespread concern over the long-term sustainability, economic viability and commercial feasibility of the programme in its present shape. The findings of the study have reinforced that ethanol production focused over sugarcane molasses as a primary feed-stock is neither economically viable nor sustainable with the available technologies. It has suggested the use of alternative feedstocks like sweet sorghum and sugar beet to partly substitute sugarcane-based ethanol production. A comparison of the efficiency of sugar cane, sweet sorghum and sugar beet as feed stocks are given in Table 16.

Table 16: A comparison across sugarcane, sweet sorghum and sugar beet as feed stocks for ethanol production

Particulars	Sugarcane	Sweet sorghum	Sugar beet
Sugar content (%)	11-12	10-14	12-15
Ethanol yield (L/ha/crop)	700-800 (from molasses)	1400 *	6,000-6,400
Cost of ethanol production (Rs/L)	30-32	17-19	12-14
Crop duration (Months/crop)	12-16	4	5-6
Water requirement (m^3/ha/crop)	20,000-30,000	4,000	8,000-10,000
Fertilizer requirement (NPK kg/ha)	250:125:125	80:50:40	120:60:60

* Two crops of sweet sorghum can be taken per year with ethanol yield of 2800 litres/ha

The study has also raised strong apprehension over the overall readiness of various stakeholders involved in the biodiesel supply chain. It is therefore, imperative to prioritize the various options

available so that the efforts are directed not only towards making it sustainable and economically viable, but also are on pro-poor and resource saving. If promoted, sweet sorghum-based ethanol may prove a better option, which would be pro-poor in the marginal and rainfed areas. Therefore, selection of the best feed stocks with long-term prospects should be one important course of action; but simultaneous thrust on improving the existing technology for higher efficiency is also central to success. Both government policies and private entrepreneurial efforts need to be fine-tuned and directed to this effect.

Achieving Improved Livelihood Security through Resource Conservation and Diversified Farming Systems in Mewat

Usha Ahuja

This study was carried out in the Mewat area of Haryana (see Table 17 for sample details) to analyse the socio-economic characteristics for improving livelihood security through technology intervention. The average family size in the area is quite large (9.9), male female ratio is 1.08, agriculture is the primary occupation and dairying is the secondary occupation. A majority of farm houholds have pucca houses with access to good quality drinking water and electricity but sanitation facilities are poor. The annual average expenditure is primarily food based (67% of total expenditure).

Table 17: Sample selection and characteristics of Mewat area of Haryana

Cluster	Characteristics of cluster	No. of villages	No of farmers	Criteria of selection
I	Resource rich	9	90	5-10 acres
II	Resource poor	5	50	Up to 5 acres + livestock (primary or secondary occupation)
III	Hilly areas	3	30	Up to 5 acres + Vegetable cultivation

The average landholding size is 9.1 acres, 3.2 acres and 4.3 acres for cluster I, II and III, respectively, 96% of which is cultivated. Irrigated area is lowest (82%) for cluster II. Further, land dependency measured by land-man ratio is highest for cluster II (0.4) and lowest for cluster I (0.9). Soil testing is uncommon in the region. Cropping intensity is 163.4% and the ratio of agricultural to non- agricultural income is 7.3. Gini coefficient (measure of income inequality) has come out to be 0.27, indicating low degree of inequality across clusters. With regard to agriculture, cluster III follows cereal and vegetable based cropping pattern, whereas clusters I and II follow cereal-based cropping pattern. Pearl millet, sorghum, wheat and mustard covering 24%, 7%, 35% and 22 % of the total cropped area, respectively are the common crops with sorghum being produced primarily for feeding livestock, whereas mustard is produced for the purpose of sale. Pearl millet and wheat are partly home-consumed and partly sold. Mustard residue is used by the households as a source of fuel, whereas byproducts of the other 3 crops are used as dry fodder.

Net agricultural income has been found to be highest for cluster I (Rs 91748), which is mainly due to high yield of all cereals and oilseeds, except barley, followed by average income of Rs 42475 for farmers of cluster III due to smaller landholding size. Cluster II has the lowest agricultural income of Rs 15351 due to poor yield, high cost of cultivation, and severe water problems. With regards to livestock, buffalo forms the largest animal population in Mewat (634.6 ACU), whereas cow (74.2 ACU) and goat (73.32 ACU) population was very low. Livestock dependence is highest for cluster II (land animal ratio being 0.77). Net income over paid out cost generated from livestock of sample farmer of clusters I, II and III is Rs 3231, Rs 3542 and Rs 6316, respectively, which is less due to low yield of buffaloes (5.2 kg), cows (4.6 kg) and goats (0.8 kg) and low market rate of Rs 16-17/L (buffalo milk). Zero tillage (6.8%), sprinkler (21.8%) and bed planting (17%) are new the practices adopted by a small group of farmers belonging to cluster 1. Given the existing practices and problems of groundwater depletion, insufficient supply of water, lack of HYV seeds, duplicate pesticides in the market, termite infestation, it seems that the project interventions are demand driven.

System of Rice Intensification

B. C. Barah

The system of rice intensification (SRI) is an important and viable alternative to conventional practice of growing rice, to increase productivity and improve household food security and help conserving precious resources such as water and, soil health and maximizing the use of solar energy and atmospheric air. It is particularly relevant to areas where water is a premium. Study of 200 farmers across 7 districts has shown that there are decisive multiple advantages of SRI in terms of higher yield, seed and fertilizer saving, water saving, employment to idle labour in the *rabi* season, and use of organic manures. The results of farm survey have revealed water saving of 25% to 39% at the farmers' field due to adoption of SRI practices. Besides water saving, gains in net return as well as productivity increase and the gender participation have also been substantial.

SRI has been found to use less input, and provides to higher production at lesser cost. That is, SRI is more cost effective, technically efficient and on the whole fulfills the economic as well as environmental criteria. Scientific validation of novel properties of SRI is a limiting factor, which is likely to diminish in future. Having proven advantages and farmers' willingness to adopt, the major challenge is to develop strategy for upscaling it in the favourable rice-growing areas in the country.

MARKETS AND TRADE

Developing Basic Framework of Commodity Outlook Model for Major Agricultural Commodities

P. Shinoj, Anjani Kumar, Rajni Jain and Shiv Kumar

Commodity outlook models serve as an important tool to provide advance information on important variables like demand, supply, trade and prices of major agricultural commodities. They are also being used as policy simulation models to deduct possible impacts of alternative policy decisions.

Many developed countries have put in place efficient systems to undertake regular monitoring and projection of the future prospects of agricultural commodities that serve as a basis for an informed and rational decision-making. As a part of the efforts to develop a similar model for India's agricultural sector, the team undertook a detailed review of various existing models so as to adopt a suitable framework for Indian situations. The review exercise revealed that most of these models are multi-commodity, spatial and dynamic models being developed under either a Computable General Equilibrium (CGE) frame work or a Partial Equilibrium Framework.

Based on the review and taking into consideration the time and resources available, a dynamic multi-commodity model under partial equilibrium framework has been found to be suitable for onward work. As an initial step, a static single commodity, policy simulation model has been developed for wheat in India incorporating all the major components of consumption, production, trade and prices. The model has been found satisfactory and is under the process of calibration and validation with further plans of expanding it to a dynamic multi-commodity model with forecasting capabilities.

Demand Projections for Wheat in India

P. Shinoj, Sant Kumar, P. Kumar, Anjani Kumar, Shiv Kumar and Rajni Jain

Even though diversification of dietary pattern towards high-value commodities has resulted in a decline of per capita direct consumption of cereals in general, consumption of wheat in India has remained at the same level or is on a rising path due to value-addition and regional preferences. Regional preferences in wheat products have become apparent in the past years. Over the past one decade, the consumption of wheat products has shown an upward trend in the urban areas and southern regions. Several studies have projected a steady growth in the wheat demand in the future years. Therefore, any unforeseen shortage in production would push up the prices of wheat and other food items beyond the purchasing power of the low income population. As a step to provide advance information on future wheat demand, the study has attempted to undertake demand projections for wheat for the years 2011-12, 2016-17 and 2021-22 and it is presented in Table 18.

Table 18: Projections for total wheat demand

(million tonnes)

Particulars	Base year (2004-05) demand	Projected demand		
		2011-12	2016-17	2021-22
Household demand	57.60	65.74	71.88	78.20
Home-away demand	2.85	3.29	3.59	3.91
Demand for other uses	8.31	9.62	10.46	11.29
Total demand	**68.17**	**78.64**	**85.93**	**93.40**

The results suggest that the household consumption demand for wheat would reach around 65.74 million tonnes by the year 2011-12, 71.88 million tonnes by 2016-17 and to 78.20 million tonnes by 2021-22. The home-away demand and demand for other uses would also grow proportionately.

At the aggregate level, nearly 10 million tonnes more wheat would be demanded by the year 2011-12 over the base year (2004-05) level. By the end of the 13th Five-Year Plan, the aggregate demand of wheat has been projected to reach 93.40 million tonnes.

Table 19: Required growth in supply to meet projected demand

Particulars	Base year (2004-05) to		
	2011-12	2016-17	2021-22
Incremental demand (million tonnes)	10.47	17.76	25.23
Required supply growth (%)	1.92	1.86	1.81

As it would be interesting to know the supply targets to meet the growth in demand for wheat over the next two Five-Year Plan periods, an exercise was carried out to work out the required growth in supply to offset the incremental demand and it is presented in Table 19. Based on this, an average annual growth rate of 1.92% is required in supply by the year 2011-12, based on the base year 2004-05. For the successive years, viz. 2016-17 and 2021-22, the required growths in supply are found to be 1.86% and 1.81%, respectively.

Estimating Marketing Efficiency of Horticultural Commodities under Different Supply Chains in India

M.B. Dastagiri, B. Ganesh Kumar and Subhasis Mandal

The study was started in seven states, viz. Andhra Pradesh, Karnataka, Tamil Nadu, Punjab, Rajasthan, West Bengal and Manipur during April 2009- March 2010. Out of these states, study in West Bengal has been completed which has shown some interesting results.

The producers' share in the consumers' price has been estimated to be 44% for brinjal, 37% for bhindi, 26% for tomato, 45% for guava and 60% for marigold. The marketing efficiency has been estimated as 0.79 for brinjal, 0.58 for guava and 1.51 for marigold marketing (Table 20). Thus, marketing in marigold has been observed to be most efficient, while marketing efficiency in tomato can be termed as poor. The marketing efficiency has been estimated for most common marketing channel, Producer-Middle man-Wholesaler-Retailer-Consumer.

Table 20: Estimation of marketing efficiency of selected crops

Particulars	Brinjal	Bhindi	Tomato	Guava	Marigold
Price received by farmers	900	600	500	1000	4500
Net price received by farmers	820	530	410	895	4390
Marketing cost	335	330	345	415	360
Marketing margin	700	590	800	675	2550
Marketing efficiency	0.79	0.58	0.36	0.82	1.51

Smallholder Dairy Farmers' Access to Modern Milk Marketing Supply Chain in India

Anjani Kumar

Integrated food supply chains serving urban areas are the fastest growing and most visible market phenomenon, yet small-scale milk market agents and chains supplying fresh milk and traditionally processed dairy products still play a very major role in India. However, the growing middle class with increasing income coupled with rapid urbanization is likely to boost the demand for more formally processed dairy products, which the traditional market generally cannot provide. These emerging trends have generated concerns on both supply and demand side and pose a few questions like (i) Will the increased role of modern, private and formal dairies put pressure for a change in the structure of production in favour of large milk producers, who may be able to supply higher quantities and better quality of milk at lower collection cost ?, (ii) Will the smallholder dairy farmers be deprived of reaping the benefits of emerging market opportunities?, or (iii) Are they inter-linked with the emerging market opportunities and maximizing their welfare? This study has addressed some of these issues by using data collected in two states of India, namely, Punjab and Bihar.

As per the study, there is no evidence that the small milk producing households are relegated to traditional supply chains or excluded from modern supply chains. This holds true for both the states. The households in Bihar having the herd size of 1, 2, 3 and more than 3, are selling respectively, 26.2%, 36.8%, 22.2% and 20.0% of their milk to modern supply chains. Milk supplied to modern supply chains in Punjab by the corresponding herd size was 97.3%, 87.9%, 96.0% and 86.5%, respectively (Table 21). In other words, there is no discernible relationship between herd size and the choice of marketing channel. The same appears to be true when examining the relationship between farm-size and choice of marketing channel of milk producing households (Table 22).

The structure of milk production and marketing have exhibited a significant regional variation. Share of landless, marginal and small holders in milk production has been found lower in Punjab than Bihar. Second, the modern milk supply chain is quite important in an agriculturally-developed state like Punjab, while the traditional milk marketing supply chain continues to play a dominant role in Bihar, which is yet to catch up to the same extent of agricultural and dairy development as witnessed in Punjab. Finally, and most importantly, there are no distinguishable differences in the profile of households supplying milk to different chains in terms of land or herd size. In other words, according to our descriptive statistics, landless and small farmers face few, if any, barriers in India's milk markets.

Table 21: Choice of marketing channels by milk producers in Bihar and Punjab

Size group	Share of farmers selling milk to marketing channels (%)			
	Bihar		Punjab	
	Traditional	Modern	Traditional	Modern
	Land size			
Landless	93.8	6.3	14.3	85.7
Marginal	77.4	22.6	7.8	92.2
Small	61.5	38.5	13.6	86.4
Medium	60.0	40.0	3.1	96.9
Large	20.0	80.0	10.7	89.3
All	**72.0**	**28.0**	**8.8**	**91.2**
	Herd size			
Only one animal	73.8	26.2	2.7	97.3
Two animals	63.2	36.8	12.1	87.9
Three animals	77.8	22.2	4.0	96.0
More than three animals	80.0	20.0	13.5	86.5
All	**72.0**	**28.0**	**8.8**	**91.2**

Table 22: Proportion of milk sold by farmers to different marketing channels in Bihar and Punjab

Size group	Share of milk purchased by marketing channels (%)			
	Bihar		Punjab	
	Traditional	Modern	Traditional	Modern
	Land size			
Landless	98.0	2.0	14.3	85.7
Marginal	62.3	37.7	9.9	90.1
Small	63.9	36.1	39.3	60.7
Medium	73.3	26.7	2.2	97.8
Large	6.6	93.4	6.4	93.6
All	**59.8**	**40.2**	**11.2**	**88.8**
	Herd size			
Only one animal	63.4	36.6	4.8	95.2
Two animals	58.5	41.5	7.0	93.0
Three animals	70.8	29.2	3.2	96.8
More than three animals	47.8	52.2	14.3	85.7
All	**59.8**	**40.2**	**11.2**	**88.8**

Factors Affecting Household Milk Marketing Choices

Anjani Kumar

Factors affecting the choice of a marketing channel for the sale of milk at household level in the states of Punjab and Bihar have been studied based on the logit model. Education, milk price, milk

test and the presence of co-operative milk collection centres in the villages have been found to have significant positive influence on famers' decision to integrate with modern formal milk marketing supply chain (Table 23). However, their marginal effect on the choice of milk marketing channel is negligible. The presence of milk collection centres of the modern milk supply chain, a proxy for saving in the transaction cost, has depicted a significant positive influence on the farmers' decision to participate in the modern milk supply chain. The marginal effect of milk collection centres established by either cooperatives/formal private processing farm is high (14%). The price offered by the channels also induces the farmers to sell milk to a modern milk supply chain.

Table 23: Factors determining the farmer's decision to sell milk to modern dairy

Explanatory variables	Coefficient	Standard error	Marginal effects	Standard error
Age (years)	-0.012	0.027	-0.0010	0.0023
Sex (Male=1, otherwise=0)	-0.203	1.607	-0.0156	0.1146
Education (No. of years)	0.110*	0.064	0.0091	0.0073
Household size (No.)	-0.005	0.088	-0.0004	0.0073
Land size (ha)	0.053	0.136	0.0044	0.0113
Milk production (litre/day)	0.007	0.024	0.0006	0.0020
Milk price (Rs/litre)	0.323**	0.136	0.0268	0.0115
Milk test=1, otherwise=0	4.888**	0.708	0.6919	0.0792
Road connectivity=1, otherwise=0	-1.466	1.043	-0.0749	0.0398
Dairy cooperative/private milk collection centre =1, otherwise=0	1.274*	0.740	0.1429	0.1079
City distance (km)	-0.126	0.088	-0.0105	0.0072
Constant	-4.437	2.939		
Number of observations	222			
log likelihood	-41.043			
LR chi^2	189.81			

**Significant at 1% level; * Significant at 10% level.

The marginal effect of price in the selection of modern milk supply chain is only 3%. The adoption of milk testing conducted by the modern milk supply chain positively and significantly affects the farmers' choice of milk marketing outlet. It is due to the reason that milk testing adopted by the modern milk supply chain promotes differential pricing of milk and gives incentives to the farmers based on the quality of the produce. Enterprising commercial farmers are particularly motivated to sell to a modern marketing supply chain and can harness the opportunities of getting better prices.

The emphasis on quality has the highest propensity to induce farmers to sell milk to a modern milk supply chain. The marginal effect of unit increase in milk testing is 69%. The household size

implying greater labour availability for the farming households has a negative influence (though not significant) on the farmers' decision for integration with the formal markets. This suggests that if labour is abundant, farmers would explore different market opportunities and would not like to tie-up with one marketing channel. With higher labour availability, they can endure the pressure of search, bargaining and delivery costs for sales to the traditional milk supply chain and maximize their price. Similarly, households producing higher quantity of milk are more likely to sell through the modern milk supply chain, which reflect their better ability to integrate with the modern supply chain. This indicates that farmers producing more milk seek out channels that may more easily accept larger and possibly more variable quantities of milk. However, again the effect of scale of production is not significant on the choice of milk marketing outlets, indicating the propensity of modern milk supply chain to include even the low-scale producers. Education affects the choice of milk marketing channels positively and significantly. Higher education creates more awareness about the market opportunities and reflects better ability of the farmers to integrate with the modern milk supply chain. Age and sex of the household head are not significantly associated with the choice of milk marketing channels. It should be noted that 98% of the households were headed by a male, and therefore, there was very little spread on this variable.

