ANNUAL REPORT
2007-08

भाकृअनुप
ICAR

National Centre for Agricultural Economics and Policy Research

राष्ट्रीय कृषि आर्थिकी एवम् नीति अनुसंधान केन्द्र

Annual Report
2007-08

jk"Vªh; Ñf"k vkfFkZdh ,oe~ uhfr vuqla/ku DsQUnz

National Centre for Agricultural Economics and Policy Research

New Delhi

NCAP Annual Report 2007-08

Published
August 2008

Published by
Dr P.K. Joshi
Director
NCAP, New Delhi

Designed & Printed at
Chandu Press
D-97, Shakarpur, Delhi - 92
Ph: 22526936, 22424396
e-mail: chandupress@gmail.com

Cover page designed at
Task Digital, New Delhi

CONTENTS

PREFACE

Indian agriculture is transforming towards commercialization, diversifying in favour of high-value commodities and integrating with the global markets, yet finds itself at the crossroads. The current scenario starkly shows that Indian agriculture is in the midst of unprecedented challenges and unparallel opportunities. The National Centre for Agricultural Economics and Policy Research (NCAP) provides policy and institutional responses to overcome the challenges and harness the opportunities. The Centre has a well trained and strong faculty and best infrastructural facilities to undertake quality research and interact with its stakeholders.

The year 2007-08 was very productive for NCAP in terms of research and policy communication. The significant achievements in research were well applauded by the stakeholders. The scientists of the Centre were awarded for their excellence in scientific contributions, and also invited to many high-level national and international committees. The year also attracted national and international agencies to support research and seek advice from the Centre. Important projects awarded to the Centre include (i) agricultural risk assessment and insurance products by the World Bank aided National Agricultural Innovation Project; (ii) developing domestic fish markets in India by the National Fisheries Development Board; and (iii) review of the buffer stock policy by the Ministry of Food & Consumer Affairs, Government of India. The scientists of the Centre were also involved in providing consultancy to several international agencies such as the Food and Agriculture Organization of the United Nations, the World Bank, and the South Asia Association of Regional Cooperation (SAARC). The Centre organized a number of policy communication activities during the year. Most of these were aimed at providing suitable response to the prevailing agrarian distress.

During the year, important studies conducted at NCAP were related to public-private partnership in agricultural research; adoption patterns of improved agricultural technologies; risk and instability in agriculture; total factor productivity in livestock sector; access to information and credit systems; agricultural commodity prices and outlook; institutional innovations in agri-marketing (especially horticultural commodities) and credit; agricultural insurance; demand projections for agricultural commodities; trade in agricultural commodities; farmers' income diversification; poverty alleviation programmes and sources of income inequity; and diversification in agriculture. There was a special programme for North-East India, which addressed sources of agricultural growth; watershed programmes; and constraints and opportunities in livestock and poultry in the region.

In accomplishing its targets, the Centre received overwhelming support from the ICAR. We are especially grateful to Dr Mangala Rai, Director-General, Indian Council of Agricultural Research, and Secretary, Department of Agricultural Research and Education, Government of India, for extending his continuous encouragement and guidance to make the Centre more vibrant and responsive. Dr K M Bujarbaruah, Deputy Director-General (Animal Sciences) provided exceptional support, guidance and motivation in strengthening the Centre's activities and programmes. We offer our sincere thanks to him for his persistent support. We are grateful to Dr J P Mishra, Assistant Director-General (Economics, Statistics and Marketing) for extending sustained support and advice in shaping the Centre's activities.

My colleagues, Dr Sant Kumar took the responsibility of compiling, editing and bringing out the report in the present form; Dr Suresh Pal and Dr K K Datta supervised and provided valuable suggestions in finalizing this report; and Mr. Ajay Tanwar patiently processed and formatted the manuscript. I sincerely acknowledge their incredible contributions in bringing out this report. I also acknowledge the outstanding contributions and team efforts of all the staff of NCAP for their overwhelming support in fulfilling the Centre's mandate.

I am sure that the research outputs and contributions of the Centre will be useful to our partners and stakeholders. We always look forward for their valuable support and suggestions in accomplishing our mission.

P.K. Joshi
Director

31 July 2008
New Delhi

LIST OF ACRONYMS AND ABBREVIATIONS

AgGDP	Agricultural Gross Domestic Product
AERA	Agricultural Economics Research Association (India)
ARIS	Agricultural Research Information System
CCEs	Crop Cutting Experiments
CGIAR	Consultative Group on International Agricultural Research
CIMMYT	Centro Internacional de Mejoramiento de Maiz Y Frigo
CSIR	Council of Scientific and Industrial Research
DBT	Department of Biotechnology
DST	Department of Science and Technology
ERNET	Education and Research Network
FTEs	Full Time Equivalents
IARI	Indian Agricultural Research Institute
IASRI	Indian Agricultural Statistics Research Institute
ICAR	Indian Council of Agricultural Research
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IP	Intellectual Property
IPRs	Intellectual Property Rights
IRC	Institute Research Council
IRRI	International Rice Research Institute
KCCs	Kisan Credit Cards
KVKs	Krishi Vigyan Kendras
LAN	Local Area Network
MC	Management Committee
MSP	Minimum Support Price
NAARM	National Academy of Agricultural Research Management
NAAS	National Academy of Agricultural Sciences
NAIS	National Agricultural Insurance Scheme
NARS	National Agricultural Research System

NASC	National Agricultural Science Centre
NER	North-Eastern Region
NGOs	Non-Governmental Organizations
NIC	National Informatics Centre
NRCWA	National Research Centre for Women in Agriculture
NSA	Net Sown Area
NSSO	National Sample Survey Organization
O&M	Organization and Management
OMSS	Open Market Sale Scheme
OPV	Open Pollinated Variety
PME	Prioritization, Monitoring and Evaluation
PP	Procurement Price
PRAN	Policy Research and Advocacy Network
PRIs	Panchyati Raj Institutions
PPV & FRs	Protection of Plant Variety and Farmers Rights
RAC	Research Advisory Committee
RMS	Rabi Marketing Season
RRBs	Regional Rural Banks
SHGs	Self-Help Groups
SPS	Sanitary and Phyto-sanitary
SPSS	Staistical Package for Social Sciences
SRI	System of Rice Intensification
TBT	Technical Barriers to Trade
TE	Triennium Ending
TFP	Total Factor Productivity
TRIP	Trade Related Intellectual Property
WST	Water Saving Technology
WTO	World Trade Organization

LIST OF TABLES AND FIGURES

Executive Summary

The National Centre for Agricultural Economics and Policy Research (NCAP) continued its efforts towards achieving excellence in agricultural economics and policy research in the country. The research studies of the Centre have enormously helped the Council in participating in agricultural policy debates and decisions more vigorously. The Centre had 20 scientists (including one ICAR National Professor and one National Fellow) and 15 other staff in the year 2007-08. The total expenditure of the Centre during 2007-08 (April-March) was Rs 445.95 lakh.

A high-powered Research Advisory Committee guides the Centre on its research programmes, and a Management Committee administers the functioning of the Centre. Besides, a number of internal committees like budget committee, store purchase committee, etc. facilitate the decentralized management of the Centre.

Research studies of topical in 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 a support of 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 2007-08, the Centre has conducted 40 research studies. Five consultancy projects have also been completed by the Centre during the year. The Centre has not only maintained but also increased the linkages and collaborations with many institutions in India and abroad. The Centre organized quite a good number of workshops, seminars, brainstorming sessions, and policy advocacy programmes. The main research achievements and a glimpse of activities undertaken during 2007-08 are reported below:

Slow growth in agriculture during the past few years has led to a crisis in Indian agriculture. Accelerating the growth in agriculture is a major challenge before researchers and policymakers. The Centre has conducted several studies to analyze the growth performance, instability and risks in agriculture.

- Analysis of growth in agriculture has revealed that agricultural growth performance was satisfactory before 1995-96, but slowed down afterwards. This has been due to slowdown in the growth of fertilizer-use, irrigation, cropping intensity, diversification towards high-value crops, and terms of trade after 1995-96. The study has suggested that stepping up of public investment in agricultural R&D, development of irrigation facilities, evolving appropriate institutional mechanism, promoting fertilizer-use, increasing power-supply to agriculture, establishing competitive markets for inputs and output and developing measures to mitigate risk in farming are the important steps to overcome the crisis in Indian agriculture.

- In a study on instability in Indian agriculture, it was concluded that Indian agriculture has developed resilience to absorb shocks due to agro-climatic and other factors. Another study on risk assessment in India has shown mixed results with respect to yield risk of different crops for the period 1981-2004. Adoption of measures like increasing irrigation facilities, promoting soil conservation measures, and

evolving new varieties have been suggested to minimize yield risks. Results at the disaggregated level in Andhra Pradesh have shown that risks in production and gross returns had reduced for rice, but increased for groundnut. The study has suggested that region-and crop-specific insurance mechanisms should be devised to address yield risks.

Meeting food demand of burgeoning population has been at the centre stage of agricultural development. Imbalances in the demand-supply in foodgrains during the past few years have sparked the prices of staple foods in India and across the globe. The Centre has undertaken some studies on this important issue.

- Domestic demand for cereals has been projected to be 219 Mt by the year 2012 and 261 Mt by the year 2020. The demand for pulses by these years would be 16 Mt and 19 Mt, respectively. Thus, the overall foodgrain demand has been projected as 235 Mt by the year 2012 and 280 Mt by 2020.

- During the past two years (2005-06 and 2006-07), demand-supply imbalance in wheat has created challenges for both policymakers and researchers. There has been a considerable increase in the prices of wheat during this period. This has been due to decline in production and poor procurement by the government. To raise production and procurement of wheat, the government had adopted a price policy support which yielded desired results. To increase domestic production of wheat, rapid dissemination of improved technologies would play a significant role.

- The shortage of wheat and its increasing prices have become a major concern not only in India but world over also. A study has shown that in controlling the prices of wheat in the country, the stock of foodgrains with the government makes a very significant impact. The behaviour of open foodgrain market can be largely checked by heavy stock inventory, besides some other factors. The study has suggested that two million tonnes of additional buffer stock of wheat would enable the government to intervene in the open market in case the private traders try to tighten the supply with the intention of raising prices and also to meet the PDS commitments.

Research and development (R&D) has potential to provide long-term solutions to the problems of agriculture sector. Several R&D related issues like research resource allocation, public-private partnerships, role of R&D in managing agrarian crisis, agricultural biotechnology, and investment in fishery research have been studied by the Centre during the year under report.

- Public-private partnership has become an integral part of the agricultural development process. The policy dialogue initiated by ICAR and decisions arrived at during the past few years are path-breaking in several ways. The technologies developed through public-private partnerships that include hybrid rice, zero-tillage, IPM, etc. are beneficial in many ways. To encourage this partnership further, ICAR provides funding support under its externally-aided programmes. The study has pointed out that many national R&D companies may not be able to compete with multinationals under the new IPR regime and would need the support of public system for R&D, even on benefit-cost sharing basis.

- ICAR in partnership with SAUs has developed numerous improved technologies for various farm operations. These technologies make farm operations easy, save natural resources, reduce crop losses, improve shelf-life of farm products and increase food production. A review of such studies has shown that available stock of technologies has enormous potential to accelerate the pace of agricultural

growth and farm income. The only need is to establish an appropriate support mechanism for exploiting the huge untapped potential.

- Government of India has invested huge resources to harness the potential of biotechnology. The emphasis in crop biotechnology is on tissue culture, tolerance to biotic (insects and diseases) and abiotic (moisture, salinity) stresses and improving quality and shelf-life of agri-food products. The presence of private biotech research is limited. Measures to attract private investment in biotechnological research have been suggested.

- Sustained growth in fisheries production is a testimony to the impact of research resource allocations to this sector. A study has revealed that allocation of resources to fisheries development has increased more than 400-fold from I to X Five-Year Plan, which demonstrates the increasing priority attention of the government to this sector. To sustain growth of the sector, development of technology, infrastructure and marketing arrangements are critical. Investments on infrastructural development like construction of mini harbours, landing centres, trawlers and mechanized vessels, supply of nets, etc. are expected to increase the catch and farm income further.

Intensive cultivation practices in agriculture have posed severe stress on agricultural resources, resulting in degradation of soil and water quality and rapid consumption of finite resources. The availability of resources is becoming a major constraint to agricultural development. Therefore, management of natural resources has become very crucial. The Centre has undertaken some studies on optimization of resource-use efficiency in agriculture.

- A study on 'System of Rice Intensification' (SRI) in the peninsular India has found it to be more advantageous over the traditional rice cultivation. The practice has potential to provide a higher rice yield (2-3-times of country's average of 2 t/ha) and conserve water (20-40% of the normal practice), besides providing savings in seeds and fertilizers. This innovative practice can be really effective to increase rice production if supportive policy interventions are evolved.

- Water being the most critical input in agriculture, a number of water-saving technologies (WSTs) are being developed. It has been found that WSTs are mainly used for horticultural crops. The empirical evidence on micro-irrigations is skewed towards drip system, because of its large application in horticultural crops. The study has suggested that for deciding priorities and provision of subsidies on WSTs, economic returns from investment and their use in crops should be estimated. To popularize the use of WSTs, awareness among users should be generated on a wider scale.

- Rainfed agriculture has a high potential in meeting the rising demand for food, provided a workable strategy is developed. On the technology front, modern technology requiring low external inputs along with soil-water management practices have been observed to be critical. Effective coordination of institutions providing services is equally important. Long-term investment in infrastructural development is also needed. Such an orientation is expected to transform rainfed agriculture from a subsistence to sustainable commercial venture and would provide food and income security to farmers relying on rainfed areas for their livelihood.

- The issue of climate change and its potential impact on agriculture is being widely debated globally. The copping strategies based on limited sets of variables (especially temperature and moisture) have been found less effective in dynamic setting. There is a need to integrate socio-economic variables with bio-physical model for better results. Location-specific appropriate technologies might help adaption to the changing climatic condition. To reduce risks related to climate change, it is necessary to formulate appropriate credit and insurance policies suiting to different ecosystems.

Considering the importance of emerging institutions in Indian agriculture, which is dominated by smallholders, the Centre has conducted studies on institutional arrangements like contract farming, crop insurance, access to information, seed system, credit delivery, etc.

- Contract farming is expected to improve the socio-economic conditions of a majority of smallholders. Its success depends on its capability to improve farm profitability and reduce cost on marketing and transportation. Considering non-farm factors, like regulation in offtake of produce, provision of inputs, services, and payments would foster a strong relationship between firm and farmers. A long-term commitment and mutual trust between these partners are essential for the success and sustainability of contract farming.

- Access to information by farmers is one of the key issues in agricultural development. A study on sources of information and its flow to farmers, particularly about improved farm technologies has revealed that access to information sources increases with increase in farm-size. This variation is more pronounced for the sources like extension workers, TV and primary cooperative society. For smallholders, progressive farmers and input dealers have been found the major sources of information for improved technologies.

- Credit is one of the critical inputs and an effective means of rural development. A study at the Centre has identified the determinants of the choice of a credit outlet. It has been found that maturity in age, family-size, education level and land-size influence the borrowers' tendency to go in for institutional sources of credit. There has been less probability of the weaker sections in getting institutional credit. The self-employed persons have preference for institutional credit, while labourers chose non-institutional sources.

- A study on the seed systems being followed in the states of Andhra Pradesh, Haryana, Himachal Pradesh and Uttar Pradesh has revealed that almost all farmers procure seeds of high-value crops like cotton, tomato and peas from commercial sources, i.e. private seed dealers, seed corporations or governmental stores. During 2003-04 and 2004-05, about 60 per cent of the seeds in the case of paddy, and 40 per cent in the case of groundnut were procured from commercial sources. It is a positive sign as better quality of seeds would improve crop productivity and raise farm income.

- The public sector plays a major role in the supply of seeds, particularly of open-pollinated varieties (OPV) grown in unfavourable environments. It is particularly important in the case of 'orphan' crops (e.g., groundnut and potato) with low seed-multiplication rate and high seed requirement. Private seed companies can play a significant role in augmenting the supply of OPV seeds. The government has enacted almost all legislations to comply with the provisions of the TRIPS agreement of WTO. But, the new IPR regime may increase the transaction cost for accessing the plant genetic resources, which will have implications on plant breeding efforts.

Indian agriculture still has enormous potential to grow across sectors and regions. Past sources of growth are plateauing, therefore new sources need to be identified. A few studies have been undertaken at the Centre on exploring the sources of growth in agriculture.

- Livestock is an integral and complementary sector of Indian agriculture. A study on total factor productivity (TFP) in the livestock sector has revealed that it had grown at an annual rate of 2.3 per cent during the period 1971-2004. This growth in TFP has accelerated overtime, from 1.5 per cent during 1971-81 to 2.6 per cent during 1981-91 and further to 2.9 per cent during 1991-2004.

- Rising global demand for livestock products has offered an opportunity to India to increase livestock export, especially of bovine meat, whose domestic demand is low. A study on identification of determinants of export in livestock products has revealed that ratio of domestic production to consumption plays a significant role in increasing export of bovine meat, poultry, livestock and mutton. It has been found that devaluation of currency during 1990s and its management during post-liberalization period played an important role in the export of livestock products. The removal of quantitative restrictions also played a significant and positive role in its export of eggs, bovine meat and muttons.

- Indian agriculture is overwhelmingly dominated by smallholders. A study on the role of smallholders in diversifying towards high-value crops has evinced that gradual diversification is pro-smallholder, as they contribute largely to the cultivation of vegetables and lesser extent to fruits. It is because of availability of enough family labour with them. Although, fruit cultivation is also labour-intensive (as compared to cultivation of staples), it is highly capital-intensive, making it a less attractive for smallholders who tend to have low-capital endowments.

- The horticulture sector is constrained by poor marketing arrangements and lack of infrastructure. Recent studies have reported that farmers get less than one-third of the price paid by consumers. During the survey in Hyderabad, features of both public owned (Rythu Bazar) and private innovative marketing institutions (by corporate sector) were studied. Data has shown that innovative models for marketing of fruits and vegetables are more efficient than public-owned markets due to lower marketing cost.

- With tremendous growth in fisheries, the sector is being referred to as the sunrise sector in India. A study has reported that during the period 1981-06, the growth in fisheries output has been 4.6 per cent, though largely due to growth in inland fisheries. In the coming decades, aquaculture would be a major contributor to fish production, as fish farmers are expanding water-bodies area and following improved practices. However, there are several challenges in fish production that need attention.

- The emerging problems like reduction in fishing days, decline in income and employment opportunities, rising food prices, etc. are the threats to livelihood of people living in the coastal areas. A study conducted by the Centre has suggested adaptation strategies and coping mechanisms to improve livelihood of people in the coastal areas. It has been found that integration of local conditions with emerging challenges is necessary for it.

- A study on economics of rice production has revealed considerable increase in the use of inputs like fertilizers, machinery, and irrigation in the states of Andhra Pradesh, Haryana, Madhya Pradesh, Punjab, Uttar Pradesh and West Bengal during 1983-84 to 2004-05. Striking differences are seen in fertilizer-use for rice production in different states. The study has observed that in spite of increase in fertilizer application, there still exists considerable scope to enhance application of fertilizer and machinery for higher yields.

- A study on medicinal and aromatic plants in the state of Uttarakhand has shown that economic returns are significantly higher from these than commercial crops like sugarcane. However, there are constraints like inadequate processing, price risks and lack of plant material for large-scale adoption. The study has observed that farmers' access to technical know-how and institutional credit on priority basis could promote establishment of processing units in the rural areas. Also, efforts towards strengthening of the market information system and management of price risks will go a long way in promoting the cultivation of medicinal and aromatic plants in Uttarakhand.

- The study on potential of different sources of farmers' income has revealed that farm households derive a significant proportion of their income from non-agricultural sources, as against the common perception that agriculture is the main source of income to farmers. In the year 2003, the wages and non-farm business activities had accounted for about 20 per cent and 24 per cent of the total income, respectively. Though, these sources are quite important for raising income of small and marginal farmers, there is high inequality in their distribution across farm households, because of their limited access. Only 14 per cent households have reported about earnings from non-farm business and 46 per cent from wage labour. The study has suggested that for raising farmers' income, it is essential to accelerate the pace of diversification of rural economy towards non-farm activities, empowering farm households in overcoming barriers to their entry into non-farm sector.

- The analysis of income diversification at the disaggregated level and its implication on income inequality help in policy decisions. To identify the factors determining income inequality, a study has been conducted in the four eastern states, viz. Bihar, Jharkhand, Orissa and West Bengal of India. Among the determinants having positive correlation with total income (both farm and non-farm) are holding-size, age and education of household-head, value of productive assets and livestock, access to market and credit. Sex of household-head, access to road and farm income (crop and livestock) have not shown a significant influence on the level of income. In the case of non-farm income, factors like household-size, age, education and sex of household-head, landholding-size, and access to road have depicted a significant influence on it. The holding-size has depicted an inverse relationship with non-farm income, the larger the holding size, the smaller is the non-farm income.

- Estimation of the share of household factors in income inequality in eastern India (mainly the states of Bihar, Jharkhand, Orissa and West Bengal), has revealed that education of household-head is the most important factor (having weightage of 8.31%), followed by the value of productive assets (5.04%), landholding-size (3.7%), age of household-head (3.07%), access to market (1.39%) and value of livestock (1.33%). In the case of farm income, landholding-size has been found as the most important variable, followed by value of livestock, age and education of household-head and access to credit. In the non-farm income category also, education and age of household-head have

been recorded as the important variables influencing income inequality. The study has highlighted that to have income equalizing effect of different source of farmers' income, limiting factors need to be addressed.

- Food safety issues are a major concern in the export of food commodities from India to the developed countries. Increasing number of non-tariff measures (mainly SPS and TBTs) is adversely affecting the country's food export. During 2006-07 (April-March), the refusal of consignments of Indian food products by USA and Japan accounted for 54 per cent and 97 per cent, respectively, of its total export. The major reasons for refusal of Indian consignments have been found as microbial contamination, filthiness, insanitary conditions, unsafe additives, etc. Thus, a majority of rejections are attributed to the lack of observance of basic hygiene and existence of microbial contamination. The study has suggested adhering to the SPS standards to export livestock and realize a higher return per unit value.

- The specifically-designed poverty alleviation programmes for generating both self-employment and wage-employment in the rural areas has shown positive results. These programmes are broadly grouped into (i) increasing farm and labour productivity and income, (ii) transferring cash/ foodgrains to poor, and (iii) reducing cost and prices through subsidies. The study has suggested that country has to give more emphasis on a multi-dimensional approach involving improvement in farm productivity, employment guarantee, development of women and children, health care, infrastructure development, sanitation, insurance, etc. for reducing poverty in the country. Analysis has shown that while planning the poverty alleviation programmes, the emphasis has to be given more on social sector than simply addressing on income poverty. Thus, a well-balanced strategy, taking lessons from the past, could result in placing the country on a sustainable growth path.

The Centre has given special attention towards the problems and prospects in the North- Eastern Region (NER) of India, along with tapping of opportunities for the benefits of farmers in the region.

- A study on crop diversification towards high-value crops has revealed high prospects in growing fruits, vegetables, oilseeds, floriculture, etc. In another study on identification of factors influencing income and employment from livestock in the NER has shown that availability of labour, occupation of households, and farm-size have made positive and significant impact on livestock-rearing, indicating existence of a strong crop-livestock interaction. Availability of irrigation facilities and institutional credit also influence livestock-rearing in the area.

- In NER, farmers practise mixed-cropping, which can be integrated with water harvesting technologies for saving runoff water. For growing crops, lower terraces are more useful for rice, whereas maize and sesamum could be grown in the upper terraces. Similarly, the available terraces (about 35-40% of the total land area) can be effectively utilized for raising perennial fodder/grasses and legumes, which would help in checking soil erosion and provide fodder for livestock. There is a need to put in place the innovative institutional arrangements for marketing of products.

- The threat of avian flu has received significant attention all over the world. In a study at the Centre, economic loss from avian flu, the most infectious disease of the poultry sector, has been assessed, after its outbreak in the Manipur state in July 2007. The total loss to producers

has been estimated to be of Rs 316 lakh, whereas farmers have received only Rs 99 lakh (about 31%) as compensation. Due to incidence of avian flu, increase in the prices of pork and fish has been registered as 35 per cent and 85 per cent, respectively in Manipur. The study has observed that the poor compensation would (a) affect the livelihood and sustenance of poultry farmers and their families, and (b) lead to poor compliance in culling and disinfection operations and hence, lack of eradication of disease outbreak that would have more serious implications.

- The Centre is handling a mega project on Visioning, Policy Analyssis and Gender (VPAGe) funded under the National Agricultural Innovation Project. Four workshops have been organized during the year under the project, including project launcing workshop.

The NCAP website available at http://www.ncap.res.in has been redesigned and regularly updated. The NCAP publications are now available in the PDF format and can be downloaded. Data revealed that policy briefs, workshop proceedings and policy papers were the most referred publications during the year. The website for Networking of Social Scientists, http://www.agrieconet.nic.in, is facilitating research, resource-sharing and optimization of response time for addressing methodology-related problems.

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

As a part of the dissemination of research output, the Centre and its staff has published one book, twenty-four journal articles, twenty-six book chapters, and seven discussion papers during the current year. The Centre's staff has been involved in a number of professional and policy interactions and projects. It organized ten workshops and several meetings at NCAP and outside. It also collaborated with a number of national and international research organizations. 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), established in 1991 by the Indian Council of Agricultural Research (ICAR), is committed to strengthen agricultural economics and policy research in the country, and provide appropriate policy options for science-led agricultural growth. The Centre continued its efforts towards achieving excellence in agricultural economics and policy research in the country. The Centre continued to manage with a small team of 20 scientists (including one ICAR National Professor and one National Fellow) and 15 other staff members in 2007-08. The actual expenditure of the Centre during 2007-08 was Rs 445.95 lakh.

Location

The Centre is located in the Pusa campus in New Delhi. It has in its close vicinity several institutions 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) centres and offices of many professional societies. Thus, the Centre 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. and
   (iv) Agricultural growth and modelling with focus on the role of technology.

(2) To strengthen capacity in agricultural economics and policy research in the National Agricultural Research System, 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 broadly covered under the following five major theme areas:

- Technology Policy
- Sustainable Agricultural Systems
- Markets and Trade
- Institutional Change
- Agricultural Growth and Modelling

The significant study areas of the Centre include: research investments, research resource allocations, 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, food policy, food systems, viz. livestock, fishery, and horticulture.

As a part of policy advocacy, the Centre organizes interaction workshops where issues of major policy interests in agriculture are discussed by policymakers, researchers, academicians, etc. The Centre also organizes lectures of distinguished scholars and policymakers for an in-depth understanding of global developments and policy changes in agricultural and allied sectors. Human resource development and capacity building in the frontier areas of research in agricultural economics are priorities of the Centre.

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

Management

A high-powered Research Advisory Committee (RAC) comprising eminent professionals, mostly from outside the ICAR system, guides the Centre on its research policies. Prof. Y.K. Alagh, the former Minister of State for Power and Science and Technology, Government of India, was the first Chairman of its RAC. Dr P.V. Shenoi, former Special Secretary, Department of Agriculture and Cooperation, Government of India, is the Chairman of present RAC, 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, Publications Committee, Consultancy Processing Cell, IPR Cell, Grievance Cell, and Women Cell are operating at the Centre for decentralization of management. The Joint Staff Council of the Centre promotes healthy interaction and congenial work environment.

Infrastructural Facilities

NCAP Website

The NCAP website (http://www.ncap.res.in) provides latest information about activities of the Centre, particularly about its staff, infrastructure, research projects, publications and linkages. The Centre's website is hosted through Education and Research Network (ERNET), New Delhi, and is updated on a regular basis. All NCAP publications like Policy Papers, Policy Briefs, PME Notes, Workshop Proceedings, etc. have been uploaded on the website and are available in the form of PDF files.

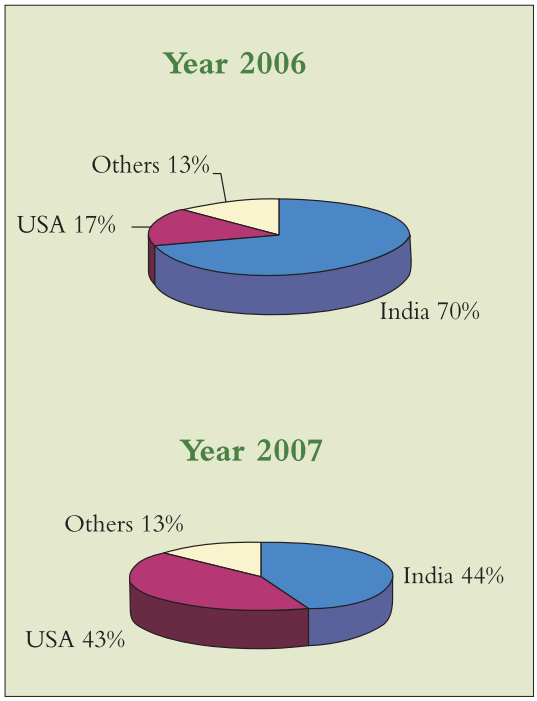


Figure 1: Visitors to NCAP website from different countries: 2006 and 2007

During the year, access to NCAP website increased significantly. Data revealed that the visitors from India and USA increased considerably during 2007 than during 2006 (Figure 1). About 87 per cent of the visitors who accessed NCAP website were from India (44%) and USA (43%). Centre's website was also accessed in Australia (2.45%), United Kingdom (1.19%) and other countries (9.01%). Overall, the website was accessed by users of 144 countries.

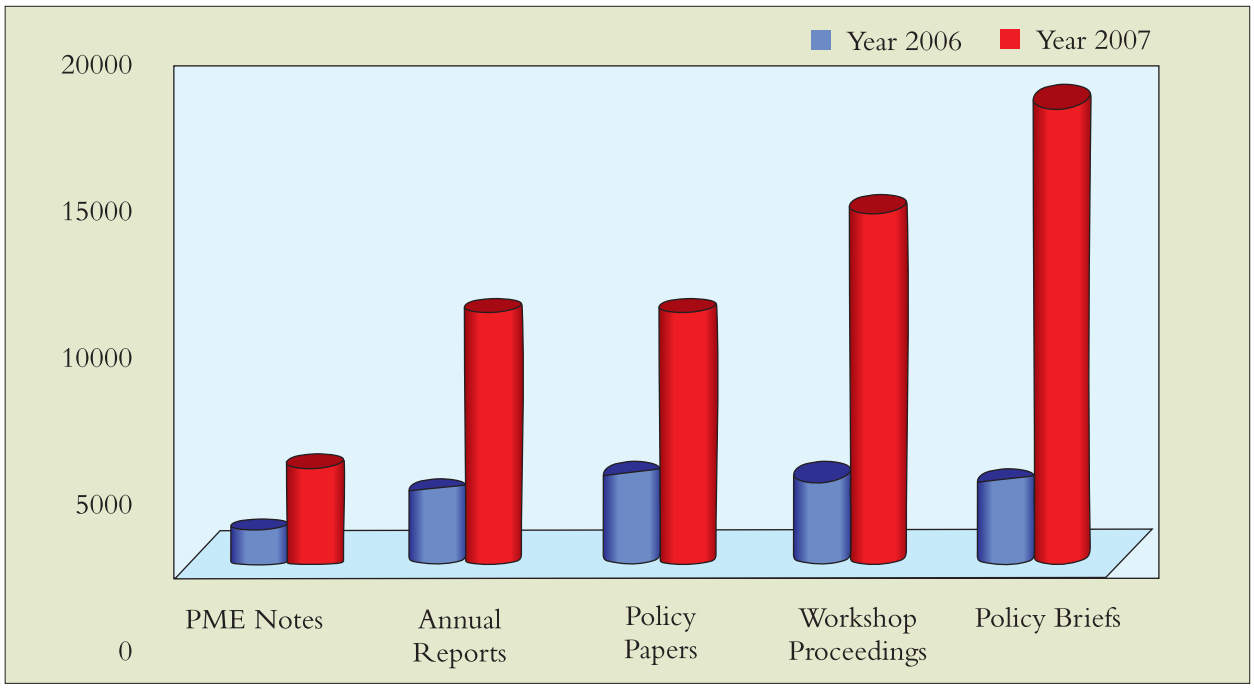


Figure 2: Access to NCAP publications: 2006 and 2007

Access to NCAP publications increased significantly during 2007 as compared to 2006 (Figure 2). Among the publications, workshop proceedings, policy papers and policy briefs were most referred. These observations reveal a wider acceptance and visibility of the Centre not only in India but across the world also.