Private Organic Basmati Paddy Contract Farming Model vis-à-vis Smallholders' Participation in Haryana

Shiv Kumar

This study on contract organic basmati paddy farming in the Kaithal district of Haryana state pertaining to year 2008-09 was conducted to discern and quantify the status of smallholders' participation in the scheme. The Agrocell Industries Private Ltd has contracted the organic basmati paddy scheme with the Cooperative Growers Association. The essential prerequisite for farmers participation in contract farming model is: farmers have to become members of a cooperative, viz. Agrocell Pure and Fair Rice growers Association, Kaithal. Standardized and certified Good Agricultural Practices (GAP) in organics in accordance with international standards, constitute, in effect, the mechanisms of market entry and exclusion, converting owner of business model into a source of power for modifying and controlling the organic production processes. Out of 180 sample contract famers, around 72% organic farmers in contract scheme were large and around 23% were medium. Smallholders' participation in the schemes was <6%, covering negligible share in cultivated area under contract farming. The current niche market mechanism is affecting access (exclusion) to smallholders in farmers' cooperative, and availing of new opportunities with the expansion of contract organic production scheme. Thus, this scheme is not encouraging the smallholders to come into the fold of organic production. This might be due to two reasons; first, smallholders would not be able to spare some land for organic paddy as per Codex and contract production mechanism due to compulsory family requirements and more risk aversion in in-conversion phase. Second, farmers in this contract scheme were selected by the cooperative in consultation with scheme owners rather than self-recruited. Therefore, this contract model has not been instrumental to involve smallholders into organic basmati paddy production in smallholder dominated agriculture in the Haryana state.

Marketing and Trade of Shrimp in India

B. Ganesh Kumar and P. Shinoj

Shrimp is a major constituent in the export basket of marine products in India. Our main buyers have been European Union, Japan, USA and China. The major species exported is *Penaeus monodon*, the tiger prawn in various processed forms. On account of disease problems as well as high cost of culture, our major competitors such as China, Thailand and Vietnam, switched to the alternate species, named *Penaeus vannamei*. This led to a crash in the prices fetched by Indian export of shrimp, while at the same time opened up a new opportunity of exploring domestic market.

Among various marine products exported from India during the period 1995-96 to 2006-07, export of frozen shrimp was largest, in terms of both quantity and value. A major source of India's shrimp exports is the *Penaeid* shrimp from Maharashtra and Kerala coasts. Cultured black tiger shrimp, mainly from West Bengal and Andhra Pradesh, is another major source of exports. Even though a change in the composition of the fishery exports has taken place, all the exported commodities registered positive growth rates during 1995-96 to 2006-07. The growth in exports of frozen fin fish was found to be higher than that of frozen shrimp, which hints a change in the demand pattern of the importing countries.

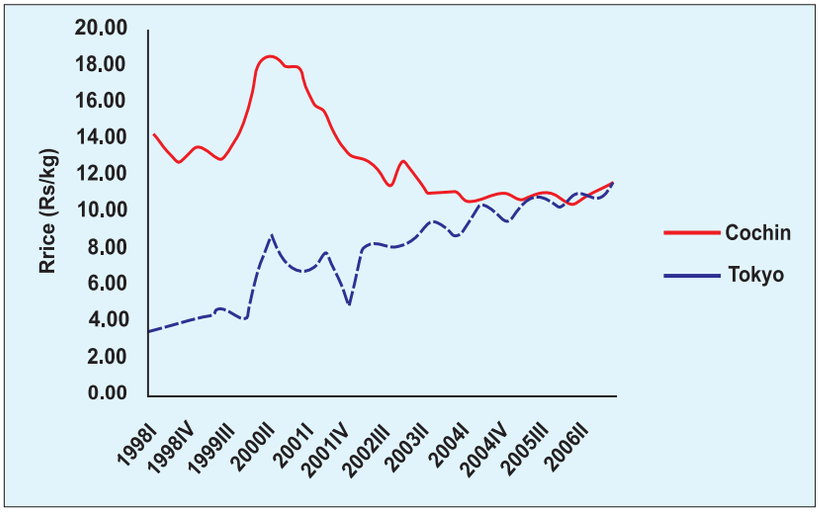
Supply Chain of Shrimp

The common supply chain for fish export involves the trader or agent and the fish processing unit. Fish is purchased from the producers by traders or agents of the export processing unit. After processing, the fish are sent to the respective destinations by the exporter. The lots which are designated for exports may either go through common independent pre-processing units or directly to big processing facilities. Kerala and Karnataka are the hubs of capture fisheries for exports. The analysis of price spread of shrimp/prawn in major markets has revealed that the retail prices of shrimp vary as per the distance from the source of production or capture and place of consumption.

Price Behaviour of Shrimp

A comparative picture of the quarterly international prices and prices fetched by shrimp exports from India is presented in Figure 9.

Figure 9: Quarterly trends in domestic and international prices of shrimp: 1998-2006



For a comparative study, Cochin was selected as the representative domestic market and Tokyo central market was considered as the international market. The prices have depicted a declining trend over the years in the case of international prices of shrimp. Over the years the difference between prices received for India export and International prices banished as Indian shrimp market got integrated with global market. This also implies that henceforth domestic prices would move according to volatility in international prices.

Policies for Fish Marketing: Status and Way Forward

B. Ganesh Kumar

Fish is not a notified commodity under the APMC Act of 1966, leading to the exploitation of fishermen by commission agents. Unlike in other agricultural commodities, where commission charges are paid by the traders, in fisheries, all commission charges are paid by the fishermen. This reduces the share of fishermen in consumer's rupee and reduces viability of fishing. Fishery is a state subject under the Constitution of India, but only a few states have a policy specifically aimed at fish marketing. The only legislation for fish marketing is the West Bengal Fish Dealer's Licensing Order, 1975. The Act has a variety of legal procedures to control the process of supply of fish to other states from West Bengal. It was constituted as a welfare measure for the people of the state, with amendments from time to time till 1997. Every fish merchant has to get a licence to conduct business by paying an annual fee. All the fish commission agents and wholesaler-cum-retailers are to be registered with the Directorate of Fisheries under this Order.

A number of organizations such as the National Cooperative Development Corporation (NCDC), the National Federation of Fishermen's Cooperatives Ltd. (FISHCOPFED) and the National Fisheries Development Board (NFDB) are involved in the promotion of fish marketing in the country. However, there is a need to formulate a uniform market policy for fishes so that the country's fish production is efficiently handled and delivered to the consuming population, ensuring at the same time remunerative prices to the fishers. The improvement in fish marketing system and distribution would not only reduce the demand-supply gap of fishes across the country, but would also contribute to food and nutritional security of a vast majority of resurgent middle income population.

INSTITUTIONAL CHANGE

Structural Changes in Landholdings of Indian Agriculture-Underlying Factors

P.A. Lakshmi Prasanna, Aruna Singh and Santosh Lata

Increasing share of smallholders and declining average size of holdings are the critical features in structural change of Indian agriculture. State-wise share of number of smallholders has revealed that in 1970-71 in 5 out of 15 selected states share of smallholders was below 50%. These five states were: Gujarat, Haryana, Madhya Pradesh, Maharashtra, and Rajasthan. In 2000-01, only in Punjab the share of smallholders was below 50 per cent. The highest increase in the share of smallholders

was recorded in Maharashtra, followed by Madhya Pradesh. This state level analysis of the share of smallholder's area has shown that (i) in 1970-71, only in Kerala the share of area of smallholders was above 50%, (ii) in 2000-01, the number of states in which the share of smallholders operational area was above 50% increased to 6. The added states were Bihar, Orissa, Tamil Nadu, Uttar Pradesh and West Bengal. Between 1970-71 and 2000-01, the share of smallholders in total holdings area declined in the case of Punjab. Land inequality in 2000-01 declined compared to that in 1970-71 in all the states, except Haryana.

Analysis of underlying factors behind the structural change in landholdings has revealed that the in Andhra Pradesh, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra and Tamil Nadu, the growth rate of smallholders was higher than population growth rate. Further in these states the share of leased-in holdings and beneficiaries under surplus land distribution program constituted only 1-6% of total smallholder farms, whereas, in the case of Assam, Orissa and West Bengal, the share ranged between 20% and 60%. But at the same time, in the three states, growth rates in the number of smallholders are less than population growth rates. In the case of states like Bihar, Rajasthan and Uttar Pradesh, the growth rates of smallholders are less than population growth rate, but still the share of smallholders in total holdings ranged from 53% to 93%. Among the 15 states studied, Punjab is the only state where smallholders growth rate was negative and as in 2000-01, about 11% of smallholders in the state constituted leased farms and surplus land beneficiaries. Hence, wide regional differences have been observed with respect to the growth of smallholders as well as underlying factors in these states.

Performance of Agricultural Credit in India

Anjani Kumar

Agricultural credit has witnessed a tremendous growth after the bank nationalization. This has resulted in significant increase in the access of rural cultivators to institutional credit and the role of informal agencies as credit sources has declined. However, still non-institutional agencies continue to play a significant role in the rural credit market.

Trends in Agricultural Credit Performance Indicator

The meaningful indicators of progress in agricultural credit are the progress of agricultural credit as percentage of agricultural GDP and trends of real agricultural credit in terms of per unit gross cropped area. The performance in terms of these indicators has been found noteworthy. The share of agricultural credit as a proportion of agricultural GDP has been rising continuously since 1970. The share of agricultural credit in agricultural GDP was only about 5% in TE 1972-73 but rose to about 8% in TE 1981-82 and has continued to grow since then. The agricultural credit made a quantum jump in recent years and the share of agricultural credit in agricultural GDP rose to 31% in TE 2008-09. The agricultural credit even as a proportion of total GDP increased during 1980s and declined during 1990s. Later on, it increased again and in TE 2008-09 it has accounted for about

6% of total GDP of the country. The agricultural credit per hectare of gross cropped area has also increased tremendously; from Rs 375 in TE 1972-73 to Rs 5651 in TE 2008-09 (Table 24). About fifteen-fold increment in agricultural credit in real terms has been registered during the period 1970-2008.

Table 24: Flow of agricultural credit: TE 1972-73 to TE 2008-09

Years (TE)	Agricultural credit/ Agricultural GDP (%)	Agricultural credit/ Total GDP (%)	Agricultural credit/ GCA (Rs/ha)
TE 1972-73	4.99	2.06	375
TE 1981-82	7.71	2.67	565
TE 1991-92	6.76	1.99	753
TE 2001-02	11.65	2.77	1849
TE 2008-09	30.88	5.54	5651

These indicators suggest that the agricultural credit system is geared to the agricultural growth and the availability of credit to the rural cultivators has increased substantially.

Equity in Institutional Credit to Agriculture

The avowed objectives of agricultural policy in India were to make credit easily accessible to all the regions and classes of the farmers. However in reality, a skewed distribution of institutional credit between regions continues to persist. The extent of variations in the distribution of institutional credit can be gauged from the fact that the institutional credit per hectare in 2007-08 in Assam was

Table 25: Distribution of institutional agricultural credit across major states of India

(Rs/hectare)

States	1990-91	2000-01	2007-08
Andhra Pradesh	1120	4604	23441
Assam	54	311	1979
Bihar (includes Jharkhand)	233	1075	8880
Gujarat	501	2809	12626
Haryana	482	2964	34012
Himachal Pradesh	207	2555	19490
Jammu & Kashmir	191	764	7893
Karnataka	546	3432	15448
Kerala	2766	7666	56890
Madhya Pradesh	320	698	9627
(includes Chhattisgarh)	320	698	9627
Maharashtra	387	1352	12138
Orissa	319	479	6730
Punjab	856	5352	46593
Rajasthan	168	667	6673
Tamil Nadu	2857	9403	52427
Uttar Pradesh	329	1708	14025
(includes Uttarakhand)	376	1529	29065
West Bengal	329	1708	14025
All India	549	2169	15936
Coefficient of variation(%)	121.88	94.15	80.71

about 1/10th of the national average and about 3% of Kerala. Per unit disbursement of institutional credit (Rs/ha) is significantly higher in states like Haryana (Rs 34012), Kerala (Rs 56890), Punjab (Rs 46593), Tamil Nadu (Rs 52427), and the same is low in states like Assam (Rs 1979), Bihar (Rs 8880), Madhya Pradesh (Rs 9627), Orissa (Rs 6730), Rajasthan (Rs 6673), etc. However, the regional disparities in the distribution of institutional credit have declined to some extent over time (Table 25).

Factors Affecting the Use of Institutional Credit at Farm Level

Anjani Kumar

Tobit model was applied to identify the factors which determine the quantity of credit borrowed from the institutional sources. The effect of age has been found significant and positive. It was expected because with age, people get matured and hence have better appreciation for the credit requirements. The effect of gender has shown that the households headed by a male are able to get higher amount of loan from the institutional agencies. The bigger household-size and larger farm- size increase the probability of taking credit from the institutional sources. The bigger size of household could spare a family member to pursue the loan disbursement procedures from the institutional sources. The requirement of credit by larger farm-size is more because of the need of higher inputs and services on large farms. The large farm-size enhances the repayment capacity also and thus facilitates credit disbursement from the institutional sources. The results have further confirmed the vulnerability of weaker sections in getting credit from the institutional sources. It has also been found that households belonging to scheduled castes, scheduled tribes and other backward castes get less credit from the institutional sources than the general caste households.

The effect of education on the use of institutional credit has been found positive. The education makes the borrower wiser and he decides not to take credit from the non-institutional sources at higher rates of interest. Higher education also helps the farmers to have better access to credit. Better educated clients are perceived to involve less credit risk; they are more likely to be aware of the financial opportunities and it may be easier for them to visit financial institutions, do the required paper work for loan applications and interact with officials in the financing institutions.

The effect of major occupation of the household on the use of institutional credit was mixed. The households with self-employment in agriculture have depicted a higher probability of availing higher amount of institutional credit; labour households obviously have lesser propensities to avail institutional credit. This seems to be rational as the households whose major occupation is agriculture, obviously need higher amount of credit.

Implications of Agricultural Debt Waiver and Debt Relief Scheme 2008

Rajni Jain and S. S. Raju

The problem of overdue loans and indebtedness has assumed menacing proportion in the recent past. The problem has been more serious for small farmers who were already in weak economic

position and were also deprived of access to institutional loans because of non-payment of loans. In order to address this problem, Government of India announced a scheme called "Agriculture Debt Waiver and Debt Relief Scheme 2008" (ADWDRS). To understand the implications of the scheme, a survey has been conducted in three districts of Haryana. These three districts, namely Mahendergarh, Hisar and Karnal, were selected based on the level of agricultural performance (represented by agricultural productivity): district Mahendergarh representing low agricultural productivity, Hisar district representing medium agricultural productivity and Karnal district representing high agricultural productivity. Some implications of the scheme, as identified, are as follows:

1. On an average, a smallholder has been benefitted of Rs 27000/- under the debt waiver scheme, while other farmers have got the benefit of Rs 19000/- under "One Time Settlement" (OTS) scheme. In 69% of the cases of the loan waiver, the benefit was intended to be used for the production purposes and 36% sample cases intended to use it for education. Of these, nearly 30% of the farmers have reported multiple use of the waived-off amount. Intention to use the waived-off amount for consumption or investment is reported to be negligible.

2. More than 90% farmers have admitted that they are relieved from debt burden and are eligible for fresh loans. Prior to announcement of the scheme, loans were pending against the beneficiary farmers on an average for about three and a half years. These beneficiary farmers could not apply for loan because the land ownership condition was not fulfilled by them.

3. About one-fourth of the farmers have opined that the scheme is discriminatory and 38% feel that it is giving an opportunity to be defaulter in future. One-tenth respondents have observed that loan waiving will encourage loans towards non-needy farmers.

4. Not much socio-economic changes have been observed in the family and it has not affected the social harmony of the village across beneficiary and non-beneficiary farmers.

5. A serious implication observed in the study is the sharp deterioration in the willingness among the farmers to pay back the loans. For example, prior to the announcement of scheme, nearly 90% non-beneficiary farmers intended to repay their loans, but after the announcement of the scheme, only 3% farmers have been found interested to repay their future loans.

Dealing with Effects of Monsoon Failure in Agriculture

Ramesh Chand and S. S. Raju

Monsoon failure is experienced in some parts of the country almost every year. The long-term trend has shown that drought is experienced at least once in five years in all the states, except the North- East region. Periodicity of drought has been found as high as once in the three years in states like Rajasthan, Andhra Pradesh, Haryana, Tamil Nadu, Gujarat, Jammu and Kashmir and West Uttar Pradesh (Table 26). Besides the amount of rainfall, its distribution is also important in affecting the level of farm production. There were some years when crop output turned out to be higher than the

normal even if rainfall was deficit and in some years, crop output turned out to be lower than the normal even with higher than the average rainfall.

Table 26: Periodicity of occurrence of drought in various parts of the country

Frequency of deficient rainfall	Meteorological sub-divisions
Once in 2.5 years	West Rajasthan; Rayalaseema; Telangana; Haryana; Chandigarh and Delhi
Once in 3 years	East Rajasthan; Gujarat Region; Jammu and Kashmir; Tamil Nadu and Pondicherry; West Uttar Pradesh
Once in 4 years	North Interior Karnataka; Uttarakhand; Vidarbha
Once in 5 years	Bihar; Coastal Andhra Pradesh; East Uttar Pradesh; Gangetic West Bengal; Jharkhand; Kerala; Orissa; South
Once in 15 years	Arunachal Pradesh; Assam and Meghalaya; Nagaland; Manipur; Mizoram and Tripura

Source: Crisis Management Plan, Drought Management Division, Ministry of Agriculture, Government of India

The study has shown that the national level shocks in crop production caused by monsoon failure do not reveal full severity of adverse effect experienced at the regional level. Almost every year some states suffer from the serious shortfall in production of foodgrains, and the severity of decline in foodgrain output at the state level is much larger than that observed for the country as a whole.

Due to rising stress on water resources, the effect of monsoon failure is felt more strongly now than before. Thus, besides relief measures, more attention has to be paid to maintain production activity during monsoon failure. It requires short-term and long-term strategies. Agricultural scientists have developed such varieties of rice, coarse grains, pulses and oilseeds which are of much shorter duration and are drought-tolerant. They also have alternative crop plans for different rainfall regimes in different agro-ecological settings. Such options can be effectively implemented if reliable information is available on rainfall and its distribution in different periods at disaggregated geographic regions. IMD forecasts on monsoon rains are too general and aggregate to be used in planning for alternative production strategies in the event of monsoon failure in a particular area, say a district. We need to improve the capacity of IMD to provide credible, usable and specific forecast on monsoon rainfall at disaggregate level like a large district and also put in place early warning system for events like droughts. Implementing alternative production plan also requires prompt action in terms of supply of seed of alternative crops and institutional credit. Agriculture being a state subject, the initiative to implement a strategy to face monsoon failure has to come from the concerned state.

Risk Assessment and Insurance Products

B. C. Barah

Indian agriculture is vulnerable to various shocks which affect farmer's income and endangers sustainability and food security. More crucially, over the time, changing pattern of risk has assumed

more importance as newer sources of risk are emerging even in the more assured areas like Punjab. Therefore, an effective strategy for mitigating risk is sine qua non to rural livelihoods. Since, the sector involves millions of resource-poor farming families, protecting them against unforeseen risks of livelihood, is a state responsibility, albeit a gigantic task. Policy responses to risk and uncertainty have remained weak. The research aimed at examining the efficacy of the existing insurance instruments and their reach out, delineating and mapping of hot spot and bright spot of agricultural risk is essential to product differentiation for crop insurance across regions. An attempt has been made in this study to develop effective insurance products to suit different risk regimes. The instability of crop production has been estimated at the disaggregate level and income risk has been decomposed into price risk and yield risk at district level. The process of risk mitigation involves multi-layer stakeholders, thus posing problem of data needs. This requires cleaning up of the problem of data inadequacy and inconsistency. The data extracting software package, ETL has been developed to provide the required data or conduct model analysis in the quickest possible manner. The multiple data sources have been used to develop on-line decision support system for the policy space, district implementing agencies and the farmers. After studying the farmers' perception, insurance products for grapes have been examined in the Nasik district. A similar survey is being conducted for baby corn and potato in Punjab.

Preliminary results of decadal analysis at the district level in two selected different ecosystems (rainfed production system in Tamil Nadu and irrigated condition in Punjab) have clearly shown that over the years,

- Crop productivity in Tamil Nadu has become more vulnerable to risk,
- Decadal average yield decreased in 11 out of 16 districts in Tamil Nadu during the decade of 1995-06 as compared to the decade of 1985-95, and
- At the same time, yield variability increased in 11 districts.

In a stark difference, a similar trend is also discernible in Punjab,

- Resource-rich and assured irrigated-region like Punjab has shown the tendency of vulnerability of productivity towards risk,
- In some districts the average yield decreased during the decade of 1995-06 as compared to decade of 1985-95, and
- There are changes in yield variability also.

Tamil Nadu is one of the important states, where the crop insurance is in operation widely. The number of crops covered and the farmers' participation have grown over the years. For instance, the total sum insured has increased from Rs 142 crore in 2000 to nearly Rs 2000 crore in 2008, while the number of farmers covered has reached 2.3 million. The availability of more farmer-friendly insurance products will improve the situation substantially. A user-friendly on-line decision

support system is being developed to accelerate the knowledge delivery and enabling environment for farmers to take optimal decision to insure their crops.

Decision Tree for Characterizing ICT-Empowered Women Farmers in India

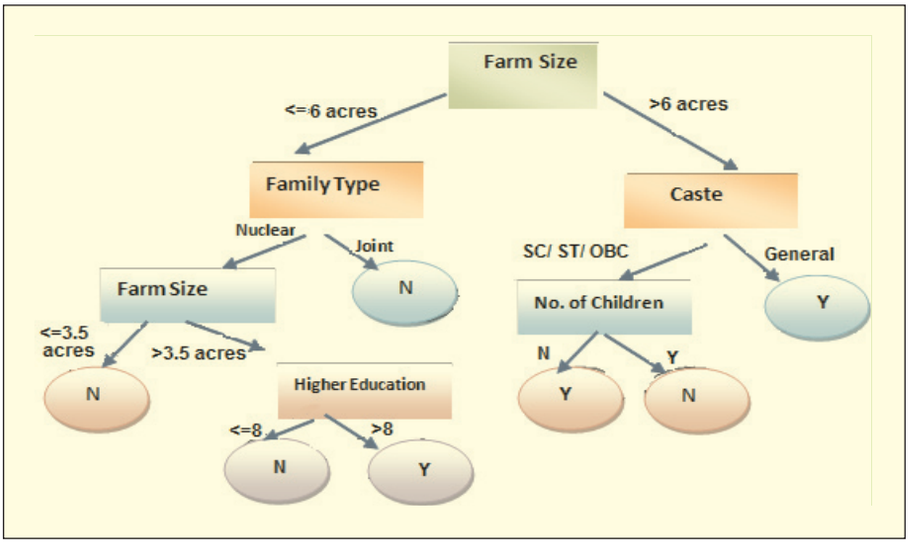
Rajni Jain and Usha Rani Ahuja

It is generally felt that women farmers are at disadvantage because extension services do not reach them. Convergence of information and communication technologies (ICTs) can revolutionize access to information in Indian scenario where women are responsible for bulk of the actual farm work and constitute a majority of farming population. To harness the potential of ICT for women farmers, it is essential to understand the constraints and factors which determine the access and use of ICT by rural women. Decision Trees have been developed to characterize the farm women who are empowered to use ICT by employing data mining algorithms for extracting pattern from real agricultural data (Figure 10). Primary survey data from 3 selected villages of the Sonepat district in Haryana has been used. The induced tree has been mapped to the following decision rules:

1. If farm size ≤ 6 acres and family type =joint, then ICT =no
2. If farm size ≤3.5 acres and family type=nuclear, then ICT=no
3. If (farm size is between 3.5 and 6 acres) and (family type=nuclear) and (highest education in the family ≤8), then ICT=no
4. If (farm size is between 3.5 and 6 acres) and (family type=nuclear) and (highest education in the family >8), then ICT=yes
5. If (farm size > 6 acres) and (caste=SC/ST/OBC) and (children=0), then ICT = yes
6. If (farm size > 6 acres) and (caste= SC/ST/OBC) and (children= present), then ICT = yes
7. If (farm size > 6 acres) and (caste=general), then ICT = yes

These rules have been discussed and validated with the domain experts. Farm size is considered indicative of farm income. In reference to rule 1, it has been explained that women farmers having small farm-size and joint family are not having access to ICT because of paucity of time. Rule 2 explains that if farm women have farm-size between 3.5 acres and 6 acres, nuclear family and somebody in the family has been educated for more than eight years, then women are expected to have access to ICT because they do less domestic work because of small family size. In reference to rules 5, 6 and 7, it has been explained that the presence of children in the economically-backward class affects the access to ICT due to expenditure and more work. On the basis of the findings from the selected sample, the study has recommended that the status of education should be improved in the villages, more income generating opportunities should be provided to the farm women and also appropriate ICT technologies should be developed for improving access to ICT of farm women.

Figure 10: Decision tree induced using C 4.5 algorithm



Private Extension in Reaching the Unreached: Innovative Role of ICT

P. Adhiguru

In the changing agriculture scenario, private players are venturing into innovative information delivery to farmers. The Centre's study on linking research-extension farmers revealed the potential of private sponsored e-extension in delivery of technology, information and services. Here a couple of illustrative cases are given.

e-Sagu

eSagu is a tool for IT-based personalized agricultural extension system. "Sagu" (means cultivation in Telugu language) was started during 2004 by Indian Institute of Information Technology, Hyderabad. It aims to improve farm productivity by delivering high quality personalized (farm-specific) agro-expert advice in a timely manner to each farm at the farmer's door-steps using ICT. A team of agricultural experts work at the e Sagu (main) lab (normally in a city) supported by agricultural information system with computer centre for a group of five to six villages. The coordinator collects information on individual farmers and farm. Each farm gets the advice at the regular intervals starting from pre-sowing operations to post-harvest precautions. Each agriculture expert can deliver advices to 150 farms a day. The round-trip advice delivery time is 24-36 hours (farm to lab and back to farmer's house).

India Agriline

EID Parry (India) Limited is a public company with headquarters in Chennai, South India, with a continuous history of business activities of more than 200 years. EID Parry Ltd. launched Indiagriline project in early 2001 to provide an end-to-end solution addressing the needs of the farming

community by setting up Internet kiosks in 16 villages around its sugar factory in Nellikuppam, Cuddalore district and in Pugalur in Tiruchy district in Tamil Nadu. These kiosks are called Parry's Corners were intended to be business hubs of their respective villages – a one-stop shop that acted as a storefront for buying farm inputs, market for selling goods and an Internet café for communication and information services. Farmers can gather information directly from the kiosk or communicate with an agronomist to get specific, customized advice via e-mail. The typical turnaround time is a day.

These two private sponsored e-extension case studies illustrates that given the increasing demand for information it is effective if the ICT tools are integrated into the delivery of information and other services in agriculture. The former case focus on the use of ICT in linking of experts directly with the farmers in farm problem diagnostics and technology delivery while the latter case illustrates not only the delivery of information and technology but also as an integral part of agri-business activities of the farmers.

AGRICULTURAL GROWTH AND MODELLING

Regional Variations in Agricultural Productivity: A District Level Study

Ramesh Chand, Sanjeev Garg and L. M. Pandey

There is a large variation in agricultural productivity across the different regions of the country. This clearly calls for a regionally differentiated strategy for the future growth and development of agriculture sector in the country. This study has prepared estimates of crop productivity at district level based on the data for all major crops including horticultural crops. The analysis has highlighted important features of those districts that have been stuck in low productivity. These include 161 districts where productivity is low and 120 districts where productivity is very low (Table 27). In general, very low and low productivity districts have been characterized by low rainfall and low irrigated area which also result in lower amount of fertilizer-use. Area under fruits and vegetables in these districts is also generally low. Moreover, the total livestock density and total bovine density in these districts have also found lower.

Table 27: Distribution of districts in broad productivity categories

Productivity category	Range (Rs/ha NSA)	No. of districts	Share in NSA (%)	Share in VCO (%)
Very low	< 18199	120	31.46	13.00
Low	18199 - 27955	161	28.38	22.86
Average	27955 - 37712	102	15.86	17.71
High	37712 - 57225	105	15.06	24.28
Very high	> 57225	63	9.24	22.15
Overall	32834	551	100.00	100.00

Fertilizer-use, irrigation and rainfall have been found to cause significant variations in productivity across districts. The highest coefficient has been for fertilizer which shows one per cent increase in fertilizer between districts results in 0.32% increase in agricultural productivity. Diversification in favour of fruits and vegetables has come next with elasticity coefficient of 0.189. Elasticity of productivity with respect to irrigation across districts has been found 0.07. These results indicate the importance and need to manage rainfall water to raise productivity, particularly in low productivity districts.

Another very interesting result from the cross section data of districts is that agricultural productivity is very powerful in reducing rural poverty. The 1% increase in land productivity reduces poverty by as much as 0.65%. The effect of dependence of workers on agriculture has been found reverse. The 1% reduction in labourforce in agriculture results in 0.57% decline in rural poverty. This highlights the need for reducing pressure on land by shifting labourforce from agriculture to non-farm activities.

Understanding the Nature and Causes of Food Inflation

Ramesh Chand

This study has looked at long-term and short-term changes in food prices in nominal and relative terms and has examined how these changes are affected by changes in production and other factors. The study has also examined the effect of trade in food products on domestic prices and supply. The average rate of inflation, based on WPI with base year 1993-94, was close to 6% during 1994-95 to 2004-05. Inflation in food items which includes food articles as well as food products was 5.64%, and it was lower than the inflation in the group of non-food commodities. The average rate of inflation among various food items has been found to vary between 4% and 7.5% (Table 28). During this period, lowest inflation was experienced in sugar and highest in fruits and vegetables.

Table 28: Inflation in food and non-food commodities during 1994-95 to January 2010 based on WPI with base year 1993-94 and growth rate in food output

(in per cent)

Item	1994-95 to 2004-05	2005	2006	2007	2008	2009	January 2010	Average 2006-2009
All Commodities	5.90	4.74	4.82	4.82	9.12	2.01	8.54	5.19
Non- food commodities	6.02	5.37	4.72	4.54	9.55	-1.76	4.53	4.27
Food articles	5.91	3.94	6.83	7.02	6.64	12.32	17.41	8.20
Food products	5.33	1.58	2.55	3.43	9.80	13.79	22.55	7.39
Food commodities (3+4)	5.64	2.97	5.09	5.60	7.87	12.90	19.42	7.86
Growth in food output: %/year	2.39	0.55	5.87	4.10	5.39	1.60	NA	4.24

Since 2005, food inflation in wholesale prices has been accelerating, and it reached close to 20% in the month of January 2010. The annual average food inflation during the period 2006 to 2009 was more than 80% higher than inflation in non-food commodities. These trends show that real prices of food (food prices relative to non-food prices) declined during 1993-94 to 2004-05 and increased after 2005. Within the food group, highest inflation has been observed in the case of pulses and lowest in edible oils. Except edible oil, real prices of all major food items have registered an increase during the past 4 years.

Food prices increased in real term and food inflation accelerated during the period 2006-2009, despite more than 5% annual growth in food output during 2005-06 to 2007-08. The main reason for a sharp surge in food prices during 2009 has been found to be the supply shock due to drought during 2009 and carryover effect of poor growth of food during the year 2008-09. As the frequency of such shocks is expected to rise, we need to have an effective food management strategy to deal with them. India needs to explore various options for price stabilization like buffer stock and trade. We need to invest heavily in expanding storage capacity for various types of foods in both public as well as private sector.

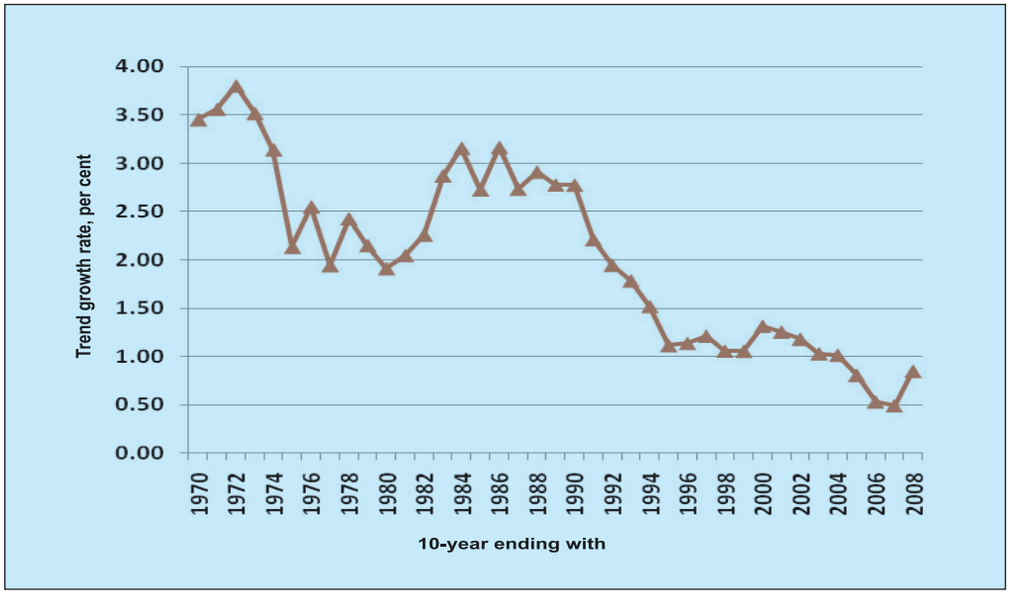
Long-run food scenario is causing greater concern as growth in food output is following a deceleration. Dependence on productivity for food growth is rising which in turn involves increase in the average cost of production. This implies that growth in food output is driven by increase in food prices. To keep food inflation at low level, we need to take strong action to develop and disseminate improved technologies for raising food production.

Challenges to Ensuring Food Security through Wheat

Ramesh Chand

Wheat has remained the most important staple food for the mankind since a very long time and is considered vital for global food security. With 44 % share in global grain output used as food, wheat is a major source of basic nutrition (energy and protein). Wheat is also found to be the cheapest source of food energy and even protein in most of the countries. This makes wheat very attractive for nutritional security of low income and poor households. Technological breakthrough in wheat, popularly known as green revolution technology, and policy support had led to much faster increase in wheat production as compared to the increase in population. This further enhanced the role of wheat in food security, especially in the developing world, which benefited at large from the new technology. The pace of growth in wheat production slowed down after early-1980s and a mismatch started developing between demand and supply. This became quite serious after mid-1990s and culminated in the form of dramatic rise in wheat prices during 2007-08. The increase in prices of wheat and also other foods has caused significant adverse effect on food and nutritional security and a setback to reduce hunger and poverty.

Figure 11: Annual growth rates (%) in world wheat production based on trend fitted to 10-year moving average 1961-1970 to 1999-2008



Slowdown in wheat production has been caused by both slowdown in productivity growth and negative growth in area under wheat since 1986. Wheat productivity after 1995 has witnessed less than 1% annual growth (Figure 11) as against 1.2 % growth rate in population. If the growth rate in wheat production is not raised by more than 50%, serious imbalances would emerge between demand and supply. A very significant source of growth in wheat production is the large gap between actual and maximum obtainable yields in most of the countries; it shows that wheat production can be put on a higher growth trajectory even if no more new technologies become available. However, this has to be done in a production environment that throws formidable challenges like global warming, threat of pests and diseases, declining relative production and profitability, and stress on natural resources like land and water. All such challenges require development of appropriate technologies and strong R&D support.

Rural Urban Linkages: A New Perspective

Ramesh Chand, S.S. Raju, L.M. Pandey and Surabhi Sonalika

The linkage effect of agriculture on rural non-farm sectors and total non-agricultural sector in India diluted considerably after early-1990s with a sharp drop in agriculture's share in GDP. This needs to be seen in the light of sharp acceleration in growth of non-agricultural sector and equally impressive growth in urban consumption. It looks as if these changes in Indian economy have reversed the linkages between agriculture and other sectors during the past 15 years. However, little empirical literature exists on the role of urban consumption in promoting agricultural output and income and non-farm employment. Similarly, while there is lot of concern in India to shift workforce from agricultural sector, linkage effect of growth in rural non-farm employment (RNFE) on income of

agricultural workers has not received much attention of researchers. This study has made a simple attempt to explore how growth in urban consumption in India affects agricultural income and rural non-farm employment, and, how growth in RNFE affects per worker agricultural income. The other variables included in the model were per hectare fertiliser use in a state (FERTPH), infrastructure level in a state (INFRA), land–labour ratio and dummy for the period 2004-05. The model has used state as a unit of observation at two points of time, viz., 1993-94 and 2004-05 (Table 29).