Website for Networking of Social Scientists

The website for networking of social scientists (http://www.agrieconet.nic.in) facilitates information exchange, resource sharing and response-time optimization for addressing methodology-related problems. The website has been hosted through NIC web server since December 2000. The website provides details about Department of Agricultural Economics in ICAR institutes and State Agricultural Universities. It also provides access to research-oriented data of about 533 projects, 659 publications, 578 scientists, and 1008 theses. The data has been classified under 12 theme areas for each category.

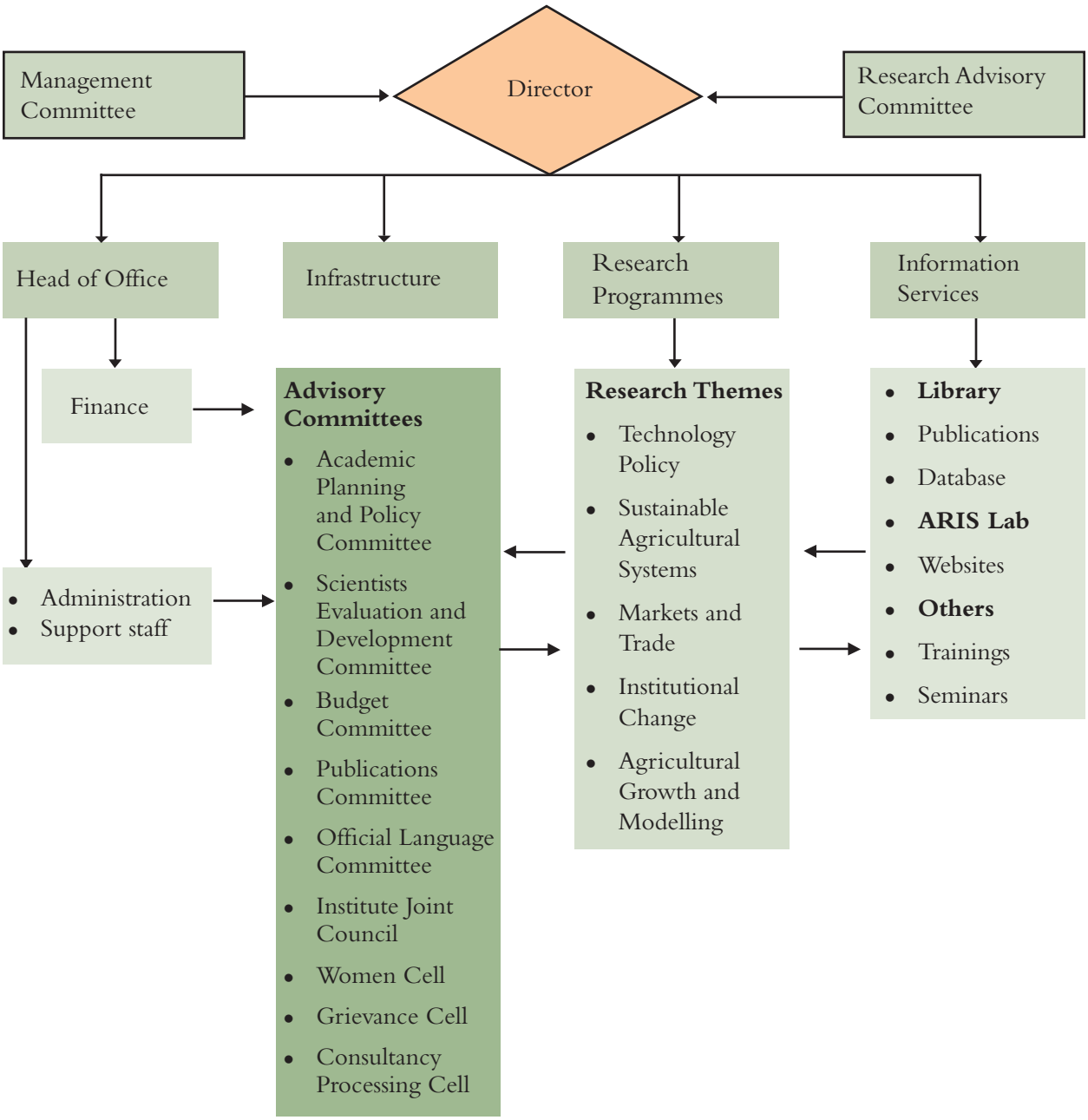
Agricultural Research Information System Lab

The agricultural research information system (ARIS) lab of the Centre is well equipped to provide the local area network (LAN) connectivity to all the research staff and to the office administration, finance and documentation centre. The LAN coonectivity can accommodate 100 users at a time. High Speed Nortal Switches have been incorporated to boost its performance. The Centre has its independent mail server to cater the needs of research staff. The other essential components of the network include a gateway for Internet services, file server for file sharing, mail server for communication, database server for data management, and other facilities like firewall server, trend micro antivirus server, high-end switches, router and leased line.

Hardware at the Centre was strengthened by 20 additional nodes during the year. The computer system in the Centre has been upgraded to the latest version of the bilingual MS-office 2007. Two additional modules of SPSS were updated in the statistical software. The mail-server of the Centre has been upgraded with enterprise version of the Linux software. Centralized firewall and antivirus software are in use at the Centre for the purpose of cyber security. E-diary, an online version of daily diary, has been installed on the intranet of the Centre to share information related to important meetings, seminars, trainings, tours, visitors and other events.

About 30 digitized forms of day-to-day requirements like leave application, tour advance, LTC advance, store indent, etc. are available on the intranet and are being used extensively than the printed forms. The work load of the administration has been lessened by computerization of forms. Two in-house trainings were organized by the ARIS for capacity building of administrative and technical staff.

Figure 3: Organogram of NCAP



Budget

The expenditure of NCAP for the year 2007-2008 is presented in Table 1 and its staff position in Table 2.

Table 1: NCAP expenditure during 2007-2008

(in lakh Rs)

Head of Account	Plan	Non-Plan	Total
Pay and allowances	-	98.50	98.50
Travelling expenses	7.00	1.13	8.13
Works	74.42	-	74.42
Other charges including equipments	153.60	18.18	171.78
Human resource development (HRD)	0.78	-	0.78
Over time allowance (OTA)	-	0.20	0.20
Sub-total	**235.80**	**118.01**	**353.81**
National Agricultural Innovation Project	-	-	18.01
National Professor Project	-	-	18.48
National Fellow Project	-	-	10.54
Other projects	-	-	45.10
Sub-total	**-**	**-**	**92.13**
Grand Total	**235.80**	**118.01**	**445.94**

Staff Position

Table 2: NCAP staff position: 2007-08

Name of post	Number
Director	1
ICAR National Professor	1
National Fellow	1
Principal Scientist	7*
Senior Scientist	10#
Scientist (Sr. Scale)	1
Scientist	1
Technical Officer (T-6)	1
Technical Officer (T-5)	3
Assistant Administrative Officer	1
Assistant Finance and Accounts Officer	1
Assistant	1
Stenographer	1
Junior Stenographer	1
Upper Division Clerk	1
Lower Division Clerk	2
Driver (T-3)	1
Supporting Staff Grade I	2

* include one ICAR National Professor, and one National Fellow.
# include one on deputation to ANGRAU, Hyderabad.

II RESEARCH ACHIEVEMENTS

TECHNOLOGY POLICY

Resource Allocation for Rice Research in India

Suresh Pal and Sushil Pandey

This study has examined investment in rice research and its allocation across different production environments of the country. A total of 284 rice scientists are involved in research in the country, which is equivalent to 246 full time equivalents (FTEs) scientists. Of these, 62 per cent scientists are working for irrigated ecosystem. The rainfed lowland ecosystem receives a quarter of the FTE scientists and rests are working for upland. Thus, almost two-thirds of India's rice research resources are allocated to irrigated ecosystem. The share of irrigated ecosystem increases to 69 per cent when the estimated FTEs are adjusted for the difference in expenditure per scientist between rainfed and irrigated areas. When the allocation of research resources between Eastern India (EI) and Rest of India (RoI) is examined, it is clear that RoI gets a much higher share, especially when FTEs are adjusted for cost differences. It reflects the importance traditionally accorded to the irrigated environments which dominate in RoI. This is also indicated by the adjusted FTE values for irrigated environments.

It is also noted that while research on rainfed rice receives minor importance in RoI, 29-35 per cent of the total resources are being allocated to the irrigated ecosystem in EI, depending on whether unadjusted or adjusted FTE figures are used. Thus, although EI is predominantly rainfed, irrigated rice research receives a substantial allocation of resources even within EI. Rainfed lowland and upland ecosystems are the other two major claimants of these resources with the deepwater ecosystem getting a rather trivial share.

The congruency in resource allocation across various rice ecosystems is very good at 99 per cent when compared with the unadjusted production share with unadjusted FTE share. Thus, FTE allocations in rice research between the two major ecosystems, irrigated and rainfed lowland, have been pretty close to their respective shares in the value of output produced. The study has shown a slightly over-allocation to uplands where productivity has remained low. When FTEs are adjusted for cost differences, the congruency still remains high at 99 per cent, but the results have shown a slightly over-allocation (4 percentage points) to irrigated environment and about 7 percentage points under-allocation to rainfed lowlands. Uplands still remain slightly over-allocated. This difference is also translated in terms of research output (Table 3.)

Table 3: Number of rice varieties released by production environments in India

Ecosystems	Area (Mha)	Varieties released until 2004		No. of varieties released/Mha
		Number	Per cent	
Irrigated	17.8	443	62	25
Rainfed				
Lowland and deepwater	17.5	182	25	10
Upland	7.0	95	13	14

The use of production share adjusted for the potential of research progress and the equity effects magnify this imbalance in resource allocation between irrigated and rainfed lowlands. The rainfed lowland environment has 21 percentage point lower allocation of research resources now than indicated by the adjusted production share. In contrast, the irrigated environment has 23 percentage point higher share than indicated by its adjusted production share. This discrepancy calls for rationalization of allocation of research resources across irrigated and rainfed lowland environments.

The results given above indicate that the current allocations of research resources between rainfed and irrigated environments do not deviate from their normative values when the efficiency criterion alone is considered. Justification of any major reallocation of research resources in favour of rainfed environments would have to be based on the equity criterion. The higher incidence of poverty in rainfed rice areas, potential for further growth in rice productivity, and the evidence that research in rainfed environments may have higher marginal effects on poverty reduction than in irrigated areas provide some justifications for adjustments in allocation of research resources in favour of rainfed environments.

Overall, the study has observed that there is some under-investment in the rainfed ecosystems (especially the rainfed lowlands). This has resulted mainly from a substantially higher level of funding per SAU scientist and ICAR scientist in the irrigated environments. In unfavourable environments where the poverty is high, the capacity of state governments to adequately fund agricultural research is also constrained. It can be corrected to a certain extent by a proportionately higher allocation of the state government funds to unfavourable areas.

Public-Private Partnership in Agricultural R&D

Suresh Pal

Several preconditions for the active participation of private sector in R&D exist in India. There are well-developed scientific and other infrastructural facilities, markets for inputs, and rapid expansion of new technologies. ICAR, as an apex agricultural R&D organization of the country, has initiated a process of reforms to respond to the emerging R&D challenges and to actively involve the private sector in the national R&D efforts. It initiated dialogues with the private R&D organizations, NGOs and other stakeholders. A number of policy decisions were taken through a consultative process during the 1990s. These decisions underscored the continuity of dialogue, sharing of resources, expertise and cost and benefits of technologies in a transparent manner; capacity building; and developing a culture of mutual confidence and trust. Although these initiatives are quite comprehensive and path breaking in several ways, there are only a few examples of successful partnerships. In the case of hybrid rice, ICAR, SAUs, IRRI and national private seed companies collaborated for the development of male sterile lines, development of hybrids, and refinement of seed multiplication technologies (Table 4). The partnership upscaled the hybrid rice technology and intensified plant breeding and seed multiplication activities in the private sector. The technology has been commercialized and is being adopted even in marginal areas of eastern India because of its significant yield advantage.

A similar example of upscaling and popularization of technology is the resource conservation technologies like zero-tillage for the rice-wheat system. In this partnership, zero-tillage technology was refined and popularized in partnership with an international organization (viz. CIMMYT),

ICAR institutes, SAUs and private drill manufacturers. The technology provides significant savings in cost and water, and is spreading rapidly in the rice-wheat system. The public research systems of other South Asian countries, particularly Pakistan and Nepal, also participated in this partnership and benefited from the technology. Partnership with non-profit private organizations, or NGOs was established for demonstration of new technologies and farmers' trainings by the Krishi Vigyan Kendras (KVKs). NGOs were also involved in farmers' participatory research like validation and local adaptation of the module for integrated pest management and farmers' training in using IPM package. In order to encourage public-private partnerships for pilot testing and commercialization of new technologies, ICAR has also established a funding programme under the externally-aided projects.

Table 4: Some examples of public-private partnerships in India

Sl No.	R&D area	Institutions involved	Nature of partnership	Synergy achieved
1.	Hybrid rice programme of ICAR	ICAR, SAUs, IRRI, Mahyco Research Foundation	Co-financing of research upscaling	Technology refinement and upgradation
2.	Plant breeding	ICRISAT and private seed companies	Private funding of ICRISAT breeding programme	Focused priorities for plant breeding
3.	Zero-tillage for rice-wheat system	Rice-Wheat Consortium, ICAR, SAUs, private manufacturers	Training and technical support to drill manufacturers	Technology refinement and transfer
4.	Commercialization of technologies	Public R&D organizations and private industry	Competitive public funding for pilot testing and commercialization of technologies	Refinement and commercialization of technologies
5.	Commercial seed	Public plant breeding, biotech programmes and private companies	Private delivery of public material	Improved efficiency of seed system
6.	Integrated pest management	ICAR, SAUs, NGOs	Refinement and upscaling of IPM packages for different crops	Cost-effectiveness and acceleration of adoption of IPM
7.	Extension services	ICAR, NGOs	Public funding for private delivery of extension services and farmers' training	Improved research-extension-farmer linkages

The Indian agricultural R&D is dominated by public organizations, but the private R&D is now expanding rapidly. It is quite unlikely that the increasing private participation will bridge the gap in the intensity of agricultural R&D in near future. Nevertheless, both the sectors can complement each other's role and useful synergies could be obtained by fostering partnerships for the development and dissemination of technologies. The experience gained so far has echoed the trend observed in the developed countries. It is quite likely that a majority of partnerships could be developed through market-based transactions. However, there are certain factors that necessitate the need for collaborative partnerships.

Most of the national R&D companies may not compete with the multinationals in the new regime of IPRs and therefore, would look forward to the public system for R&D support, even on benefit-cost sharing basis. The public sector should take lead in transfer of technologies, and wherever necessary, should provide incentives and funding support for the delivery of sustainability-enhancing agricultural technologies, and capacity building at the grassroot level for technology adaptation.

Managing Agrarian Crisis: Role of Agricultural R&D Policy

Sant Kumar, Suresh Pal and Rashi Mittal

A number of issues like declining factor productivity, climate change, persisting poverty, debt-trap, post-harvest losses, weak linkages (both backward and forward), and other supply-side constraints are dragging Indian agriculture into distress condition. How to make agriculture get rid of the existing problems is a technology and policy challenge? The R&D in agriculture has potential to provide long-term solutions to these problems, because efforts in agricultural R&D have helped in upscaling yield potential, reducing crop losses, facilitating value-addition, etc. The regular screening of cultivars/ breeds has provided opportunities for adaptation to various production environments. Although technology alone is not capable of providing complete solution to all the problems, it does provide better possible solutions.

Status of Potential Technologies

Indian Council of Agricultural Research in partnership with state agricultural universities has developed numerous technologies for performing various farm operations under different agro-climatic conditions of the country (Table 5). These technologies cover crop production to resource conservation and value addition and have enormous potential to contribute to agricultural development. Studies have shown that improved technologies are capable of making farm operations easy, providing savings in resources, reducing crop losses, increasing shelf-life, doing value addition, and finally, increasing food production.

Increasing Role of Development Strategy

The potential technologies, listed in Table 5, have clearly depicted that technology is not a constraint to manage problems in agriculture. The main concern is their low and partial adoption on farmers' fields. At the first instance, there is a need to refine improved technologies suitable to local conditions and make them available to farmers, and then develop appropriate conditions for their adoption. This emphasizes the increasing role of development strategy. The management of problems of the agriculture sector like yield gap, crop losses, depleting natural resources, global competitiveness, changing climate,

etc. requires huge investments. For example, managing the problems of yield gap and crop loss needs reliable database on both potential and actual yields at agro-ecological regions level. Protecting and improving natural resources (land, water and biodiversity) again need strong infrastructural support and awareness generation compaign.

Table 5: Features of potential agricultural technologies in India

Sl No.	Technology	Expected benefits
1	**Crop improvement**	
	Hybrid rice	Provides an additional yield of 1.0-1.5 t/ha over popular check varieties, and is becoming popular in low-to-medium yield areas of eastern India.
	Quality protein maize	It contains 40.7% higher tryptophan and is suitable for growing in maize zones I and IV.
2	**Improved crop management**	
	Integrated Water Management	Provides extra rice yield of 13% in summer and 15% in *kharif* season and water-use efficiency of 28.7% and 52.8%, respectively over the flooding method.
	Integrated Nutrient Management	Balanced use of fertilizers (120 kg N, 60 kg P_2O_5, 20 kg K_2O, 20 kg S and 5 kg Zn per ha) increase wheat yield by 15-24% in Madhya Pradesh. Skipping the use of P and S has resulted in yield losses.
3	**Resource conservation**	
	Zero-tillage	Saves water by 11.3%, and increases wheat yield marginally over conventional sowing technique.
	Micro-irrigation	It (ferti-irrigation) improves banana quality and yield. The drip system improves overall profitability of the system.
	Pressurized irrigation system	Pressurized irrigation (sprinkler and drip) increases yield by 40-50%, and saves water by 30-70%, depending on the crop. Sprinkler irrigation is suitable for all crops (except rice and jute), while drip is more effective in horticultural crops, cotton and sugarcane.
4	**Improved livestock methods**	
	Use of artificial insemination (AI)	Use of AI improves conceptions in cattle and buffaloes by 20-25%.
	Supplementation of deficient minerals	It improves the productivity of livestock by 10-15%.

Continued.....

Table 5: Features of potential agricultural technologies in India—*Continued.....*

Sl No.	Technology	Expected benefits
	Use of urea ammoniation technology	Its proper use improves the nutritive value of roughages and production by 5-8%.
	Livestock health care management	Feed blocks sustain the production, and can be transported to places of acute feed shortage.
	Diagnostic kits and vaccines	Capable in controlling diseases and parasites like foot and mouth disease (FMD), infectious bovine rhinotracheitis (IBR), *peste des petitis ruminants* (PPR), bovine viral diarrhoea (BVD), bluetongue and avian influenza.
5	**Improved machines**	
	Production operations	
	Rotavator	Saves time (30-35%), water (30%), and cost of operation (20-25%) as compared to tillage by cultivator and harrow.
	Sugarcane cutter planter	Suitable for cutting and planting sugarcane setts and application of granular fertilizer in single operation. Its use reduces labour requirement by 78% and operation time by 50%.
	Potato planter	Useful for potato planting and also for inter-culture and earthing operations.
	Post-harvest processing	
	Rice mills	Gives rice outturn of 70-72%, against 65-68% from the traditional huller. Its use provides additional 2.0 million tonnes rice bran and gives 0.25 million tonnes high quality rice bran oil (RBO).
	Modern ginneries	Modernizing cotton ginning using variable speed double roller (VSDR) saves 30% energy and increases lint efficiency, including competitiveness in lint production.
	Biomass energy plant	
	Biogas plants (solid waste)	It requires 75-100% less water, produces up to 30% more gas, needs one-fourth space for slurry storage/ drying and costs 10% more than the common design.

Agricultural Biotechnology Research

Suresh Pal

One of the important challenges of R&D policy is to promote and regulate agricultural biotechnology research. The government has invested a large amount of resources in agricultural

biotechnology, and guidelines are being developed for conducting research and evaluating its products (transgenics) for their economic, health, bio-safety and other impacts. It is estimated that public investment on agricultural biotechnology in India was about 130 million 1999 PPP dollars in 2000 and most of it was on crop biotechnology. China had also made almost the same level of public investment (167 million PPP dollars in 2000) on agricultural biotechnology and about 60 per cent of it was on crop biotechnology. This is in contrast to the R&D scenario in developed countries where the private sector is a dominant player in biotechnological research. Also, the focus of crop biotechnology is on tissue culture and crop improvement for tolerance to biotic (insects and diseases) and abiotic (moisture, salinity, etc.) stresses and only a few programmes emphasize on improving the quality and shelf-life of products. These initiatives indicate the intention of the government to harness biotechnology for strengthening household food and nutritional security and welfare of the poor. However, the growth of private biotech research is restricted because of lack of comprehensive policy on development and use of transgenic crop varieties, and the prevailing uncertainty regarding future of transgenic food crops.

Policy reforms are crucial for the development of agricultural biotechnology research, especially in the private sector. Fiscal and other incentives to attract research investments from the business sector have been provided. This coupled with favourable industrial and regulatory policies allowed the private sector to grow and diversify into research to increase their market share. These policies were further liberalized and entry of fully foreign-owned companies was allowed during the economy-wide reforms of 1991. Imports of seed and planting material for the horticultural crops were also allowed under the New Seed Policy of 1988. More importantly, India followed a policy of open access of the private sector to public research products (e.g., plant varieties and inbred lines) which has provided tremendous boost to the growth of private (seed) sector and eventually to biotech research.

Total Factor Productivity in Livestock Sector of India

Pratap S. Birthal and A.K. Jha

Over the past three decades, India's livestock sector has been growing at an annual rate of 4.3 per cent as against the annual growth of 2.7 per cent in the crop sector. It has provided a cushion to the agricultural growth and livelihood of poor farmers, for whom livestock are important source of income and employment.

A robust growth in the livestock sector has been the interplay of a number of factors such as public investment in dairying, private investment in poultry, technological change in breeding,

Table 6: Annual growth in total factor productivity in India's livestock sector: 1971-2004

(per cent)

Sources of growth	1971-1981	1982-1991	1992-2004	1971-2004
Output growth	3.9	5.0	3.7	4.3
Input growth	2.4	2.4	0.8	2.0
TFP growth	1.5	2.6	2.9	2.3

feeding and health care, and market infrastructure. Facilitated by investment and expanding markets, technology has played a critical role in boosting the growth of livestock sector. The total factor productivity (TFP), which is the combined effect of technological change and technical efficiency, grew at an annual rate of 2.3 per cent during the period 1970-71 to 2003-04, and accounted for over half of the growth in livestock sector (Table 6). The TFP-led growth in livestock sector would sustain agricultural growth, reduce rural po verty and relieve pressure of number-led growth on natural resources, which are already facing quantitative and qualitative deterioration.

Economics of Rice Cultivation in Major Indian States

Sant Kumar and Sonia Chauhan

Rice is the staple food of a majority of Indian population. Rice contributed about 46 per cent of total cereals production in the country during triennium ending (TE) 2005. After green revolution, rice cultivation is characterized by new management practices, and machinery requiring large amount of purchased inputs. While variations in use of these inputs across states show the differences in adoption of technology, changes in the share of various inputs in the total cost of cultivation over years reflect the extent of technology diffusion at different points of time. The states of Andhra Pradesh, Haryana, Madhya Pradesh, Punjab, Uttar Pradesh and West Bengal contributed nearly 50 per cent to total rice production in India during TE 2005. The cost and returns data related to TE 1973-74 to TE 2004-05, first were deflated using wholesale price index (at 1993-94 prices) and then transformed into triennium base to make them comparable.

State-wise Net Returns

Profit is the net margin over cost. Profit / net returns (estimated over cost A2) in cultivation of rice has depicted mixed trends during 1973-74 to 2004-05. Increasing trends in net returns have been noticed for Andhra Pradesh and Punjab during this period, and vice versa in the case of Madhya Pradesh and West Bengal, with few exceptions (Table 7). In Haryana and Uttar Pradesh, net returns increased moderately in 1993-94 over 1983-84, but declined in 2004-05. It was noted that the pace of net returns in rice cultivation has slowed down in 2004-05 as compared to that in 1993-94 in majority of states. This has resulted rice cultivation not remunerative to farmers and making farmers despair in cultivating rice. Data revealed that the decline in net returns from rice production was due to increasing cost of cultivation over the years. Though gross returns also moved up over years in all the states, but declined in Haryana, Madhya Pradesh, and West Bengal during 2004-05 as compared to 1993-94.

Use of Inputs Quantity

Increased use in quantity of inputs like fertilizer, machinery and irrigation was noticed across states during 1983-2005. Striking differences in fertilizer-use across states were noticed in rice cultivation. Fertilizer-use in the states of Uttar Pradesh and West Bengal varied between 113 and 121 kg/ha, while its use in Punjab and Haryana ranged between 216 and 218 kg/ha in 2004-05. During 1983-84, fertilizer-use in cultivation of rice in Andhra Pradesh was 127 kg/ha and in Punjab 188 kg/ha. The fertilizer-use in Madhya Pradesh is still around 50 kg/ha. The role of fertilizers in increasing yield and production is well recognized during the past few years. Further, a large scope exists to increase the use of fertilizers in rice and other food crops to increase food production in the country.

With the use of modern practices and technology in rice cultivation, the role of machinery has increased significantly across states. The use of machinery in Punjab and Haryana has become so popular that use of animal pair hours was negligible (2 pair hours) in 2004-05, from 31-40 pair hours in 1983-84. The quantum of machinery cost in total variable cost has increased from 1 per cent to 8 per cent in Andhra Pradesh and Uttar Pradesh during 1973-2005. In Madhya Pradesh and West Bengal, share of machinery cost in total variable cost increased from negligible to nearly 5 per cent during this period.

Table 7: Trends in costs and returns from rice cultivation in various states of India

(Rs/ha)

Particulars	Andhra Pradesh	Haryana	Madhya Pradesh	Punjab	Uttar Pradesh	West Bengal
Gross returns						
1973-74	9789.4	-	7054.6	-	-	11917.4
1983-84	11340.3	14038.6	5120.7	17317.8	6638.7	10182.1
1993-94	13084.6	18368.6	7225.2	17471.9	9290.4	16784.9
2004-05	18805.6	18219.1	5416.4	21650.7	10372.6	12167.1
Operating cost (Cost A_2)						
1973-74	5143.2	-	2253.5	-	-	3855.4
1983-84	6679.5	7398.9	2008.4	9507.2	3487.6	4912.4
1993-94	7167.2	7134.7	3393.2	7209.8	4195.1	7217.2
2004-05	8857.7	8727.0	3432.0	10226.3	5414.7	7630.0
Net returns (over Cost A_2)						
1973-74	4646.2	-	4801.1	-	-	8062.0
1983-84	4660.8	6639.7	3112.3	7810.6	3151.1	5269.7
1993-94	5917.4	11233.9	3832.0	10262.1	5095.3	9567.7
2004-05	9947.9	9492.1	1984.4	11424.4	4957.9	4537.1

Rice cultivation requires more water than other crops. The cost of irrigation in rice cultivation has increased considerably across states during 1973-2005, with few exceptions. The cost of irrigation though declined in Haryana and Punjab in 1993-94 as compared to 1983-84, it again increased in 2004-05. In Haryana, Punjab, and Andhra Pradesh, irrigation charges are highly subsidized in terms of electricity tariff and low canal water charges for irrigation. The major sources of irrigation in Haryana and Punjab are canals and electricity-operated tubewells. Contrary to this, in Uttar Pradesh and Madhya Pradesh, diesel-operated pumps are the major source of irrigation. In these states, only critical irrigation is provided in rice cultivation, as sufficient rainfall occurs during monsoon seasons.

Cost of Inputs Use

An increasing trend in cost of inputs like seed, fertilizers, human labour, machinery and irrigation has been observed in Madhya Pradesh, Uttar Pradesh and West Bengal during the period 1973-2005.

The rising trend in cost of inputs is either due to increasing/or stagnating use of these inputs in rice production. In Madhya Pradesh, Uttar Pradesh and West Bengal the use of inputs in cultivation of rice was low during 1973-74. With the increasing level of technology adoption, the use of inputs has shown rising trend and still has more potential to increase yield and production. In Andhra Pradesh and Haryana, cost of both machinery and human labour has shown upward trend, while in Punjab, only the cost of machinery has shown a rising trend. The increasing cost of human labour in Andhra Pradesh and Haryana is due to more use of casual labour and its high wage rate. Human labour (man hrs) per ha has come down in these states, but only marginally. In Punjab, use of machinery in cultivation of rice is more to perform various farm operations. Therefore, the cost of machinery in total variable cost showing upward trend.

Access to Information through Different Sources across Farm-sizes in India

P. Adhiguru and Pratap S. Birthal

Farmers' access to information remains one of the key issues in agricultural development. A study has been conducted to assess if there was any bias in information dissemination by public and private extension systems, using household level data collected by the National Sample Survey Organization (NSSO) in its 59th round in 2003. The sample covered 51,770 farm households which are spread over 6638 villages throughout the country. Based on landholding size, farm households were classified into three categories, viz. small (< 2 ha), medium (2-4 ha) and large (> 4 ha).

Table 8: Access to information through different sources across farm-sizes in India

(per cent)

Sources of information	Farm-size			All sizes
	Small	Medium	Large	
Progressive farmers	16.01	20.20	20.73	16.75
Input dealers	12.59	14.74	18.27	13.15
Radio	12.40	16.35	16.78	13.09
TV	7.70	15.28	22.35	9.38
Newspapers	5.98	10.30	15.86	7.02
Extension workers	4.77	9.78	12.38	5.75
Primary cooperative society	2.97	6.24	7.95	3.61
Output buyers/food processors	2.09	3.60	3.41	2.33
National demonstrations	1.70	3.37	4.56	2.05
Village fairs	1.95	2.37	2.38	2.03
Credit agencies	1.62	2.75	3.42	1.85
Miscellaneous	3.63	6.36	7.40	4.40
Any source	**38.19**	**51.00**	**53.62**	**40.49**

Data on utilization of information sources by different categories of farm households have been provided in Table 8. It has been found that the access to information source increases with increase in farm-size. This variation is more pronounced in the case of extension workers, newspapers, TV and primary co-operative society. Though the public extension system is considered as the most credible source of information, it is often criticized for its bias against small farmers.