Table 29: Estimates of econometric model on agricultural income and rural non-farm employment

Included observations: 34
Total system (balanced) observations: 68

	Coefficient	Standard error	t-statistics	Probability
Equation 1: Dependent Variable: Agricultural income per agricultural worker				
C(1) Constant	1.847	2.016	0.916	0.364
C(2) PCCUS	0.463	0.250	1.853	0.069
C(3) RNFE	0.830	0.160	5.183	0.000
C(4) LANDPERWRKR	0.493	0.079	6.220	0.000
C(5) FERTPH	0.251	0.064	3.911	0.000
C(6) DUMMY	-0.197	0.086	-2.289	0.026
Equation 2: Dependent Variable: Share of rural non-farm workers in rural workers				
C(11) Constant	-2.127	2.767	-0.769	0.445
C(12) PCCUS	0.638	0.318	2.005	0.050
C(13) INFRA	0.174	0.089	1.951	0.056
C(16) DUMMY	0.193	0.109	1.769	0.082
Determinant residual covariance		0.005064		
Equation 1:				
R-square	0.833	Mean dependent variable		9.482
Adjusted R-square	0.803	S.D. dependent variable		0.531
S.E. of regression	0.236	Sum of squared residuals		1.555
Equation 2:				
R-square	0.340	Mean dependent variable		3.324
Adjusted R-square	0.274	S.D. dependent variable		0.373
S.E. of regression	0.318	Sum of squared residuals		3.027

The growth in urban consumption (PCCUS) has been found to be an important determinant of growth in agricultural income and non-farm rural income measured by employment. Ten per cent growth in urban consumption was associated with 4.6% growth in agricultural income and 4.9% growth in rural non-farm employment. Further, a 10% increase in RNFE has found to result in 8.3% increase in income of an agricultural worker. The study emphasized on the need for understanding impact of urban growth on rural agriculture and rural non-farm sectors and impact of growth in rural non-farm sector on farm sector.

III. POLICY INTERACTIONS

Dr Ramesh Chand, ICAR National Professor

- Member, Committee for Mid Term Review of Agriculture in the 11th Plan, Planning Commission, Government of India, New Delhi.
- Member, ICAR Committee to prepare ICAR Perspective Plan 2030.
- Special Invitee to the Audit Board on "Functioning of Food Corporation of India and its Impact on Food Subsidy" by Office of the Comptroller and Auditor General of India.
- Participated in Pre-Budget Consultations with stakeholders and experts from agricultural sector held by the Hon'ble Finance Minister, Government of India, New Delhi on June 1, 2009.

Dr P Adhiguru, Senior Scientist

- Member, of delegation of SAARC Second meeting of the inter-governmental core group on Agricultural Research and Extension held at Central Soil and Water Conservation Research and Training Institute, Dehradun during 7-8 May 2009. Presented India's status on "Innovations in linking research-extension-farmers-markets" so as to fulfil requirements of participating member countries. Subsequent to this presentation, recommendations were made to take up studies on "Upscaling ICT Approaches in Agriculture among SAARC Countries".

IV. AWARDS/RECOGNITIONS

Dr P K Joshi, Director

- Member, Apex Committee on "Technology Vision 2020 Mission Mode Projects on Agriculture and Forestry", Technology Information, Forecasting and Assessment Council (TIFAC), Department of Science and Technology, Government of India, New Delhi.
- Member, Program, Planning and Policy Committee, "Protection of Plant Variety and Farmers' Right Authority", Ministry of Agriculture, Government of India, New Delhi.
- Member, International Steering Committee on Climate Change, Agriculture and Food Security of CGIAR Challenge Programme and Earth Sciences.
- Member, Independent Evaluation Group of the World Bank on "Agriculture and Agribusiness", Washington, DC, USA.
- Member, UGC-DAE Consortium for Scientific Research (CSR), University Grants Commission, New Delhi.
- Re-elected as Secretary, Agricultural Economics Research Association (India), New Delhi.
- Member, Editorial Board, Indian Journal of Agricultural Sciences, DIPA, New Delhi.
- Member, Editorial Board, Indian Journal of Animal Sciences and Farming, DIPA, New Delhi.
- Reviewer, International Journal of Agricultural Sustainability (UK based), Indian Journal of Agricultural Economics; Agricultural Economics Research Review; Food Policy; Land Economics, etc.

Dr B C Barah, Principal Scientist

- Chairman, Technical Session on "Role of Government, NGOs, Farmers' Organizations and other Institutions", in Workshop on Agricultural Productivity Challenges in Eastern India, BIRD, Lucknow, 25 February, 2010.

Dr S S Raju, Senior Scientist

- Expert Member, Theses Award Committee for Evaluation of Theses of Master's and Doctoral Programme for 2008-09 from the disciplines of dairy economics and extension, National Dairy Research Institute, Karnal, 10 March, 2010.
- Rapporteur, Technical Session VIII on Socio-economics and marketing for International Buffalo Conference on Optimising Buffalo Productivity through Conventional and Novel Technologies at NASC, New Delhi, 3 February, 2010.
- Rapporteur, Technical Session IV on Harnessing potential of development interventions in NCAP-NRAA seminar on Prioritization of Interventions in Rainfed Areas for Sustainable Livelihoods held at NASC, New Delhi, 24 April, 2009.

Dr Anjani Kumar, Senior Scientist

- Lead Speaker, Technical Session VIII on Socio-economics and marketing for International Buffalo Conference on Optimising Buffalo Productivity through Conventional and Novel Technologies at NASC, New Delhi, 3 February, 2010.
- Convenor, Technical Session on Innovations in quality and safety assurance for enhancing agricultural income for 9th Agricultural Science Congress at SKUAST-K, Srinagar, 22-24 June, 2009.

Dr B Ganesh Kumar, Senior Scientist

- Dr R.T. Doshi Foundation Award (1st Prize) for best paper published in *Agricultural Economics Research Review* in the year 2008.

Dr Harbir Singh, Senior Scientist

- Dr R.T. Doshi Foundation Award (2nd Prize) for best paper published in *Agricultural Economics Research Review* in the year 2008.

Dr P Shinoj, Scientist

- Awarded USDA Norman E. Borlaug International Agricultural Science and Technology Fellowship in 2009.
- Invited as a discussant at the workshop on "Study Design and Methodology of Coordinated Projects Assigned in 2009", sponsored by the Ministry of Agriculture at Institute of Economic Growth, New Delhi, 11February, 2010.
- Expert in the first and second meetings for discussions on "FDI Policy on Agriculture", held at Department of Agriculture and Co-operation, Ministry of Agriculture in February, 2010.
- Rapporteur, Technical Session I of 23rd National Conference on Agricultural Marketing organized by Indian Society of Agricultural Marketing at CRIDA, Hyderabad, 12-14 November, 2009.

Sh. Khyali Ram, Technical Officer

- Member, Souvenir Committee, National Conference on "Knowledge Management in the Globalized Era", organized by Association of Agricultural Librarians and Documentalists of India.
- Member, Hospitality/Accommodation/Transport Committee, "National Conference on Knowledge Management in the Globalized Era", organized by Association of Agricultural Librarians and Documentalists of India.

V. PUBLICATIONS

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Raju, S. S. and Ramesh Chand. 2009. *Problems and Progress in Agricultural Insurance in India*. NCAP Policy Brief No 31.

(b) Policy Paper

Kumar, Anjani. 2009. *India's Livestock Sector Trade: Opportunities and Challenges*, NCAP Policy Paper No. 24.

(c) Book

Raju, S. S. and Ramesh Chand. 2009. *Agricultural Risk and Insurance in India*: *Problems and Prospects*, Academic Foundation, New Delhi.

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(f) Book Review

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VI. ON-GOING RESEARCH PROJECTS

Sl. No.	Title of Research Projects	PI/Co-PI
Technology Policy		
1.	Spatial and temporal changes in productivity and economics in crop sector	Sant Kumar
2.	Water management constraints in eastern Indo-gangetic plains	Sant Kumar
3.	Indian poultry sector in transition: Role of technology and institutions	B Ganesh Kumar and K K Datta
4.	Assessing implications of IPM technology on farm woman	Usha Ahuja P Adhiguru B Ganesh Kumar and K K Datta
Sustainable Agricultural Systems		
5.	System of rice intensification: A productivity enhancing and resource conserving practice	B C Barah
Markets and Trade		
6.	Estimating marketing efficiency of horticultural commodities under different supply chains in India	M B Dastagiri B Ganesh Kumar and K K Datta
7.	Emerging paradigm in trade implications on Indian agriculture and the way forward	Anjani Kumar and P Shinoj
8.	Assessing market integration of major agricultural commodities in India	Shiv Kumar
Institutional Change		
9.	Supply chain and institutional change in agriculture—A case study of potato	Harbir Singh
10.	Nature and extent of agricultural indebtedness in different states of India using data mining techniques	Rajni Jain S S Raju and P A Lakshmi Prasanna
11.	Smallholders in Indian agriculture: Past, present and future	P A Lakshmi Prasanna P Adhiguru Rajni Jain and Shiv Kumar
12.	Innovations in linking research-extension-farmers-markets in agriculture	P Adhiguru

Agricultural Growth and Modelling		
13.	Future sources of growth in agriculture in North-East India with reference to agricultural diversification in favour of high-value crops and livestock	B C Barah
National Professor Project		
14.	Analyzing impact of agricultural policy, technology, institutions and trade on agricultural growth, farm income, sustainability and rural poverty	Ramesh Chand and S S Raju
National Agricultural Innovation Projects		
15.	Visioning, policy analysis and gender (V-PAGe)	P Ramasundaram Sant Kumar B Ganesh Kumar and P A Lakshmi Prasanna
16.	Developing decision support system for agricultural commodity market outlook	Anjani Kumar Rajni Jain Shiv Kumar and P Shinoj
17.	Agricultural risk assessment and insurance prouducts under basic and strategic research	B C Barah and Diana Sarungbam
Other Projects		
18.	Intellectual property management and transfer/ commercialization of agricultural technology under ICAR headquarters scheme on management and information services (ICAR funded)	Harbir Singh
19.	Tracking change in rural poverty in household and village economies in South Asia (ICRISAT funded)	Anjani Kumar Usha Ahuja Harbir Singh and Rajni Jain
20.	Economic impact of FMD and its control in the dairy and meat value chains of selected high potential regions of India: A pilot study (ICAR funded)	B Ganesh Kumar
21.	Assessment of literacy, income and health status of fishers in India (CMFRI Network Project)	B Ganesh Kumar
22.	Machine learning approach for data mining in agricultural datasets (IASRI Project)	Rajni Jain

VII. CONSULTANCY AND CONTRACT RESEARCH PROJECTS

Name of Scientist	Institution to which consultancy was provided	Area of consultancy
Ramesh Chand*	FAO	Conducted Regional Capacity Building Training Workshop on Pro-Poor Policies at FAO/RAP Bangkok, Thailand as International Consultant, 15-26 June, 2009.
	FAO	Review and revise the Draft Reports prepared for FAO by Department of Planning and Statistics, Ministry of Agriculture, Cambodia and to brief FAO RAP Bangkok, about the report as a Policy Consultant from 25 November–4 December, 2009: Phnom Pen, Cambodia and 4–5 December, Bangkok, Thailand.
	FAO	Editorial Service to edit and finalise Reports of Cambodian Studies on Pro-poor Policies, FAO/Rap, Bangkok, 10 days between 7 and 31 December, 2009.
Sant Kumar P A Lakshmi Prasanna*	Ministry of Environment and Forests (ME&F), Govt. of India, New Delhi	Ex-ante Study to Assess the Socioeconomic Benefits of Bt Brinjal
S S Raju, P Shinoj and P K Joshi**	IFPRI	Implications of biofuels on food security, social welfare and environment in India

* Consultancy; ** Contract research

VIII. LINKAGES

The Centre maintains close linkages with several national and international organizations involved in agricultural research, development and policy. Collaborative research projects, seminars, workshops, publications and participations in policymaking bodies are the usual modes of policy interface which help improve the outreach activities of NCAP. Key partners of the Centre are listed below:

- **National**
  - ❖ IASRI, IARI, NAARM, DRWA, ICAR fisheries institutes, 16 PME Cells in ICAR institutes and State Agricultural Universities
  - ❖ ISEC, CESS, IGIDR, IIM-A, ICRIER, NAFED, NFDB
  - ❖ Ministry of Agriculture, Government of India
- **International**
  - ❖ CGIAR Centres:

    ICRISAT, ILRI, IFPRI, ICRAF, CIMMYT, ICARDA, IRRI, IWMI
  - ❖ UN Organizations

    FAO

    UN-CAPSA
  - ❖ The World Bank
  - ❖ SAARC Agriculture Centre
- **Corporate and Agri-business Sector**
  - ❖ YES Bank
  - ❖ Agriwatch
  - ❖ Agriculture Insurance Company of India Limited

IX. RESEARCH ADVISORY COMMITTEE (RAC)

The Joint Research Advisory Committee (RAC) of the National Centre for Agricultural Economics and Policy Research (NCAP) and Indian Agricultural Statistics Research Institute (IASRI) was constituted for a period of three years w.e.f. 29 January 2007. The composition of RAC is as follows:

Dr. P. V. Shenoi, Chairman Former Special Secretary (DAC) Govt. of India 20-C, First Main Road RMV Extension, Stage-II, Block - I Bangalore – 560 094 Karnataka	Dr. S.M. Jharwal Principal Economic and Statistical Advisor Ministry of Agriculture Govt. of India Krishi Bhawan, New Delhi- 110 114
Dr. S. S. Acharya Former Director Institute for Development Studies (IDS) 8-B, Jhalana Institutional Area D-95, Fist Floor, Krishna Marg Bapu Nagar, Jaipur – 302 015 Rajasthan	Dr. Rajeev L. Karandikar Executive Vice-President-Analystics Cranes Software International Limited 4th Floor, Block I, Shankaranarayana Building 25, Mahatma Gandhi Road Bangalore – 560 001 Karnataka
Dr. Rahul Mukherjee Professor Indian Institute of Management (IIM) Joka Diamond Harbour Road P.O. Alipur, Kolkata – 700 027 West Bengal	Dr. V. K. Bhatia Director Indian Agricultural Statistics Research Institute Library Avenue, Pusa New Delhi- 110 012
Dr. A. K. Nigam Director Institute of Applied Statistics & Development Studies (IASDS) B-16/1, First Floor, Rajaji Puram Lucknow- 226 017 Uttar Pradesh	Assistant Director General (ESM) Indian Council of Agricultural Research Krishi Bhawan New Delhi- 110 114
Dr. A. P. Gore Professor Department of Statistics University of Pune Ganeshkind, Pune- 411 007 Maharashtra	Director National Centre for Agricultural Economics and Policy Research (NCAP) DPS Marg, Pusa New Delhi- 110 012

Meeting of Research Advisory Committee

The 11th meeting of the Research Advisory Committee of NCAP and 3rd meeting of the Joint Research Advisory Committee (RAC) of IASRI and NCAP was held on 16 January 2010 under the Chairmanship of Dr. P.V. Shenoi.

The salient points that emerged during the meeting were:

- Both IASRI and NCAP should involve themselves in macro-studies having national importance. Micro studies should only be undertaken for developing the methodologies.
- Both IASRI and NCAP should concentrate on the basic research in the problems arising from the real applications in agricultural research and also on novel applications of statistical, econometric and informatics tools. These Institutes should not involve themselves in data generation or providing estimates as there are several other government agencies for performing such tasks.
- Both IASRI and NCAP should prepare the index on food security, land degradation, etc. on a macro level for state/country rather than district level indices.
- Vacant scientific positions at IASRI and NCAP should be filled on priority basis and concerned authorities may be approached for this.
- It was suggested that there should be follow up of the press of upgradation of NCAP to a National Institute of Policy Research (NIPoR).

X. MANAGEMENT AND OTHER COMMITTEES

Management Committee (MC)

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

Director
Department of Economics and Statistics
Delhi State, Old Secretariat
Delhi - 110 054

Dr. P. K. Aggarwal
ICAR National Professor
Division of Environmental Sciences
Indian Agricultural Research Institute
Pusa, New Delhi – 110 012

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

Dr. V. P. S. Arora
Vice-Chancellor
Kumaun University
Sleepy Hallow, Mallital
Nainital – 263 001
Uttarakhand

Dr. Suresh Pal
Head
Division of Agricultural Economics
Indian Agricultural Research Institute (IARI)
Pusa, New Delhi – 110 012

Director
Department of Economic &
Statistical Analysis
Govt. of Haryana
30, Bes Building, Sector – 17
Chandigarh

ADG (ESM)
Indian Council of Agricultural Research
(ICAR), Krishi Bhawan
New Delhi - 110 114

Dr. S. L. Goswami
Joint Director (Research)
National Dairy Research Institute
(NDRI), Karnal – 132 001
Haryana

Finance & Accounts Officer
National Bureau of Plant Genetic
Resources (NBPGR)
Pusa, New Delhi – 110 012

Sh. Vinod Kumar
Assistant Administrative Officer
and Member Secretary
NCAP, Pusa, New Delhi - 110 012

Institute Research Council (IRC)

Institute Research Council (IRC) of NCAP, is composed of Director NCAP, and Scientific staff of the Centre. Director, NCAP is the Chairman of IRC. Eleven meetings of the IRC were held

during 2009-10. A total of 30 presentations (including 13 presentations on deputations to foreign visits), almost 3 presentations in each meeting, were made. During the IRC meetings, progress of the ongoing project activities was discussed and some new research proposal were discussed. Experiences and the outcome of the foreign deputations of the scientists were also shared at the IRC meetings.

Other Committees

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

Academic Planning and Policy Committee

- To strengthen internal planning, functioning and policy direction.