The extension workers have acted as a source of information only for about 4.8 per cent of small farmers, as compared to 12.4 per cent of large farmers. For small farmers, 'progressive farmers' and 'input dealers' have been found the major sources of information, probably because of higher cost of information acquisition from other sources. However, radio has been recorded as one of the most important information sources because of its affordability by the poor. For medium and large farmers, radio, television and newspapers are as important information sources as progressive farmers and input dealers.

Investment in Fisheries Development and Research

B. Ganesh Kumar and A.K. Vashisht

Sustained growth in the fisheries sector is a testimony to the concerted efforts of the government to develop this sector. The financial allocation to fisheries research and development over different Five-Year Plan periods has been studied. Plan allocation to fisheries development has gone up by more than 400-fold during the past five decades (Figure 4). Further, the higher priority to fisheries development led to substantial increase in the share of this sector in the total agriculture from the First to Sixth Plan (from 1.6 per cent to 5.6 per cent). Thereafter, the relative share has been found to decline gradually, although in absolute terms, the sector is getting more attention. The per cent allocations to fisheries development in relation to total resource allocation and to agriculture outlay have also shown declining trends (Figure 5).

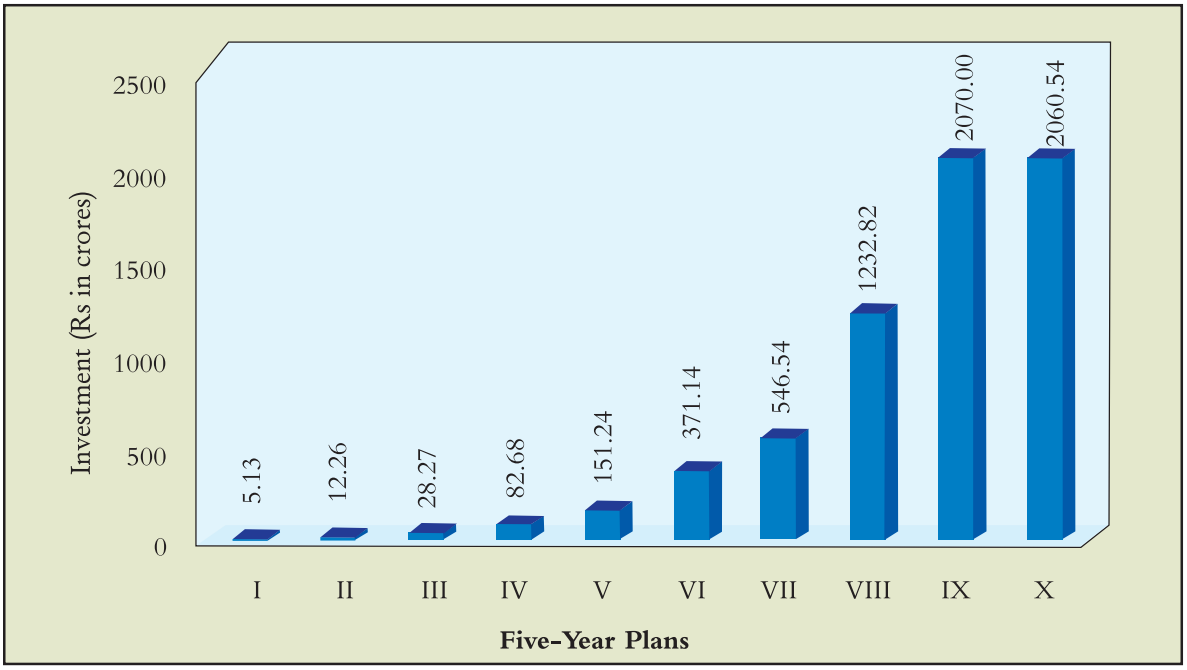


Figure 4: Investment on fisheries development by central government

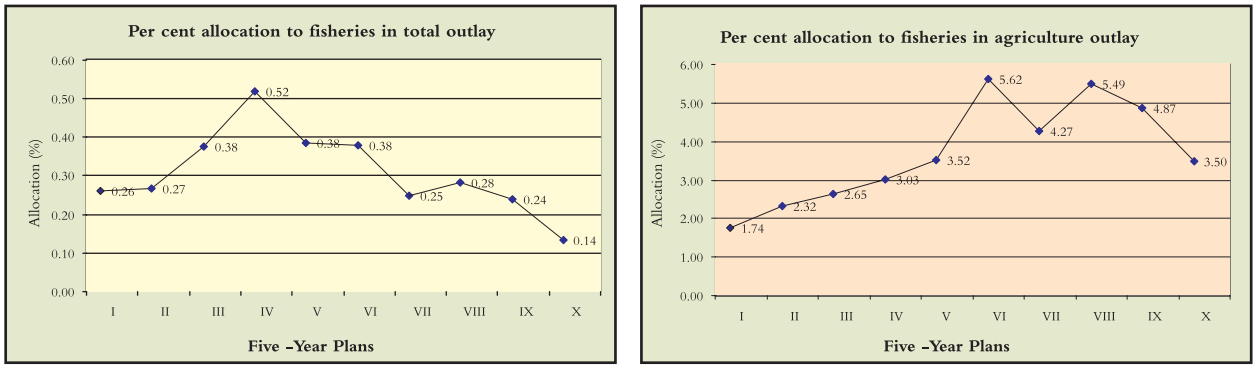


Figure 5: Resource allocation (per cent) to fisheries sector in different Five-Year Plans

Allocation to Fisheries Research

Fisheries research in India is carried out by a large network of ICAR institutes and fisheries colleges/ departments in SAUs, including institutions like CSIR, DST, DBT, IITs, IIMs, Ministry of Agriculture, Ministry of Commerce, Ministry of Food Processing Industries, several voluntary agencies/private industries, etc. The efforts of these institutions in the past have helped in releasing yield-enhancing technologies. The role of ICAR in fisheries research is significant and it is credited for developing and disseminating several technically-feasible, economically-viable and environmentally-sustainable technologies.

The Plan outlay by ICAR to fisheries research in total agricultural research has also grown continuously over different Plan periods (Figure 6). This shows the increasing priority attention by the ICAR also to this sector. It has been found that the share of research resource allocation remained at 3 per cent in the IVth Plan as also in the Xth Plan. It shows that planners are convinced that both technology and public investment are driving the growth in this sector.

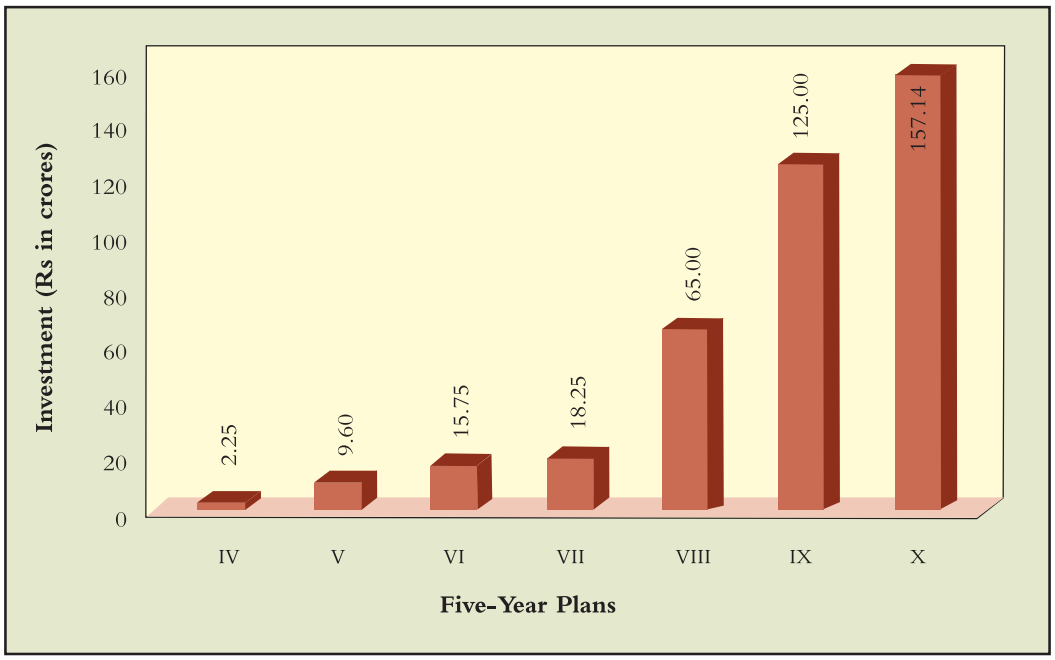


Figure 6: Investment on fisheries research by ICAR

Drivers for Future Growth

In sustaining growth of the fisheries sector, technology, infrastructure and marketing arrangements 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 polyculture 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. have led to increased catch and contribution from the capture fisheries sector. However, market has not been able to play a major role in the growth of the sector so far. To tap potential of this sector, market would have to take the lead in accelerating the growth in the fisheries.

SUSTAINABLE AGRICULTURAL SYSTEMS

System of Rice Intensification (SRI) in Peninsular India

B.C. Barah

System of rice intensification (SRI) is a viable alternative for the conventional practice of growing rice. The SRI has potential to save water and other resources, and also improve productivity. The system is particularly relevant in areas where water is scarce. It gives higher yield of rice (2–3-times of the national average of 2 t/ha) and conserves water (20-49 per cent over the normal practice). The peninsular states of India, viz. Andhra Pradesh, Tamil Nadu and Karnataka, have provided the needed public policy support to promote SRI among the farmers. A study of 128 farmers across 7 districts of Andhra Pradesh and Tamil Nadu has shown that there are decisive advantages of SRI in terms of higher yields, savings in water, seeds and fertilizers, and provision of employment to labour during the rabi season. The SRI produces more grain with lesser inputs, leading to higher production at lower cost. Thus, SRI is more cost-effective, efficient and satisfies economic as well as environmental criteria. In view of the perpetuated lower productivity and declining production growth at the macro level, innovative practices like SRI should be promoted vigorously, and should be necessarily accompanied by the required supportive policy interventions.

Water-saving Technologies for Sustainable Water Management in Agriculture

K.K. Datta and Harbir Singh

Under the traditional flow irrigation method, on-farm irrigation efficiency is just around 45 per cent, whereas the sprinkler and drip methods of irrigation result in 70 per cent and 90 per cent efficiency, respectively. Despite clear technical and economic advantages, the application of these technologies remains limited and to certain pockets only. The moot question is why these technologies are not being adopted on a wider scale?

A review of empirical evidence has shown that the benefits derived from different water-saving technologies (WSTs) are largely confined to vegetable and horticultural crops. The extent of water-saving realized by improvements in water productivity through adoption of technologies varies from crop to crop and the type of WST being used. Sprinkler and drip methods of irrigation save water by 30-70 per cent and increase yield by 40-50 per cent. The available evidence on water-use efficiency, crop yield and water management of WSTs are highly skewed towards drip irrigation systems, with

little information on other types of WSTs (sprinklers, etc.). The evaluation studies of micro-irrigation systems are also skewed towards drip systems, and lack comprehensive coverage. The main reason is that drip irrigation is largely used for high-value crops and even a marginal increase in yield enhances the returns. The other reasons of getting higher returns from high-value crops are superior quality of products and early arrival in the markets. These may not be true for other cash crops, and field crops.

About deciding the investment priorities and the provision of subsidies for WSTs, it is necessary to estimate the economic returns from investments on different types of WSTs for different crops. The other important issue is that in areas, where water availability in wells is poor, it is advisable to adopt WSTs. But, this principle cannot be applied to the areas where availability of water is abundant. The review has clearly indicated that slow growth of WST is not due to economic reasons but due to factors like lack of awareness about economic and social benefits. Therefore, there is a need to generate awareness about WSTs for a better management of water.

MARKETS AND TRADE

Wheat Outlook

Ramesh Chand

(a) Wheat supply and price prospects

India's performance in raising wheat production through high-yielding seed, fertilizer and irrigation has been quite impressive. During the period from late-1960s to late-1990s, the wheat production increased by above 4.5 per cent per annum. There was a huge build-up of wheat stock with public sector after 1998, and the average stock in the year 2002 reached the peak level of 33.7 million tonnes (Mt). This level of stock was equal to 50 per cent of wheat produced in the country in the year 2001. Surprisingly, these stocks accumulated when growth in output started slowing down and there was no increase in per capita production of wheat. Consequently, India used export option to liquidate these stocks. It exported 2.65 Mt wheat during 2001-02 and 4.26 Mt during 2002-03. Despite fall in foodgrain production to the tune of 16 Mt during 2002-03 over the previous year, India exported more than 4 Mt of wheat during 2003-04. Wheat was exported on a large-scale in 2004-05 and it continued till 2005-06.

The year 2005-06 turned out to be somewhat bad for wheat harvest as production was about 5 per cent lower than the anticipated level. It was not a big decline in production compared to the negative fluctuations seen even during the recent past, but, this turned wheat market out of control of the government, first time after the late-1960s, when the government had started playing an active and dominant role in foodgrain management. Even wheat import of much larger magnitude than the shortfall in production failed to ease the pressure on wheat supply and prices.

On per capita basis, wheat production started declining around triennium ending (TE) 2000-01, and the downward trend has been found continuing even in TE 2007-08 (Figure 7). But, its impact could not be felt since a large stock of wheat was available with the public agencies. The domestic supply was augmented by drawings from the buffer stock to the tune of 4.6 Mt during 2003-04, about 0.9 Mt during 2004-05 and 1.24 Mt during 2005-06. Because of replenishment of

production by drawing on stock, impact of shortfall in production of wheat could not be felt for a couple of years.

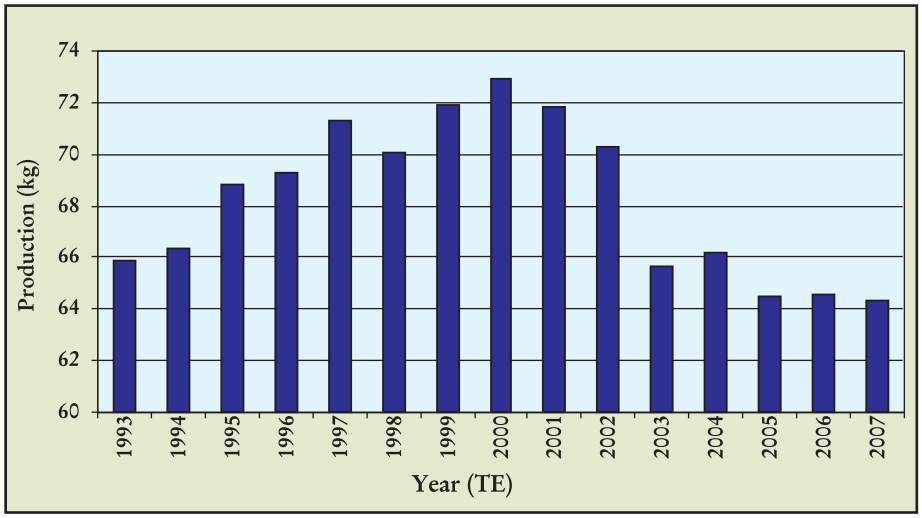
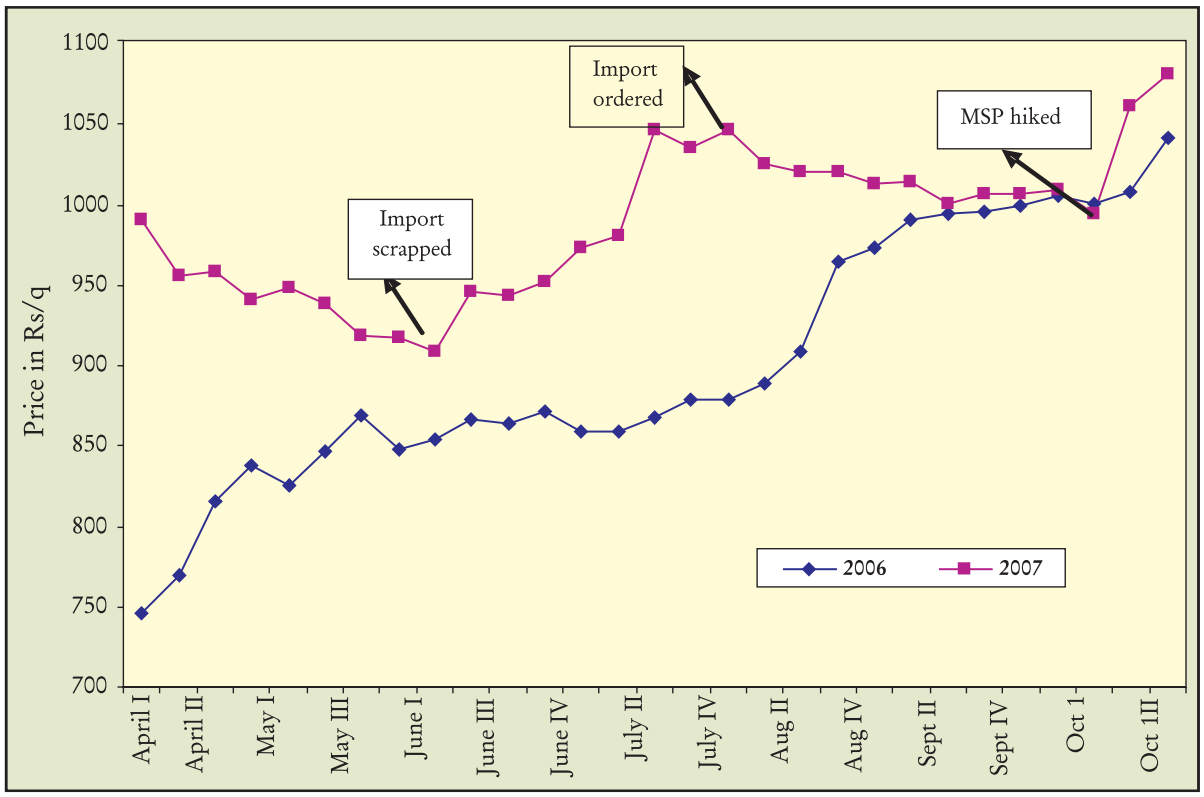


Figure 7: Per capita production of wheat in India

The slowdown in production of wheat was first reflected in its prices during the year 2005-06, when wheat prices in monthly data showed a growth trend of 17 per cent on annual basis between April 2006 and March 2007. Future market started giving signals of price rise in the following months and the private sector took advantage of this situation. Large private companies and several medium-sized players actively participated in wheat procurement and little wheat was available for official agencies at MSP. Despite raising the procurement price by Rs 50 per quintal, the government agencies could procure only 9.2 Mt as against the target of 15 Mt. This caused hardship to the consumers, and the private sector harvested high dividends. Farmers with marketable surplus in favourable environments also benefited to some extent from this price rise.

(b) Wheat import and price outlook for 2007-08

It was observed that the behaviour of open market depends significantly on the action of government relating to purchase and sale and stock of foodgrain with the government. It can be seen from the movement in wheat prices in Delhi market since the first week of April in the years 2006 and 2007 (Figure 8). In 2007, wheat prices declined to the lowest level of Rs 910 per quintal on 30 May, which was the last date for announcing decision on the import tender. On the same day, the tenders of wheat import were scrapped. This led to rise in the prices of wheat. The upward trend continued till 10 July when the government ordered for import of 5.11 lakh tonnes of wheat. The prices remained flat in the subsequent weeks till the first week of October and jumped upward by 6 per cent on 10 October 2007, a day after the government announced a record hike of Rs 150 in MSP for the *rabi* marketing season (RMS) 2008-09. This gives a strong indication that wheat prices in the secondary (wholesale) market are highly sensitive to the policy actions of government to intervene in market through actual stock. Therefore, till the wheat market reaches a matured level, government has to interfere through procurement, open market sale scheme (OMSS) and maintenance of buffer stock in order to maintain price stability in the country.



***Note*: I, II, III, and IV depict the week of that month**

Figure 8: Weekly wholesale prices of wheat in Delhi market: 2006 and 2007

Determinants of Livestock Exports

Anjani Kumar, Steven J. Staal, N. P. Singh and Dhiraj K. Singh

The Indian livestock sector is on a rising path and currently contributes 27 per cent to the agricultural gross domestic product (AgGDP). But, the major thrust of livestock development in India has been on achieving self-sufficiency in livestock products through import substitution. The policy initiatives triggered in 1991 were re-oriented towards improving growth and efficiency in livestock production and processing and integration with world economy. The global demand for livestock products is on a rising path and this offers an opportunity to India to increase its exports, especially for products like bovine meats@, whose domestic demand is low. Nevertheless, there are apprehensions about the ability of livestock farmers in taking advantage of the emerging opportunities, particularly under the liberalized trade scenario. With this background, a study has been undertaken to identify the determinants of export growth in livestock products.

The export of a commodity is influenced by a number of demand and supply-side factors. A double log-linear regression analysis has been carried out to understand the role of different factors. The included explanatory variables could explain 77 to 97 per cent of the total variations in exports of different livestock products (Table 9). Coefficients largely have the expected signs

@Bovine meat refers to only buffalo meat as there is a ban on slaughtering and export of cattle meat.

with a few exceptions. The ratio of domestic production to consumption (DPC_t), which indicates higher availability of domestic surplus, has been observed to play a significant role in increasing the export of bovine meat, poultry meat and muttons. The ratio of international and domestic prices (DIP) has no influence on the export of livestock products, except dairy products. The expanding world export (WEO_t) market is expected to play a significant role only in export of eggs. The coefficient of exchange rate (ER_t) has been found positive for all the products and significant for eggs, bovine meat and dairy products. A high exchange rate indicates lower purchasing power of the domestic currencies in relation to standard international currencies. In other words, devaluation lowers the export price of commodity for the importers and pushes up the domestic price of exportable and importable commodities and therefore, encourages exports. The estimates for the exchange rate have indicated that devaluation of domestic currency in India during 1990s and its management during the post-liberalization period have played an important role in the export of livestock products. The removal of quantitative restrictions (QRs) in post-WTO regime seems to have a significant and positive impact on export of eggs, bovine meat and muttons. The coefficient of QR_t though not significant, is positive for poultry meat and pigs, while it is negative for the export of dairy products.

Table 9: Estimates of export functions for livestock products

Explanatory variables	Eggs	Bovine meat	Poultry meat	Dairy products	Pig meat	Muttons
DPC_t	10.3134	11.3351***	698.0938***	18.4750	88.6826	85.7985***
DIP_t	-0.2879	-0.1139	-0.8068	-2.2317*	-0.8801	0.1821
WEO_t	4.6932**	-0.2363	-3.2860	3.8969	4.1337	0.6178
ER_t	2.8532***	0.4940***	0.3564	2.7634***	1.9414	0.0737
QR_t removed=1, otherwise=0	1.1581**	0.1976*	1.7737	-0.2979	0.9529	0.1310*
Constant	7.6345	2.0304**	-11.5523	0.0887	2.8888	2.1386**
R^2	0.9053	0.9912	0.7742	0.9246	0.7787	0.9765

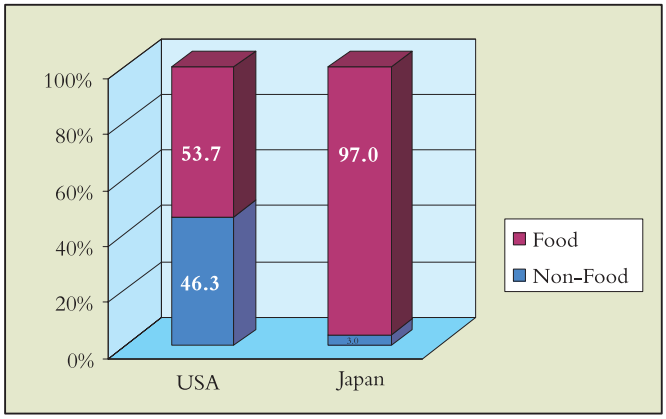
Note: ***, **, and * indicate statistical significance at 1, 5 and 10 per cent levels, respectively

Food Safety Issues in Livestock in New International Trade Regime

Anjani Kumar, Steven J. Staal, N. P. Singh and Dhiraj K. Singh

Food safety issues are becoming a major concern in the export of food commodities from India to developed countries. India has been facing increasing number of non-tariff measures (mainly SPS and TBTs) in its main importing countries. The food products refusal of the total exports by USA and Japan during April-March (2006-07) accounted for 54 per cent and 97 per cent, respectively (Figure 9). The Indian consignments had the dubious distinction of being the second highest refusals after Mexico by the USA during this period, and these accounted for more than 13 per cent of the import consignments refused by United States.

The major reasons for refusal of Indian consignments by USA and Japan have been microbial contamination, filthiness, insanitary conditions, inadequate labelling/inappropriate information, and



Source: http://www.fda.gov.oasis & http://www.mhlw.go.jp

Figure 9: Share of food and non-food products in total consignment refusals by USA and Japan: 2006-07

unsafe additives (Table 10). Thus, a majority of rejections are attributable to the lack of observance of basic hygiene and microbial contamination. The share of meat and meat products, including poultry and dairy products, was around 5 per cent in the total refusals of food products exports, though their export had only a little share in the pie of total exports from India to USA and Japan. India's exports of livestock products are concentrated mainly towards Middle East and East Asian countries, where SPS norms are not very stringent. Hence, adhering to the SPS standards is an important challenge for the livestock exports from India, wherein compliance of food safety regulations is a dire necessity for expanding its trade wings and realizing a higher per unit value.

Table 10: Reasons for refusals of agri-export consignment by USA and Japan: 2006-07 (April-March)

Reasons	USA		Japan	
	Number	Share of each reason in total number of causes (%)	Number	Share of each reason in total number of causes (%)
Microbiological contamination	248	19.1	6	25.0
Filthiness	220	17.0	0	0.0
Insanitary	7	0.5	0	0.0
Inadequate labelling/ Inappropriate information	412	31.7	1	4.2
Unsafe additives	179	13.8	17	70.8
Miscellaneous	232	17.9	0	0.0
All reasons	1298	100.0	24	100.0

Source: http://www.fda.gov.oasis & http://www.mhlw.go.jp

Analyzing Features of Marketing Models for Horticultural Commodities in India

M.B. Dastagiri, B. Ganesh Kumar and K.K. Datta

Horticultural development has been receiving priority attention in recent years. Since post-mid 1990s, the sector has been allocated increased plan resources and knowledge-based technologies. A National Horticulture Mission has been launched in 2005 to promote holistic growth of the sector. The Eleventh Five-Year Plan approach paper has clearly highlighted the role of horticulture and floriculture in the diversified and accelerated growth of agriculture in the country.

Table11: Features of different models for marketing of fruits and vegetables in Hyderabad

Sl No.	Particulars	*Rythu bazaar*	*Reliance fresh*	*Subhiksha*
1	Marketing of produce	Government acts as a facilitator between farmers and consumers	Direct purchase from farmers	Direct purchase from farmers
2	Farmers' share in consumer rupees	Farmers get a higher share than that in retail marketing. However, their share is lower than that in private companies like *Reliance fresh* and *Subhiksha*	Farmers get a higher share than that in government-controlled *Rythu bazaar*, as costs on transport, marketing and other incidental charges are low	Farmers get a higher share than that in government-controlled *Rythu bazaar*, as costs on transport, marketing and other incidental charges are low
3.	Role of middle-men	Partially and indirectly exists	Completely eliminated	Completely eliminated
4.	Consumers status	Middle class and poor people	High income group in metro cities	High income group in metro cities
5.	Organizational status	Government	Private	Private
6.	Business goal	Nominal profit	High profit	High profit
7.	Products grading	No grading	Graded products	Graded products
8.	Prices	Low	Low/and high	Low/and high
9.	Marketing channel	Farmer–consumer	Farmer–company –consumer	Farmer–company–consumer
10	Stakeholders in marketing	Farmers, unemployed women, self-help groups, unemployed youths, and government agencies (civil supplies corporation), cooperative societies, etc.	Company	Company

Presently, the Indian horticulture is constrained by poor marketing network. Horticultural produce is typically collected from farmers by agents and sold in the organized markets. Unfortunately, these markets are under the control of a few traders who operate in a highly non-transparent mode. Besides it, facilities for grading and handling are poor, methods of price discovery are non-transparent, and wastage is high, owing to poor logistics and absence of cold chains. The net result is realization of lower income by the farmers. The gap between prices received by the farmers and paid by the urban consumers is large, reflecting inefficient marketing network. In has been found in a survey that farmers get less than one-third of the price paid by the consumers.

The features of different systems operating for marketing of fruits and vegetables were studied through a survey conducted with the officials of Department of Marketing, Hyderabad, and discussions held with management of government controlled *Rythu bazaar*, Hyderabad. Other models beeing followed in marketing of fruits and vegetables were also studied, these included *Reliance fresh* and *Subhiksha*. The features of these marketing models have been presented in Table 11. Analysis has shown that the marketing models of private agencies, particularly *Reliance fresh* and *Subhiksha* were more efficient than that of *Rythu bazaar*, due to their low cost on marketing, transport, and incidental charges.

INSTITUTIONAL CHANGE

Seed Systems: Performance and Options for Development

Suresh Pal and Harbir Singh

Sources of Seed

The study on seed systems being conducted in the states of Andhra Pradesh, Haryana, Himachal Pradesh and Uttar Pradesh has revealed that almost all farmers procure seeds of cotton, tomato and peas from commercial sources, i.e. private seed dealers, sale counters of seed corporations or governmental stores (Table 12). In the case of paddy, 61 per cent of the seed used is commercial. In potato and groundnut, farmers mostly use farm-saved seed or seed sourced from other farmers. It may be noted that although the share of groundnut seed procured from commercial sources is about 40 per cent, it is largely produced by progressive farmers and therefore, its comparison with other crops in terms of quality is difficult.

Table 12: Sources of seeds procurement and planted area by households across states: 2003-04 & 2004-05

Particulars	Cotton (Maharashtra)	Tomato (Himachal Pradesh)	Pea (Himachal Pradesh)	Paddy (Haryana)	Potato (Uttar Pradesh)	Groundnut (Andhra Pradesh)
1. Sources of seed procurement (%)						
Commercial	98	98	98	61	37	41
Other farmers	1	2	0	14	21	23
Farm-saved	1	0	2	25	42	36
2. Area planted with commercial seeds (%)	96	99	97	60	24	37

The trends in procurement of commercial seeds are echoed by the area planted with different types of seeds. As expected, proportion of commercial seed has been found highest for hybrids, where farmers need to replace seed every year. However, increasing trends in use of quality seeds of pea and paddy are quite encouraging. The cases of farmers buying seed from other farmers are quite low, for both paddy and potato. It is interesting in the sense that as the supply of commercial seed improves and farmers have better access to seed markets, importance of the traditional seed system diminishes. However, traditional seed systems are very effective for popularization and supply of seed of new varieties. Once a variety is accepted by the farmers, formal seed systems face little risk in the production and delivery of new variety on a large scale. As regards the reasons for acquisition of commercial seed, most of the farmers buy fresh seed to get 'pure' seed of popular varieties. The percentage of farmers acquiring seed because of exhaustion of all the stock is quite low, except for potato and groundnut. Thus, seed quality is the most important criterion for the farmers to go in for fresh/ new seed.

Options for Seed System Development

Public sector plays a major role in the supply of seeds, particularly of open-pollinated varieties (OPV) in unfavourable environments. It is particularly important in the case of 'orphan' crops (e.g., groundnut and potato) with low seed multiplication rate and high seed requirement. In favourable production environments, private seed companies too, with little extra investment and efforts to maintain seed quality, can play a significant role in augmenting the supply of OPV seeds. Private sector dominates in hybrids for the simple reason that it enables the company to reap the investment in a shorter period. The implementation of IPR regime may further improve the incentive of the private sector to participate in the seed system, at least for the crops having high seed demand. Another major opportunity for private sector's participation is provided by expanding markets for products with specific attributes (e.g., nutritional value, taste, colour, size, storability, processing, etc.). Seed is the basic unit for engineering such attributes into the final products which have high demand in the niche markets. Such niche markets demand immediate response and the private sector has an inherent advantage in terms of flexibility in responding to these market signals. However, the public sector will continue to play an active role in plant breeding to ensure competitiveness in seed market and cater the needs of public and decentralized seed production programmes. Another important responsibility of the public sector, specifically the government, is to provide adequate information to farmers to make informed seed choice in the market.

The Government of India has enacted all the legislations to comply with the provisions of the TRIPS Agreement of the World Trade Organization (WTO). The Patents Act 1970 — amended in 1999, 2002 and December 2004 — has the provisions for both process and product patents in all fields of technology, including biotechnology. For the protection of plant varieties, the PPV&FR Act 2001 and the PPV&FR Authority to oversee its implementation are in place. Though it is too early to assess the impact of IPR regime in agriculture, available evidence provides a good canvas to the likely scenario of the seed sector. In the past, non-IPR mechanisms such as hybrids, trade secrets, contracts and favourable government policies have contributed to the growth of private seed industry. The enactment of new IPR legislation (PPV&FR Act and Seed Bill) is expected to further balance the interests of all the stakeholders. However, the ultimate impact can not be assessed at this juncture. For example, the PPV&FR Act may help to safeguard parental lines owned by a company,

but it is not clear to what extent the Act would encourage the private sector to invest more in plant breeding for OPV and meet the seed requirements of farmers in marginal environments. The new IPR regime may increase the transaction cost for accessing the plant genetic resources, which will have implications for small plant breeding companies and concentration of the industry. Recent studies have indicated that increased privatization of seed industry is directly related to increase in seed prices.

The public sector IPR policy should address the goals of revenue generation, recognition of achievements and acceleration of technology transfer. Further, public IP portfolio and other resources should be used to reduce entry barriers for new entrants to promote competitiveness and enhance farmers' access to improved technology. Recent guidelines of ICAR for IP management seek to balance these objectives and align the IPR policy with the broad objective of transforming Indian agriculture into a globally competitive venture.

Linkages for Information Flow in Potato Supply Chain

Harbir Singh and Suresh Pal

Knowledge deficiency constrains agricultural productivity in India and explains much of the difference between yields realized at experimental stations and farmers' fields. It can be overcome by development of appropriate linkages. Effective linkages between stakeholders in potato supply chain have helped in delivering timely and useful information to all the partners, particularly farmers. In the case of potato, such linkages were initiated by a few agro-processing firms who wanted quality produce and assured raw material supply to cater the consumer tastes and preferences for processed potato products.

In a majority of cases, the agro-processing firm had contracted the potato growers with assured buy-back arrangements at a pre-determined price and timely payment (Table13). The firm provided quality seed, pesticides (in some cases), and information on agronomic practices to its contracted growers. The regular visits by the field company staff helped the farmers in taking right decisions for raising quality produce. In addition, the information package included weekly weather information forecast which was found most useful to the farmers as it helped them in taking optimal farm management decisions. Such information-sharing linkages need to be strengthened for realizing higher returns to the farmers. Moreover, we need to integrate such information sharing with public research and development (R&D) system. It will enable R&D system to anticipate problems of new technology and find appropriate solutions for them.

Table 13: farmers' response on reasons for entering into contract

Sl. No.	Reasons for contracts	Response (%)
1	Timely payment	93
2	Assured procurement	92
3	Guaranteed prices	89
4	Access to credit	39
5	Higher prices	38
6	Access to inputs and technology	35
7	Higher income	15
8	Others	9

Making Contract Farming Workable on Smallholder Agriculture

Pratap S. Birthal and P.K. Joshi

The agri-food marketing policy in India has undergone a sea change in recent years. Some important policy initiatives include de-regulation of food industry, enactment of an integrated food law and de-monopolization of agricultural markets, allowing contract farming. However, these policy developments have sparked a debate, particularly on contract farming. Proponents of contract farming view it as a partnership between agribusiness firms and farmers, which if properly managed can offer solutions to many problems, such as limited access to markets, insurance, credit, inputs, technology, information and services that small farmers face in the process of transition from subsistence towards commercial production. Critics, on the other hand, argue that contract farming is a partnership between unequals, and offer a scope for agribusiness firms to exploit farmers through under-pricing of produce, overpricing of inputs and taking control of farm decisions. Other arguments against it include its favour towards production of cash, perishable and riskier commodities which may adversely affect household food-security and income. Also, there is an apprehension that contract farming schemes may exclude small farmers because of higher transaction costs to the firms in contracting with a large number of them.

Based on the empirical evidence, the study has identified factors that are critical to the success of contract farming. The evidence leads to us to conclude that:

- *Ceteris paribus* the success of any contract farming scheme would depend on its capability to improve farm profitability and reduce costs on marketing and transaction.
- In capital-intensive and riskier enterprises, the success of contract farming would depend on the extent to which it can protect farmers against production and market risks.
- Probability of success in contract farming would be high if prices of outputs and inputs are linked to open market prices, and firms abstain from anti-competitive behaviour.
- Contract farming should also focus on non-price factors such as regularity in offtake of produce, provision of inputs and services and timely payments, which are as important in fostering long-term relationship between firms and farmers as are the prices.
- In smallholder-dominated agrarian economies, contract farming would work if the agribusiness firms follow innovative approaches such as intermediate contracts and group action that not only reduce transaction costs of contracting with small farmers and spread supply risk, but also make contract farming a politically acceptable and socially desirable market institution.
- A long-term commitment and mutual trust between firms and farmers are essential for the success and sustainability of contract farming.

To develop contract farming as a pro-poor market institution, the central and state governments should create a conducive climate for private investment in agribusiness, promote competition among various market players whilst curbing any tendency of regional monopsony and collusive oligopsony; develop and facilitate implementation of grades and standards; improve farmers' access to credit, insurance, technology and extension services; and facilitate smallholders to organize themselves into cooperatives, growers' associations and self-help groups so as to empower them to effectively deal with big business firms.

Determinants for Choice of Credit Outlets

Anjani Kumar, Dhiraj K. Singh and Prabhat Kumar

Credit is one of the critical inputs in agriculture, and an effective means of rural development. A large number of agencies, including co-operatives, regional rural banks (RRBs), commercial banks, non-banking financial institutions, self-help groups (SHGs) and a widely spread informal credit outlets together constitute the Indian rural credit delivery system. The main objective of the credit policy is to minimize the role of non-institutional sources, mainly money-lenders, in the flow of agricultural credit. For a scientific and empirical analysis of rural credit delivery system, one needs to examine at the micro-level

Table 14: Estimates of multinomial logit regression for choice of credit outlets

Explanatory variables	Institutional	Non-Institutional
Age of household-head	0.01177**	-0.00762**
Gender of household-head, Male =1, otherwise =0	0.31241**	0.17455**
Household size	0.04296**	0.01672**
Operated land-size	0.14161**	0.06788**
Social group		
ST=1, otherwise=0	-0.72042**	-0.55630**
SC=1, otherwise=0	-0.31526**	0.21063**
OBC=1, otherwise=0	-0.05296	0.21402**
Education level		
Primary =1, otherwise=0	0.32765**	-0.01791
Secondary=1, otherwise=0	0.47076**	-0.26560**
Higher secondary or certificate/diploma course=1, otherwise=0	0.76794**	-0.25878**
Graduate and above=1, otherwise=0	0.71077**	-0.47697**
Household type		
Agricultural labour=1, otherwise=0	-0.17302*	0.07531
Other labour=1, otherwise=0	0.16560	0.14224*
Self-employed in agriculture=1, otherwise=0	0.50192**	-0.12668*
Others=1, otherwise=0	0.08432	-0.39089**
Agro-Ecological Zone		
Arid=1, otherwise=0	0.19867	-0.60995**
Coastal=1, otherwise=0	1.37183**	0.85422**
Hill & mountain=1, otherwise=0	-0.65499**	-0.58896**
Rainfed=1, otherwise=0	0.51580**	-0.09620**
Constant	-4.47912**	-1.71239**
Chi-squared	2586.55	
log-likelihood	-54565.09	
Number of observations	89529	
R-square	0.0516	

Note: ** and * indicate statistical significance at 1 per cent and 5 per cent levels, respectively

the distinguishing characteristics of the rural households that lead them in approaching one type of credit institution as opposed to others by the borrowers groups.

Application of multinomial logit model has revealed the following factors which determine the choice of a credit outlet in rural areas.

Age of household-head: The effect of age on probability of borrowing was significant and positive from institutional sources and negative from non-institutional sources (Table 14). It was expected because with age, people mature and hence avoid opting for borrowing from non-institutional sources.

Gender of household-head: The effect of gender though was positive for institutional and non-institutional sources, it was more so for getting loans from institutional sources. Only 11 per cent of the rural households have been estimated to be headed by a female. Male-headed households have depicted higher probabilities of getting loans from the institutional sources.

Household size: The bigger household-size and larger farm-size increase the probability of taking credits from institutional sources. The bigger size of household could spare a family member to pursue the loan disbursement procedures from the institutional sources, while larger farm-size enhances the repayment capacity and thus facilitates credit disbursement from the institutional source.

Social groups: Households belonging to scheduled castes, scheduled tribes and other backward classes have less probability of getting credit from the institutional sources than the general caste households.

Education: The effect of education on the choice of credit source has been found quite interesting; higher the level of education, higher has been the probability of having loan from intuitional sources. The education makes the borrower wiser not to take credit from non-institutional sources at higher rates of interest. This indicates the need for simplification of the procedures of credit disbursement from institutional sources so that even the illiterates could have increased access to institutional credit in the rural areas.

Household type: The effect of household type on the choice of credit outlet has been found mixed. The households with self-employment in agriculture have depicted a higher probability of availing credits from the institutional sources, while the labour households generally turn to non-institutional sources for borrowing.

Agro-climatic zones: Agro-climatic conditions also influence the choice of credit outlets. As compared to households located in the irrigated region, those located in the coastal region have shown a higher probability of borrowing from institutional sources.

Determinants for Holding of Kisan Credit Cards by Rural Households

Anjani Kumar, Dhiraj K. Singh and Prabhat Kumar

The Kisan Credit Cards (KCCs) scheme was introduced in 1998-99 to facilitate farmers' access to short-term credit from the formal financial institutions. The KCC scheme has made rapid progress and 64.5 million cards have been issued by co-operative banks, commercial banks and regional rural banks till 31 October 2006. The pattern of distribution of KCCs across different states has exhibited considerable variations. Employing NSSO data, a logit model was used to identify the factors influencing the holding of kisan credit cards by rural households considering age, gender, household-size, farm-size, and education level. The effect of all these factors has been found positive on the decision of rural households to have KCCs.

Table 15: Factors influencing households' decision to hold kisan credit cards

Explanatory variables	Coefficient	Explanatory variables	Coefficient
Age of household-head	0.00580*	Household type	
Gender of household-head Male =1, otherwise =0	0.70213**	Agricultural labour=1, otherwise=0	-0.00112
Household size	0.04222**	Other labour=1, otherwise=0	-0.44277
Operated land-size	0.17254**	Self-employed in agriculture=1, otherwise=0	1.35050**
Social group		Others=1, otherwise=0	0.14047
ST=1, otherwise=0	-0.79435**	Agro-Ecological Zone	
SC=1, otherwise=0	-0.40651**	Arid=1, otherwise=0	-0.15307
OBC=1, otherwise=0	-0.19294*	Coastal=1, otherwise=0	0.71743**
Education level		Hill & mountain=1, otherwise=0	-1.44643**
Primary =1, otherwise=0	0.18214*	Rainfed=1, otherwise=0	-0.09308
Secondary=1, otherwise=0	0.27765**	Constant	5.70096**
Higher secondary or certificate/diploma course=1, otherwise=0	0.58799**	log-likelihood	9683.06
Graduate and above=1, otherwise=0	0.51073**	R-square	0.1213

Note: ** and * indicate statistical significance at 1 per cent and 5 per cent levels, respectively

Social group: The possession of KCCs has been found biased in favour of general castes; in their comparison households of other castes have depicted less probability of possessing kisan credit cards (Table 15).

Household type: The households with self-employment in agriculture have revealed a higher probability of having KCCs, as per expectations. The purpose of a kisan credit card is to increase the flow of institutional credit, particularly the short-term credit for agricultural operations and therefore, households involved in agriculture are more in need of these credits.

Agro-ecological zone: As compared to the irrigated regions, households in the coastal regions have exhibited a higher probability of possessing KCCs. Farmers in other regions are placed disadvantageously as compared to those in the irrigated regions.

Instability in Indian Agriculture

Ramesh Chand and S.S. Raju

The issue of instability had attracted lot of attention of researchers during the early phase of adoption of green revolution technology. Later, it was concluded that adoption of new technology had increased instability in foodgrain and agricultural production in India. This conclusion was based on the data for a shorter time period when improved technology was being adopted. This study has shown that when a little longer period is taken into consideration, which witnessed spread of improved technology to a large area, the inference of increase in instability due to adoption of new technology gets totally refuted.

Table 16: Risk in crop performance, farm harvest prices and gross revenue at districts level in Andhra Pradesh

(per cent)

Crops	Periods	Area	Production	Yield	Farm harvest price	Gross returns
Rice	1981-1993	7-60	16-86	9-43	7-18	20-79
	1993-2004	11-44	16-67	11-46	6-18	19-70
Groundnut	1981-1993	9-54	14-62	10-47	7-22	15-64
	1993-2004	8-50	18-83	15-75	9-19	17-82
Cotton	1981-1993	6-89	32-139	37-137	20-86	45-154
	1993-2004	7-67	32-90	18-63	16-43	34-99

Production of foodgrains and total crop sector was more stable in the recent than pre-green revolution period and during the first two decades of green revolution in the country. This indicates that Indian agriculture has developed a resilience to absorb various shocks in supply caused by agro-climatic and other factors.

Risk in crop production has also been measured in Andhra Pradesh at districts level during 1981-1993, and 1993-2004. The results have been compared with state level. Risk in rice area at the state level was 11.5 per cent during 1981-1993 and 13.4 per cent during 1993-2004. At the district level, it ranged from 7 per cent to 60 per cent during 1981-93 and from 11 per cent to 44 per cent during 1993-2004. In groundnut, district level risk in area ranged from 9 per cent to 54 per cent and 8 per cent to 50 per cent against the state level risk of 8.4 per cent and 7.9 per cent during above two periods, respectively (Table 16).

There are not only wide variations in risk across districts, in some cases the range of risk at district level has narrowed down in contrast to increase in risk at the state level. A similar pattern has been observed in the case of production, yield, farm harvest price and gross returns. In some cases, risk shown by the state aggregate has been found lower than the minimum value in the range of risk across districts. These results indicate that in a large state like Andhra Pradesh, state level estimates of risk involved in agricultural production, prices and returns are highly underestimated at disaggregate level. The state level estimates have provided an indication of shock in supply or agricultural output at the aggregate level, but have completely concealed the volatility to which sub-region could be subjected.

The estimate of district level risks have shown that range of risk in production and gross returns narrowed down for rice and cotton, but widened for groundnut. The net effect of fluctuations in production and prices on farm income has shown that risks in area, production, yield and prices do not negate each other. Risk has been found higher in farm income than area, production and prices in all the cases, and it has not changed over time. This underscores the need for addressing risk in farm income by devising area-specific crop insurance or some other suitable mechanisms.

National Agricultural Insurance Scheme in India: An Overview

S.S. Raju and Ramesh Chand

National Agricultural Insurance Scheme (NAIS) was introduced in the country during 1999-2000 *rabi* season, and covers both boorowers and non-borrowers. It covers all foodgrains, oilseeds, and annual

horticultural/commercial crops for which past yields data are available for adequate number of years. Data revealed that in the first season, i.e. 1999-00 r*abi* season, only 0.5 per cent of the holdings were covered by NAIS (Table 18) and this proportion has been slowly going up, reaching 4.31 per cent in 2006-07 *rabi* season. In the first k*harif* season of 2000, more than 7 per cent of the holdings in country were provided insurance cover for some crop(s). This has been going up and touched 11.19 per cent in k*harif* 2006. The same is more or less true for area coverage as well. It is also noteworthy that except for some years, the percentage of coverage was higher for holdings than area, suggesting a higher penetration among small holdings.

Table 17: Season-wise coverage of farm holdings and area under NAIS in India

(per cent)

Crop year	*Rabi*		*Kharif*		Total	
	Holdings	Area	Holdings	Area	Holdings	Area
1999-00	0.50	0.41	-	-	0.50	0.41
2000-01	1.81	1.66	7.28	7.07	9.09	8.73
2001-02	1.70	1.65	7.53	6.77	9.23	8.42
2002-03	2.02	2.30	8.46	8.82	10.48	11.12
2003-04	3.83	3.39	6.90	6.48	10.73	9.88
2004-05	3.06	2.80	10. 99	12.73	14.04	15.53
2005-06	3.51	3.79	10. 97	10.77	14.45	14.56
2006-07	4.31	4.02	11.19	10.32	15.51	14.32

Between 2000-01 and 2006-07, the scheme covered 9-16 per cent farmers, 8-15 per cent cropped area and 2.24 - 3.76 per cent of crop output in value-terms in different years (Table 17). The amount of claims was much higher than the premium paid, indicating loss in the operation of this scheme. During 2000-01 and 2002-03, the claims were more than five-times of the premiums paid. During 2003-04 and 2004-05, the amount of claims was more than double of the premiums collected. As claims exceeded premiums, there was a net loss in the scheme, even without considering the administrative cost. The magnitude of loss can also be seen by comparing the ratio of 'claims to sum assured' with ratio of 'premium to sum assured'. During the year 2005-06, claims constituted 7.52 per cent as against 2.97 per cent premium on the sum assured (Table 18). This implies a loss of 4.55 per cent of the assured value of output.

In the beginning, only 3 per cent non-borrowers had opted for the crop insurance offered under NAIS, and the proportion reached 15 per cent in 2005-06. This shows that the scheme is operational mainly because farmers availing loan from institutional sources are required to go for insurance, irrespective of the fact whether they are interested in it or not.

Crop insurance can be successful only with public support, which could be in terms of subsidy on premium, meeting part of administrative expenditure, reinsurance, etc. Global experience shows that due to special nature of agriculture production, in several countries, premium payable by farmers is subsidized by the government.

Table 18: Performance of NAIS over the years in India

Periods	Sum assured as % of value of crop output	Claims ratio (claims / premium)	Premium / sum assured, %	Claims / sum assured, %	Ratio of borrower and non-borrower insured farmers
2000-01	2.14	5.45	2.76	15.06	97:3
2001-02	2.17	1.91	3.24	6.20	93:7
2002-03	2.83	5.52	3.23	17.84	86:14
2003-04	2.41	3.29	3.11	10.22	75:25
2004-05	3.57	2.24	3.16	7.06	88:12
2005-06	3.76	2.53	2.97	7.52	85:15

Salient Findings of Case Study on NAIS in Andhra Pradesh

- About 82 per cent of farmers have taken insurance as a financial security mechanism and mandatory requirement of the bank.
- The most effective sources of awareness generation about crop insurance are village fairs, TV and farmers' meetings.
- The farmers would prefer conducting crop cutting experiments (CCEs) in the presence of villagers/farmers committees, and desire coverage of more crops under insurance.
- Most farmers have suggested that affordable premium should be 2 per cent of the sum insured.
- The preferred service providers are rural agents at the door step and village level.
- Parameters to be considered for payment of insurance claims are rainfall, crop conditions, and revenue reports.

Policy Implications

The insurance coverage in terms of area, farmers and value of agricultural output is very small. Payment of indemnity based on area approach does not consider the affected farmers outside the compensated area, and most of the schemes are not viable. It requires renewed efforts by the government in terms of designing appropriate mechanisms and providing financial support to agricultural insurance schemes.

Assessment of Risk and Insurance Products for Agriculture

B.C. Barah

High risk in agriculture poses a threat to sustainability of food production and food security. The changing pattern in the nature of risks at the disaggregate level in both intensity and spread, has assumed considerable significance and has several policy implications. Providing insurance cover to the farmers against risk of crop losses is an urgent need. Public initiatives in agricultural insurance have so far been ineffective and unattractive for business deals. Lack of effective methodologies for risk assessment and limited alternative options for insurance products are other constraints. The need is to develop efficient models for risk assessment and insurance products with pro-farmer emphasis. The new network project aims at assessing risks and developing situation-specific insurance products. It plans to provide due emphasis to appropriate dissemination mechanisms such as online decision

support system (DSS) and participation of public-private partnerships. Although, rice is an important crop grown widely across the country in highly diverse ecosystems, it is a high-risk candidate. It being a major staple food for the majority of population, any change in rice production system has wider implications. The study has characterized the rice-growing districts in the country and drawn mapping of hot spots with respect to risk. A relevant spatio-temporal rice database for the past three decades has been generated for nearly 522 districts of the country. A risk decomposition model has been developed and will be applied to district analysis, which is expected to provide important policy implications.

AGRICULTURAL GROWTH AND MODELLING

Growth Crisis in Indian Agriculture

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

The growth performance of Indian agriculture was somewhat favourable during initial years of economic reforms, but the post-WTO period witnessed sharp decline in the growth of almost all sub-sectors and commodity groups in the agriculture sector (Table 19). Another disquiet aspect of recent growth process has been that agriculture and non-agriculture sectors are on a disparate growth path. At the state level, growth rate has turned negative in four out of 20 major states, while six states have shown growth rate in the range of 0.10–0.95 per cent. Further, growth rate of agriculture in most of the low-productivity states was much higher than the national average during the period 1984-85 to 1995-96. However, after 1995-96, their growth rates have not only declined but also turned out to be much lower than the national average.

Table 19: Growth rate in output of various sub-sectors of agriculture at 1993-94 prices
(per cent)

Periods	Crops	Livestock	Fruits & vegetables	Non-horticultural crops	Cereals
1981 to 1990	2.71	4.84	2.42	2.77	3.15
1991 to 1996	3.22	4.12	5.92	2.59	2.23
1997 to 2005	0.79	3.67	3.28	0.05	0.02

The main reasons for deceleration and stagnation in agricultural output after 1995-96 are slowdown in growth of use of fertilizers, irrigation, and energy (electric power) in some cases, stagnation or even decline in other cases (Table 20). Crop intensity and area under cultivation have also shown either poor growth or decline. Diversification towards high-value crops has slowed down and in some cases, farmers have been found diversifying away from high-value crops towards low-value, less-risky and less-input demanding crops. Terms of trade for agriculture have shown deterioration and agricultural incomes have faced increased instability in recent years. Low level of input-use and low-productivity in most of the states offer some ray of hope to revive agricultural growth, but it would require simultaneous efforts on several fronts. These include: (a) stepping-up investments and putting in place suitable institutional mechanisms to exploit irrigation potential that exists in most of the states; (b) increasing power supply to the agriculture sector; (c) promoting fertilizer-

use by expanding distribution network and improving credit facilities for farmers; (d) establishing competitive seed markets and ensuring attractive prices for seed; (e) improvement in terms of trade for agriculture; and (f) evolving measures to mitigate risk in farming.

Table 20: Annual growth in variables related to agricultural performance in India

(per cent)

Variables	1981-90	1991-1996	1997-2005
Gross cropped area	0.430	0.430	-0.480
Net sown area (NSA)	-0.080	0.040	-0.550
Cropping intensity	0.510	0.390	0.070
Gross irrigated area	2.280	2.620	0.510
NPK use/ha of NSA	8.255	2.401	2.044
Electricity consumed in agriculture/ha of NSA	14.162	9.390	-0.159
Area witnessed crop shift (per cent)	5.600	5.600	4.800
Terms of trade	0.189	0.947	-1.630
Public sector net fixed capital stock/ha of NSA	3.939	1.872	1.976
Private sector net fixed capital stock/ha of NSA	0.642	2.134	1.721
Total net fixed capital stock/ha of NSA	2.085	2.010	1.838
Credit supply/ha of NSA	3.810	7.466	15.336

Note: Growth rates in area and cropping intensity are up to the year 2003-04.

Demand for Foodgrains towards 2011 and 2020

Ramesh Chand

Per capita production of foodgrains had increased from 183 kg during early-1970s to 207 kg by mid-1990s, even though country's population increased by more than 50 per cent. However after mid-1990s, foodgrain production has not been able to keep pace with the population growth. Per capita production of cereals has declined by 17 kg and of pulses by 3 kg during the past decade (Table 21). This could create a serious threat to food security, as the country identifies its food security with foodgrain security.

Table 21: Production of foodgrains in India: 1971-2007

(kg/person)

Periods	Cereals	Pulses	Foodgrains
1971-75	164	19	183
1976-80	172	18	190
1981-85	179	17	196
1986-90	182	16	198
1991-95	192	15	207
1996-00	191	14	205
2001-05	177	12	189
2004-07#	175	12	186

#Figures for 2006-07 are based on 4th advance estimate which places foodgrain production at 216 Mt.

Long-term trend in consumption pattern based on household consumption data of NSSO shows that per capita direct consumption of foodgrains has been declining and that of livestock products and fruits and vegetables has been going up for a fairly long time. This pattern of dietary diversification is often misinterpreted, as it is concluded that decline in per capita cereal production is consistent with dietary diversification. However, this interpretation does not seem to be justified because of several reasons. One, foodgrains consumed as food outside home and in various types of bakery products, except bread, are not included in the NSSO estimates and their per capita demand is significant and rising. Two, due to increase in per capita production and consumption of livestock products, proportion of foodgrains diverted towards livestock feed is increasing. Thus, demand for foodgrain should include both the components of demand: (a) foodgrain demand for direct consumption at household level, and (b) indirect foodgrains demand in the form of seed, feed, industrial use, meals taken outside home, bakery products, snacks, sweets, etc.

The study has estimated direct, indirect and total demand for foodgrains in India towards 2011-12 and 2020-21 by taking into account population growth, composition of rural and urban population, growth in per capita income in rural and urban areas and changes in taste and preferences. It has been found that total demand for cereals would grow to 218.9 Mt by the year 2011-12 and would reach 261.5 Mt by the year 2020-21 (Table 22). Demand for pulses during this period would grow to 16.1 Mt and 19.1 Mt, respectively. Domestic demand for foodgrains is projected to reach 235.0 Mt by the year 2011-12 and 280.6 Mt by the year 2020-21. It is important to mention that these projections do not include export demand.

Table 22: Projected domestic demand for foodgrains in India

(million tonnes)

Food items/types of demand	Base year (2004-05)	2011-12	2020-21
Cereals			
Direct demand as household food	151.7	159.1	166.6
Indirect food demand and other uses	41.1	59.8	94.9
Total demand	192.8	218.9	261.5
Pulses			
Direct demand as household food	9.8	11.8	12.5
Indirect food demand and other uses	4.4	4.3	6.6
Total demand	14.2	16.1	19.1
Foodgrains			
Direct demand as household food	161.5	170.9	179.1
Indirect food demand and other uses	45.5	64.1	101.5
Total demand	207.0	235.0	280.6

Despite dietary diversification, involving sharp decline in per capita direct consumption of foodgrains, demand for cereals and pulses has been projected to grow at the rate of about 2 per cent per year on account of increase in population and growth in indirect demand.

State of Indian Agriculture and Future Prospects

Ramesh Chand

The present state of Indian agriculture is a matter of serious concern and there is a need to ponder over its future. It is widely acknowledged that there is lot of potential to raise agricultural output in the country. This potential is believed to be very large in the eastern and central regions of the country. On the other hand, global scenario of agricultural production is undergoing profound changes. The future prospects of agriculture would depend on how the domestic potential is exploited and how we adjust to the global changes. The prospects would remain bleak if appropriate measures are not taken. Some measures which can help in improving growth and profitability of agriculture have been listed below along with addressing other issues.

(a) Raising of agriculture growth requires substantial increase in public investments. While central government provides a large amount for making investments in irrigation, R&D and special area programmes, the major initiative in this connection must come from the states.

(b) Good quality seed is the primary determinant of productivity. The main reason for this is non-availability of quality seed and to some extent lack of awareness. Harnessing the benefit of technology generation requires a well-developed system for sales and distribution of seeds and plant propagation material. There is a need to develop competitive seed industry by involving private sector in seed production and distribution.

(c) Farm size in India is quite small. More than 61 per cent holdings are below 1 ha and more than 80 per cent are below 2 ha. Further, 60 per cent cultivated area being non-irrigated, the options to go in for high-value agriculture at such farms are highly limited. These farms face serious constraints in adopting modern technology and in marketing their produce. To some extent, the size disadvantage can be obviated through contract farming. In most cases, the size of farm would remain unviable and insufficient to provide enough income for the farmers and their families. There are two ways to raise size of operational holdings. One, create suitable jobs in the non-agriculture sector to attract or pull out unviable marginal and small farmers from the agriculture sector. Two, liberalize land lease markets so that those who want to rent out land can do so without fear of losing ownership rights. A large number of farmers are tied to small plots of land because they do not want to sell it. This constrains such farmers to explore sources of income outside agriculture. Options for easy leasing out, and getting income from it, would encourage several farm households to venture out of agriculture. This would also create opportunity for others to raise their size of holdings by leasing-in of land.

(d) Some countries have very effectively applied tools of biotechnology to raise yields, reduce cost on production, and improve quality of some edible oilseeds; it has imparted them significant advantage. India needs to learn from the experience of other countries, particularly China, to take advantage of future biotech crops.

(e) Past experience indicates that food and agricultural prices in real terms followed a declining trend in the long-run. Various predictions of growth in food supply falling short of growth in demand proved wrong. However, this may not repeat in the future, as the long-term changes in markets will result from the growing use of cereals, sugar, oilseeds and vegetable oils to produce fossil fuel substitutes, ethanol and bio-diesel. It would improve terms of trade for agriculture but

at the same time, points to the emerging scarcity of agricultural products for use as food. This also undermines the need for self-reliance, as the global markets would turn costly and less-dependable.

(f) Private sector should be encouraged to forge efficient linkages between production and consumption by setting up value chains, contract farming, post-harvest processing, and direct marketing to benefit producers as well consumers.

Income Diversification among Farm Households and its Distributional Effects

Pratap S. Birthal, A.K. Jha and Dhiraj K. Singh

Raising farmers' income has emerged as a major concern in recent discussions on agricultural and rural development policy. Given the small yet shrinking farm size, income-augmenting strategies focusing on agriculture alone are unlikely to contribute much to farmers' income. In this study, the potential of different sources in raising farmers' income and their impact on income distribution have been investigated. The income sources for farm households have been depicted in Figure 10. As against the common perception that agriculture is the main income-source for farm households, it is observed that these households derive a significant proportion of their income from non-agricultural sources. Wages and non-farm business activities account for about 20 per cent and 24 per cent of the total income, respectively. These sources are more important for the households at the lower end of income distribution.