Scientists Evaluation and Development Committee

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

Internal Management Committee

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

Budget Committee

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

Purchase Committee

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

Publications Committee

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

Consultancy Processing Cell

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

Computer Committee

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

Women Cell

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

Grievance Cell

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

Official Language Committee

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

PME/NATP Cell

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

IPR and Technology Commercialization Committee

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

Staff Recreation Committee

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

Workplace Committee

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

XI. PARTICIPATION IN SCIENTIFIC ACTIVITIES

Name of Scientist	Topic and date(s)	Place
P. K. Joshi	NCAP-NRAA Seminar on Prioritization of Interventions in Rainfed Areas for Sustainable Livelihoods 24 April, 2009	NCAP, New Delhi
	Brainstorming, Sensitization and Planning Workshop on Tracking Changes in Rural Poverty in Household and Village Economies in South Asia 25-26 April, 2009	NCAP, New Delhi
	FAO study related to Pro-Poor Policies 3 May, 2009	NCAP, New Delhi
	2nd Meeting of the Inter-governmental Core Group on Agriculture and Extension 7-8 May, 2009	CSWCR&TI, Dehradun
	Brainstorming Session on Future Technological Needs in Genetics and Plant Breeding for Sustainable Agriculture 15 May, 2009	IARI, New Delhi
	International Day for Biological Diversity 2009 22 May, 2009	NBPGR, New Delhi
	Meeting for development of Post Graduate Diploma Course on Agriculture (Management) 25 May, 2009	NAARM, Hyderabad
	Review meeting of project, Estimating Marketing Efficiency of Horticultural Commodities under Different Supply Chains in India 28 May, 2009	NCAP, New Delhi
	Pre-budget Consultation on Agriculture with the Hon'ble Finance Minister of India 1 June, 2009	Ministry of Finance, New Delhi
	ICAR Vichar Munch 3 June, 2009	NASC, New Delhi
	NAAS Annual General Body Meeting 4-5 June, 2009	NASC, New Delhi

	Brainstorming workshop on Issues and Strategies for Increasing Productivity and Production of Pulses in India, organized by Indian Council of Agricultural Research and Ministry of Agriculture 9 June, 2009	Ministry of Agricutlure, New Delhi
	9th Agricultural Science Congress on Technological and Institutional Innovations for Enhanching Agricultural Income 22-24 June, 2009	SKUAST-K, Srinagar
	44th Institute Management Committee Meeting of NAARM 27 June, 2009	NAARM, Hyderabad
	Workshop on Tracking Changes in Rural Poverty in Household and Village Economies in South Asia 30 June-2 July, 2009	ICRISAT, Patancheru
	Orientation Meeting of Conservation Agriculture Project of NAIP 4 July, 2009	NCAP, New Delhi
	4th Meeting of IBSA Working Group on Agriculture 7 July, 2009	ICAR, New Delhi
	Food Security: Technologies and Policies, organized by Bill and Melinda Gates Foundation 10 July, 2009	Intercontinenal Hotel, Nehru Place, New Delhi
	ICAR Annual Day and Directors' Conference 16 July, 2009	NASC, New Delhi
	Conservation Agriculture: Post Conference Meeting 17 July, 2009	CASA, New Delhi
	ICAR Vichar Munch 28 July, 2009	NAAS, New Delhi
	Editorial Board Meeting of Indian Journal of Agricultural Sciences 29 July, 2009	KAB-I, New Delhi
	Brainstorming Workshop on Climate Change, Soil Quality and Food Security 11 August, 2009	NAAS, New Delhi

	NAIP Orientation Meeting 5 September, 2009	NCAP, New Delhi
	Editorial Board Meeting of International Journal of Agricultural Sustainability (IJAS) 8 September, 2009	DIPA, KAB-I, New Delhi
Ramesh Chand	NCAP–NRAA Seminar on Prioritization of Interventions in Rainfed Areas for Sustainable Livelihoods 24 April, 2009	NCAP, New Delhi
	Round Table on Global Economic Slow Down and Indian Agriculture, organized by Agriculture Today 24 April, 2009	IARI, New Delhi
	Meeting for development of Post Graduate Diploma Course on Agriculture (Management) 25 May, 2009	NAARM, Hyderabad
	Food Production and Food Management Strategy for Sustaining Food Security towards 2021-22 in Consultative Meeting on Food Security and Achieving Targeted Growth in Agriculture 12 June, 2009	DAC, New Delhi
	Brainstorming Session on National Action Plan for Adapting Indian Agriculture to Climate Change 29 September, 2009	NAAS, New Delhi
	1st Indian Agricultural Scientists and Farmers Congress on Technological Innovation for Enhancing Agricultural Production, as a Guest of Honour at the Inaugural Session 3 October, 2009	CCSU Campus, Meerut
	As a discussant in the third session entitled Impact of Investments in Augmenting Food Supply through Improved Productivity, in midterm workshop, "Policies for Ensuring Food Security in South and Southeast Asia" 21 October, 2009	NASC, New Delhi
	National Conference on Competition, Public Policy and Common Man in the session Competition in Agricultural Markets: Advantage Farmer 16 November, 2009	Competition Commission of India, New Delhi

	National Seminar on Challenges of Growing Rural-Urban Disparities in India, the Council for Social Development 5 January, 2010	India International Centre, New Delhi
	Trade and Macro Economic Issues in the Convention of Institutional Process in New Development Paradigm 22 January, 2010	ISEC, Bangalore
	National Science Day 28 February, 2010	NDRI, Karnal
B. C. Barah	Interactive Dialogue on Upscaling SRI 4 May, 2009	ANGRAU, Hyderabad
	Meeting on Wheat Climate Change Study in India 9 September, 2009	ICAR, New Delhi
	Sampling Design and Methodology to Assess the Socio-economic Conditions of Fisheries 13 November, 2009	CIBA, Chennai
	Result Framework Document (RFD): Performance Monitoring and Evaluation System (PMES) of Govt Departments 2-3 November, 2009	IIFT, New Delhi
	Meeting of the Networking of Agricultural Economists and AERA Annual Conference 19-21 November, 2009	TNAU, Coimbatore
	4th Meeting of the Executive Committee of the National Food Security Mission 7 December, 2009	National Food Security Mission, New Delhi
	Meeting of the RFD for Department of Agricultural Research and Education, MoA, GoI 17 December, 2009	Cabinet Secretariat, New Delhi
	Seminar on Scaling-up of SRI— Future Directions 18 December, 2009	PRADAN, New Delhi
	NCAP Research Advisory Committee Meeting 16 January, 2010	IASRI, New Delhi

	Consortium Advisory Committee Meeting on Risk Assessment and Insurance Products for Agriculture 25-27 January, 2010	NCAP, New Delhi
	Potential Areas of Technical Cooperation for Climate Change Adaptation in the North-Eastern Region 8 February, 2010	NEDFi/GTZ, Guwahati
	Pattern of Rice Productivity Growth in Eastern India: Implication for Research and Policy 24-26 February, 2010	BIRD, Lucknow
	Preparation for the Joint Action Initiatives for SRI 29 March, 2010	ICAR, New Delhi
	Training Workshop on Risk Management in Agriculture 26-30 March, 2010	TNAU, Coimbatore
Usha Ahuja	Prioritization of Interventions in Rainfed Areas for Sustainable Livelihood 23-24 April, 2009	NASC, New Delhi
	Brainstorming, Sensitization and Planning Workshop on Tracking Change in Rural Poverty in Household and Village Economies in South Asia 25-26 April, 2009	NCAP, New Delhi
	Review Meeting of the project, Estimating Marketing Efficiency of Horticultural Commodities under Different Supply Chains in India 28 May, 2009	NCAP, New Delhi
	NAIP Orientation Meeting 4 July, 2009	NCAP, New Delhi
	NAIP Orientation Meeting 5 September, 2009	NCAP, New Delhi
	International Conference on Nurturing Arid Zones for People and the Environment: Issues and Agenda for the 21st Century 24-28 November, 2009	CAZRI, Jodhpur
	National Seminar on Women in Agriculture 4-5 December, 2009	DRWA, Bhubaneswar

	National Workshop on Sources of Growth in Indian Agriculture – Trends, Challenges and Prospects under V-PAGe-NAIP 27 March, 2010	NCAP, New Delhi
M. B. Dastagiri	Organizing to Cope with Global Warming by Prof. Thomas C. Schelling 22 June, 2009	Hotel Shangri-La, New Delhi
	Climate Change, Mitigation and Developing Country Growth by Prof. Michael Spence, organized by ICRIER 7 September, 2009	Hotel Claridges, New Delhi
	23rd National Conference on Agricultural Marketing 12-14 November, 2009	CRIDA, Hyderabad
	International Conference on Achieving Food Security in India: Improving Competition, Markets and the Efficiency of Supply Chains, organized by NCAER 24 November, 2009	Hotel Claridges, New Delhi
P. Adhiguru	Brainstorming, Sensitization and Planning Workshop on Tracking Changes in Rural Poverty in Household and Village Economies in South Asia 25-26 April, 2009	NCAP, New Delhi
	Regional Seminar on Strategies for Multi-Agency Extension Approach for Agricultural Development, organized by International Society of Extension Education, Nagpur 8 August, 2009	Zonal Project Directorate, Zone VIII, ICAR, Bangalore
	Consultation on Enhancing Open Access in Indian Agriculture: Prospects, Opportunities, Advantages & Challenges 6-7 September, 2009	ICRISAT, Patancheru
	Bio-economy E-conference, organized by Iowa State University and Cornell University 2 December, 2009	Iowa State University, USA
	Brainstorming Seminar on Upscaling Science Contents in Extension Journals 5 January, 2010	Agricultural Extension Division, ICAR, New Delhi

S. S. Raju	NCAP-NRAA Seminar on Prioritization of Interventions in Rainfed Areas for Sustainable Livelihoods 23-24 April, 2009	NASC, New Delhi
	International Conference on Achieving Food Security in India: Improving Competition, Markets and the Efficiency of Supply Chains, organized by NCAER 24 November, 2009	Hotel Claridges, New Delhi
Rajni Jain	NCAP-NRAA Seminar on Prioritization of Interventions in Rainfed Areas for Sustainable Livelihoods 23 April, 2009	NASC, New Delhi
	Workshop on Expert Systems in Agriculture 12 June, 2009	IASRI, New Delhi
	Partnership Session of Social Scientists: A Review by European Commission 5 December, 2009	ICRISAT, Patancheru
	Inaugural Session of Agricultural Policy Analysis Training 14 December, 2009	CSD, India International Centre, New Delhi
	4th Indian International Conference on Artificial Intelligence 16-18 December, 2009	Siddya Institute of Technology, Tumkur
	Workshop-cum Training on Bioinformatics Applications in Crop Science 21-23 December, 2009	USI, IARI, New Delhi
	Vad vivad pratiyogita on "Gender Discrimination is Present at the Work Place" 19 February, 2010	IARI, New Delhi
	Launching Workshop of the project "Tracking Changes in Rural Poverty in Household and Village Economies in Eastern India" 20 February, 2010	NCAP, New Delhi
	International Conference on Data Management 11-12 March, 2010	Institute of Management Technology, Ghaziabad

	National Workshop on ICT Initiatives of the NAIP with special reference to the Uniformity in Guidelines for ICAR Websites 19 March, 2010	NBPGR, New Delhi
	Workshop on Sources of Growth in Indian Agriculture— Trends, Challenges and Prospects under V-PAGe 27 March, 2010	NCAP, New Delhi
Anjani Kumar	9th Agricultural Science Congress on Technological and Institutional Innovations for Enhancing Agricultural Income 22-24 June, 2009	SKUAST-K, Srinagar
	Project Launch Workshop on Tracking Rural Poverty in Household and Village Economies in South Asia 30 June-2 July, 2009	ICRISAT, Hyderabad
	WTO and Doha Negotiations: What is at Stake, Where Do We Stand and the Way Forward 3 September, 2009	Federation House, Tansen Marg, New Delhi
	WTO-ESCAP Seminar on Trade in Agriculture and Agricultural Negotiations, organized by Centre for WTO Studies 9-11 September, 2009	IIFT, New Delhi
	A Stakeholder Consultation on Agriculture, Nutrition and Health in India, organized by the Agriculture and Health Research Platform (AHRP) 12-13 October, 2009	NASC, New Delhi
	69th Annual Conference of Indian Society of Agricultural Economics 17-19 December, 2009	Guru Nanak Dev University, Amritsar
	Millions Fed: Proven Successes in Agricultural Development, organized by IFPRI, APAARI and TAAS 19 January, 2010	India Habitat Centre, New Delhi
	International Buffalo Conference on Livestock Trade under WTO Regime: Challenges and Opportunities, organized by Indian Society for Buffalo Development, ICAR, CIRB, ABA 1-4 February, 2010	NASC, New Delhi

Sant Kumar	NCAP-NRAA Seminar on Prioritization of Interventions in Rainfed Areas for Sustainable Livelihoods 23-24 April, 2009	NASC, New Delhi
	Brainstorming, Sensitization and Planning Workshop on Tracking Changes in Rural Poverty in Household and Village Economies in South Asia 25-26 April, 2009	NCAP, New Delhi
	17th Annual Conference of Agricultural Economics Research Association (India) 19-21 November, 2009	TNAU, Coimbatore
	National Workshop on Networking of Agricultural Economists 21 November, 2009	TNAU, Coimbatore
	National Seminar on Challenges of Growing Rural-Urban Disparities in India 5-6 January, 2010	India International Centre, New Delhi
	Project Launch Workshop on Tracking Change in Rural Poverty in Household and Village Economies in Eastern India 20 February, 2010	NCAP, New Delhi
Harbir Singh	NCAP-NRAA Seminar on Prioritization of Interventions in Rainfed Areas for Sustainable Livelihoods 23-24 April, 2009	NASC, New Delhi
	Brainstorming, Sensitization and Planning Workshop on Tracking Changes in Rural Poverty in Household and Village Economies in South Asia 25-26 April, 2009	NCAP, New Delhi
	9th Agricultural Science Congress on Technological and Institutional Innovations for Enhancing Agricultural Income 22-24 June, 2009	SKUAST-K, Srinagar
	Workshop on Roadmap to Success—Enhancing Effectiveness through Self—Awareness 3-4 July, 2009	Hotel Sheraton, New Delhi
	23rd National Conference on Agricultural Marketing 12-14 November, 2009	CRIDA, Hyderabad

	International Conference on Nurturing Arid Zones for People and the Environment: Issues and Agenda for the 21st Century 24-28 November, 2009	CAZRI, Jodhpur
	First Regional Coordination Meeting of ICARDA on Strategic Partnership towards Enhancing Food and Nutritional Security in South Asia and China 12–13 December, 2009	NAAS, New Delhi
	Regional Workshop on Quality Seed in SAARC Countries: Production, Processing, Legal and Quality Control and Marketing System 16–18 December, 2009	NASC, New Delhi
	Launching Workshop on Tracking Change in Rural Poverty in Household and Village Economies in Eastern India 20 February, 2010	NCAP, New Delhi
B. Ganesh Kumar	NCAP-NRAA Seminar on Prioritization of Interventions in Rainfed Areas for Sustainable Livelihoods 23-24 April, 2009	NASC, New Delhi
	National Workshop on Advances in Aquaculture and Fisheries: Perspectives, Prospects and Challenges 3 July, 2009	Pragati Maidan, New Delhi
	Indian Fish Festival (INFISH-2009) 10-12 July, 2009	NFDB, Hyderabad
	National Seminar on A Roadmap to Emerging Trends in Food Processing and Marketing 17-18 September, 2009	Pt Jawaharlal Nehru College of Agriculture & Research Institute, Karaikal
	National Workshop on Sampling Design and Methodology to Assess the Socio-economic Conditions of Fishers and Fish Farmers in India 13 November, 2009	CIBA, Chennai
	17th Annual Conference of Agricultural Economics Research Association (India) 19-21 November, 2009	TNAU, Coimbatore

	69th Annual Conference of Indian Society of Agricultural Economics 17-19 December, 2009	Guru Nanak Dev University, Amritsar
	National Seminar on Indian Marine Fisheries—Sustainability at Crossroads 22-23 December, 2009	KVAFSU, Mangalore
	Professional Fisheries Graduates Forum (PFGF)'s VII Annual Meet 23 December, 2009	KVAFSU, Mangalore
	National Seminar on Challenges of Growing Rural-Urban Disparities in India 5-6 January, 2010	CSD, New Delhi
	Orientation Meeting on Economic Impact of FMD and its Control in the Dairy and Meat Value Chains in India: A Pilot Study (ICAR sponsored research project) 8 January, 2010	NCAP, New Delhi
	Launching Workshop on Tracking Change in Rural Poverty in Household and Village Economies in Eastern India 20 February, 2010	NCAP, New Delhi
	National Workshop on Role of Low Value Fish Species in Strengthening Food Security in India 25-26 March, 2010	KVAFSU, Mangalore
	National Workshop on Sources of Growth in Indian Agriculture – Trends, Challenges and Prospects 27 March, 2010	NCAP, New Delhi
A. Suresh	National Seminar on Stress Management in Small Ruminant Production and Product Utilization, organized by Indian Society of Small Ruminant Production and Utilization 29-31 January, 2010	Jaipur, Rajasthan
P. Shinoj	Mid-term Workshop on Policies for Ensuring Food Security in South and Southeast Asia, organised by IFPRI-ADB 21 October, 2009	NASC, New Delhi
	23rd National Conference on Agricultural Marketing, organized by Indian Society of Agricultural Marketing 12-14 November, 2009	CRIDA, Hyderabad

	17th Annual Conference of Agricultural Economic Research Association 19-21 November, 2009	TNAU, Coimbatore
	Workshop on Study Design and Methodology of Coordinated Projects Assigned in 2009 11 February, 2010	IEG, New Delhi
	First Official Meeting of the India-Canadian Joint Working Group on Agriculture 16-17 March, 2010	NASC, New Delhi
Khyali Ram	International Conference on Academic Libraries (ICAL)–2009 5-8 October, 2009	University of Delhi
	International Seminar for Information Professionals (ISIP)-2009 on Library at Crossroads 9 October, 2009	Rajasthan University, Jaipur
	International Conference on Digital Libraries (ICDL) 23-26 February, 2010	TERI and IGNOU New Delhi