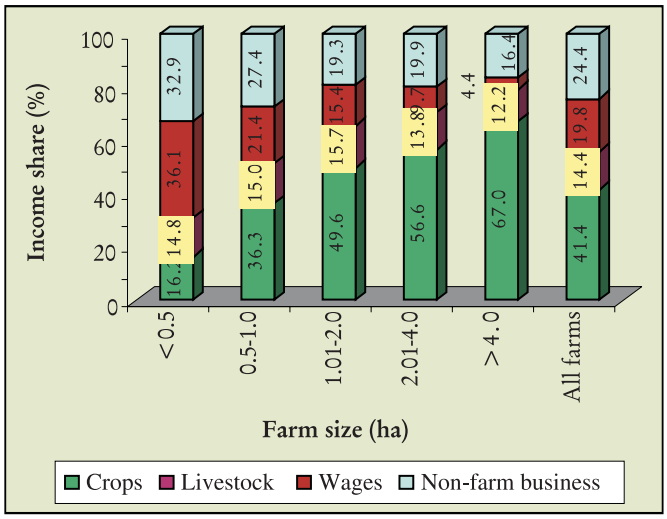


Figure 10: Income sources of farm households by landholding size: 2003

Income from different sources has exhibited a varied pattern of distribution. Non-farm business and wages are the most unequally distributed income sources (Table 23), because of farm households' limited access to them. Only 14 per cent households have reported income from non-farm business and 46 per cent from wage labour. Non-farm business income accounts for 37 per cent of the total inequality and is the second largest source of inequality after agriculture. The Gini income elasticity for non-farm business income is greater than unity, implying that an increase in non-farm business income would have an inequalizing effect on income distribution. Effect of agricultural income on income distribution appears to be neutral, while wages and livestock have an equalizing effect on income distribution. For raising farmers' income, it is essential to accelerate the pace of diversification of rural economy towards non-farm activities by empowering farm households in overcoming barriers to their entry into non-farm sector. However, it is also equally important to ensure that the poor are not left out of the process of diversification.

Table 23: Contribution of income sources to total inequality

Income sources	Households reporting income (%)	Gini coefficient of inequality	Share in total inequality (%)	Gini income elasticity
Crops	90.1	0.684	39.4	0.952
Livestock	64.5	0.745	10.6	0.737
Wages	45.7	0.834	13.2	0.668
Non-farm business	14.2	0.958	36.7	1.505
All sources	-	0.584	100.0	-

Diversification of Agriculture towards High-value Crops: Role of Smallholders

Pratap S. Birthal, P.K. Joshi, Devesh Roy and Amit Thorat

Agricultural diversification towards high-value crops has considerable potential to raise farm income, especially when demand for high-value food products has been increasing faster than that for staple foodgrains. Indian agriculture is overwhelmingly dominated by smallholders, and researchers have long debated the ability of a smallholder-dominated subsistence farm economy to diversify into riskier high-value crops. This study has presented evidence that gradual diversification of agriculture towards high-value crops exhibits a pro-smallholder bias, with smallholders playing a proportionally larger role in the cultivation of vegetables versus fruits (Table 24). The observed patterns are consistent with simple comparative advantage-based production choices. The comparatively high labour endowments of the small farmers, as reflected in their larger family sizes, induce them to diversify towards vegetables. Although fruit cultivation is also labour-intensive (as compared to cultivation of staples), it is highly capital-intensive, making it a less advantageous choice for smallholders who tend to have low capital endowments. Furthermore, both the probabilities of participation in fruit and vegetable cultivation as well as land allocation to horticulture decrease with increase in the size of landholdings in India. Small or medium holders do not appear to allocate a greater share of land to fruits or vegetables. However, the share allocated to vegetables is significantly higher if the family size is bigger, while reverse is true in the case of fruits.

Table 24: Contribution of smallholders to horticultural production: 1998

(per cent)

Parameters	Items	Small	Medium	Large
Share in total vegetable growing households	**Vegetables**	83.5	11.9	4.6
Share in total vegetable area		61.0	20.9	18.1
Share in total friut growing households	**Fruits**	88.4	7.1	4.5
Share in total fruit area		51.9	19.3	28.8

Determinants and Factors Contributing to Household Income Inequality in Eastern India

Anjani Kumar

(a) Determinants of income in inequality

Regional disparities and income inequalities are the persistent problems of developing countries. The analysis of income diversification at the disaggregate level and its implications on income inequality is a potential tool for policymakers. Regression-based decomposition methodology has been used to assess the relative contribution of each factor to the determination of different sources of income inequality, based on primary data collected from 60 villages in 15 districts, representing different agro-climatic zones of four eastern states (Bihar, Jharkhand, Orissa and West Bengal) of India.

Of the ten determinants considered in the regression estimation, six variables, viz. size of landholding, age and education of household-head, value of productive assets and livestock, access to market and credit have been found positively related with income (Table 25). On the other hand, household-size is negatively correlated. A large family-size has depicted a negative impact on the level of income. Sex of household-head and access to roads have not shown significant influence on the level of income.

Table 25: Determinants of rural income in eastern region of India

Variables	Total income	Farm income	Non-farm income
Household size	-0.05276*	-0.09375*	0.15446*
Age of household-head	0.01079*	0.01444*	0.03870*
Sex of household-head	0.00503	0.10811	-0.95027*
Education of household-head (years)	0.05090*	0.10267*	0.19605*
Operated land (acres)	0.04975*	0.32606*	-0.09496*
Access to market	0.35029*	-0.39207**	1.21776*
Access to road	0.01718	0.02276	-0.30315
Access to credit	0.06579**	0.37910*	0.03950
Productive assets value	0.00001*	-0.00000	0.00002*
Livestock value	0.00001*	0.00010*	-0.00001
State Dummies			
Bihar	0.56760*	0.09130	1.12044*
West Bengal	0.38160*	0.53029*	0.44931**
Orissa	-0.20052*	0.70763*	-0.87066*
Constant	7.55154*	3.99226*	2.08166*
R^2	0.34690	0.33010	0.17230

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

In the farm income (crops and livestock), all variables except sex of household-head, access to road and value of productive assets, have been found significant. The household-size and access to market have been observed negatively correlated with farm income, while other significant variables like size of landholding, age and education of the household-head, access to credit, and value of livestock are positively correlated. A negative relationship is expected between household-size and farm income, but negative relationship between farm income and access to road does not seem plausible and looks counter-intuitive.

The non-farm income has been found to be influenced by six variables, viz. household-size, age, education and sex of household-head, size of landholding, and access to road. The size of landholding has depicted an inverse relationship with non-farm income; the larger the size of landholding, the lower is the non-farm income. It is as per expectation, because large farmers are able to derive adequate income from farming and have higher opportunity cost for working in non-farm activities. The smallholders have to seek opportunities for engagement in non-farm activities for supplementing their income. Positive relationship between household-size and non-farm income suggests that larger households divert their surplus labour to non-farm activities. Further, a female-headed household has depicted a negative impact on the level of non-farm income. Access to market has been found important for non-farm income, for it provides connectivity and improves the flow of information, which are vital for seeking opportunities for engagement in non-farm activities.

(b) Factors contributing to income inequality

The share of different factors in household income inequality has been studied in the eastern region (Bihar, Jharkhand, Orissa and West Bengal) of India. Amongst different statistically significant variables, the most important ones are education of household-head with a factor inequality weight of 8.31 per cent (Table 26), followed by value of productive assets (5.04%), operated land (3.72%), and age of household-head (3.07%), access to market (1.39%) and value of livestock (1.33%). However, different factors have different loadings for different income sources. In the farm income, size of landholding has been found the most important variable, with a factor inequality weight of 15.54 per cent, followed by value of livestock (11.58%), education of household-head (3.78%), age of the household-head (0.98%) and access to credit (0.73%).

In the case of non-farm income, education of household-head has been observed the most significant variable with a factor inequality weight of 5.59 per cent, followed by value of productive assets (2.43%), age of household-head (2.33%), and household-size (2.17%). Location as shown by state dummies is the second significant factor next to regression residual in total income with a factor inequality weight of 12.34 per cent. It is the third most important factor in the non-farm income with an inequality share of 5.02 per cent. Its importance, however, is minimal in the inequality distribution of farm income with a share of 1.78 per cent only. To have income equalizing effect of different sources of the rural income, addressing of these constraints has to be prioritized.

Table 26: Inequality weight of different variables across income sources in eastern region of India

(per cent)

Factors	Total income	Farm income	Non-farm income
Household-size	-0.78	-0.92	2.17
Age of household-head	3.07	0.98	2.33
Sex of household-head	0.00	0.00	0.09
Education of household-head (years)	8.31	3.78	5.59
Operated land (acres)	3.72	15.54	-0.39
Access to market	1.39	-0.21	0.66
Access to road	0.22	-0.03	-0.63
Access to credit	0.05	0.73	0.00
Productive assets value	5.04	-0.25	2.43
Livestock value	1.33	11.58	-0.05

Growth of Fisheries Sector in India

B. Ganesh Kumar and B.C. Barah

Fish production in India and at global level has increased significantly over the past 50 years. At the world level, it has increased from about 23 million tonnes (Mt) in 1951 to 140 Mt in 2004, while in India, this increase has been from less than 1 Mt to above 6 Mt. In 2004, the country's share in total world fish production was above 4 per cent, and with its robust growth, the sector is referred to as a sunrise sector in India.

During the past two and a half decades, the contribution of fisheries to gross domestic product (GDP) of India has continued to grow at a rapid pace due to expansion of culture fisheries. While the share of agriculture and allied activities in the total GDP has constantly declined, the contribution of fisheries has gone up from less than 1 per cent in 1980-81 to 1.04 per cent in 2004-05 (at current prices). Similarly, the share of fisheries in agricultural GDP has increased from about 2.2 per cent in 1980-81 to almost 6 per cent in 2004-05.

Fish Production: Structure, and Growth Trend

During the past two and a half decades, fish production at the country level has grown at the rate of about 4.6 per cent, which has mainly been contributed by annual growth of above 6 per cent in inland sector and of about 3 per cent in marine fisheries (Table 27).

Table 27: Annual growth rate in fish production in India

(per cent)

Year	Marine	Inland	Total
1981-1990	3.80	5.28	4.39
1991-2000	2.33	6.55	4.13
2001-2006	-0.21	5.37	2.75
1981-2006	3.24	6.20	4.60

The trend in fish production growth has been found to be linear (Figure 11). The trends in marine and inland fish production have revealed that while the former has been increasing at a decreasing rate, the latter has been increasing at an increasing rate. This may be due to the increasing importance of inland fisheries (mainly aquaculture) and adequate policy support in states like Uttar Pradesh, Andhra Pradesh, and Punjab in recent years. In the coming decades, aquaculture would be a major contributor to fish production, as fish farmers are expanding the waterbodies area and following improved management practices. Besides, there are several challenges in fish production that need attention.

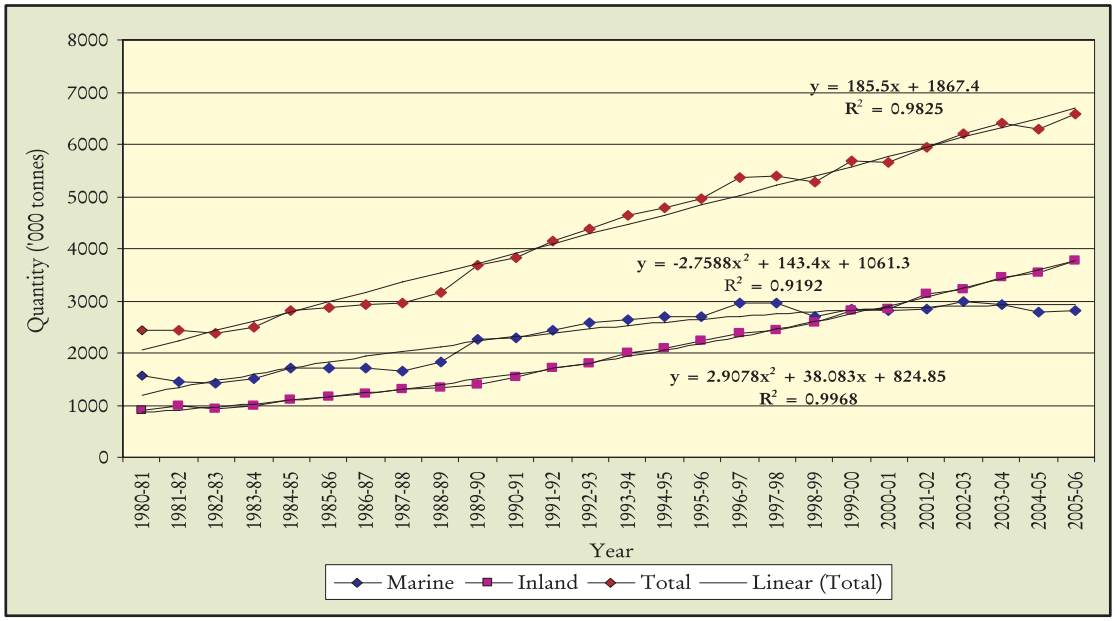


Figure 11: Trends in fish production: 1980-81 to 2005-06

Assessment of Poverty Alleviation Programmes in India

Shinoj P. and P.K. Joshi

The Indian economy has witnessed significant reduction in poverty during the past few decades. During early-1950s, around 50 per cent of rural and 35 per cent of urban population of the country was living below the poverty line. But, concerted efforts in reducing the miseries of the people have paid rich dividends by the end of the twentieth century. The average monthly per capita expenditure of people has risen steadily over the past three decades, which indicates a reduction in poverty. In 1973-74, the monthly per capita expenditure of rural people was Rs 53 (at current prices), which increased to Rs 486 by the year 1999-00. The corresponding increase for the urban people was from Rs 71 to Rs 855. The specifically designed anti-poverty programmes for generation of both self-employment and wage-employment in the rural areas were restructured in 1999-00 to enhance their efficacy/impact on the poor and improve their sustainability. These programmes were broadly grouped based on their impact channels into four categories: (i) Programmes aimed at increasing farm and labour productivity and agricultural income, (ii) Inclusion of local, rural and agricultural economies in a wider process of economic growth, (iii) Transfer of cash/ foodgrains to the poor, and (iv) Reducing costs and increasing prices through subsidies.

The poverty alleviation programmes have been a source of great relief to the burgeoning millions of the country who live below the poverty line. However, targeting government expenditures simply to reduce poverty is not sufficient. Government expenditures also need to stimulate economic growth and help generate resources for the future government expenditures. Therefore, the country has to lay higher emphasis on multi-dimensional approach, involving agricultural productivity improvement, employment guarantee, women and children development, healthcare, infrastructure development, sanitation, insurance, subsidies, etc. While planning poverty alleviation programmes, it has to be taken into consideration that the process should ultimately address livelihood quality rather than simply income poverty. That is, higher per capita income needs to be translated into higher levels of social infrastructure and government expenditure on social services, which in turn, would lead to reduction in the levels of human poverty. Thus, a well-balanced strategy, taking lessons from the past, would indeed result in placing the country on sustainable growth path.

Decision Tree Model for Classifying Technology Savvy Farmers

Rajni Jain

Decision Tree (DT) induction represents a simple and powerful method for the classification of any population in different categories, based on selected characteristics. One of the strengths of decision trees compared to other methods of induction is the ease with which it can be used for numeric as well as non-numeric domains. Another advantage of decision tree is that it can be easily mapped to rules. On the either side, one of the challenges in decision tree induction is to develop algorithms that produce decision trees of small size and depth. Rough set-based Decision Tree (RDT) model, a hybrid of rough set methodology with decision tree induction under the umbrella of data mining applications, is used to produce decision tree.

The field of agriculture has many problems whose solutions in the form of decision tree are important in social context. A case study for the state of Haryana involving identification of farmers adopting pesticides, insecticides /fungicides in their fields for crop protection has been studied through this methodology, using NSSO data for 1998. The data have been characterized by 40 attributes, including the decision attribute, i.e. *Ifpesticide* in this case (Table 28). The decision attribute 'Ifpesticide' with value 1 denotes that the farmer has applied agrochemicals to protect crops, while value 2 signifies their non-adoption.

Table 28: Description of codes of attributes in decision tree

Attributes name	Code specifications
Ifweedicide	Yes -1, No-2
CropCode	Paddy-1, wheat-2, other cereals-3, pulses-4, oilseeds-5, mixed crops–6, sugarcane -7, vegetables-8, fodder-9, fruits & nuts-10, other cash crops-11, others-99
Iffertilizer	Entirely -1, partly-2, none-3
Ifpesticide	Yes-1, No-2

The study has been carried out to develop a simple classifier which can provide some understanding regarding the adoption of pesticides for crop protection. Figure 12 shows best candidate for the classifier with nearly 85 per cent accuracy and 6 rules using three important variables. The nodes of the tree denote the variables to be tested and the branches indicate the possible values of the variable. Leaves denote the predictions for the decision attribute. The tree has been mapped to the following six decision rules that characterize the adoption of agrochemicals for plant protection in Haryana:

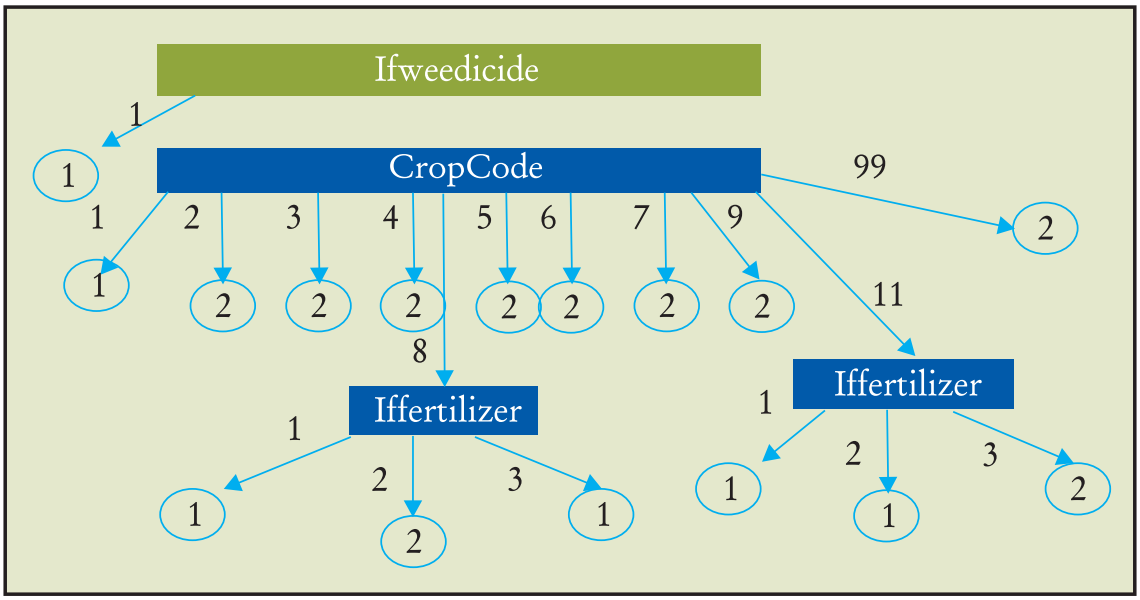


Figure 12: Decision tree for farmers adopting plant protection chemicals

1. If Ifweedicide=yes, then Ifpesticide=yes

2. If Ifweedicide=no, CropCode=paddy, then Ifpesticide=yes

3. If Ifweedicide=no, CropCode=vegetables and Ifferilizer=entirely, then Ifpesticide=yes

4. If Ifweedicide=no, CropCode=vegetables and Ifferilizer=none, then Ifpesticide=yes

5. If Ifweedicide=no, CropCode=othercashcrops and Ifferilizer=entirely, then Ifpesticide=yes

6. If Ifweedicide=no, CropCode=othercashcrops and Ifferilizer= partly, then Ifpesticide=yes

The decision tree-based model has advantages over the conventional models in terms of interpretability of the output and improved performance. Thus, data mining of real time datasets from agricultural domain is useful for evolving models for prediction.

III RESEARCH ON NORTH-EASTERN REGION

Future Sources of Growth in North-East India with Reference to Agricultural Diversification in Favour of High-value Crops

B.C. Barah and Pratap S. Birthal

Agricultural development in North-East region (NER) has received attention at various forums, notwithstanding the absence of relevant information and policy perspectives. An excellent database of North-East India has been generated, and being analysed for better understanding. Agriculture is the main stay in the NER, yet its productivity is low and risky, which has been pushing the rural people of the area below the poverty line. Practising of traditional mode of agriculture is its main cause. The innovations such as crop diversification in the region have very high prospects; unfortunately, despite its existence in the region for a long time, local people have not been able to reap the benefits. The contribution of crop diversification to income enhancement remains marginal, as most of it is meant for home consumption. Crop diversification in the area needs to be evolved as a commercial enterprise rather than being simply a subsistence activity. The production of fruits and vegetables play an important role in crop diversification, as proportion of their area in NER is around 14 per cent, which is higher than the national average of 10 per cent. Therefore, higher intervention is required to promote crop diversification in the NER through improved value-addition and marketing strategies.

Livestock Sector in North-Eastern Region of India

Anjani Kumar, Steven Staal, K. Elumalai and Dhiraj K. Singh

Livestock is an important component of crop-livestock mix system in the North-Eastern Region (NER) of the country. It has potential of providing an alternative source of income and employment to the farmers in the area. However, responding to the burgeoning demand for livestock products in a sustainable manner is a big challenge. The widening gap between demand and supply can be bridged through changes in the production structure or opening the international trade; either of these will correct the imbalances in the long-run. In the present study, factors influencing development of livestock sector in NER have been analyzed using a logit model.

The study has shown that landless labourers and small and marginal farmers are earning a significant proportion of their income from the livestock sector. A number of factors influence the livestock rearing and their impact on livestock economy in the NER has been observed as follows (Table 29):

Labour resource: The availability of labour has a positive and significant influence on livestock rearing.

Occupation of household: It has a significant role in decision-making for livestock rearing.

Table 29: Factors influencing farmers' decision to keep livestock in North-Eastern region

Explanatory variables	Coefficient	Explanatory variables	Coefficient
Age of household-head (years)	-0.0036	Caste+	
Gender of household-head Male =1, otherwise =0	0.1841	ST=1, otherwise=0	0.1769
Household-size	0.1384***	SC=1, otherwise=0	0.1983
Farm-size (hectare)	0.7801***	Others=1, otherwise=0	0.5296***
Household type		States#	
Agricultural labour=1, otherwise=0	-0.0981	Arunachal Pradesh=1, otherwise=0	0.5881***
Other labour=1, otherwise=0	-0.2263*	Assam=1, otherwise=0	0.6386***
Self-employed in agriculture=1, otherwise=0	1.2558***	Manipur=1, otherwise=0	-0.6585***
Other household=1, otherwise=0	0.2687**	Meghalaya=1, otherwise=0	-1.1230***
Own tubewell=1, otherwise=0	0.5185***	Nagaland=1, otherwise=0	1.2719***
Access to institutional credit =1, otherwise=0	0.2615	Sikkim=1, otherwise=0	0.9817***
Access to telephone=1, otherwise=0	-0.3322	Tripura=1, otherwise=0	0.1920
Access to newspapers =1, otherwise=0	0.1146	Constant	-2.22364
Access to TV =1, otherwise=0	-0.4173***	log-likelihood	-4952.96
Access to Radio =1, otherwise=0	0.1717***	R^2	0.2317

Note : ***, **, and * indicate statistical significance at 1per cent, 5 per cent and 10 per cent levels, respectively.

+-Other Backward Caste was treated as the reference caste;

#Mizoram was treated as the reference state.

Age and gender of household-head: The effect of these variables is not significant.

Farm-size: The relationship between farm-size and livestock-rearing has been found positive and significant, indicating the existence of a strong crop-livestock interaction.

Tubewell: The coefficient of tubewell is positive and significant, indicating that assured irrigation ensures availability of fodder, which induces the farmers to keep livestock.

Institutional credit: Access of farm households to institutional credit though influences farmers' decision to rear livestock positively, but not significantly.

Access to information sources: It influences the farmers' decision to rear livestock.

Caste: Caste (general) has positive and significant influence on the decision of livestock rearing.

Dummies for states: The coefficients for state dummies except Manipur and Meghalaya have shown a positive and significant effect. This indicates the role of a state in promoting livestock development.

Assessment of Economic Losses from Avian Flu in Poultry Sector in Manipur State

B. Ganesh Kumar, P.K. Joshi, K.K. Datta and S.B. Singh

The threat of avian influenza (also called as 'bird flu') has received a great deal of attention globally in recent years. Ever since the 1996-discovery of the highly pathogenic H5N1 strain of avian influenza in China, the virus has spread rapidly within the continents of Asia, Europe, and Africa.

While the focus has been on the potential impacts of pandemic influenza in humans, a little attention has been paid to the economic losses that have already resulted from the appearance of the highly pathogenic H5N1 avian flu in wild and domestic birds. This study has been done in the Manipur state of India where outbreak of 'avian flu' had occurred in July 2007, causing a massive economic loss on account of culling of nearly 3.39 lakh birds after it was notified by the Government of India. The study is based on the responses from poultry farmers (30 each of different species and farm sizes), chick and poultry traders, integrators, private hatcheries and chicken retail outlets. The data were collected from farmers both from the infected zone (0-5 km radius from the affected site) and the surveillance zone (5-10 km radius outside the infected zone) through a structured schedule making personal visits. Secondary data have been collected from the officials and veterinarians.

Impact of Avian Flu

(i) Poultry Farmers

The immediate financial loss to producers due to avian flu outbreak was worked out by taking into account the number of birds culled, their average body weight at the time of culling and their market prices. The figures were compared with the actual compensation received from the Government at the rate of Rs 10 per chick, Rs 30 per brolier and Rs 40

per layer (http://www.dahd.nic.in). The total loss to the producers has been estimated to be of Rs 316 lakh, while they have received only Rs 99.13 lakh (nearly 31 per cent) as compensation. Such an inadequate compensation would lead to two consequences: (i) it would affect the livelihood and sustenance of poultry farmers and their families, particularly in the area like Manipur which is already experiencing internal disturbances on account of economic reasons, and (ii) it might lead to poor compliance in culling and disinfection operations and hence lack of eradication of disease outbreak, that will have more serious implications.

(ii) Consumers

After the outbreak of avian flu in Manipur, the prices of chicken dropped below normal, in spite of short supply in the market. This is indicative of the fact the bio-security is the concern of consumers even in the less-developed states like Manipur in India. In fact, the financial impact was so severe on the chicken retail outlets that some of them had to shift their business to selling of other meat products which are competitive to poultry meat such as fish and pork. The prices of chicken and its competitive products given in Table 30, reveal that the price of dressed chicken even from a disease-free zone slashed by 13 per cent post-flu, while the prices of fish rose by a staggering 85 per cent and of pork by 37 per cent in the Manipur state.

Table 30: Price of chicken and its competitive products in Manipur

(Rs/kg)

Products	Pre-Flu	Post-Flu	Change, %
Dressed chicken	75	65	-13.33
Fish	65	120	84.62
Pork	80	110	37.50

The overall financial impact on the poultry sector in Manipur has been estimated to be of around Rs 2455.17 lakh on account of avian flu outbreak (Figure 13), which amounts to about 14 per cent of total value of livestock outputs and 0.5 per cent of State Gross Domestic Product. Study has shown that producers and input industry have been more sufferers than meat and egg retailers. However, further investigations are needed to assess the impact of avian flu on other subsidiary sectors like transport, hotelling, tourism, trade, etc. On adding every perceivable loss, the actual impact would be much larger, which is very harsh for the small and developing states like Manipur.

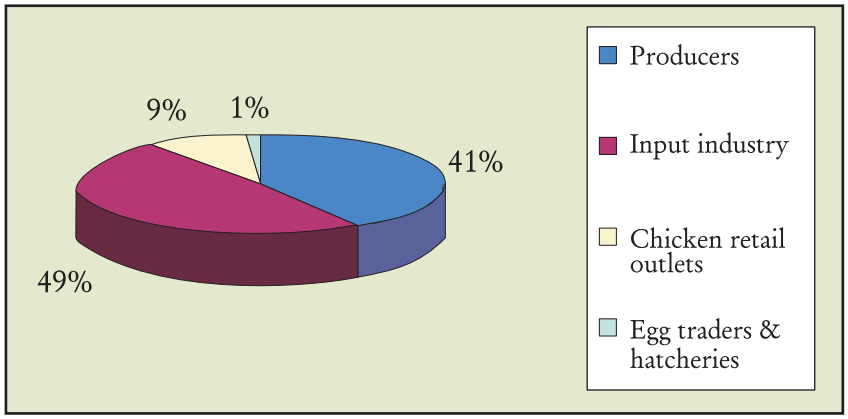


Figure 13: Distribution of financial loss from avian flu in poultry sector in Manipur

Success of Watershed Programmes in North-Eastern Region of India: Some Pre-requisites

K.K. Datta and A.K. Jha

Strong community bondage and prevailing traditional institutions are the two major forces that offer opportunity to the successful implementation of watershed programmes in the North-Eastern Region (NER) of India. In this regard, use of traditional knowledge of farmers in the successful implementation of the watershed development programmes is essential. For example, farmers in the NER have preferences for growing mixed-cropping, which provides a favourable crop canopy and reduces the loss of rainwater through run-off, which is enormous and precious. Therefore, this practice can be integrated with suitable water-harvesting technologies for saving run-off water.

Empowerment of smallholders is a pre-requisite for the success of watersheds. About 86 per cent households in NER are small and marginal farmers who have enough labour resources, but lack capital because of poor surpluses and weak resource-base. Therefore, it is essential to give emphasis on the production portfolios of these smallholders so that they may be able to generate (i) quick returns, (ii) higher income, (iii) secured and stable earnings, and (iv) more demand for labour. The existing higher level of diversified upland farming systems can be transformed into a profit-making commercial farming using watershed activities.

The production portfolio would be sustainable if market is ensured to absorb the product. Small and marginal farmers are forced to bear high costs on transportation and transaction in the marketing of their produce because of their small-scale productions and generation of low marketable surpluses. 'Demand driven' and high-value products may lead to the success of watershed.

Since the availability of moisture in the lower terraces is more, it is useful to grow rice, whereas maize, sesamum, etc. could be raised in the upper terraces. Similarly, the available terrace area (about 35-40 per cent of the total land area) can be effectively utilized for raising perennial fodder grasses and legumes, which would not only help to check soil erosion but would also provide feed for the livestock. There cannot be a single window solution through watershed. It is necessary to identify specific problems in the locality where watersheds are going to be launched.

The role of marketing in the process of transition from subsistence to commercial farming is very crucial. In the era of market-driven economy, evolution of mechanisms that link producers with markets is imperative. This requires some innovative institutional arrangements, which could connect these nearly landlocked solitary states of NER with the domestic and global markets.

The role of policies is also highly critical. Frequent changes in the policy directions adversely affect the performance and participation of watersheds. Besides, a continuous monitoring and critical financial/ institutional support are essential to sustain the watershed programmes beyond the project period. It has been observed that as the financial support is withdrawn, watersheds suffer due to shortage of funds and slowly the participatory mode gets eroded.

IV POLICY INTERACTIONS

Dr B.C. Barah, Principal Scientist

- Member, National Food Security Mission Executive Committee, Ministry of Agriculture, Government of India, New Delhi.

Dr Ramesh Chand, ICAR National Professor

- Member, Steering Committee on Agriculture for 11th Five-Year Plan, Planning Commission, Government of India, New Delhi.
- Member, Expert Committee to Examine Various Strategic Options and to Recommend Measures to Ensure Adequate Procurement of Wheat during RMS 2007-08, Department of Food & Public Distribution, Ministry of Consumer Affairs & Public Distribution, Government of India, New Delhi.

Dr P.K. Joshi, Director

- Member, Working Group on Land Leased-in and Owned Land, Department of Agriculture & Cooperation, Ministry of Agriculture, Government of India, New Delhi.
- Member, Working Group on Legal and Technical Experts on Liability and Redress in the Context of Cartagena Protocol on Biosafety, Ministry of Environment and Forest, Government of India, New Delhi.
- Member, Indo-Brazil and South Africa Joint Working Group on Policy Issues and Poverty Alleviation, Department of Agricultural Research and Education, Government of India, New Delhi.
- Member, 11th Five-Year Plan sub-group on Adoption and Generation of Relevant Technologies and their Dissemination to the Farmers, Planning Commission, Government of India, New Delhi.

Dr Suresh Pal, Principal Scientist

- Preparation of DARE/ICAR Outcome Budget 2008-09.
- Member Secretary, ICAR Committee on Projectized Mode of Research.
- Member, Evaluation of ICAR Plan Scheme: CSSRI, Karnal.
- Member, Evaluation Committee of ICAR Plan Scheme: CIAE, Bhopal.

V AWARDS AND RECOGNITIONS

Dr Pratap S. Birthal, National Fellow

- Member, Management Committee, Central Avian Research Institute, Izatnagar
- Member, Management Committee, National Bureau of Animal Genetic Resources, Karnal

Dr Ramesh Chand, ICAR National Professor

- Nominated Fellow, National Academy of Agricultural Sciences (NAAS), New Delhi
- Member, Governing Body, Agro-Economic Research Centre, University of Delhi, Delhi
- Member, Editorial Board, Indian Journal of Agricultural Economics, Mumbai
- Member, Editorial Board, Journal of Commodity Markets and Risk Management, New Delhi
- Member, Quinquennial Review Team, Directorate of Wheat Research, Karnal
- Member, Research Advisery Committee of NICR (NCDEX Institute for Commodity Research), New Delhi

Dr P.K. Joshi, Director

- Chairman, Governing Board, SAARC Agriculture Centre, Dhaka, Bangladesh
- Chairman, Governing Board, United Nation's Centre for Alleviation of Poverty through Secondary Crops' Development in Asia and Pacific (CAPSA), Bogor, Indonesia
- Chairperson, Academic Advisory Committee, Agro-Economic Research Centre, Government of India, New Delhi
- Member, Inter-governmental Panel on International Assessment of Agricultural Science and Technology for Development (IAASTD), Washington, DC, USA
- Member, Technical Committee, United Nation's Centre for Alleviation of Poverty through Secondary Crops' Development in Asia and Pacific (CAPSA), Bogor, Indonesia
- Member, Central Technology Management Committee, Indian Council of Agricultural Research, New Delhi
- Member, Quinquennial Review Team, Indian Agricultural Staistics Research Institute, New Delhi
- Member, Editorial Board, Indian Journal of Animal Sciences, New Delhi
- Member, Research Advisory Committee, Indian Society of Agricultural Economics (Mumbai)
- Secretary, Agricultural Economics Research Association (India), New Delhi
- Fellow, National Academy of Agricultural Sciences (NAAS), New Delhi
- Awarded *RT Doshi Prize* for research article on 'Diversification towards High-Value Crops and its Impact on Smallholders' published in Agricultural Economics Research Review, Vol. 19, July-December 2006, alongwith Laxmi Tewari and Pratap S. Birthal

Dr Anjani Kumar, Senior Scientist

- Elected as Associate of National Academy of Agricultural Sciences, w.e.f. 1 January 2008
- Reviewer for 18th Annual Internal Food and Agribusiness Management Association (IAMA) Symposium

VI PUBLICATIONS

(a) Book

Rao, Parthasarathy P. and Pratap S. Birthal. 2008. *Livestock in Mixed Farming Systems in India*. International Crops Research Institute for the Semi-Arid Tropics, Patancheru (India); National Centre for Agricultural Economics and Policy Research, New Delhi; and CGIAR Systemwide Livestock Programme, International Livestock Research Institute, Addis Ababa, Ethiopia.

(b) Research Papers

Barah, B.C. 2007. Criticality of rice wheat system in sustainable food security in India, *Agricultural Situation in India*, **61** (5):29-37.

Birthal, Pratap S., A.K. Jha and Harvinder Singh. 2007. Linking farmers to markets for high-value agricultural commodities, *Agricultural Economics Research Review*, **20** (Conference Number): 425-440.

Birthal, Pratap S. 2008. Linking smallholder livestock producers to markets: Issues and approaches, *Indian Journal of Agricultural Economics*, **63** (1):19-37.

Birthal, Pratap S., Anjani Kumar and T.N. Datta. 2008. Trading in livestock and livestock products. *Indian Journal of Agricultural Economics*, **63** (1): 58-63.

Chand, Ramesh. 2007. Marketing and trade policies in a globalising world, *Indian Journal of Agericultural Marketing*, **21** (3):20-30.

Chand, Ramesh. 2007. Wheat supply, price prospects and food security, *Economic and Political Weekly,* **42** (19): 1659-1663.

Chand, Ramesh. 2007. Wheat import and price outlook for 2007-08: Separating the grain from the chaff, *Economic and Political Weekly,* **42** (30): 3196–3199.

Chand, Ramesh, S.S. Raju and L.M. Pandey. 2007. Growth crisis in agriculture: Severity and options at national and state levels, *Economic and Political Weekly,* **42** (26):2528-2533.

Datta, K.K., Subhasis Mandal, A.K. Tripathi, S.B. Singh, M.R. Verma, and S. Mohanty. 2007. Retrospect and prospect of food security in north-eastern hilly region of India, *Agricultural Situation in India*, **64** (5):37-50.

Kumar, Anjani, Dhiraj K. Singh and Prabhat Kumar. 2007. Performance of rural credit and factors affecting the choice of credit sources, *Indian Journal of Agricultural Economics*, **62** (3): 297-313.

Kumar, Anjani, Steven J. Stall, N.P. Singh and Dhiraj K. Singh. 2007. Livestock sector trade of India: Surging momentum in the new liberalised regime, *Indian Journal of Agricultural Economics*, **62** (3): 395-410.

Kumar, Anjani, Steven J. Staal, K. Elumalai and Dhiraj K. Singh. 2007. Livestock sector in North-Eastern Region of India: An appraisal of performance, *Agricultural Economics Research Review*, **20** (2):255-72.

Kumar, Sant. 2007. Exploring possibility to bring second green revolution in India: The case of wheat, *Agricultural Situation in India*, **64** (5): 71-74.

Mandal, Subhasis. B.K. Mahapatra, A.K. Tripathi, Med Ram Verma, K.K. Datta and S.V. Ngachan. 2007. Agribusiness opportunities of ornamental fisheries in North-Eastern Region of India, *Agricultural Economics Research Review*, **20** (Conference Number): 471-488.

Pandey, S. and Suresh Pal. 2007. Are less-favored environments over invested? The case of rice research in India, *Food Policy* (Elsevier), **32** (5-6): 606-623.

Raju, S.S. 2007. Indian livestock products and their global competitiveness, *Outlook on Agriculture,* **36** (4): 281-284.

Raju, S.S. 2007. A framework of sustainable agricultural development in the context of globalization, *Journal of Global Economy,* **3** (1): 33-36.

Raju, S.S. and Ramesh Chand. 2007. Progress and problems in agricultural insurance, *Economic and Political Weekly,* **42** (21): 1905-1908.

Singh, Harbir. 2006. Policy issues and options for agricultural development of rainfed areas in India, *Agricultural Situation in India*, **63** (5): 301-308.

Singh, Harbir. 2007. Plant variety protection and food-security: Lessons for developing countries, *Journal of Intellectual Property Rights*, **12** (4): 391-399.

Singh, Harbir. 2007. Reorientation of agricultural research for addressing food-security issues through agricultural biotechnology, *Asian Biotechnology and Development Review*, **9** (3): 83-93.

Singh, Harbir and Suresh Pal. 2007. Development of the Indian seed system: The roles of public policy, markets and institutions, *Tailoring Biotechnologies*, **3** (3): 55–66.

Verma, M. R., K.K. Datta, Subhasis Mandal and A.K. Tripathi. 2007. Production and consumption pattern of major food items in North-Eastern Region of India, *Agricultural Situation in India*, **64** (3): 89-95.

Verma, M.R., K.K. Datta, Subhasis Mandal and A.K. Tripathi. 2007. Diversification of food production and consumption patterns in India, *Journal of Agricultural & Food Information*, **8** (3):87-100.

(c) Book Chapters

Ahuja, Usha Rani, M.A. Khan and G.S. Jodha. 2007. Socio-economic impact of a watershed in hot arid region. In: *Proceedings of the Conference on Environmental and Livelihood Security through Resource Management in Northern India,* Eds: A.K. Tewari, V.K. Bhat, Pavan Sharma, Pratap Singh, S.L. Arya, R.P. Yadav and Ram Prasad,113-114 pp.

Ananthram, K., S.S. Raju, C.S. Prasad and K.T. Sampath. 2007. Commercialization of Indian livestock economy: Problems and prospects. In: *Marketing of Livestock and Livestock Products in India*. Eds: S. Bhaskaran and Suchitra Mohanty, The Icfai University Press, Hyderabad (India), 45-60 pp.

Arora, A., Rajni Jain and Shuchita Upadhyaya. 2007. Rough set based feature selection for clustering. In: *Proceedings of 3rd Indian International Conference on Artificial Intelligence*, Ed: Bhanu Prasad, Pune, India, 1615-1625 pp.

Barah, B.C., Sushil Pandey and L. Velasco. 2007. Rice technologies for rainfed environment in Asia. In: *Institutional Alternatives and Good Governance of Agriculture*, Ed: Vishva Ballabh; Academic Foundation, New Delhi, 209-34 pp.

Birthal, Pratap S. and P.K. Joshi. 2007. Smallholder farmers' access to markets for high-value agricultural commodities in India. In: *Food Policy for Developing Countries: The Role of Government in Global Food System*. Eds: Per Pinstrup-Andersen, Fushi Cheng, S.E. Frandsen, A. Kuyvenhoven and Joachim von Braun, Cornell University, Ithaca, New York.

Chand, Ramesh. 2007. Role of state in agricultural prices in liberalised era, In: *Institutional Alternatives and Governance of Agriculture*, Ed: Vishva Ballabh, Academic Foundation, New Delhi.

Chand, Ramesh. 2007. Development of agriculture and allied sectors in Punjab. In: *Rural Development in Punjab: A Success Story Going Astray*, Eds: A.S. Dhesi and Gurmail Singh, Routledge, New Delhi, 83-105 pp.

Chand, Ramesh. 2008. The state of Indian agriculture and prospects for the future. In: *Growth Equity, Environment and Population,* Eds: Kanchan Chopra, and C.H. Hanumantha Rao, Sage Publications (India), New Delhi. 133-148 pp.

Chand, Ramesh. 2008. International trade, food security and response to the WTO in South Asian Countries. In: *Food Security; Indicators, Measurement and the Impact of Trade Openness*. Eds: Basudev Guha Khasnobis, Shabd S. Acharya and Benjamin Davis, Oxford University Press, UK.

Chand, Subash, A.K. Sikka, P. Sundrambal, B. Ganesh Kumar and Z. George. 2007. Impact assessment of village ponds rehabilitation programme in Ramanathapuram District of Tamil Nadu: A case study. In*: Proceedings of 10th Inter-Regional Conference on Water and Environment (ENVIROWAT 2007) – Ensuring Water and Environment for Prosperity and Posterity,* held at IARI, New Delhi during 17-20 October, 6-7 pp.

Chand, Subash, B. Ganesh Kumar, R.C. Srivastava, Z. George and K. Roy. 2007. Socio-economic characteristics of dairy farming households in South Andaman. In: *Proceedings of International Symposium on Management of Coastal Ecosystem: Technological Advancement and Livelihood Security,* organized by CSSRI, Canning Town, at Science City, Kolkata, 27-30 October, 21-22 pp.

Chattopadhyay, S., Rajni Jain and Gautami Chattopadhyay. 2007. Neurocomputing-based estimation of evapotranspiration over Gangetic West Bengal. In: *Proceedings of 2nd National Conference on Methods and Models in Computing (NCM2C 2007)*, Eds: S. Minz and D.K. Lobiyal, Allied Publishers Pvt. Ltd., New Delhi, 157-167 pp.

Datta, K.K. 2007. Adaptation to climate change through market driven strategies. In: *Combat Climate Change through Market Driven Strategies*, Ed: J.S. Ahluwalia, World Environment Foundation, New Delhi, 73-91 pp.

Datta, K.K. 2007. Importance of livestock towards diversified food economy, In: *Complementary Role of Livestock and Fisheries towards Sustainable Farming in North-East India*, Eds: Anubrata Das, A. Kumaresan, R.K. Bardoloi, K.M. Bujarbaruah and S. Naskar, ICAR Research Complex for NEH Region, Umiam, Meghalaya, 22-31 pp.

Ganesh Kumar, B. 2007. Coastal eco-system: Structure, character, challenges & strategies in India. In*: Proceedings of International Symposium on Management of Coastal Ecosystem: Technological Advancement and Livelihood Security,* CSSRI, Canning Town, Kolkata, 27-30 October, 173 pp.

Ganesh Kumar, B. and K.K. Datta. 2008. Growth of fisheries sector in India: Drivers for future. In: *Proceedings of National Workshop on Development of Strategies for Domestic Marketing of Fish and Fishery Products,* organized by College of Fishery Science, SVVU, Muthukur, Nellore (A.P.) and Professional Fisheries Graduates Forum (PFGF), Mumbai, held at CFSc, Muthukur, 7-8 February, 7 pp.

Ganesh Kumar, B., Z. George, Subhash Chand and R.C. Srivastava. 2007. Impact of tsunami on agricultural and allied activities in south Andaman, In: *Proceedings of International Symposium on Management of Coastal Ecosystem: Technological Advancement and Livelihood Security,* organized by CSSRI, Canning Town, held at Science City, Kolkata, 27-30 October, 122 pp.

Ganesh Kumar, B., K.K. Datta and P.K. Joshi. 2008. Exploring domestic market opportunities for fisheries sector in India: A step towards future. In*: Proceedings of National Workshop on Development of Strategies for Domestic Marketing of Fish and Fishery Products,* organized by College of Fishery Science, SVVU, Muthukur, Nellore (A.P.) and Professional Fisheries Graduates Forum (PFGF), Mumbai, held at CFSc, Muthukur, 7-8 February, 24pp.

Jain, Rajni. 2007. Approximate core-based RDT model for classifying technology savvy farmers. In: *Proceedings of 3rd Indian International Conference on Artificial Intelligence*, Ed: Bhanu Prasad, IICAI, Pune, 1669-1683 pp.

Jain, Rajni, Goutami Chattopadhyay and Surajit Chattopadhyay. 2008. Forecasting winter shower in India: A comparison between artificial neural network and regressive approach. In: *Data Management,* Eds: J. Ranjan and Poonam Garg, Macmillan Advanced Research Series, New Delhi, 877-885 pp.

Jain, Rajni and Sona Minz. 2007. Intelligent data analysis for identifying rich: The rough set way. In: *Proceedings of 2nd National Conference on Methods and Models in Computing*, Eds: S. Minz and D.K. Lobiyal, Allied Publishers Pvt. Ltd., New Delhi, 117-130 pp.

Jha, D. and Suresh Pal. 2007. Agricultural research and technology in India: Status, impact, and contemporary issues. In: *The Dragon and the Elephant: Economic Reforms in China and India*, Eds: Shenggen Fan and Ashok Gulati, John Hopkins University Press/IFPRI, (also published by Oxford University Press): 160-179 pp.

Joshi, P.K. and Ashok Gulati. 2007. From plate to plough: Agricultural diversification in India. In: *The Dragon and the Elephant: Economic Reforms in China and India*, Eds: Shenggen Fan and Ashok Gulati, John Hopkins University Press/IFPRI (also published by Oxford University Press): 384-402 pp.

Joshi, P.K. and Pratap S. Birthal. 2007. Contract farming and new dimension of Indian agrarian structure. In: *Institutional Alternatives and Governance of Agriculture*, Ed: Vishva Ballabh, Academic Foundation New Delhi, 237-258 pp.

Pal, Suresh and D. Jha. 2007. Public-private partnership in agricultural R&D: Challenges and prospects. In: *Governance and Development: Issues, Challenges and Strategies*, Ed: Vishva Ballabh, Sage Publications, New Delhi, 151-171 pp.

Raju, S.S. and Ramesh Chand. 2007. Agricultural insurance in India Problems and prospects. In: *Agricultural Risks Management: Challenges and Strategies*. Eds: B.V.S. Prasad and Suchitra Mohanty, The Icfai University Press, Hydearbad (India), 143-161 pp.

Sharma, A. and Rajni Jain. 2007. Decision tree for automatic classification of agricultural web documents, In: *Proceedings of 3rd Indian International Conference on Artificial Intelligence (IICAI-07)*, Ed: Bhanu Prasad, IICAI, Pune, India, pp.1525-1532.

(d) Book Reviews

Chand, Ramesh. 2007. China's Agricultural Development: Challenges and Prospects. Eds: Dong, Xiao-Yuan; Song, Shunfeng and Zhand, Xiaobo, *Indian Journal of Agricultural Economics*, 62 (4): 694-696.

Chand, Ramesh. 2007. China's Rural Economy after WTO: Problems and Strategies. Eds: Song, Shunfeng and Aimin, Chen. *Indian Journal of Agricultural Economics*, 62 (4): 694-696.

(e) Discussion /Working /Occasional Papers, Research Reports and Workshop Proceedings

Barah, B.C., R.K. Singh and Panjab Singh. 2007. Innovations in rural institutions: Driver for rural prosperity. *Policy Paper 39*, National Academy of Agricultural Sciences, New Delhi.

Birthal, Pratap S. 2007. Linking smallholder livestock producers to markets: Issues and approaches. *Working Paper 8*. National Centre for Agricultural Economics and Policy Research, New Delhi.

Birthal, Pratap S., A.K. Jha and Dhiraj K. Singh. 2007. Income diversification among farm households and its effects on inequality and social welfare. *Working Paper* 7. National Centre for Agricultural Economics and Policy Research, New Delhi.

Birthal, Pratap S., P.K. Joshi, Devesh Roy and Amit Thorat. 2007. Diversification of Indian agriculture towards high-value crops: The role of smallholders. *IFPRI Discussion Paper 00727*. International Food Policy Research Institute, Washington DC, USA.

Chand, Ramesh. 2007. Agro-industries characterization and appraisal: Soybeans in India, Agricultural Management Marketing and Finance *Working Document 20,* Food and Agricutlure Organization of the United Nations, Rome, Italy.

Chand, Ramesh and S.S. Raju. 2008. Instability in Indian agriculture during different phases of technology and policy, *Discussion Paper NPP: 01*, National Centre for Agricultural Economics and Policy Research, New Delhi.

Pal, Suresh. 2007. *Agricultural R&D policy reforms in developing countries*, *Working Paper No. 9,* National Centre for Agricultural Economics and Policy Research, New Delhi, p 26.

Rameswar, Deka, William Thorpe, M. Lucila Lapar and Anjani Kumar. 2007. *Assam's Pig Sub-sector: Current Status, Constraints and Opportunities*, International Livestock Research Institute, Nairobi, Kenya, 117 p.

(f) Popular Articles

Adhiguru, P., Suresh Pal and P.K. Joshi. 2008. Agricultural research and technology transfer to farmers, *University News,* 46(05):65-74.

Joshi, P.K. 2007. Incentive investment in farm sector. *The Economic Times*, New Delhi, 14 May.

Joshi, P.K. 2007. Are food prices reaching crisis level? *The Economic Times*, New Delhi, 25 December.

Joshi, P.K. 2008. Technology provides a sustainable higher growth rate in agriculture. *The Financial Express*, New Delhi, 7 January.

Joshi, P.K. 2008. Non-farming activities and technology could provide sustainable growth in Indian agriculture. *Commodityindia.com*, **2**(2), February, 12-18 pp.

(g) TV Talks

P. K. Joshi. 2007. *Preparing for Green Revolution-II*, DD Lok Sabha Channel, Public Forum, 19 May.

P. K. Joshi. 2007. *Contract Farming,* DD Lok Sabha Channel, Public Forum, 3 September.

P. K. Joshi. 2008. *Cess for Agriculture,* NDTV, 7 January.

P. K. Joshi. 2008. *Union Budget 2008-09 and Agriculture*, Panel Discussion, eTV, New Delhi, 29 February.

(h) Presentations in Conferences/Workshops/Symposia

Adhiguru, P. 2007. Evolution of technology transfer system. Paper presented at the national workshop on *Centre-State Systems in India*, organized as a part of the NAIP sub-project on VPAGe by NCAP-YESBank-ISEC-UASB, at Institute for Social and Economic Change, Bangalore, 24-25, August.

Adhiguru, P. and Pratap S. Birthal. 2007. ICT in Indian agriculture: Lessons for upscaling. Paper presented at the national seminar on *Appropriate Extension Strategies for Management of Rural Resources*, University of Agricultural Sciences, Dharwad, 18-20 December.

Arora, A., Rajni Jain and Shuchita Upadhyaya. 2007. Rough set-based feature selection for clustering. Paper presented at the *Third Indian International Conference on Artificial Intelligence*, organised jointly by IICAI and National Insurance Academy, Pune, India, 17-19 December.

Birthal, Pratap S. 2007. Conditions for the success of contract farming. Paper presentd at the *Indo-US AKI Workshop on Contract Farming: Methods and Experiences*, organized by National Centre for Agricultural Economics and Policy Research, New Delhi; United States Department of Agriculture; and International Food Policy Research Institute, at NASC Complex, New Delhi, 5-6 May.

Birthal, Pratap S. 2007. Supply chains in agribusiness in India. Paper presented at the workshop on *Research on Supply Chains in Agri-business*, organized by the Asian Productivity Organization at Tokyo, 5-7 June.

Birthal, Pratap S. 2007. Livestock industry: A backbone to sustainable agricultural economy. Paper presented at the *Symposium on Livestock Industry – A Key Driver of Agricultural Economy*, organized by Compound Livestock Feed Manufacturers Association (Mumbai), at Ootty, Tamil Nadu, 18 September.

Birthal, Pratap S. 2007. Linking smallholder livestock producers to markets: Issues and approaches. Presented a keynote paper at the *Sixty-seventh Annual Conference of the Indian Society of Agricultural Economics*, at Bankers' Institute of Rural Development, Lucknow, 5-7 November.

Chand, Ramesh. 2007. *Food Requirement and Other Projections for the Years 2011- 2012 and 2020*. Presented at the meeting with Honourable Union Agriculture Minister, Government of India and Private Sector, organized by Ministry of Agriculture, Government of India, at Mumbai, 3 April.

Chand, Ramesh. 2007. Growth crisis in Indian agriculture: Severity and options at national and state levels. Paper presented at the *National Conference on Expanding Freedom: Towards Social and Economic Transformation in a Globalizing World*, organized by Institute of Economic Growth, Delhi, 11 April.

Chand, Ramesh. 2007. Rise and decline of rainfed agriculture. Paper presented at the *National Seminar on Rainfed Agriculture,* organized by Institute for Development Studies, at Jaipur, 23-24 April.

Chand, Ramesh. 2007. Strategies to accelerate agricultural growth. Paper presented at the *National Seminar on Agrarian Distress: Problems and Remedies*, organized jointly by NCAP and IASE, at NCAP, New Delhi, 1-2 August.

Chand, Ramesh. 2008. Role of price and trade policies for agricultural growth. Paper presented at the *Babu Jagjivan Ram Birth Centenary Seminar on Role of State Policies and Institutions for the Second Green Revolution on Agricultural Revolutions, Inclusive Growth and State Policies,* organized by ICAR, at Vigyan Bhawan, New Delhi, 7 February.

Chand, Ramesh. 2008. Globalization, regional trade and food security in South Asia. Paper presented at the *South Asian Conference on Science-based Agricultural Transformation towards Alleviation of Hunger and Poverty in SAARC Countries*, organized by IFFCO Foundation, ICAR, and Ministry of Agriculture, Government of India, at NASC Complex, New Delhi, 5-7 March.

Chattopadhyay, S., Rajni Jain and Gautami Chattopadhyay. 2007. Neurocomputing based estimation of evapotranspiration over Gangetic West Bengal, paper presented at the *Second National Conference on Methods and Models in Computing*, organised by Jawaharlal Nehru University, New Delhi, 13-14 December.

Datta, K.K. 2007. Adaptation of climate change through market driven strategies. Paper presented at the *Convention on Corporate Response to Climate Change*, organized by World Environment Foundation (New Delhi) at Palampur, Himachal Pradesh, 8-10 June.

Datta, K.K. and Subhasis Mandal. 2007. Marketing of horticulture product in North East: Constraints, opportunities and strategies. Paper presented at the *Second Indian Horticulture Congress-2007* on *Opportunities and Linkages for Horticulture Research and Development with Focus on North-Eastern Region,* organized by Indian Horticulture Association, at the ICAR Complex for NEH, Barapani, Meghalaya, 18-21 April.

Datta, K.K. and Subhasis Mandal. 2007. A suggestive methodology to measure the coastal livelihood: An empirical evidence from east coast area. Paper presented at the *International Symposium on Management of Coastal Ecosystem: Technological Advancement and Livelihood Security*, organized by Indian Society of Coastal Agricultural Research; at Science City Kolkata, 27-30 October.

Ganesh Kumar, B. 2007. Coastal eco-system: Structure, character, challenges & strategies in India. Paper presented at the *International Symposium on Management of Coastal Ecosystem: Technological Advancement and Livelihood Security,* organized by Indian Society of Coastal Agricultural Research, held at Science City Kolkata, 27-30 October.

Ganesh Kumar, B., Z. George, Subhash Chand and R.C. Srivastava. 2007. Impact of tsunami on agricultural and allied activities in south Andaman, paper presented at the *International Symposium on Management of Coastal Ecosystem: Technological Advancement and Livelihood Security,* organized by Indian Society of Coastal Agricultural Research, held at Science City Kolkata, 27-30 October.

Ganesh Kumar, B. and K.K. Datta. 2008. Growth of fisheries sector in India: Drivers for future. Paper presented at the *National Workshop on Development of Strategies for Domestic Marketing of Fish and Fishery Products,* organized by College of Fishery Sciences, SVVU, Muthukur, Nellore (A.P.) and Professional Fisheries Graduates Forum (PFGF), Mumbai, at CFSc, Muthukur, 7-8 February.

Ganesh Kumar, B., K. K. Datta and P. K. Joshi. 2008. Exploring domestic market opportunities for fisheries sector in India: A step towards future. Paper presented at the *National Workshop on Development*

of Strategies for Domestic Marketing of Fish and Fishery Products, organized jointly by College of Fishery Sciences, Nellore (A.P.) and Professional Fisheries Graduates Forum (Mumbai), at College of Fishery Sciences, Nellore, 7-8 February.

Jain, Rajni. 2007. Identifying research areas for computer applications in agricultural research. Paper presented at the *National Conference of Agricultural Research Statisticians*, organised jointly by Indian Agricultural Statistics Research Institute, New Delhi, and Birsa Agricultural University, Ranchi, at Birsa Agricultural University, Ranchi, 3-4 December.

Jain, Rajni and Sona Minz. 2007. Intelligent data analysis for identifying rich: The rough set way. Paper presented at the *Second National Conference on Methods and Models in Computing,* organised by Jawaharlal Nehru University, at New Delhi, 13-14 December.

Jain, Rajni. 2007. Approximate core-based RDT model for classifying technology savvy farmers. Paper presented at the *Third Indian International Conference on Artificial Intelligence,* organised jointly by IICAI, Pune and National Insurance Academy, at Pune, 17-19 December.

Jain, Rajni. 2008. Rough sets driven datamining: Case studies using agriculture datasets. Paper presented at the *National Conference on Application and Trends in Data Warehousing, Data Mining and Data Modelling,* organized jointly by Computer Society of India and Forest Research Institute (FRI), at FRI, Dehradun, 9-10 February.

Jain, Rajni, Goutami Chattopadhyay and Surajit Chattopadhyay. 2008. Forecasting winter shower in India: A comparison between artificial neural network and regressive approach. Paper presented at the *International Conference on Data Management,* at Institute of Management Technology, Ghaziabad, UP, 25-26 February.

Joshi, P.K. 2007. Socioeconomic impact of climate change on agriculture. Paper presented at the *National Conference on Climate Change in Indian Agriculture,* organized by Indian Council of Agricultural Research, at National Agriculture Science Centre Complex, New Delhi, 12 October.

Joshi, P. K. and Suresh Pal. 2007. Socioeconomic consideration in application of herbicide resistant. Paper presented at the *Consultation Workshop on Herbicides Tolerance of GM Crops*, organized by Biotech Consortia India Limited and National Research Centre for Weed Sciences, at National Agriculture Science Centre Complex, New Delhi, 11 December.

Joshi, P.K., and P. Shinoj. 2008. Role of government programmes and policies in poverty alleviation and employment generation in India. Paper presented at *Babu Jagjivan Ram Birth Centenary Seminar on Role of State Policies and Institutions for the Second Green Revolution on Agricultural Revolutions, Inclusive Growth and State Policies*, organized by ICAR, at Vigyan Bhawan, New Delhi, 7 February.

Kumar, Anjani and Dhiraj K. Singh. 2007. Performance of livestock production system in India: Where rainfed region stands?, paper presented at the *Silver Jubilee Seminar on Livestock Development in Rainfed Areas*, Institute of Development Studies, Jaipur , 22-23 April.

Kumar, Sant. 2008. Agricultural R&D and crop technologies. Paper presented at the *National Workshop on Impact Assessment of New Agricultural Technologies*, organized under VPAGe at NCAP, New Delhi, 30-31 January.

Kumar, Sant. 2008. Impact of horticultural research. Paper presented at the *National Workshop on Impact Assessment of New Agricultural Technologies*, organized under VPAGe at NCAP, New Delhi, 30-31 January.

Pal, Suresh, Sant Kumar and Rashi Mittal. 2007. Managing agricultural crisis: Role of agricultural R&D. Paper presented at the *National Seminar on Agrarian Distress: Causes and Remedies*, organized jointly by National Centre for Agricultural Economics and Policy Research, New Delhi, and Indian Society of Agricultural Economics, Mumbai, at NCAP, New Delhi, 1-2 August.

Rao, Parthasarathy P. and Pratap S. Birthal. 2007. High-value agriculture, and linking farmers to markets. Paper presented at the *National Workshop on Impact Assessment of New Agricultural Technologies*, organized jointly by NCAP and ISAE at NCAP, New Delhi, 1-2 August.

Shinoj, P. and P.K. Joshi 2007. Poverty alleviation programmes in India: A brief profile. Paper presented at the *Regional Meeting on Poverty Alleviation though Agriculture*, organized by UNESCAP-CAPSA, at Bangkok, Thailand, 21 November.