XII. VISITS ABROAD

Name of Scientist	Purpose	Place	Duration
P. K. Joshi	Steering Committee Meeting of Climate Change, Agriculture and Food Security (CCAFS)	Paris, France	26 April to 1 May, 2009
	Food Security in South Asia	Dhaka, Bangladesh	10 June, 2009
	Governmental Meeting of IBSA (India, Brazil and South Africa)	Rio de Janeiro, Brazil	14 July, 2009
	Council Meeting of International Center for Research on Agro-forestry (ICRAF)	Nairobi, Kenya	30 August to 4 September, 2009
	Global Environment Change and Food Systems (GECFS) Synthesis Workshop 2009	Oxford, UK	23-26 September, 2009
	Invited as Guest Speaker to give presentation on The Impact of the CGIAR in South Asia: Implications for ICARDA Research in South Asia in 2nd Annual Science Week	Aleppo, Syria	20-22 October, 2009
	Steering Committee Meeting of the Challenge Program on Climate Change, Agriculture and Food Security (CCAFS)	Faculty of Life Sciences, University of Copenhagen, France	26-30 October, 2009
Ramesh Chand	For conducting Regional Capacity Building Training Workshop on Pro-Poor Policies	Bangkok, Thailand	15-26 June, 2009
	For presenting a paper on "Hunger and Poverty Reduction: The Need for Inclusive Growth" at Sub-regional Workshop on Aligning Policies and Strategies to Achieve the Millennium Development Goals in South Asia	Kathmandu, Nepal	4-6 November, 2009

	For reviewing and revising the Draft Reports prepared for FAO by Department of Planning and Statistics, Ministry of Agriculture, Cambodia and to brief FAO/RAP Bangkok, about the report as a Policy Consultant	Phnom Penh Cambodia and Bangkok, Thailand	25 November– 4 December, 2009
S. S. Raju	Annual Biofuel Modelling Workshop-II	IFPRI, Washington, DC, USA	26 October– 4 November, 2009
P. Adhiguru	Training on ICT-mediated Agricultural Knowledge Management	Iowa State University, USA	16 November- 12 December, 2009
Anjani Kumar	US Norman Borlaug Fellowship Programme	Ohio State University, USA	12 October- 21 November, 2009
Harbir Singh	To interact with scientists at ICARDA and Develop Collaborative Work Plan International Training under NAIP sub-project on Visioning, Policy Analysis and Gender	Aleppo, Syria Cornell University, Ithaca, New York, USA	24-30 May, 2009 25 February- 17 March, 2010
P. A. Lakshmi Prasanna	To interact with scientists at ICARDA and Develop Collaborative Work Plan	Aleppo, Syria	24-30 May, 2009
B. Ganesh Kumar	Specialized Training Course on Household Survey: Data Collection, Entry, Analysis and Result Interpretation and Reporting and Value Chain Analysis at ICARDA	Aleppo, Syria	25 October– 5 November, 2009
P. Shinoj	Annual Biofuel Modelling Workshop-II	IFPRI, Washington, DC, USA	26 October- 4 November, 2009

XIII. POLICY ADVOCACY ACTIVITIES

Training Programme on Economic Models for Human Welfare Analysis: Application to Crop-based Biofuels
27-30 July, 2009

The Centre organised a 4-day training programme on "Economic Models for Human Welfare Analysis: Application to Crop-based Biofuels" during 27-30 July, 2009. It was collaborated by International Food Policy Research Institute (IFPRI), Washington D. C. Twenty-five participants working in different ICAR institutes and SAUs participated in the training programme. Dr Karl M. Rich, of the American University, New Cairo, was the main resource person for the training programme.

The training programme aimed at enhancing the policy analysis skills of agricultural economists in the NARS. It covered the topics like global biofuels production expansion, multi-market models of agricultural policy, partial equilibrium policy analysis and spatial multi-market models. The training programme also covered interactive computer-based exercise using GAMS software. Construction of multi-market model in GAMS was demonstrated to the trainees. Policy simulations was also demonstrated by using the model. The participants found the programme very useful for application in their research work. Dr Siwa Msangi, Senior Research Fellow and Project Manager, "Biofuels and the Poor" project of IFPRI, presented certificates to the participants. Dr S. S. Raju, Senior Scientist and Dr P. Shinoj, Scientist coordinated this training programme.

Methodological Workshop on Impact Assessment of Improved Agricultural Technologies
26-28 August, 2009

This workshop was designed to provide exposure to the participants on innovations in methodologies and their quantitative methods. These were duly supported by a number of case studies. It is expected that such an exposure will promote impact assessment studies. The workshop was organized at NCAP, New Delhi during 26-28 August 2009.

The specific objectives of the workshop were to: (i) provide exposure to the participants on the methodologies available for assessing impact of improved technologies, (ii) illustrate case studies on assessment of different improved technologies, and (iii) develop some case studies for undertaking impact of improved technologies. The workshop was attended by 25 participants (15 from ICAR institutions and 10 from SAUs), representing various commodities and agro-ecological zones of the country.

The workshop was inaugurated by Dr P K Joshi, Director NCAP, and Course Coordinator of the Workshop on 26 August 2009. Dr Joshi mentioned that agricultural economics is assuming increasing importance in research priority setting, monitoring and evaluation of institute's activities. He emphasized that ICAR is insisting on regular impact studies of agricultural technologies developed by NARS, as the society in general, is seeking convincing evidence about the welfare of the public.

The topics covered during the programme included overview of impact assessment, benefit cost analysis, production function approach, total factor productivity approach, economic surplus approach, environmental impact, indicators for gender studies, and a few case studies covering genetic enhancement, watershed programmes, livestock and fisheries technologies. Introduction to SPSS and DREAM software was also provided. The workshop was conducted in an interactive mode and trainee participants expressed satisfaction on the coverage of the workshop.

Agricultural Risk Management and Extension
22-26 September, 2009

The Centre organised a 5-day study visit on "Agricultural Risk Management and Extension" during 22-26 September, 2009. Four officials working in Agricultural and Agrarian Insurance Board, Colombo, Sri Lanka, participated in the programme. The Centre arranged visits to several institutions like Agricultural Insurance Company of India Limited (AIC), Indian Agricultural Research Institute (IARI), Yes Bank, and National Agricultural Science Complex (NASC) Museum. Scientists of the ICAR and officials of the AIC were the main resource persons of this programme. Dr B. C. Barah, Principal Scientist and Dr S. S. Raju Senior Scientist coordinated this visit. The participants found that the study visit was very useful for application in their country.

Winter School on Decision Making in Agriculture using Data Mining
27 October-16 November, 2009

A winter school on "Decision Making in Agriculture using Data Mining" was organised at NCAP during 27 October-16 November, 2009, which was coordinated by Drs Rajni Jain, S S Raju and P Adhiguru. Twenty-five trainees, representing 14 states of India, participated in the course. Discipline-wise, maximum participants were from agricultural economics (48%), followed by computer applications (28%), soil science (12%), statistics (8%) and horticulture (4%).

The syllabus of winter school was consisted of 4 modules, namely data pre-processing, data mining tasks and techniques, applications and software for data mining. The practical classes were highly appreciated by the trainees and they opined that they had either learnt a new skill or a sharpened known skill. Data mining being a frontier area of research, a big faculty of 36 members was constituted which included members from IASRI, IARI, DU, JNU and Jamia Millia Islamia. Trainees were divided into 8 groups for the purpose of evaluation. Each group was assigned a mini project based on the data mining technique they had learnt during the course and presentations were made by each group. The participants found the programme very useful for application in their research work. Dr C D Mayee, Chairman ASRB delivered the valediction address and distributed certificates to the participants. Dr Mruthyunjaya, former Director, NAIP, delivered special remarks on this occasion. All the trainees were provided with sufficient reference material in the form of two sets of manuals and a CD containing lectures delivered by the faculty members.

National Workshop on Networking of Agricultural Economists 21 November, 2009

NCAP organized a national workshop on Networking of Agricultural Economists (NAE) at Tamil Nadu Agricultural University (TNAU), Coimbatore, on 21 November, 2009. The main objective of the workshop was to identify the short-term and medium-term priorities for agricultural economics and policy research, and discuss modalities for agricultural economics and policy research in the fast changing scenario. The workshop was inaugurated by Prof. S. Mahendra Dev, Chairman, Commission for Agricultural Costs and Prices (CACP), Government of India. Prof. Dev emphasized on the need for networking of agricultural economists to face numerous tasks with limited resources. Need for networking of limited resources was also emphasized by Dr Mruthyunjaya, President, Agricultural Economics Research Association (India). He said that seed for networking of agricultural economists was sown during the NATP period, and in NAIP too, PME Cells were being supported under V-PAGe headquartered at NCAP, New Delhi. The followings recommendations were made at the workshop:

- *Developing System Framework:* There is a need to evolve an institutional mechanism on the lines of All India Coordinated Research Project (AICRP) and institutionalize for undertaking activities of agricultural economics and policy research.
- *Administrative Acceptability:* For an effective implementation of the mechanism at the national level, an "agenda note" be placed in the next ICAR Directors/ SAUs Vice Chancellors conference.

- *Activity Priority:* NCAP to identify and prioritize stakeholders' expectations/ demand of national and regional importance for quick and timely delivery of policy inputs.
- *Identifying Networks:* Networks may be identified at sectoral/commodity or at any other level for meeting the demand of socioeconomic inputs.
- *Tool Pool Group:* A group of 4-5 economists may be identified for capacity building of scientists of ICAR and SAUs on quantitative analysis, by involving students and staff of social scientists and biological scientists.

Training Program on Agricultural Policy Analysis

7-11 December, 2009

The role of government policies in determining pace and patterns of agricultural growth is well recognized. However, relevance and appropriateness of any particular policy or policy mix vary overtime and place, changing socioeconomic needs, physical environment, stages of economic development and several other factors. In fact, a proper understanding of the dynamics of any agricultural policy is important for the policymakers on one hand and policy researchers on the other. Hence, a training program on "Agricultural Policy Analysis" was organized for capacity development of social scientists of NARS who are the policy analysts and agricultural planners and policymakers of tomorrow. The program was organized under the National Agricultural Innovation (NAIP) sub-project on "Visioning Policy Analysis and Gender (V-PAGe)" during 7-11 December, 2009 at New Delhi. National Centre for Agricultural Economics and Policy Research (NCAP) and Council for Social Development (CSD), New Delhi, organized this programme jointly.

The specific objectives of the workshop were to: (i) orient participants on tools and techniques of agricultural policy analysis, (ii) familiarize the participants with various agricultural policies pursued in India, and (iii) illustrate how agricultural policies contribute to accelerated, diversified and inclusive agricultural growth. The training was attended by 22 participants (14 from ICAR institutions and 8 from SAUs) from various parts of the country. The participants mainly belonged to the discipline of agricultural economics (one from extension and one from biological science). The topics covered during the program included agricultural research policy, policy for land and water resources, price policy, trade policy, agricultural subsidies, credit policy, insurance policy, food policy, etc. The program also provided recent developments in agricultural policies and driving forces affecting their proper implementation at the ground level and efficacy.

Launching Workshop on Tracking Change in Rural Poverty in Household and Village Economies in Eastern India

20 February, 2010

This project is part of a larger project on "Tracking Change in Rural Poverty in Household and Village Economies in South Asia" being undertaken by International Crops Research Institute for Semi-Arid Tropics (ICRISAT), Hyderabad, International Rice Research Institute (IRRI), Manila, Philippines, and National Centre for Agricultural Economics and Policy Research (NCAP), New Delhi. The project is supported by Bill and Melinda Gates Foundation and aims at understanding the dynamics process for reducing poverty in the poverty-laden agro-ecologies of South Asia by tracking the household and village economies continuously.

NCAP is leading the project in Eastern India. The Eastern India is one of the poverty-laden regions, in terms of both prevalence rates and total members. Reducing poverty in Eastern India has been a major challenge and successful implementation of this project is expected to contribute to our understanding of the complex poverty dynamism. The NCAP will focus on the three states of India, namely Bihar, Jharkhand and Orissa. The overall objective of the project is to evolve appropriate and effective strategies for accelerated poverty reduction in Eastern India.

The launch workshop of this project was organized at NCAP on 20 February, 2010. It was inaugurated by Dr H. S. Gupta, Director, IARI, New Delhi. The workshop was attended by several dignitaries like Dr M. C. S. Bantilan, Global Theme Leader, Socio-economic Program, ICRISAT, Dr Ramesh Chand, ICAR National Professor, Dr Surjit Singh, Director, IDS, Jaipur and Dr B. Jayaraman, General Manager, NABARD. The main objective of the launch workshop was to assess the existing situation of Eastern India in terms of magnitude of rural poverty, agricultural productivity and policies for agricultural development, institutional flow of rural credit and employment diversification in Eastern India. As part of this workshop, a brain-storming session was also organized to identify the important issues, possible strategies and roadmap for poverty reduction in Eastern India.

XIV. LECTURES DELIVERED BY NCAP SCIENTISTS

Name of Scientist	Topic and Date	Venue
Ramesh Chand	Fertilizer Growth, Imbalances and Subsidies to the IES Probation Batch–XXX, undergoing training 21 April, 2009	IEG, New Delhi
	Indian Agriculture: Issues, Growth, Market, Trade and Sustainability to the IES Probation Batch–XXX, undergoing training 28 April, 2009	IEG, New Delhi
	State of Agriculture and Fishery Sectors in India 1 May, 2009	CIBA, Chennai
	Estimating Instability in Agriculture: Methods and Empirical Results in Winter School on Decision-making in Agriculture using Data Mining 30 October, 2009	NCAP, New Delhi
	Macro-Economics Model to Achieve Targeted Growth during XI Plan in Winter School on Decision-making in Agriculture using Data Mining 31 October, 2009	NCAP, New Delhi
	Interactive Session on Agriculture and Food Policy in the Winter School on Decision-making in Agriculture using Data Mining 3 November, 2009	NCAP, New Delhi
	Current Food Price Crises and its Implication on Food Security in Lal Bahadur Shastri Memorial Lectures 11 January, 2010	IVRI, Izatnagar
	Demand and Supply Scenario of Food in India towards 2020, ICAR Directors' Conference 15 February, 2010	NASC, New Delhi
	India's Agriculture Challenge 25 February, 2010	IRMED, New Delhi

B. C. Barah	SRI for Sustainable Rice Production. 16 September, 2009	IARI, New Delhi
	Decomposition Model for Income Variabiligy in Winter School on Decision-making in Agriculture using Data Mining 9 November, 2009	NCAP, New Delh
Usha Ahuja	Indicators of Gender Empowerment in a Methodological Workshop on Impact of Improved Agricultural Technologies 28 August, 2009	NCAP, New Delhi
	Gender Budgeting in Winter School on Decision-making in Agriculture using Data Mining 7 November, 2009	NCAP, New Delhi
	Impact of Improved Technologies on Farm Women: A Case Study of IPM in Vegetable Cultivation in Winter School on Decision-making in Agriculture using Data Mining 12 November, 2009	NCAP, New Delhi
M. B. Dastagiri	Market Reforms in Indian Agriculture in the Winter School on Decision-making in Agriculture using Data Mining 29 October, 2009	NCAP, New Delhi
P. Adhiguru	India's Status paper on Innovations in Linking Research-Extension-Farmers-Markets, In: SAARC Second meeting of the Inter-governmental Core Group on Agricultural Research and Extension 8 May, 2009	Central Soil and Water Conservation Research and Training Institute, Dehradun
	Participatory Qualitative Tools in Agricultural Extension-Poverty Assessment Perspective in Summer School on Tools and Techniques for Planning, Monitoring, Evaluation and Impact Assessment of Extension Programs 31 July, 2009	IARI, New Delhi
	Role of Extension in Agricultural Risk Management, In: Field visit on Agricultural Risk Management, for participants from Agricultural and Agrarian Insurance Board, Sri Lanka 22 September, 2009	NCAP, New Delhi
	Innovations in Linking Research-Extension-Farmers-Markets, In: Orientation Training of SAARC Scientists on New Dimensions of Agricultural Research and Extension 12 November 2009	IARI, New Delhi

	India's Extension Status paper on Agricultural Extension 8 December 2009	Iowa State University, USA
S. S. Raju	Agricultural Insurance in India: Problems and Prospects for the Sri Lankan Council for Agricultural Research Policy (CARP) officials, Sri Lanka 22 September, 2009	NCAP, New Delhi
	Problems and Progress in Agricultural Insurance in India, in the Winter School on Decision-making in Agriculture using Data Mining 9 November, 2009	NCAP, New Delhi
	Risk Management in Agriculture in training programme on Climate Change, Environment Sustainability and Agricultural Development under ICAR Scheme of the Centre of Advanced Faculty Training in Agricultural Economics 17 March, 2010	IARI, New Delhi
Rajni Jain	Introduction to Data Mining, in the Winter School on Decision-making in Agriculture using Data Mining 27 October, 2009	NCAP, New Delhi
	Decision Tree Induction, in the Winter School on Decision-making in Agriculture using Data Mining 29 October, 2009	NCAP, New Delhi
	R S Approach and Applications, in the Winter School on Decision-making in Agriculture using Data Mining 4 November, 2009	NCAP, New Delhi
	An Overview of Data Mining for Bioinformatics, in the Winter School on Bioinformatics 3 December, 2009	IASRI, New Delhi
	Analytical Tools for Reporting: OLAP and Dashboard, to the participants of specialized training programme on Forestry and Information Technology for Computer Scientists 8 December, 2009	FRI, Dehradun

	Decision Tree for Data Mining, to the participants of specialized training programme on Forestry and Information Technology for Computer Scientists 8 December, 2009	FRI, Dehradun
	DDL and DML Commands in SQL Server, to the participants of Recent Advances in Web Technology for Information Management in Agriculture 22 February, 2010	IASRI, New Delhi
	Rough Set Based Data Mining—invited key lecture in 3rd International Conference on Data Management 12 March, 2010	IMT, Ghaziabad
Harbir Singh	Intellectual Property Rights and Use of Information Technology in the Winter School on Decision-making in Agriculture using Data Mining 3 November, 2009	NCAP, New Delhi
	Indian Seed System Development in training Programme on Climate Change, Environmental Sustainability and Agricultural Development under ICAR Scheme of the Centre of Advanced Faculty Training in Agricultural Economics 26 March, 2010	IARI, New Delhi
P. Shinoj	An Overview of SPSS in Methodological Workshop on Impact Assessment of Improved Agricultural Technologies 27 August, 2009	NCAP, New Delhi
	Recent Developments in Trade Theory: Application of Gravity Model in the Winter School on Decision-making in Agriculture using Data Mining 10 November, 2009	NCAP, New Delhi
	Econometric Analysis using SPSS 8 December, 2009	NASC, New Delhi

XV. DISTINGUISHED VISITORS

Dr S. Ayyappan, Deputy Director General (Fy), Indian Council of Agricultural Research, Krishi Anusandhan Bhawan-II, New Delhi

Dr K. M. Bujarbaruah, DDG (AS), Indian Council of Agricultural Research, Krishi Bhawan, New Delhi

Dr S. P. Tiwari, Deputy Director General (Edn), Indian Council of Agricultural Research, Krishi Anusandhan Bhawan-II, New Delhi

Dr A K Singh, DDG (NRM), Indian Council of Agricultural Research, Krishi Anusandhan Bhawan-II, New Delhi

Dr Nawab Ali, DDG (Engg), Indian Council of Agricultural Research, Krishi Anusandhan Bhawan-II, New Delhi

Prof. S. Mahendra Dev, Chairman, Commission for Agricultural Costs and Prices (CACP), Ministry of Agriculture, Government of India, New Delhi

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

Dr V. S. Vyas, Professor Emeritus, Institute of Development Studies (IDS), Jaipur

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

Dr P. K. Mishra, Secretary, Ministry of Agriculture, Government of India, Krishi Bhawan, New Delhi

Dr P. G. Chengappa, Vice Chancellor, University of Agricultural Sciences, GKVK, Bangalore

Dr S. M. Jharwal, Principal Advisor, Department of Agriculture & Cooperation, Ministry of Agriculture, Krishi Bhawan, New Delhi

Dr B. R. Sharma, International Water Management Institute, South Asia Liasion Office, NASC, New Delhi

Dr A. K. Nigam, Director, Institute of Applied Statistics and Development Studies, Lucknow

Mr Ian Mortimer, Counsellor (Agriculture), Australian High Commission, New Delhi

Dr T. Haque, Director (Academic), Council for Social Development, New Delhi

Dr Mruthyunjaya, National Director, National Agricultural Innovation Project (NAIP), New Delhi

Dr Bishwanath Sinha, TATA Trust, Mumbai

Mr C. Shmabu Prasad, Xavier Institute of Management, Bhubaneswar

Dr Adam Drucker, Senior Economist (Ecological), Biodiversity International H. Q., Rome

Dr Therma R. Paris, International Rice Research Institute (IRRI), Manila, Philippines

Dr Ranji Wifethilke, Secretary, Ministry of Agriculture Development and Agrarian Services, Sri Lanka

Prof. Rohan Rajapakse, Executive Director, Sri Lankan Council of Agricultural Research and Policy, Colombo, Sri Lanka

Dr Dkng Pushpakumara, Department of Crop Science, Faculty of Agricultural University of Paradeniya, Paradeniya, Sri Lanka

5-Member High Level Delegation led by Dr Edward J. Ray, President, Oregon State University

6-Member delegation from National Agricultural Research Organization (NARO), Uganda

XVI. PERSONNEL

Scientific

Name	Designation	Area of Specialization
P. K. Joshi	Director*	Technology Policy Sustainable Agricultural System
Ramesh Chand	ICAR National Professor and Director**	Markets and Trade Agricultural Growth and Modelling
B. C. Barah	Principal Scientist and Acting Director***	Agricultural Growth and Modelling Sustainable Agricultural System
Suresh Pal	Principal Scientist	Technology Policy Institutional Change
K. K. Datta	Principal Scientist	Sustainable Agricultural System Agricultural Growth and Modelling
P. Ramasundaram	Principal Scientist	Technology Policy
Pratap S. Birthal	Principal Scientist****	Technology Policy Agricultural Growth and Modelling
Usha Rani Ahuja	Principal Scientist	Technology Policy Institutional Change
Smita Sirohi	Principal Scientist	Agricultural Growth and Modelling Markets and Trade
Aldas Janaiah	Senior Scientist*****	Technology Policy Agricultural Growth and Modelling
M. B. Dastagiri	Senior Scientist	Markets and Trade Institutional Change
P. Adhiguru	Senior Scientist	Technology Policy Institutional Change
S. S. Raju	Senior Scientist	Institutional Change Sustainable Agricultural System
Rajni Jain	Senior Scientist	Institutional Change
Anjani Kumar	Senior Scientist	Technology Policy Markets and Trade
Sant Kumar	Senior Scientist	Technology Policy Agricultural Growth and Modelling
Harbir Singh	Senior Scientist	Sustainable Agricultural System Institutional Change

B. Ganesh Kumar	Senior Scientist	Agricultural Growth and Modelling Sustainable Agricultural System
Shiv Kumar	Senior Scientist	Institutional Change
P. A. Lakshmi Prasanna	Senior Scientist	Institutional Change
A. Suresh	Senior Scientist	Sustainable Agricultural System
P. Shinoj	Scientist	Agricultural Growth and Modelling Markets and Trade
Diana Sarungbam	Scientist	Technology Policy

* Director till 18 September, 2009
** Director from 2 March, 2010
*** Acting Director from 19 September, 2009 to 1 March 2010
**** On deputation to ICRISAT, Hyderabad since 15 May, 2008
***** On deputation to ANGRU, Hyderabad since 25 June, 2007

Technical

Name	Designation
Prem Narayan	Technical Officer (T 7-8)
Khyali Ram Chaudhary	Technical Officer (T-5)
Mangal Singh Chauhan	Technical Officer (T-5)
Sonia Chauhan	Technical Officer (T-5)
Satinder Singh	Driver (T-3)

Administrative

Name	Designation
Vinod Kumar	Assistant Administrative Officer
T. A. Vishwanath	Assistant Finance & Accounts Officer
S. K. Yadav	Assistant
Inderjeet Sachdeva	Upper Division Clerk
Sanjay Kumar	
Ajay Tanwar	Lower Division Clerk
Umeeta Ahuja	Stenographer
Seema Khatter*	Junior Stenographer
Mahesh Kumar	S.S.Gr II
Mahesh Pal	S.S.Gr I

* on deputation to DMR, New Delhi

XVII. TRAININGS ATTENDED

Scientists

Name	Topic	Duration	Institution
P. Adhiguru	Orientation Training of SAARC Scientists on "New Dimensions of Agricultural Research and Extension"	4-13 November, 2009	IARI, New Delhi
	ICT-mediated Agricultural Knowledge Management	16 November to 12 December, 2009	Iowa State University, USA
Diana Sarungbam	Winter School on "Decision-making in Agriculture using Data Mining"	27 October to 16 November, 2009	NCAP, New Delhi
	Training Program on Agricultural Policy Analysis	7-11 December, 2009	CSD, New Delhi
	Training cum workshop on "Risk Assessment in Agriculture"	26-30 March, 2010	TNAU, Coimbatore
B. Ganesh Kumar	Training Workshop on Impact Assessment of Improved Agricultural Technologies	26-28 August, 2009	NCAP, New Delhi
Harbir Singh	Impact Assessment of Agricultural Technology (Biotechnology)	25 February – 17 March, 2010	Cornell University, Ithaca, New York, USA
M. B. Dastagiri S. S. Raju Rajni Jain Harbir Singh B. Ganesh Kumar Shiv Kumar P. A. Lakshmi Prasanna P. Shinoj	Training Programme on Economic Models for Human Welfare Analysis: Applications to Crop-based Biofuels	27-30 July, 2009	NCAP, New Delhi
Rajni Jain	Bio-informatics Applications in Crop Science	21-23 December, 2009	Unit of Simulation and Informatics, IARI, New Delhi
Sant Kumar	Methodological Training Workshop on Impact Assessment of Improved Agricultural Technologies	26-28 August, 2009	NCAP, New Delhi
	Training Program on Agricultural Policy Analysis	7-11 December, 2009	CSD, New Delhi

Administration and Others

Name	Topic	Duration	Institution
Prem Narayan	Agricultural Production and its Export Policy in India	13-15 April, 2009	IARI, New Delhi & Bhartiya Krishi Anusandhan Samiti, Karnal
M. S. Chauhan Sonia Chauhan	Training Programme on Economic Models for Human Welfare Analysis: Applications to Crop-based Biofuels	27-30 July, 2009	NCAP, New Delhi
Khyali Ram	Managing Bibliographical Research Information in Agriculture and Allied Science	25-29 May, 2009	DIPA, New Delhi
	Strengthening of Digital Library and Information Management under NARS (e-Granth)	27 August, 2009	NRCPB, New Delhi

XVIII. OTHER INFORMATION

Participation in ICAR Inter-zonal Sports Meet

Dr S. Diana (Chief-de-Mission and Manager) and Ms Sonia Chauhan represented the Centre in ICAR Inter-Zonal Sports Tournament-2009, organized by National Dairy Research Institute, Karnal during 12-15 December, 2009. Ms Sonia Chauhan participated in athletics, carrom and chess events. She was declared as the winner of the ICAR Chess Champion (Women) for the year 2009.

Participation in ICAR Sports Meet

A contingent of 8 sportspersons comprising Mr T. A. Vishwanath, Mr M. S. Chauhan, Ms Sonia Chauhan, Mr Inderjeet Sachdeva, Mr Ajay Tanwar, Mr Mahesh Pal, Mr Mahesh Khokhara and Mr Satender Singh participated in Central Zone ICAR Sports Meet held at NBSS&LUP, Nagpur during 4-8 March, 2010. Dr Shiv Kumar was the Chief-de-Mission and Mr Vinod Kumar was Manager of the team. The team brought laurels to the Centre by winning 3 Gold and 3 Silver medals. Ms Sonia Chauhan bagged 3 Gold medals in Chess, Carrom and High Jump events and 3 Silver medals in 100 metre race, 200 metre race and Long Jump events, respectively.

NCAP Annual Day

The Centre celebrated its 18th Annual Day on 2 May, 2009. On this occasion, 2nd Prof. Dayanatha Jha Memorial Lecture was delivered by Dr Ashok Gulati, Director in Asia, IFPRI, New Delhi. Dr S. S. Johl, Prof. Sukhadeo Thorat, Dr Mruthyunjaya and other dignitaries graced the function and wished for the overall development of the Centre.

Hindi Pakhwara

For the promotion and extensive use of Rajbhasha by the staff of the Centre, a Committee on Official Language Hindi was established with the target given by Rajbhasha Department. This Committee suggests measures for the promotion of Hindi and monitors the progress. Monthly and quarterly meetings of the Rajbhasha Committee were organized regularly by the Centre.

Hindi Pakhwara was organized at the Centre during 14-30 September, 2009 to generate more awareness among the staff about the use of Hindi. Many activities were organized during the period. Essay writing competition was conducted to develop creative writing skill in Hindi on the topics "Mansoon ki Anishachitataa ke Karan Badhati Mahangai ki Samasya" and "Delhi Metro ke Badhate Hadase". A debate was organized on the topic "Introduction of Grading System in Indian Education up to Matric Level: Boon or Bane" in Hindi. Non-Hindi speakers also participated on this occasion. Other activities like dictation, translation, quiz and antakachhari were also organized during the Hindi Pakhwara. All events received overwhelming response from the employees. A Kavita Path was orgnaised on the last day of the Hindi Pakhwara. Dr Pooran Chand, Principal Scientist, Agricultural Economics Division, IARI, New Delhi and Dr Ranjana Agrawal, Principal Scientist, IASRI, New Delhi were the judges for the event. At the end, valedictory session was organized under the chairmanship of Dr B. C. Barah, Acting Director, NCAP. Dr V.K. Bhatia, Director, IASRI was the Chief Guest and distributed prizes to winners of various events.

The details of events and prize winners were:

Events	Prize winners
Essay Writing	Khyali Ram, Yogesh Saini, Sonia Chauhan
Debate (Hindi Bhashi)	Sushil Kumar Yadav, Sonia Chauhan, Anjani Kumar
Debate (Non-Hindi Bhashi)	All Participants
Debate (Women)	Sonalika Surabhi, Rashi Mittal, Sonia Chauhan
Quiz and Antakshari	Team A, Team B
Dictation	Ajay Tanwar, Sonalika Surabhi, Sushil Kumar Yadav
Translation	Ajay Tanwar, Khyali Ram, Inderjeet Sachdeva
Poem Recitation	Sushil Kumar Yadav, Raj Kumar Rai, Yogita Ahuja, Sonia Chauhan

Promotions

Dr P. A. Lakshmi Prasanna, Scientist (Senior Scale) promoted to Scientist (Selection Grade) w.e.f. 5-7-2007 and Senior Scientist w.e.f. 29-5-2008.

Sh. Prem Narayan, Technical Officer T-6, promoted to T(7-8) w.e.f. 12-9-2006.

New Joining

Name & Designation	Date of Joining	Former Designation and Institution
Dr P. Ramasundaram Principal Scientist	22-10-2009	Principal Scientist, Directorate of Farming System Research, Modipuram, Meerut
Dr A. Suresh Senior Scientist	24-12-2009	Scientist (SS), Central Sheep and Wool Research Institute, Avikanagar, Rajasthan
Dr Diana Sarungbam Scientist	21-08-2009	Scientist (Probationer), NAARM, Hyderabad
Sh T. A. Vishwanath AF&AO	01-07-2009	Assistant Finance and Accounts Officer, Directorate of Medicinal and Aromatic Plants, Anand

Transfers

Name & Designation	Date of Transfer	Place
Dr Suresh Pal Principal Scientist	02-04-2009	Head, Division of Agricultural Economics I.A.R.I., Pusa, New Delhi
Dr K. K. Datta Principal Scientist	03-06-2009	Head, Division of Dairy Economics, Statistics and Management, NDRI, Karnal
Dr Smita Sirohi Principal Scientist	03-06-2009	Principal Scientist, Division of Dairy Economics, Statistics and Management, NDRI, Karnal
Dr P. K. Joshi Director	18-09-2009	Director, NAARM, Hyderabad

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वर्ष 2009–10 में राष्ट्रीय कृषि आर्थिकी एवम् नीति अनुसंधान केन्द्र में उन्नीस वैज्ञानिकों (एक राष्ट्रीय प्राध्यापक सहित) ने पन्द्रह अन्य कर्मचारियों के साथ अनुसंधान में उत्कृष्टता प्राप्त करने का अपना प्रयास जारी रखा। इस वर्ष केन्द्र का कुल व्यय, बाह्य–पोषित परियोजनाओं के खर्च सहित, 612.81 लाख रूपये था।

इस केन्द्र में सामयिक विषयों पर अनुसंधान कार्य पाँच प्रमुख क्षेत्रों में किये जाते हैं। ये क्षेत्र हैं: प्रौद्योगिकी नीति, वहनीय कृषि व्यवस्था, विपणन एवं व्यापार, संस्थागत परिवर्तन, तथा कृषि वृद्धि एवं मॉडलीकरण। प्रत्येक प्रमुख क्षेत्र में वैज्ञानिकों का एक लघु समुह एक वरिष्ठ कृषि अर्थशास्त्री के मार्गदर्शन में अनुसंधान कार्य करता है। केन्द्र में शोध अध्ययनों का समन्वय इस प्रकार किया जाता है कि केन्द्र के निर्धारित लक्ष्यों को प्राप्त किया जा सके। वर्ष 2009–10 के दौरान केन्द्र में 37 शोध अध्ययन किये गये। इसी अवधि में केन्द्र ने पाँच परामर्शी एवं अनुबंधित परियोजनाओं को भी सम्पन्न किया।

केन्द्र ने राष्ट्रीय एवं अंतर्राष्ट्रीय संस्थानों के साथ अपने शोध सम्बन्धों और अनुबंधों को न केवल बनाए रखा वरन् उन्हें और भी व्यापक एवं सुदृढ़ बनाया। इसके अतिरिक्त, केन्द्र ने कई शिक्षण कार्यक्रमों, कार्यशालाओं, विचार–विमर्श गोष्ठियों एवं अन्य नीति समर्थन बहसों का आयोजन भी किया। वर्षावधि 2009–10 में केन्द्र की मुख्य शोध उपलब्धियों एवं अन्य गतिविधियों की एक झलक यहां प्रस्तुत है।

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- केन्द्र ने देश की मुख्य फसलों की 'कुल कारक उत्पादकता' का आकलन करने के लिए एक अध्ययन किया। इस अध्ययन के अनुसार, वर्ष 1975 से 2005 के दौरान सकल उत्पादन वृद्धि में 'कुल कारक उत्पादकता' का योगदान अन्न में 24 से 59 प्रतिशत, दलहन में 10 से 26 प्रतिशत, तिलहन में 6 से 27 प्रतिशत तथा रेशा फसलों में 32 से 74 प्रतिशत था। वास्तविक मूल्यों के संदर्भ में प्रति इकाई उत्पादन लागत में गिरावट दर्ज की गई। यह गिरावट अन्न की उत्पादन लागत में 1.0 से 2.3 प्रतिशत, चने तथा मूंग में लगभग 1 प्रतिशत, तिलहन में 0.8 से 2 प्रतिशत, रेशा फसलों में 1.7 प्रतिशत तथा ईख में 0.4 प्रतिशत से कम हुई। उत्पादन लागत में कमी उत्पादक तथा उपभोक्ता दोनों ही के लिए लाभदायक होती है।

- चयनित कृषि प्रौद्योगिकियों के अंगीकरण या स्वीकरण स्तर में भिन्नता विभिन्न राज्यों में कृषि उत्पादकता में अंतर का एक प्रमुख कारण है। कृषि प्रौद्योगिकी स्वीकरण का राज्यवार अंगीकरण सूचकांक तैयार करने तथा इसको प्रभावित करने वाले कारकों की पहचान करने के लिए एक अध्ययन किया गया। अध्ययन से यह पता चला है कि पंजाब, हरियाणा, तमिलनाडु तथा गुजरात कृषि प्रौद्योगिकी स्वीकरण में शीर्ष राज्य हैं। विश्लेषण से यह भी ज्ञात हुआ कि सिंचाई सुविधाऐं, प्रसार, सड़क से संयोजकता,

कृषि मजदूरी तथा औपचारिक ऋण की उपलब्धता कृषि प्रौद्योगिकी के स्वीकरण में महत्वपूर्ण भूमिका निभाते हैं। अतः अध्ययन ने कृषि प्रौद्योगिकी स्वीकरण को प्रोत्साहन देने के लिए मूलभूत संरचनाओं के विकास की संस्तुति की है।