Shinoj, P. and P.K. Joshi 2007. An inventory of pro-poor policies and programmes for poverty alleviation in India. Paper presented at the *International Seminar on Pro-poor Policy Formulation Dialogue*, organized jointly by NCAP-FAO-MoA-AERA, at NCAP, New Delhi, 14-15 December.

Singh, Harbir, 2008. India's seeds policy and new seeds bill: An assessment. Paper presented at the orientation workshop on *India's Seed Policy, Genetically Modified Crops and Farmers' Rights*, Directorate of Research, College of Horticulture, Kerala Agricultural University, Vellanikkara, 22 January.

(i) Institutional Publications

1. NCAP. 2007. *Vision 2025: Perspective Plan of NCAP,* xviii+72 p.
2. NCAP. 2007. *Evaluation Report of Central Soil Salinity Research Instutute,* Karnal, 55p.
3. NCAP. 2007. *Evaluation Report of Central Institute of Agricultural Engineering,* Bhopal, 115 p.

VII ON-GOING RESEARCH PROJECTS

Sl.No.	Title of Research Projects	PI/CCPI
	Technology Policy	
1	Economics of agricultural biotechnology: Investment, regulations and impact	Suresh Pal
2	Productivity and impact of agricultural research	Suresh Pal
3	Spatial and temporal changes in productivity and profitability in Indian agriculture	Sant Kumar
4	Impact assessment of fisheries research in India	B. Ganesh Kumar
5	Determinants of improved cultivation practices: Data mining approaches	Rajni Jain and Ramesh Chand
	Sustainable Agricultural Systems	
6	System of rice intensification: A productivity enhancing and resource conserving practice	B.C. Barah Ratna Reddy and K. N. Selvaraj
	Markets and Trade	
7	Exploring market opportunities for fisheries sector in India	B. Ganesh Kumar K.K. Datta and P. Shinoj
8	Estimating marketing efficiency of horticultural commodities under different supply chains in India	M.B. Dastagiri B. Ganesh Kumar and K.K. Datta
	Institutional Change	
9	Upcoming of supermarkets' in India: Implications for smallholders	Pratap S. Birthal P. Adhiguru and Shiv Kumar
10	Agricultural insurance in India : Problems and prospects	S. S. Raju and Ramesh Chand
11	Geometry of information flow in agriculture	P. Adhiguru and Pratap S. Birthal
12	Supply chain and institutional change in agriculture—A case study of potato	Harbir Singh
	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 and Pratap S. Birthal
14	Subsidies and investments in livestock sector	M. B. Dastagiri

15	Indian poultry sector in transition: Role of technology and institutions	B. Ganesh Kumar and K.K. Datta
	National Professor Project	
16	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 Fellow Project	
17	Returns to investment on livestock research and development: Implications for growth, equity and sustainability	Pratap S. Birthal
	National Agricultural Innovation Project	
18	Visioning, policy analysis and gender (VPAGe)	Suresh Pal

VIII CONSULTANCY PROJECTS

Name of Scientist	Institution to which consultancy was provided	Area of consultancy
Ramesh Chand	FAO Asia Pacific Regional Office, Bangkok	Agricultural Policy Strengthening and Capacity Building
Pratap S. Birthal, P.K. Joshi and S.S. Raju	International Crops Research Institute for the Semi-Arid Tropics, Patancheru, Andhra Pradesh	Combating Desertification in South Asia: The Agriculture-Environment Nexus
Pratap S. Birthal	World Bank (India), New Delhi	Background Study on India's Livestock Sector
Pratap S. Birthal Suresh Pal and P.K. Joshi	Ministry of Consumer Affairs, Government of India, New Delhi	Review of Buffer-stock Policy
P.K. Joshi	NABARD, Mumbai	Implementable Plan for Overcoming Agrarian Distress

IX RESEARCH ADVISORY COMMITTEE

The composition of Research Advisory Committee (RAC) constituted by the ICAR for NCAP and IASRI is given below:

Dr P.V. Shenoi
Chairman
Former Special Secretary (DAC), Govt. of India
Shanthi Prem, 20-C 1st, Main Road Dollars Colony,
Rajmahal Vikas, 2nd Stage I Block
Bangalore-560 094

Dr S.S. Acharya
Former Director
Institute for Development Studies (IDS)
8 B, Jhalana Institutional Area
Jaipur – 302 004

Dr A.K. Nigam
Director
Institute of Applied Statistics & Development Studies (IASDS)
B-16/1, I Floor, Rajajaipuram
Lucknow- 226 017

Dr R.S. Deshpande
Head, ADRT Unit
Institute for Social & Economic Change (ISEC)
Nagarabhavi Post
Bangalore-560 072

Dr Mahesh Pathak
Honorary Director
Agro Economic Research Centre
Sardar Patel University
Ballabh Vidhya Nagar- 388 120

Dr S.D. Sharma
Director
Indian Agricultural Statistics Research Institute
Library Avenue, Pusa
New Delhi- 110 012

Dr P.K. Joshi
Director
National Centre for Agricultural Economics and Policy Research (NCAP)
DPS Marg, Pusa,
New Delhi-110 012

Dr S.M. Jharwal
Principal Advisor, Ministry of Agriculture
Government of India
Krishi Bhawan,
New Delhi- 110 001

Dr A.P. Gore
Professor
Department of Statistics
University of Pune, Ganeshkind
Pune- 411 007

Dr Rahul Mukherjee
Professor
Indian Institute Management (IIM)
Joha Diamond Harbour Road
P.O. Alipur, Kolkata

Dr Rajeev Karindikar
Professor
Indian Statistical Institute
Delhi Centre, 7, SJS Sansanwal Marg
Delhi- 110 016

Dr J.P. Mishra
Assistant Director General (ESM)
Indian Council of Agricultural Research (ICAR), Krishi Bhawan
New Delhi- 110 014

Dr V.K. Bhatia
Member Secretary &
Principal Scientist
Indian Agricultural Statistics Research Institute
Library Avenue,
Pusa, New Delhi- 110 012

Meeting of Research Advisory Committee

The ninth meeting of the Research Advisory Committee (RAC) of NCAP and its sister institute IASRI was held jointly on 26 November 2007. Dr P.K. Joshi, Director NCAP welcomed the RAC members and presented NCAP Perspective Plan, its on-going research programmes and plan for 2008-09. The Chairman of RAC appreciated the efforts of NCAP and emphasized on the need of regularly updating the Centre's website for providing up-to-date information. One of the RAC members Dr S.S. Acharya opined that the Centre should be elevated to a National Institute. The members confirmed the proceedings of previous RAC meeting and expressed satisfaction on the action taken by NCAP.

X MANAGEMENT AND OTHER COMMITTEES

Members of Management Committee (MC)

Dr P.K. Joshi Chairman & Director NCAP, Pusa New Delhi - 110 012	Shri M.L. Sharma Economic and Statistical Advisor Government of Haryana, Chandigarh
Dr S.L. Goswami Joint Director (Research) National Dairy Research Institute Karnal - 132 001	Dr B.K. Sharma Director Economics and Statistics Department Delhi State, Old Secretaritat, Delhi
Dr Mahesh Pathak Honorary Advisor (Agro Economic Research Centre) Sardar Patel University, P. Box. No. 24,Vallabh Vidhya Nagar - 388 120 Dist. Anand, Gujarat	Dr B.C. Barah Principal Scientist NCAP, Pusa New Delhi - 110 012
Dr R.S. Deshpande Head, ADRT Unit Institute for Social and Economic Change (ISEC) Nagarabhavi P.O., Bangalore 560 072	Ms Sanjeevan Prakash Finance & Accounts Officer NBPGR, Pusa, New Delhi -110 012
Dr P.G. Chengappa Vice-Chancellor University of Agricultural Sciences Bangalore – 560 065	Shri Vinod Kumar Assistant Administrative Officer NCAP, Pusa, New Delhi - 110 012
Dr V.K. Gupta ICAR National Professor IASRI, Pusa, New Delhi-110 012	

Meeting of the Management Committee

The 20th meeting of the Management Committee of NCAP was held on 5 December 2007. The major observations of the Committee were:

The Committee appreciated the achievements made by the Centre at the research and development front. It approved the expenditure incurred by NCAP during 2006-07, and for 2007-08 till October 2007. About the progress of staff quarters, the Committee was informed that Master Plan of Indian Agricultural Research Institute, Pusa, New Delhi, has been approved, and action to construct new staff quarters will be started soon. The Committee reiterated to focus on human resource development. The Committee felt satisfaction and appreciated the work of NCAP and emphasized on policy research related to institutions and livestock. The Committee also suggested that younger faculty of the Centre should be exposed to macro policy environment as well as ground realities. The Management Committee desired that the training hall, and committee room at NCAP should be equipped with modern facilities, including video conferencing facility.

The Management Committee suggested to take-up research in the following areas on priority basis: (a) Bt cotton: impacts & regulations, (b) livestock, (c) labour marketing, and (d) efficiency in allocation and use of resources. Committee expressed happiness over the network programme of the Centre. In view of increased cadre strength of scientists at NCAP, Committee felt the need to increase the number of technical positions at the Centre to provide necessary help in research coordination.

Meetings of the Institute Research Council (IRC)

Institute Research Council (IRC) of NCAP is comprised of Director NCAP, scientific staff of the Centre and Assistant Director General (Economics, Statistics and Marketing) of ICAR. Director, NCAP is the Chairman of IRC. Eleven meetings of the IRC were held during 2007-08 (April-March). A total of thirty-six presentations (including eight presentations on deputations to foreign visits), almost three presentations at each meeting were made. During the IRC meetings, progress of the on-going projects/activities was discussed and other new research proposals were presented. Presentations were also made at the IRC meetings to share the experiences and outcome of the foreign deputations of NCAP scientists and other staff.

Other Committees

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

Academic Planning and Policy Committee

- To strengthen internal planning, functioning and policy direction

Scientists Evaluation and Development Committee

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

Internal Management Committee

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

Budget Committee

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

Purchase Committee

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

Publications Committee

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

Consultancy Processing Cell

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

Computer Committee

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

Women Cell

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

Grievance Cell

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

Official Language Committee

- To monitor the progress of works done in official language from time to time and suggest relevant measures for improvement
- To organize Raj Bhasha Month/Fortnight/Week/Day as intimated by the Council from time to time

- To report to the Council and other agencies on progress from time to time
- 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 on the progress of 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 at the Centre
- To provide feedback on improving the working environment at the Centre

XI PARTICIPATION IN SCIENTIFIC ACTIVITIES

Name of Scientist	Topic and date(s)	Place
P. Adhiguru	Seminar on Indo-US Agricultural Knowledge Initiative 30 April 2007	India Habitat Centre, New Delhi
	ICAR-NCAP-USDA Workshop on Contract Farming: Methods and Experiences 5-6 May 2007	NASC Complex, New Delhi
	Seminar on Strategy for Accelerated and Inclusive Agricultural Growth in XI Five-Year Plan 11 May 2007	ICAR Committee Room, New Delhi
	Brainstorming Session on Agricultural Science and Technology for Women Farmers: Prospects and Priorities 11 June 2007	NCAP, New Delhi
	Project Launching Workshop on Visioning, Policy Analysis and Gender (VPAGe) 26-27 June 2007	NCAP, New Delhi
	Brainstorming Workshop on Mainstreaming Gender in Agricultural Research and Education 10 July 2007	NCAP, New Delhi
	Focus Group Discussion on Meeting Science/ Technology Needs in the Policy Community of Developing Countries 24 July 2007	PRAXIS Institute for Participatory Practices, New Delhi
	NCAP-ISAE National Seminar on Agrarian Distress: Problems and Remedies 1-2 August 2007	NCAP, New Delhi
	Policy Dissemination Workshop on Agricultural Science and Technology Indicators for India 13 August 2007	NCAP, New Delhi
	VPAGe Workshop on Role of Centre and State Systems in Agriculture 24-25 August 2007	ISEC, Bangalore
	World Food Day Celebrations 2007 16 October 2007	NASC Complex, New Delhi
	FAO Inception Workshop on Pro-poor Policy Formulation Dialogue and Implementation at the Country Level 14-15 December 2007	NCAP, New Delhi
	National Seminar on Appropriate Extension Strategies for Management of Rural Resources 18-20 December 2007	UAS, Dharwad

	Science-based Agricultural Transformation towards Alleviation of Hunger and Poverty in SAARC Countries 5 March 2008	NASC Complex, New Delhi
Usha Rani Ahuja	Project Launching Workshop on Visioning, Policy Analysis and Gender (VPAGe) 26-27 June 2007	NCAP, New Delhi
	National Workshop on Gender Responsive Budgets 12-13 July 2007	Hotel Claridges, New Delhi
	NCAP-ISAE National Seminar on Agrarian Distress: Problems and Remedies 1-2 August 2007	NCAP, New Delhi
	Policy Dissemination Workshop on Agricultural Science and Technology Indicators for India 13 August 2007	NCAP, New Delhi
	Conference on Environmental and Livelihood Security through Resource Management in Northern India 29-31 October 2007	Chandigarh, Punjab
	National Workshop on Impact Assessment of New Agricultural Technologies 30-31 January 2008	NCAP, New Delhi
B.C. Barah	ICAR-NCAP-USDA Workshop on Contract Farming: Methods and Experiences 5-6 May 2007	NASC Complex, New Delhi
	National Workshop on Improvement of Agricultural Statistics 5-6 July 2007	NASC Complex, New Delhi
	NCAP-ISAE National Seminar on Agrarian Distress: Problems and Remedies 1-2 August 2007	NCAP, New Delhi
	Policy Dissemination Workshop on Agricultural Science and Technology Indicators for India 13 August 2007	NCAP, New Delhi
	Meeting of the State Ministers of Agriculture on Food Security Mission 16 October 2007	NASC Complex, New Delhi
	Water and Environment : Ensuring Water and Environment for Prosperity and Posterity 17-20 October 2007	NASC Complex, New Delhi
	A special Meet on System of Rice Intensification 18 October 2007	Krishi Bhavan, New Delhi

	Brainstorming Workshop on Networking of Agricultural Economics and Policy Research 24 October 2007	UAS, Dharwad
	Workshop on Towards Green Village 19 November 2007	Centre for Science & Environment, New Delhi
	Technical Advisory Group Meeting, NAIP (component 4) 15 February 2008	NCAP, New Delhi
	Executive Committee Meeting of NFSM 12 March 2008	NASC Complex, New Delhi
	International Workshop on Stress-tolerant Rice for Poor Farmers in Africa and South Asia 16-20 March 2008	NASC Complex, New Delhi
	Meeting of Research Programme Committee of NAIP 24-25 March 2008	KAB II, New Delhi
Pratap S. Birthal	ICAR-NCAP-USDA Workshop on Contract Farming: Methods and Experiences 5-6 May 2007	NASC Complex, New Delhi
	Multi-country Project Meeting on Supply Chains in Agri-business 5-7 June 2007	Tokyo, Japan
	NCAP-ISAE National Seminar on Agrarian Distress: Problems and Remedies 1-2 August 2007	NCAP, New Delhi
	Policy Dissemination Workshop on Agricultural Science and Technology Indicators for India 13 August 2007	NCAP, New Delhi
	Symposium on Livestock Industry – A Key Driver of Agricultural Economy 18 September 2007	Ootty, Tamil Nadu
Ramesh Chand	Presentation of Report of Steering Committee on Agriculture for 11th Plan 30 April 2007	South Block, New Delhi
	ICAR-NCAP-USDA Workshop on Contract Farming: Methods and Experiences 5-6 May 2007	NASC Complex, New Delhi
	Brainstorming Workshop on Mainstreaming Gender in Agricultural Research and Education 10 July 2007	NCAP, New Delhi

	Brainstorming Workshop for Finalizing the Priority Area for NAIP Funding 2 August 2007	NASC Complex, New Delhi
	NCAP-ISEC-YES Bank Workshop on Role of Centre and State Systems in Agriculture 24-25 August 2007	ISEC, Bangalore
	National Workshop on Commodity Market Dynamics 10 October 2007	India International Centre, New Delhi
	National Conference on Climate Change and Indian Agriculture 12 October 2007	NASC Complex, New Delhi
	National Workshop on Networking for Agricultural Economics and Policy Research 24 October 2007	UAS, Dharwad
	Agrarian Crisis and Food Security of India 17 November 2007	IDC, Chandigarh
	FAO Inception Workshop on Pro-Poor Policy Formulation Dialogue and Implementation at the Country Level 14-15 December 2007	NCAP, New Delhi
	Meeting of Agricultural Experts and Agriculturists for Pre-budget Consultation for Forthcoming Union Budget:2008-2009 7 January 2008	Ministry of Finance, New Delhi
	Consultative Conference on APMC Model Rules 18 January 2008	FICCI Federation House, New Delhi
	National Conference on New Directions in Agricultural Marketing 6 February 2008	Bhopal, Madhya Pradesh
M.B. Dastagiri	NCAP-ISAE National Seminar on Agrarian Distress: Problems and Remedies 1-2 August 2007	NCAP, New Delhi
	International Workshop on Feasibility of Asian Currency Unit 15 October 2007	India Habitat Centre, New Delhi
	International Conference on India and Italy in the Global Economy: Enhancing Trade and Co-operation 1 November 2007	India Habitat Centre, New Delhi

	Workshop on Innovation Policy and Competition Policy 3 November 2007	NISTADS, New Delhi
	International Conference on Financial Globalisation and Financial Sector Development in South and Central Asia 22-23 November 2007	India Habitat Centre, New Delhi
	International Conference on Capacity Building in Science and Technology: Policy Perspective, Challenges and Opportunities 27-29 November 2007	INSA, New Delhi
	International Conference on India and Japan in the Globalized Economy 4 December 2007	Shangri-La Hotel, New Delhi
	International Conference on India and China's Role in International Trade and Finance 6-7 December 2007	India Habitat Centre, New Delhi
	FAO Inception Workshop on Pro-poor Policy Formulation Dialouge and Implementation at the Country Level 14-15 December 2007	NCAP, New Delhi
	South Asian Conference on Trade and Development: Harnessing Gains from Trade: Domestic Challenges and Beyond 19-20 December 2007	Hotel Claridges, New Delhi
	Discussion on Union Budget: 2008-09 7 March 2008	ASSOCHAM House, New Delhi
K.K. Datta	Second Indian Horticulture Congress on Opportunities and Linkages for Horticultural Research and Development with Focus on North-Eastern Region 18-21 April 2007	ICAR RC, Barapani, Meghalaya
	Convention on Corporate Response to Climate Change 8-10 June 2007	Palampur, Himachal Pradesh
	International Symposium on Management of Coastal Ecosystem: Technological Advancement and Livelihood Security 27-30 October 2007	Science City, Kolkata
B. Ganesh Kumar	ICAR-NCAP-USDA Workshop on Contract Farming: Methods and Experiences 5-6 May 2007	NASC Complex, New Delhi
	Project Launching Workshop on Visioning, Policy Analysis and Gender (VPAGe) 26-27 June 2007	NCAP, New Delhi

	Brainstorming Workshop on Mainstreaming Gender in Agricultural Research and Education 10 July 2007	NCAP, New Delhi
	NCAP-ISAE National Seminar on Agrarian Distress: Problems and Remedies 1-2 August 2007	NCAP, New Delhi
	Policy Dissemination Workshop on Agricultural Science and Technology Indicators for India 13 August 2007	NCAP, New Delhi
	VPAGe Workshop on Role of Centre and State Systems in Agriculture 24-25 August 2007	ISEC, Bangalore
	ICRIER-OECD Seminar on Economic Survey of Indian Economy 9 October 2007	The Imperial Hotel, New Delhi
	International Workshop on Feasibility of Asian Currency Unit 15 October 2007	ICRIER, New Delhi
	Tenth Inter-Regional Conference on Water and Environment– Ensuring Water and Environment for Prosperity and Posterity 17-20 October 2007	IARI, New Delhi
	International Symposium on Management of Coastal Ecosystem: Technological Advancement and Livelihood Security 27-30 October 2007	Science City, Kolkata
	Conference on India and Italy in the Global Economy: Enhancing Trade and Cooperation 1 November 2007	ICRIER, New Delhi
	Eighth Asian Fisheries Forum on Fisheries and Aquaculture: Strategic Outlook for Asia 20-23 November 2007	Le Meridien Hotel, Kochi
	International Conference on India and China's Role in International Trade and Finance and Global Economic Governance 6-7 December 2007	NCAP, New Delhi
	FAO Inception Workshop on Pro-Poor Policy Formulation Dialogue and Implementation at the Country Level 14-15 December 2007	NCAP, New Delhi
	Inception Workshop on Exploring Market Opportunities for Fisheries Sector in India 3 January 2008	NCAP, New Delhi

	National Workshop on Impact Assessment of New Agricultural Technologies 30-31 January 2008	NCAP, New Delhi
	National Workshop on Development of Strategies for Domestic Marketing of Fish and Fishery Products 7-8 February 2008.	College of Fishery Science, Nellore
Rajni Jain	ICAR-NCAP-USDA Workshop on Contract Farming: Methods and Experiences 5-6 May 2007	NASC Complex, New Delhi
	Seminar on Strategy for Accelerated and Inclusive Agricultural Growth in the XI Plan 11 May 2007	Krishi Bhavan, New Delhi
	Project Launching Workshop on Visioning, Policy Analysis and Gender (VPAGe) 26-27 June 2007	NCAP, New Delhi
	Brainstorming Workshop on Mainstreaming Gender in Agricultural Research and Education 10 July 2007	NCAP, New Delhi
	NCAP-ISAE National Seminar on Agrarian Distress: Problems and Remedies 1-2 August 2007	NCAP, New Delhi
	Policy Dissemination Workshop on Agricultural Science and Technology Indicators for India 13 August 2007	NCAP, New Delhi
	National Conference of Agricultural Research Statisticians 3-4 December 2007	Birsa Agricultural University, Ranchi
	Second National Conference on Methods and Models in Computing 13-14 December 2007	JNU, New Delhi,
	FAO Inception Workshop on Pro-Poor Policy Formulation Dialogue and Implementation at the Country Level 14-15 December 2007	NCAP, New Delhi
	Third Indian International Conference on Artificial Intelligence 17-19 December 2007	National Insurance Academy, Pune
	Inception Workshop on Exploring Market Opportunities for Fisheries Sector in India 3 January 2008	NCAP, New Delhi
	National Workshop on Impact Assessment of New Agricultural Technologies 30-31 January 2008	NCAP, New Delhi

	National Conference on Application and Trends in Data Warehousing, Data Mining and Data Modelling 9-10 February 2008	Forest Research Institute, Dehra Dun
P.K. Joshi	Brainstorming Session on Models of Public-Private Partnership in Agricultural Biotechnologies 7 April 2007	NASC Complex, New Delhi
	ICAR-IWMI Workshop 13 April 2007	NASC Complex, New Delhi
	National Seminar on Rainfed Agriculture 23-24 Arpil 2007	IDS, Jaipur
	ICAR-NCAP-USDA Workshop on Contract Farming: Methods and Experiences 5-6 May 2007	NASC Complex, New Delhi
	Seminar on Strategy for Accelerated and Inclusive Agricultural Growth in the XI Plan 11 May 2007	Krishi Bhavan, New Delhi
	Project Launching Workshop on Visioning, Policy Analysis and Gender (VPAGe) 26-27 June 2007	NCAP, New Delhi
	Brainstorming Workshop on Mainstreaming Gender in Agricultural Research and Education 10 July 2007	NCAP, New Delhi
	NCAP-ISAE National Seminar on Agrarian Distress: Problems and Remedies 1-2 August 2007	NCAP, New Delhi
	Policy Dissemination Workshop on Agricultural Science and Technology Indicators for India 13 August 2007	NCAP, New Delhi
	NCAP-ISEC-YES Bank Workshop on Role of Centre and State Systems in Agriculture 24-25 August 2007	ISEC, Bangalore
	National Workshop on New Paradigm for Rainfed Farming 27-29 September 2007	NASC Complex, New Delhi
	Brainstorming Workshop on Networking for Agricultural Economics and Policy Research 24 October 2007	UAS, Dharwad
	Fifteenth Annual Conference of Agricultural Economics Research Association on Agribusiness Opportunities: Requirements and Roadmap 25-26 October 2007	UAS, Dharwad

	FAO Inception Workshop on Pro-poor Policy Formulation Dialogue and Implementation at the Country Level 14-15 December 2007	NCAP, New Delhi
	Inception Workshop on Exploring Market Opportunities for Fisheries Sector in India 3 January 2008	NCAP, New Delhi
	National Workshop on Impact Assessment of New Agricultural Technologies 30-31 January 2008	NCAP, New Delhi
	Consultation Workshop on Accelerating Agricultural Growth in India 9 February 2008	NASC Complex, New Delhi
	Workshop to Launch World Development Report 15 February 2008	IFPRI-World Bank, New Delhi
Anjani Kumar	Sixty-seventh Annual Conference of Indian Society of Agricultural Economics 5-7 November 2007	BIRD, Lucknow
	National Workshop on Impact Assessment of New Agricultural Technologies 30-31 January 2008	NCAP, New Delhi
	Consultation Workshop on Accelerating Agricultural Growth in India 9 February 2008	NASC Complex, New Delhi
	International Conference on Universalizing Socio-economic Security in South Asia 17-20 February 2008	IHD, New Delhi
Sant Kumar	Brainstorming Session on Agriculture Science Technology for Women Farmers: Prospects and Priorities 11 June 2007	NCAP, New Delhi
	Brainstorming Workshop on Mainstreaming Gender in Agricultural Research and Education 10 July 2007	NCAP, New Delhi
	NCAP-ISAE National Seminar on Agrarian Distress: Problems and Remedies 1-2 August 2007	NCAP, New Delhi
	Policy Dissemination Workshop on Agricultural Science and Technology Indicators for India 13 August 2007	NCAP, New Delhi

	FAO Inception Workshop on Pro-Poor Policy Formulation Dialogue and Implementation at the Country Level 14-15 December 2007	NCAP, New Delhi
	Inception Workshop on Exploring Market Opportunities for Fisheries Sector in India 3 January 2008	NCAP, New Delhi
	National Workshop on Impact Assessment of New Agricultural Technologies 30-31 January 2008	NCAP, New Delhi
	Consultation Workshop on Accelerating Agricultural Growth in India 9 February 2008	NASC Complex, New Delhi
Shiv Kumar	FAO Inception Workshop on Pro-Poor Policy Formulation Dialogue and Implementation at the Country Level 14-15 December 2007	NCAP, New Delhi
	Inception Workshop on Exploring Market Opportunities for Fisheries Sector in India 3 January 2008	NCAP, New Delhi
	National Workshop on Impact Assessment of New Agricultural Technologies 30-31 January 2008	NCAP, New Delhi
Suresh Pal	Project Launching Workshop on Visioning, Policy Analysis and Gender (VPAGe) 26-27 June 2007	NCAP, New Delhi
	Sixty-seventh Annual Conference of Indian Society of Agricultural Economics 5-7 November 2007	BIRD, Lucknow
	Fifteenth Annual Conference of Agricultural Economics Research Association on Agribusiness Opportunities: Requirements and Roadmap 25-26 October 2007	UAS, Dharwad
	Brainstorming Session on Developing Benefit Sharing Guidelines for Implementation on National Biodiversity Act and Rules 19 December 2007	Ministry of Environment and Forest, New Delhi
	National Workshop on Impact Assessment of New Agricultural Technologies 30-31 January 2008	NCAP, New Delhi

	Expert Consultation Meeting of the Ministry of Environment and Forest on Cartagena Protocol 7 February 2008	Ministry of Environment and Forest, New Delhi
	Consultation Workshop on Accelerating Agricultural Growth in India 9 February 2008	NASC Complex, New Delhi
	Workshop to Launch World Development Report 15 February 2008	IFPRI-World Bank, New Delhi
S. S. Raju	Seminar on Enhancing Control of Highly Pathogenic Avian Influenza in Developing Countries through Compensation: Issues and Good Practice 17 April 2007	NCAP, New Delhi
	Seminar on Policy Imperatives to Break Stagnation in Indian Agriculture 1 May 2007	NCAP, New Delhi
	Seminar on Strategy for Accelerated and Inclusive Agricultural Growth in the XI Five-Year Plan 11 May 2007	Krishi Bhawan, New Delhi
	Discussion on Global and Regional Reports on Agricultural Knowledge, Science and Technology 18 May 2007	NCAP, New Delhi
	Project Launching Workshop on Visioning, Policy Analysis and Gender (VPAGe) 26-27 June 2007	NCAP, New Delhi
	Brainstorming Workshop on Mainstreaming Gender in Agricultural Research and Education 10 July 2007	NCAP, New Delhi
	NCAP-ISAE National Seminar on Agrarian Distress: Problems and Remedies 1-2 August 2007	NCAP, New Delhi
	Policy Dissemination Workshop on Agricultural Science and Technology Indicators for India 13 August 2007	NCAP, New Delhi
	National Conference on Emerging Platforms for Agricultural Marketing 20-21 September 2007	FICCI, New Delhi
	NCDEX Institutes of Commodity Markets and Research Launch Workshop 10 October 2007	India International Centre, New Delhi

	World Food Day Celebrations 2007 16 October 2007	NASC, New Delhi
	Second IG Patel Lecture on Economics of Climate Change 26 October 2007	British Council, New Delhi
	FAO Inception Workshop on Pro-poor Policy Formulation Dialogue and Implementation at the Country Level 14-15 December 2007	NCAP, New Delhi
	Inception Workshop on Exploring Market Opportunities for Fisheries Sector in India 3 January 2008	NCAP, New Delhi
	National Workshop on Impact Assessment of New Agricultural Technologies 30-31 January 2008	NCAP, New Delhi
	Launch of Grameen Vikas Rath 4 March 2008	Inter Continental Hotel, New Delhi
P. Shinoj	International Conference on Financial Globalisation and Financial Sector Development in South and Central Asia 22-23 November 2007	India Habitat Centre, New Delhi
	International Conference on India and Japan in the Globalized Economy 4 December 2007	Shangri-La Hotel, New Delhi
	South Asian Conference on Harnessing Gains from Trade: Domestic Challenges & Beyond 19-20 December 2007	CENTAD, New Delhi
	Inception Workshop on Exploring Market Opportunities for Fisheries Sector in India 3 January 2008	NCAP, New Delhi
	Seminar on Classification and Segmentation Technique using SPSS 16.0 28 February 2008	SPSS, New Delhi
Harbir Singh	Seminar on Strategies for Accelerated and Inclusive Agricultural Growth in XI Five-Year Plan 11- May 2007	ICAR, New Delhi
	Project Launching Workshop on Visioning, Policy Analysis and Gender (VPAGe) 26-27 June 2007	NCAP, New Delhi

	NCAP-ISAE National Seminar on Agrarian Distress: Problems and Remedies 1-2 August 2007	NCAP, New Delhi
	Brainstorming Workshop on Networking for Agricultural Economics and Policy Research 24 October 2007	UAS, Dharwad
	Fifteenth Annual Conference of AERA on Agribusiness Opportunities: Requirements and Roadmap 25-26 October 2007	UAS, Dharwad
	Consultation on Herbicide Tolerant GM Crops 10-11 December 2007	NASC, New Delhi
	National Workshop on Impact Assessment of New Agricultural Technologies 30-31 January 2008	NCAP, New Delhi
	Consultation Workshop on Accelerating Agricultural Growth in India 9 February 2008	NASC, New Delhi

XII VISITS ABROAD

Name of Scientist	Purpose	Place	Duration
Pratap S. Birthal	Meeting of Multi-Country Project on Supply Chains in Agribusiness	Tokyo, Japan	5-7 June 2007
Ramesh Chand	To Prepare Concept Paper on Identification of Key Issues and Countries Interest for Policy Analytical Work and for Policy Networking	Bangkok, Thailand	24 June to 7 July 2007
	To Revise Concept Paper on Key Issues and Countries Interest for Policy Analytical Work and for Policy Networking	Bangkok, Thailand	23 September to 6 October 2007
Aldas Janaiah	World Agriculture Congress on Creating Prosperity through Investments in Agriculture	Saint Louis, USA	8-10 May 2007
P.K. Joshi	Third Bureau Meeting for IAASTD Bureau Members	Washington, DC, USA	29-31 May 2007
	First Governing Board Meeting of SAARC Agriculture Centre and Selection Committee Meeting	Dhaka, Bangladesh	4-8 November 2007
	Alleviation of Poverty through Agriculture and Secondary Crop Development	Bangkok, Thailand	21-22 November 2007
	Workshop on Rice Policy Support and Impact Assessment	IRRI, Philippines	18-19 February 2008
	Commonwealth Foundation Briefing on Climate Change and Food Security	London, UK	26 March 2008
Sant Kumar	Training Course on Food & Agri Business Management Program: Accessing Global Markets	Cornell, New York, USA	2-9 May 2007
Suresh Pal	Interaction on Impact of Agricultural Research	IRRI, Philippines	3-6 February 2008

XIII POLICY ADVOCACY ACTIVITIES

Contract Farming: Methods and Experiences

5-6 May 2007

Contract farming is emerging in a big way in India, and its costs and benefits to farmers, especially small farmers are being widely debated. Proponents of contract farming argue that properly managed contract farming can offer solutions to many problems, such as limited access to markets, insurance, credit, inputs, technology, information and services that small farmers face in transition from subsistence towards commercialization production. Critics, on the other hand, view contract farming as a partnership between unequals, and argue that agribusiness firms may exploit farmers in output and input markets. It is also apprehended that contract farming schemes may exclude small farmers because of higher transaction costs to firms of contracting with a large number of small farmers. To discuss such issues, a two-day workshop was organized by NCAP, New Delhi, in collaboration with Indian Council of Agricultural Research (ICAR) and United States Department of Agriculture (USDA) on 5-6 May 2007, at National Agricultural Science Centre Complex, New Delhi. The workshop was inaugurated by Shri Sharad Pawar, Union Minister of Agriculture, Consumer Affairs & Public Distribution, Government of India, and was chaired by Dr Mangala Rai, Secretary, Department of Agricultural Research and Education & Director-General, Indian Council of Agricultural Research. The workshop was attended by the economists, policymakers, farmers and representatives of agribusiness firms and civil society organizations from India and the United States.