- केन्द्र में कृत्रिम न्युरल नेटवर्क, मशीनी विद्या आधारित पद्धति तथा जैवप्रौद्योगिकी जैसे नवीनतम क्षेत्रों में भी कुछ अध्ययन किये गए। इन अध्ययनों से कृषि के क्षेत्र में इन आधुनिक तकनीकों के प्रयोग की अनन्वेषित संभावनाओं के बारे में पता चला है। कृत्रिम न्युरल नेटवर्क द्वारा पश्चिम बंगाल के गंगीय क्षेत्र से वाष्पिक उत्सर्जन की अधिकतम मात्रा का आकलन किया गया। इस अध्ययन के परिणामों से कृत्रिम न्युरल नेटवर्क अरेखीय रिग्रेसन पद्धति की अपेक्षा बेहतर साबित हुआ है। मशीनी विद्या आधारित पद्धति द्वारा आम की पाउडरी मिलडयु नामक बीमारी का पूर्वानुमान 85 प्रतिशत तक सही साबित हुआ। साथ ही साथ, यह पद्धति समझने में आसान एवं कार्यान्वित करने में ज्यादा सरल है।

- बैंगन पर किए गए एक अध्ययन से ज्ञात हुआ है कि उर्वरकों का अत्यधिक उपयोग, उच्च उत्पादकता वाले बीजों का प्रयोग, सिंचाई एवं कीट प्रबन्धन के परिणाम स्वरूप 1981–2008 की अवधि के दौरान बैंगन की उपज में महत्वपूर्ण सुधार हुआ।

- सूक्ष्म एवं द्वितीयक पोषक तत्वों के प्रभाव के आकलन से ज्ञात हुआ है कर्नाटक राज्य में उपयुक्त पोषक तत्वों की कमी को पूरा करने से उत्पादन एवं कृषि आय में बढ़ोतरी की काफी संभावनाएं हैं।

- बासमती धान की जैविक खेती के एक वृत्त अध्ययन से पता चला है कि पारंपरिक खेती के स्थान पर जैविक खेती अपनाने से सभी जोतों पर धान की उपज में कुछ कमी आ जाती है। तथापि उपज में आई यह कमी दूसरे वर्ष से घटने लगती है। पद्धति परिवर्तन की अवधि के दौरान यह कमी 10% तक पहुंच जाती है। जैविक पद्धति अपनाने से धान की उपज में होने वाली कमी बड़ी जोतों पर ज्यादा होती है। इसका कारण यह है कि छोटे तथा मझोले किसान बड़े किसानों की अपेक्षा खेती पर ज्यादा ध्यान देते हैं और उनका प्रबन्धन भी बेहतर होता है। पारंपरिक विधि से जैविक खेती के रूपान्तरण काल में उत्पादन की औसत परिवर्तनीय लागत ज्यादा होती है। पारंपरिक विधि के स्थान पर जैविक खेती अपनाना किसानों के लिए भारी साबित होता है तथा वित्तीय सहायता के बिना जैविक खेती अपना पाना काफी मुश्किल है। परिवर्तन काल के बाद जैविक खेती से मिलने वाले सकल तथा शुद्व लाभों में तीव्रता से बढ़ोतरी होती है तथा पारंपरिक खेती की तुलना में ये ज्यादा होते हैं क्योंकि कृषिजन्य व्यापारिक कम्पनियॉ जैविक धान को खुले बाजार मूल्य से 25 प्रतिशत अधिक कीमत पर खरीदती हैं।

- मत्स्य क्षेत्र के प्रभाव आकलन से पता चला है कि पिछले 55 वर्षों में इस क्षेत्र में हुई 800 प्रतिशत से अधिक की वृद्धि मुख्य रूप से विज्ञान एवं तकनीक के कारण हुई है। इस क्षेत्र की वृद्धि में अभी तक बाजार एक प्रभावी भूमिका नहीं निभा पाया है।

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- भूमि उपयोग गतिकी के एक अध्ययन से ज्ञात हुआ है कि राष्ट्रीय स्तर पर पारिस्थितिकी क्षेत्र की अवांछित भूमि का स्थानांतरण गैर–कृषि क्षेत्रों की ओर हुआ है। 1950 से 2000 तक के विभिन्न दशकों में आबादी में एक व्यक्ति की वृद्धि होने पर, गैर–कृषि उपयोग के लिए भूमि में औसतन 0.011 हेक्टेयर से 0.027 हक्टेयर की वृद्धि हुई।

- तमिलनाडु में धान की खेती पर किये गये एक अध्ययन से पता चला है कि सामान्य पद्धति की जगह एस. आर. आई. तकनीक के प्रयोग से 39% जल की बचत हुई। इस तकनीक का व्यापक उपयोग करने से जल की कमी से निजात पाई जा सकती है तथा साथ ही देश की खाद्य सुरक्षा सुनिश्चित करने में भी मदद मिल सकती है।

- जैव–ईंधनों पर किये गए एक अध्ययन से ज्ञात हुआ है कि भारत में जैव–इंधन क्षेत्र का विकास बहुत धीमा है तथा इथानॉल एवं जैव डीजल के मिश्रण का लक्ष्य 2017 तक तो संभव नहीं दिखता। अतः द्वितीय पीढ़ी के जैव–इंधनों के लिए प्रौद्योगिकियों के विकास संबंधी अनुसंधान पर जोर देना चाहिए। इस अध्ययन में यह सुझाव दिया गया है कि ईख–आधारित इथानॉल उत्पादन का मीठे ज्वार एवं चुकंदर से स्थानापन्न किया जाना चाहिये। मीठा ज्वार सीमांत एवं वर्षा–आधारित क्षेत्रों में गरीबों की एक सहायक फसल है। अतः सरकारी एवं निजी उद्यमियों को इस दिशा में अधिक कार्य करने की आवश्यकता है।

- संसाधनों के संरक्षण एवं विविधता वाली कृषि प्रणाली के द्वारा बेहतर आजीविका सुरक्षा प्राप्ति से संबंधित एक अध्ययन हरियाणा राज्य के मेवात जिले में किया गया। इस अध्ययन के अनुसार इस क्षेत्र की सामान्य समस्याएं हैं भूजल में ह्रास, पानी की अपर्याप्त आपूर्ति, अधिक उत्पादकता वाले बीजों की कमी, नकली कीटनाशक, फसलों में दीमक लगना, कृषि मजदूरों का अभाव एवं नील गायों द्वारा फसलों को नुकसान। अतः मेवात में किसानों की आवश्यकता के अनुरूप हस्तक्षेप की आवष्यकता है।

- मत्स्य के जैव अनुवंशिक संसाधनों के मूल्यांकन से संबंधित एक अध्ययन में जलीय अनुवंशिक संसाधनों के आर्थिक महत्व की पहचान की गई है। जलीय अनुवंशिक संसाधनों एवं उनके उपयोगों के मध्य के क्रियात्मक सम्बन्धों की बेहतर समझ हमें अपने देश में जैव–विविधता के संरक्षण का सही मूल्यांकन करने में सहायक होगी।

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- पिछले एक दशक में शहरी क्षेत्रों में गेहूँ उत्पादों के उपभोग में वृद्धि देखी गई है; यह वृद्धि विशेषकर दक्षिणी राज्यों में ज्यादा परिलक्षित हुई है। भारत में गेहूँ की कुल माँग वर्ष 2011–12 में 78.64 मिलियन

टन, वर्ष 2016–17 में 85.64 मिलियन टन तथा वर्ष 2021–22 तक 93.40 मिलियन टन आंकी गई है।

- भारत के विभिन्न क्षेत्रों में दुग्ध उत्पादन, विपणन एवं आपूर्ति प्रणाली में काफी विविधता पाई गई है। आधुनिक दुग्ध आपूर्ति प्रणाली पंजाब जैसे कृषि–विकसित राज्यों में काफी महत्वपूर्ण है जबकि बिहार में आज भी पारंपरिक आपूर्ति प्रणाली द्वारा ही दूध का विपणन होता है। भूमिहीन तथा छोटे दुग्ध उत्पादकों को दुग्ध व्यापार में शायद ही कोई कठिनाई आती हो। किसानों को आधुनिक दुग्ध विपणन प्रणाली से जुड़ने का निर्णय लेने में शिक्षा, दूध का मूल्य, दूध की जांच तथा गाँव में सहकारी दूध संकलन केन्द्रों की उपस्थिति महत्वपूर्ण सकारात्मक भूमिका निभाते हैं।

- भारत से श्रिम्प के निर्यात में 1995–96 से 2006–07 की अवधि में सकारात्मक वृद्धि हुई। शीतित समुद्र फेनी (frozen squid) तथा शीतित कटलफिश (cuttle fish) के निर्यात में मध्यम वृद्धि हुई जबकि मछली के सूखे एवं शीतित उत्पादों के निर्यात में वृद्धि दर दो अंकों में दर्ज की गई। मत्स्य विपणन अध्ययन से यह निष्कर्ष निकला है कि भारत में मत्स्य विपणन की एक समान विपणन प्रणाली निरूपित की जानी चाहिये जिसे आसानी से कियान्वित एवं नियमित किया जा सके।

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- संरचनात्मक परिवर्तन पर किये गये एक अध्ययन से यह पता चला है कि वर्ष 1970–71 की तुलना में वर्ष 2000–01 में छोटे भूमिधारकों की संख्या में 99% की बढ़ोतरी हो गई तथा छोटी जोतों के भूखंडों में 84% की वृद्धि हुई। इस प्रकार की वृद्धि से साधनों के उपयोग, उत्पादों के प्रकार तथा भारतीय खाद्य सुरक्षा पर असर पड़ेगा।

- वर्ष 2008–09 के दौरान संस्थागत कृषि ऋण वितरण में अनुसूचित व्यवसायिक बैंकों, सहकारी बैंकों एवं क्षेत्रीय ग्रामीण बैंकों की भागीदारी क्रमशः 73%, 17% तथा 10% थी। 1970 से 2008 की अवधि में संस्थागत कृषि ऋणों में वास्तविक मूल्यों के आधार पर पन्द्रह गुणा वृद्धि हुई है। तथापि, संस्थागत ऋणों का वितरण सभी कृषि निकायों में समानुपातिक नहीं हुआ। संस्थागत ऋण में बहुसंख्यक छोटे किसानों (82%) की भागेदारी सिर्फ 50 प्रतिशत थी। दूसरी ओर 18 प्रतिशत किसानों, जिनकी जोत 2 हेक्टेयर से अधिक है, ने कुल 49% संस्थागत ऋण हासिल किए। संस्थागत ऋण प्राप्त करने में किसानों की उम्र, लिंग, जोत का आकार, शिक्षा तथा व्यवसाय, महत्वपूर्ण कारक पाये गये हैं।

- 'ऋण माफी एवं ऋण राहत योजना' के तहत हरियाणा के चयनित क्षेत्रों में छोटे किसानों को औसतन 27000/– रूपये का लाभ हुआ है। ऋण माफी योजना से वितीय अनुशासन में आया ह्रास कर्ज अदायगी को गंभीर रूप से प्रभावित कर सकता है। किसानों के अनुसार संसाधनों के उपयोग में

प्रोत्साहन, बिजली की उपलब्धता, खेती से बाहर रोजगार की उपलब्धता एवं उत्पादों के अच्छे मूल्य ऋण चुकाने में मददगार साबित होंगें।

- मानसून के एक दीर्घकालिक अध्ययन से ज्ञात हुआ है कि भारत के सभी राज्यों में, उत्तर पूर्वी राज्यों को छोड़कर, प्रत्येक पाँच वर्षो में कम से कम एक बार सूखे की स्थिति अवश्य पैदा होती है। मानसून की बार–बार कमी के प्रभाव से निपटने के लिए एक बहु–आयामी रणनीति बनाने की आवश्यकता है। इस के तहत जलवायु के अनुरूप तथा सूखा–सह्य फसलों की नई किस्मों की खोज, रोजगार के अवसर बढ़ाने एवं मौसम के पूर्वानुमान के माडॅल की क्षमता बढ़ाने पर जोर दिया जाना चाहिए।

- इस केन्द्र में ऑकड़ा खनन पद्धति द्वारा एक ऐसे निर्णय–तरू का विकास किया गया है जो सूचना एवं संचार प्रौद्योगिकी की ज्ञाता महिला–किसानों के विशिष्ट गुणों की पहचान कर सकेगा। अध्ययन ने सूचना एवं संचार प्रौद्योगिकी की शक्ति द्वारा महिलाओं को सशक्त करने के लिए गावों में शिक्षा के स्तर में सुधार, आय के अवसरों में वृद्धि तथा उपयुक्त ग्रामीण प्रौद्योगिकीयों के विकास की संस्तुति की है।

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- कृषि उपलब्धियों एवं इससे संबंधित कारकों में पाई जाने वाली क्षेत्रीय असमानताओं के विषय में जानने के लिए इस केन्द्र ने जिला स्तर पर कृषि उत्पादकता (उद्यान फसलों सहित) का एक आकलन किया। इस अध्ययन के अन्तर्गत कृषि–आर्थिकी लक्षणों जैसे वर्षा, सिंचाई, उर्वरक–उपयोग, निर्धनता स्तर, आदि से संबंधित सूचनाओं को जिला स्तर पर एक ही जगह संकलित किया गया है। जिला–आधारित आकड़ों से ज्ञात हुआ है कि भूमि उत्पादकता में एक प्रतिशत की वृद्धि होने से गरीबी में 0.65 प्रतिशत की कमी हो जाती हैं। इसके अतिरिक्त, कृषि श्रम–शक्ति में एक प्रतिशत की कमी से ग्रामीण निर्धनता में 0.57 प्रतिशत की कमी होती है। अतः इस अध्ययन के अनुसार कृषि भूमि पर दबाव कम करने के लिए श्रम–शक्ति को गैर–कृषि क्षेत्रों की ओर अग्रसित करना चाहिए।

- 2006–09 की अवधि के दौरान खाद्य–पदार्थों के मूल्यों में बढ़ोतरी अखाद्य–पदार्थों की अपेक्षा 80 प्रतिशत अधिक हुई। इसका मुख्य कारण खाद्य–पदार्थों के उत्पादन में गिरावट था। खाद्य–पदार्थों की उत्पादन वृद्धि में उनकी उत्पादकता पर निर्भरता बढ़ने की वजह से औसत उत्पादन लागत बढ़ जाती है। इसका अर्थ यह हुआ कि खाद्य–पदार्थों के उत्पादन में वृद्धि, खाद्य–पदार्थों के मूल्यों में वृद्धि से प्रेरित होती है। खाद्य–पदार्थों के बढ़ते मूल्यों को कम रखने के लिए हमें खाद्य–पदार्थों के उत्पादन बढ़ाने वाली बेहतर प्रौद्योगिकियों के विकास एवं प्रचार–प्रसार करने के लिए मजबूत कदम उठाने होंगें।

- खाद्य सुरक्षा को गेहूँ के द्वारा सुनिश्चित करने की चुनौतियों के विश्लेषण से ज्ञात हुआ है कि 1986 के बाद प्रति व्यक्ति गेहूँ उपलब्धता में कमी का कारण गेहूँ उत्पादकता–वृद्धि में ह्रास तथा इसके उत्पादन

क्षेत्रों में कमी है। अध्ययन इस निष्कर्ष पर पहुँचा है कि यदि गेहूँ उत्पादन में वृद्धि दर 50 प्रतिशत नहीं बढ़ती तो गेहूँ की मांग एवं आपूर्ति में गंभीर असंतुलन का सामना करना पड़ेगा। गेहूँ उत्पादन वृद्धि में प्रमुख चुनौतियाँ हैं: वैश्विक उष्णता, बीमारियों एवं नाशककीटों का आतंक, सापेक्ष उत्पादकता एवं लाभदायिकता में कमी, तथा भूमि एवं जल, आदि प्राकृतिक संसाधनों पर अधिक दबाव, आदि। इन चुनौतियों का सामना करने के लिए समुचित प्रौद्योगिकियों की खोज एवं एक सुदृढ़ अनुसंधान एवं विकास कार्यक्रम के सहयोग की आवश्यकता है।

- ग्रामीण एवं शहरी क्षेत्रों के पारस्परिक सम्पर्क से संबंधित एक अध्ययन के अनुसार शहरी क्षेत्रों की उपभोगता में 10% की वृद्धि से कृषि आय में 4.6% तथा ग्रामीण गैर–कृषि रोजगार में 4.9% की वृद्धि होती है। इसके अतिरिक्त ग्रामीण गैर–कृषि रोजगार में 10% की वृद्धि से खेतिहर मजदूरों की आय में 8.3% की वृद्धि हो जाती है। अतः शहरी क्षेत्रों में वृद्धि का ग्रामीण कृषि एवं ग्रामीण गैर–कृषि क्षेत्रों पर प्रभाव तथा गैर–कृषि क्षेत्रों का कृषि क्षेत्रों पर प्रभाव के अध्ययन की आवश्यकता है।

केन्द्र की वेबसाइट (http://www.ncap.res.in) का नियमित तौर पर अद्यतन किया जाता है। केन्द्र के सभी नये प्रकाशन पी. डी. एफ. प्रारूप में उपलब्ध हैं तथा इन्हें डाउनलोड किया जा सकता है। उपलब्ध आँकड़ों के अनुसार केन्द्र द्वारा प्रकाशित नीति सार (Policy Brief), कार्यशाला वृत्ति (Workshop Proceedings), तथा नीति पत्र (Policy Paper) सर्वाधिक अवलोकित किये गए।

केन्द्र द्वारा स्थापित 'कृषि शोध एवं सूचना प्रणाली', केन्द्र के अधिकारियों एवं कर्मचारियों को ई–मेल तथा इन्टरनेट सुविधाएं उपलब्ध कराती है। इन सेवाओं को मजबूत करने के लिए केन्द्र की उपलब्ध लीज लाईन की क्षमता को बढ़ाकर 2 मेगा बाईट प्रति सेकंड कर दिया गया है। केन्द्र का अपना ई–मेल सर्वर है जिसकी क्षमता का भरपूर उपयोग किया जा रहा है।

अपने शोध अध्ययनों के परिणामों के प्रसार हेतु इस वर्ष केन्द्र द्वारा दो नीति सार, एक नीति पत्र, एक पुस्तक, 32 शोध पत्र तथा 31 लेख पुस्तकों में प्रकाशित किए गए। केन्द्र के वैज्ञानिकों ने अनेक व्यावसायिक तथा नीति संबंधी कार्यक्रमों तथा अनेक परियोजनाओं में भाग लिया। इस वर्ष केन्द्र ने एक 'शीतकालीन पाठशाला' का आयोजन भी किया। इसके अतिरिक्त केन्द्र ने कई प्रशिक्षण कार्यक्रमों तथा अनेक संगोष्ठियों का आयोजन किया। इन सभी प्रयासों से केन्द्र के प्रभाव, ख्याति एवं विश्वसनीयता में व्यापक वृद्धि हुई है।

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