Participants discussed methods and experiences of contract farming in India and the United States and distilled out conditions for making contract farming work on smallholders-dominated Indian agriculture. Specific recommendations of the workshop are as follows:

Contract farming works if its advantages outweigh disadvantages. Therefore, both firms and farmers should try to address the sources of potential disadvantages that countervail the synergy between them. For this, following suggestions were made:

- Agribusiness firms should provide inputs, technology and support services to farmers.
- Agribusiness firms should avoid any tendency of extracting monopsonistic rent in the output market and monopoly rent in the input market.
- Contract prices should be linked to the prevailing market prices and the agribusiness firms should pay some premium over it to minimize problems of opportunism by farmers.

- For high risk commodities, contract farming should aim at reducing production as well as marketing risks.
- A long-term commitment and mutual trust are important to the sustainability of contract farming in the long-run.

To develop contract farming as a pro-smallholder market institution, central and state governments should:

- Invest in public infrastructure that cut down transaction costs and induce private investment in agribusiness,
- Promote competition by effectively implementing the amended Agricultural Produce Market Committee Act, but should also take appropriate measures to curb any tendency of regional monopsony and collusive oligopsony, which could be detrimental to the interests of the farmers,
- Evolve mechanisms for speedy resolution of conflicts between farmers and agribusiness firms.
- Promote farmers' organizations and other intermediaries to involve smallholders in contract farming schemes, to create scale economies in disposal of produce and acquisition of inputs, technology, information and services, and to empower farmers to effectively deal with externalities of unequal partnership with big agribusiness firms.
- Develop grades and standards to minimize problems of opportunism by any of the parties.
- Enhance farmers' capacity to invest, and cope up with risk by improving their access to institutional credit and risk-mitigating instruments.

Project Launching Workshop on Visioning, Policy Analysis and Gender (VPAGe)

26-27 June 2007

A two-day workshop of the project "*Visioning, Policy Analysis and Gender (VPAGe)*" was organized on 26-27 June 2007 at NCAP, New Delhi, to launch the project. The project is being funded under the Component I of National Agricultural Innovation Project (NAIP) and the main goal of this project is to enhance capacity for policy planning and implementation for leveraging innovations for transformation of agriculture and empowerment of rural women. The project has the following six components: (i) Visioning of Indian Agriculture, (ii) Technology Forecasting, (iii) Policy Analysis and Market Intelligence, (iv) Research Impact Assessment, (v) Gender Issues in Agriculture, and (vi) Role of Centre and State Systems. Specific work programmes of these components were discussed in details and refined. The project is being implemented by NCAP as lead institution, in collaboration with NAARM, IASRI, NRCWA, YES Bank and AgriWatch. The workshop was attended by project team members, research managers, and resource persons and associated scientists from the collaborating institutions. This is the first project of NAIP being initiated and the output from this project is expected to provide inputs to other components and enhance their effectiveness. Specially, the input on vision for Indian agriculture and its implications for R&D strategy, balancing the roles of centre and state

systems, policy perspective and sensitize research agenda for empowerment of rural women will be of great significance.

The following decisions were taken at the workshop:

- To look at policy and institutional aspects of science with particular attention to the role of social science in agricultural sciences.
- Identification of high priority areas like rainfed, irrigated and hill agriculture, allied sectors/activities like dairy, livestock, etc. in terms of their relevance to capacity building and policymaking.
- Innovation of new ideas to take technology to farmers and pathways to revitalize the farming sector and learn from other countries like strategy for promoting cross-breeding in Canada.
- Promote participation of the private sector for increasing competitiveness in agriculture and wherever possible, lessons from other countries should be followed to motivate science-led growth.
- Evaluation of outcome of training and capacity building programs by opting a peer expert group for monitoring and evaluation, besides those of NAIP to maintain efficiency.
- Use disaggregate analysis of demand and supply estimation, instead of aggregate analysis and examine improved estimation method for income elasticity.
- Assessment of all possible impacts beyond economic like social, environmental, health, etc. and also, focus on non-measurable indicators, like contingent evaluation, willingness to pay, locational and temporal externalities, etc.
- Assessment and control of activities that are going to make a difference in gender biasness and examine its cost in agriculture. Attention should also be given to non-farm rural sector.

Workshop on 'Mainstreaming Gender in Agricultural Research and Education

10 July 2007

A Brainstorming Workshop on *Mainstreaming Gender in Agricultural Research and Education* was organized at the National Centre for Agricultural Economics and Policy Research (NCAP), on 10 July 2007. The workshop was chaired by Dr Rita Sharma, the then Financial Advisor, Department of Agricultural Research and Education, ICAR, Deputy Director-Generals Dr P. Das (Extension) and Dr S.P. Tiwari (Education), ICAR, Vice Chancellors from SAUs (CCSHAU, Hisar, UAS, Banglore), Dr S.M. Ilyas, Director, NAARM, and other dignitaries from Council and Delhi-based ICAR institutes participated in the workshop.

The main objectives of the workshop were to (i) evolve institutional mechanisms for gender mainstreaming in NARS; (ii) develop criteria for gender budgeting in agricultural research and education system; and (iii) identify key areas for building organizational capacity for gender sensitive research and education programs. The discussion covered issues related to institutional arrangements, gender budgeting and capacity strengthening. A pyramidal structure was suggested for institutional arrangements in ICAR and SAUs with a view to gender mainstreaming. Forum suggested that gender budgeting may be viewed from three angles: (i) women engaged in agricultural research and development; (ii) agricultural research and development directly benefiting farm women; and (iii) agricultural research and development empowering farm women and promoting gender equity. The group felt that there are approaches available to develop gender budgets and accordingly, the same may be prepared after collecting required information from different ICAR institutes and SAUs.

Agrarian Distress: Problems and Remedies

1-2 August 2007

Agrarian distress is a reality, which is the outcome of the vicious cycle of poverty, deteriorating household food-security and tendency towards exclusion from agriculture. It has become a serious concern requiring urgent and timely policy response. A two-day national seminar on '*Agrarian Distress: Causes and Remedies*' was organized during 1-2 August 2007 by the NCAP in collaboration with Indian Society of Agricultural Economics (ISAE), Mumbai. Dr S.S. Johl, President, ISAE was the Chairperson of this seminar.

Dr P.K. Joshi, Director (NCAP) and convenor of the national seminar, welcomed guests and participants and provided background and the expected output from the seminar. Dr Mangala Rai (Secretary, DARE and Director-General, ICAR) delivered the Inaugural Address, which was focused on priorities of Eleventh Five-Year Plan. He remarked that technologies were available, but there was a fatigue of policy and adoption of technology. The appropriate application of technology had given results even under stressful conditions. Dr Rai added that food security and high food productivity would not be achieved without improving farm profitability. Dr S.S. Johl highlighted the importance of barren land, and problems of small and marginal farmers and suggested that there was a need to provide incentives to them.

Dr S.S. Acharya, former Chairman, Commision for Agricultural Costs and Prices (CACP), suggested strategies to overcome the current crisis, which included restoring farmers' faith in agriculture, arresting the widening gap between rural and uran incomes, and generating off-farm income.

Dr P.K. Joshi (Director) NCAP, emphasized on the issues like inclusive growth, improving irrigation and cold storage facilities, value addition, public-private partnership, centre-state system, land policy, investement in agriculture, frontier technologies, market reforms, and attraction of private sector. He said that a good business environment would promote farmers to remain in agriculture.

Workshop discussed issues like exposition of Indian farmers to multiple risks and need for their protection. The insurance against agricultural eventualities and climate change is becoming indispensable. Newer insurance products such '*Varsha Bima*', *Sookha Suraksha Kavach*, flood insurance, livestock insurances, fruit and vegetable insurance, frost insurance, etc. are being developed, but these need to be tested for the socio-economic feasibility and adaptability under diverse regional specificities before launching on a wider scale.

Agricultural Science and Technology Indicators for India

13 August 2007

The Centre organized a policy dissemination workshop on *Agricultural Science and Technology Indicators for India,* under a joint research project of NCAP-ICAR-IFPRI, at NCAP, New Delhi, on 13 August 2007. Dr Mruthyunjaya, National Director (NAIP) Chaired the workshop. Dr P.K. Joshi, Director, NCAP, welcomed the Chairman, Dr Mruthyunjaya, Dr Nienke Beintema (from IFPRI, USA), distinguished scientists from ICAR, and media persons. The project was a part of global initiative covering more than 12 countries and generating information from a large number of public and private sector research organizations for planning future research priorities and human resource development. Dr Nienke Beintema, along with the project team (Drs Pratap S. Birthal, P. Adhiguru and A.K. Bawa) presented the trend of scientific manpower and research investment over the past decade, and made its comparison with other conutries.

In 2003, more than 60 per cent of the researchers (in full time equivalent terms) devoted their time to crop research. Livestock accounted for 13 per cent of time; and forestry, natural resources, and fisheries accounted for 5-6 per cent each. The study results were useful in providing directions to ICAR for allocating financial and manpower resources.

Workshop on Role of Centre and State Systems in Agriculture

24-25 August 2007

A workshop on *Role of Centre and State Systems in Agriculture* was organized as a component of the project 'Visioning, Policy Analysis and Gender (V-PAGe)' on 24-25 August 2007 at the Institute for Social

and Economic Change (ISEC), Bangalore, in collaboration with NCAP, YES Bank and University of Agricultural Sciences, Bangalore (UASB). The main objective of the workshop was to review the roles of central, state and private institutions in agriculture and to raise the issues in their relations. The workshop was organized under the following technical sessions: (i) Issues in Centre-State Relations in Agriculture, (ii) Centre-State Relations in Agricultural Extension, (iii) Centre–State Relations in Agricultural Research and Education, and (iv) Role of Private Sector in Agriculture. A panel discussion on 'Roadmap for Centre-State Relations in Agricultural Research, Extension and Education' was also held. Delegates from central and state government organizations, eminent policy researchers, policy advisors and private organizations attended the workshop. The main recommendations made at the workshop were as follows:

- Enhance funding from the state systems, since a large amount of funds flow from the centre, while agriculture is a state subject.
- Simplify centre-state policies and procedures, including IPRs for promoting more involvement of private institutions in agricultural research and extension.
- Reorient policy formulation and optimize institutional arrangements so as to strengthen research–extension–farmer linkages.
- Redefine and delineate the roles of public-private institutions and centre-state systems in terms of policy planning, funding, monitoring, capacity building and delivery of services to minimize the overlapping of roles and responsibilities and strengthening the agricultural R&D and extension.
- Devolve powers and responsibilities with involvement of Panchayati Raj institutions to ensure bottom-up planning, prioritization of programmes and accountability in utilization of funds.
- Use of information and communication technologies (ICTs) as a tool to promote vertical and horizontal communications for maintaining transparency and good governance.
- Strengthen the capacity for developing a shared vision for agricultural sciences.

Networking for Agricultural Economics and Policy Research in the NARS

25-26 October 2007

A workshop on '*Networking for Agricultural Economics and Policy Research in the NARS*' was organized by the National Centre for Agricultural Economics and Policy Research on 24 October 2007 at the University of Agricultural Sciences, Dharwad (Karnataka). It was a part of activities proposed under the NAIP project on

Visioning, Policy Analysis and Gender (V-PAGe) being implemented by NCAP along with other partners. This workshop coincided with annual conference of the Agricultural Economics Research Association on 25-26 October 2007. The workshop intended to (i) develop short- and medium-term priorities for agricultural economics and policy research; (ii) identify capacity strengthening areas in agricultural economics and policy research; and (iii) develop modalities for strengthening agricultural economics and policy research in the changing scenario. The workshop was organized in four technical sessions: (i) Priorities for agricultural economics and policy research; (ii) Enhancing economic impact in agricultural research; (iii) Status and need assessment on applications of quantitative methods; and (iv) Need assessment for human resource development and networking. The workshop was attended by senior professional economists and statisticians representing state agricultural universities, ICAR institutes, eminent policy researchers, representatives of private sector and civil societies from different parts of the country. The major recommendations of the workshop were as follows:

- Develop networks of agricultural economists and policy researchers at regional and national levels, with NCAP as facilitator. Region-wise brainstorming workshops may be organized to identify the key areas for research in network mode.

- Poor resources, insufficient numbers, and multiple (non-research) responsibilities of agricultural economists are adversely affecting their productivity and silently eroding their potential. It adds to low impact of agricultural economists in many ICAR institutes and state agricultural universities.

- Develop a 'matrix for network research' and identify specialists and institutions to take up the research programmes in network mode.

- Agricultural environment is rapidly changing and agricultural economists should be alert in responding to the changing scenario. Agricultural economists must play a highly pro-active role by analyzing the issues, providing clear and feasible recommendations; and reporting the consequences of 'no action' and of alternative options. A futuristic scenario should be included in the conclusions, based on the results and judgments to argue the consequences of 'no action' scenario.

- Establish policy advocacy forums at national and regional levels to regularly provide policy options on issues of topical debate. A forum named as 'Policy Research and Advocacy Network (PRAN)' should be constituted at the national level with its chapters at regional and state levels. The forum will consist of senior policy advisors and researchers and also up- coming agricultural economists. It was suggested that NCAP would coordinate this and regularly organize policy advocacy activities.

- Networking should not be restricted to agricultural economists. The network should also include few biological scientists to seek their views on various technical aspects and add value in their research outputs.

- Develop HRD programme to provide training to agricultural economists in advance international research institutes and reputed foreign universities. These programmes should be for a period of 3-6 months with specific research proposals or courses.

The workshop also identified priority areas for policy research, human resource development and key resource persons by themes.

Pro-poor Policy Formulation Dialogue

14-15 December 2007

An international seminar on '*Pro-poor Policy Formulation Dialogue*' was organized jointly by NCAP, and Agricultural Economics Research Association (India), on 14-15 December 2007, at New Delhi. The seminar was sponsored by Food and Agriculture Organization (FAO) of United Nations (Rome) and Ministry of Agriculture, Government of India. Eminent personalities, policymakers and researchers participated and provided valuable inputs.

Dr Mangala Rai, Secretary, Department of Agricultural Research and Education (DARE) and Director General, Indian Council of Agricultural Research, New Delhi, in his inaugural address emphasized that the road map should be evolved on holistic approach rather than following a piecemeal approach. Dr H. K. Upadhyay, FAO Policy Facilitator, provided a clear orientation of the theme, and Dr S.M. Jharwal, Principal Advisor, Department of Agriculture and Cooperation, Government of India, dealt with the overall perspectives of the seminar.

The seminar dealt in-depth the issues of growth-poverty disconnect; calorie deficiency; controversies in poverty line-price index relationship; changes in expenditure and poverty; inequality and rural urban divide; changing pattern of consumption basket, food insufficiency, etc.

The seminar evolved and re-emphasized that development of agriculture continues to be important for containing poverty. Therefore, multi-pronged strategy is needed to enhance entitlement and access through innovative methods to promote rural non-farm enterprises. The need for measurement of poverty from different angles and infrastructure development was emphasized for a better understanding of growth in agriculture and development dynamics in rural areas. There is also a need to have comprehensive policy review of infrastructure with pro-poor orientation, including ICT coverage of the required scale.

Fourth Meeting of SAARC Technical Committee on Agriculture and Rural Development

8-9 January 2008

India hosted the *Fourth Technical Committee Meeting on Agriculture and Rural Development* during 8-9 January 2008 at NASC Complex, New Delhi. The meeting attended by delegations from Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka, was inaugurated by Dr Mangala Rai, Secretary, Department of Agricultural Research and Education and Director-General, Indian Council of Agricultural Research. In his inaugural address, Dr Rai emphasized on greater collaboration among SAARC countries in agricultural research and education. He highlighted the

emerging challenges in agriculture, including dwindling resources and rising cost of production. He suggested to raise water-use efficiency, and combat impact of climate change on agriculture. He advocated for greater cooperation on quarantine issues and regulatory aspects on seed quality. Earlier Dr P. K. Joshi, Director, National Centre for Agricultural Economics and Policy Research, welcomed the delegations from SAARC Countries and listed issues challenging agriculture and rural development in SAARC countries. Dr Kheya Bhattacharya, Joint Secretary, Ministry of External Affairs, Government of India, extended the vote of thanks and assured full cooperation and support of India to the activities proposed and initiated for the SAARC countries.

Dr P.L. Gautam, Deputy Director-General (Crop Sciences, Indian Council of Agricultural Research) led the Indian delegation and chaired the meeting. The meeting reviewed the programs initiated in the past and identified some new programs. Among important programmes reviewed were related to the perspective vision for SAARC countries, milk grid among SAARC countries, inter-boundary disease control, seed production and capacity strengthening in entrepreneur development and bee-keeping. The meeting also reviewed the programs of the SAARC Agriculture Centre located at Dhaka, Bangladesh. It was decided that a special session of TCARD would be organized to discuss the perspective vision of SAARC countries and a workshop would be organized with private sector for developing modalities of milk grid.

Impact Assessment of New Agricultural Technologies

30-31 January 2008

A national workshop on *Impact Assessment of New Agricultural Technologies* was held at NCAP, New Delhi, during 30-31 January 2008. This was a part of the recently launched project '*Visioning, Policy Analysis and Gender*' (*VPAGe*) supported under the National Agriculture Innovation Project (NAIP) by the Indian Council of Agricultural Research (ICAR) with NCAP as the lead centre. The main objectives of this workshop were to: (a) Document the promising agricultural technologies, (b) Assess their adoption and initial impact, and (c) Plan case studies for systematic impact evaluation. About 60 participants from ICAR institutes, and State Agricultural Universities attended this workshop. The workshop comprised five technical sessions, viz. impact of engineering research, field crops research, NRM research, livestock research and fisheries research, and horticultural research.

Dr P.K. Joshi, Director (NCAP) provided the background and expected output of the workshop. Dr Joshi described the role of PME partners in assessing feasibility of technology, identification of conditions for the success of technology, and constraints limiting the spread of technology and quantification of impacts. Dr Joshi also described conditions for the successful adoption of any technology, viz. awareness, availability of technology and its component, affordability, and applicability of technology. The outputs expected from the workshop were documentation of frontier technologies, past impacts of technologies, and identification of technologies for further innovation.

Dr Mruthyunjaya, National Director (NAIP), in his remarks said that PME as a culture was formally chosen during National Agricultural Technology Project (NATP) period. He said that NATP studies have yielded good returns to research investment and informed that PME activities during NATP period have increased awareness, and changed mind-set of people. Now, PME should be viewed as a methodological innovation. He observed that the major challenges before PME practitioners were developing models for converging micro and macro priorities, evaluating social sciences research which has implications for policy analysis in agriculture and technology forecasting, and visioning future scenarios.

Dr A.K. Singh, Deputy Director-General (NRM), ICAR, in his remarks echoed the importance of research impact assessment. He specifically outlined the challenges in assessing the impact of technologies for natural resource management, which have tremendous sustainability and environmental impacts. He drew attention towards the urgency in undertaking this work because a considerable impact has been made by NRM technologies but only a few few studies are available, and need of assessing the problems associated with the transfer of these technologies.

Dr K.M. Bujarbaruah, Deputy Director-General (Animal Sciences), ICAR, formally inaugurated the workshop and advised that PME Cells should have a heterogeneous group of scientists. He mentioned that due care should be taken to select the indicators for research impact and a baseline should be developed for a comparison with final output.

The major recommendations of the workshop were as follows:

- Impact studies should be undertaken on recently developed technologies that have gone to farmers' fields, and for other improved technologies, ex-ante framework was suggested.
- The scope of research impact assessment should be broadened and factors influencing spread of technology and realizing final impacts should also be studied.
- Indicators for measuring research impact should be identified carefully and these should amply capture sustainability, environmental, social and other issues, besides economic indicators. The indictors should demonstrate how research is contributing to inclusive agricultural growth.
- Need-based technical backstopping should be provided for the studies on research impact assessment and appropriate mechanisms should be used for the dissemination of results.
- It was observed that all PME cells should complete the requirements like constitution of the Cell, MOUs, submission of audit certificate of SAUs, and bank account details for timely release of funds.

Accelerating Agricultural Growth in India

9 February 2008

A workshop on *Accelerating Agricultural Growth in India* was organized jointly by National Centre for Agricultural Economics and Policy Research with the Department of Agricultural Cooperation, Ministry of Agriculture, Agricultural Economics Research Association (India) and Food and Agriculture Organization (FAO) of the United Nations, on 9 February 2008 at the National Agricultural Science Centre (NASC) Complex, New Delhi. The workshop was a follow-up of a report submitted by the FAO and the meeting of its Director-General with the Honourable Prime Minister of India. The FAO report has taken into consideration international experiences and emerging global trends on narrowing the gap between high rate of overall economic growth and slow pace of agricultural change.

The workshop was inaugurated by Dr Y.K. Alagh, former Union Minister of Science and Technology, Government of India. In his inaugural address, Dr Alagh suggested to improve water productivity and accelerate adoption of improved technologies. Dr P.K. Mishra, Secretary, Department of Agricultural Cooperation, Ministry of Agriculture, Government of India, provided the background of the workshop and glimpses of on-going programmes of the Ministry to accelerate agricultural growth. In his special remarks, Dr Mangla Rai, Director-General, Indian Council of Agricultural Research, and Secretary, Department of Agricultural Research and Education, emphasized on the strengthening of agricultural research system for higher and sustained agricultural growth. Earlier Dr P.K. Joshi, Director, National Centre for Agricultural Economics and Policy Research welcomed the delegates and emphasized on evolving innovative institutional arrangements duly supported by the policies in the changing agrarian context.

The key issues discussed at the workshop were related to: (i) maintaining and increasing agricultural productivity, particularly in intensive cereal-producing regions; (ii) improving efficiency of water withdrawals for agriculture; (iii) preventing environmental degradation; (iv) mitigating and adapting measures for climate change; (v) biofuels and food security; (vi) problems in distressed areas; (vii) increasing importance of rural non-farm employment and income; and (ix) improving agricultural systems and policies. The discussion centred around the FAO report, XI Plan chapter on agriculture, Report of the Steering Committee on Agriculture, and National Policies for the Farmers. It was emphasized that more non-farm employment opportunities need to be generated besides massive investments to create need-based agri-infrastructure, strengthen agricultural research and improve resource-use efficiency to accelerate agricultural growth and raise farm income.

The workshop was attended by about fifty delegates representing policy advisors, financial institutions and representatives of civil society from different parts of the country. Among others, eminent economists like Dr Michael Lipton, Dr Shenggen Fan, Dr Mahboob Hossain, Dr V.S. Vyas, Dr Abhijit Sen, Dr G.K. Chadha, Dr S.S. Acharya, Dr C. Ramasamy, and Shri J.N.L. Srivastava shared their views at the workshop.

XIV LECTURES DELIVERED BY NCAP SCIENTISTS

Name of Scientist	Topic and Date	Venue
P. Adhiguru	Management Reforms in Agricultural Extension 3 March 2008	IARI, New Delhi
Pratatp S. Birthal	Conditions for the Success of Contract Farming 5-6 May 2007	NASC Complex, New Delhi
	High-Value Agriculture, and Linking Farmers to Markets 1-2 August 2007	NCAP, New Delhi
	Livestock Industry: A Backbone to Sustainable Agricultural Economy 18 September 2007	Ootty, Tamil Nadu
	Linking Smallholder Livestock Producers to Markets: Issues and Approaches 5-7 November 2007	BIRD, Lucknow
Ramesh Chand	Agriculture during 11th Plan: Major Concerns and Strategy 7-8 May 2007	IRMA, Anand
	WTO and the Future of Indian Agriculture 17 September 2007	IEG, New Delhi
	Strengthening Indian Agriculture : Status and Perspectives 19 September 2007	NAARM, Hyderabad
	Status of Agriculture Food-Security and Poverty in India 17 October 2007	GBPUA&T, Pantnagar
	State of Indian Agriculture and Prospects for the Future 7 November 2007	LBSNAA, Mussoorie
	Trade Liberalization in Agriculture: Issues & Methods 13 December 2007	IASRI, New Delhi
	Trade Policy and Challenges in Indian Agriculture 19 December 2007	Hotel Claridges, New Delhi
	Marketing and Trade Policies in a Globalizing World 20 December 2007	Madurai, Tamil Nadu
	Status of Livestock Sector and its Role in Agriculture Growth during XI Plan 13 March 2008	NDRI, Karnal
	Food and Nutritional Security Concerns in South Asia 24 March -03 April 2008	ANGRAU, Hyderabad

	Changing Market Structure and Policies in the Context of Globalization and its Implications on the Food and Nutritional Security 24 March -03 April 2008	ANGRAU, Hyderabad
Rajni Jain	Rough Sets and its Applications 26 September 2007	DRDO, Metcalfe House, Delhi
	Identifying Research Areas for Computer Applications in Agricultural Research 4 December 2007	Birsa Agricultural University, Ranchi
	Rough Sets Driven Data Mining: Case Studies using Agriculture Datasets 9-10 February 2008	Forest Research Institute, Dehradun
P.K. Joshi	Valuation of Technologies for Commercialization 16 August 2007	NAARM, Hyderabad
	Agri-business Opportunities for Smallholders 16 August 2007	NAARM, Hyderabad
	Rainfed Agriculture and High-value Commodities. 17 September 2007	IARI, New Delhi
Suresh Pal	Seed Industry Development: The Role of IPRs 10 May 2007	National Productivity Council, New Delhi
	Evaluation of Agricultural Research and its Outputs 30 June 2007	NAARM, Hyderabad
	Centre-State Relations in Agricultural R&D 25 August 2007	ISEC, Bangalore
	Towards Agricultural Innovation Policy 14 September September 2007	NISTADS, New Delhi
	Access and Benefit Sharing for Use of Plant Genetic Resources 7-8 September 2007	GBPUA&T, Pantnagar
	Agricultural Scenario Planning 26-27 June 2007	NCAP, New Delhi
	Contemporary Issues in Agricultural R&D Policy 17 March 2008	IARI, New Delhi
P. Shinoj	Gravity Model: Theory and Applications 10 December 2007	IASRI, New Delhi
Harbir Singh	ICAR Guidelines for IP Management and Technology Transfer/Commercialization 18 August 2007	NCAP, New Delhi.

XV DISTINGUISHED VISITORS

Dr Mangala Rai, Secretary, Department of Agricultural Research and Education & Director-General, Indian Council of Agricultural Research, Krishi Bhawan, New Delhi-110 014

Dr Rita Sharma, the then Additional Secretary and Financial Advisor, Department of Agricultural Research and Education, Krishi Bhawan, New Delhi-110 014

Dr P.K. Mishra, Secretary, Ministry of Agriculture, Government of India, Krishi Bhawan, New Delhi-110 014

Dr V.S. Vyas, Professor Emeritus, Institute of Development Studies, Jaipur- 302 018

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

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

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

Dr P.L. Gautam, Deputy Director-General (CS), Indian Council of Agricultural Research, Krishi Bhawan, New Delhi- 110 014

Dr P. Das, Deputy Director-General (Ag. Extn), Indian Council of Agricultural Research, Krishi Annusandhan Bhawan-I, New Delhi- 110 012

Dr K.M. Bujarbaruah, Deputy Director-General (AS), Indian Council of Agricultural Research, Krishi Bhawan, New Delhi- 110 014

Dr S.P. Tiwari, Deputy Director-General (Edn), Indian Council of Agricultural Research, Krishi Annusandhan Bhawan-II, New Delhi- 110 012

Dr Nawab Ali, Deputy Director-General (Engg), Indian Council of Agricultural Research, Krishi Annusandhan Bhawan-II, New Delhi- 110 012

Dr S. Ayyappan, Deputy Director-General (Fy), Indian Council of Agricultural Research, Krishi Annusandhan Bhawan-II, New Delhi- 110 012

Dr H.P. Singh, Deputy Director-General (Hort.), Indian Council of Agricultural Research, Krishi Annusandhan Bhawan-II, New Delhi- 110 012

Dr A.K. Singh, Deputy Director-General (NRM), Indian Council of Agricultural Research, Krishi Annusandhan Bhawan-II, New Delhi- 110 012

Dr Pronab Sen, Chief Statistician of India & Secretary, Ministry of Statistics and Programme Implementation, Government of India, New Delhi.

Dr S.M. Jharwal, Principal Advisor, Department of Agriculture & Cooperation, Ministry of Agriculture, Krishi Bhawan, New Delhi- 110 012

Dr Arvind Virmani, Chief Economic Adviser, Department of Economic Affairs, Ministry of Finance, Govt. of India, New Delhi

Dr J.C. Katyal, Vice Chancellor, Chaudhary Charan Singh Haryana Agricultural University, Hisar – 125 004

Dr C. Ramasamy, Vice Chancellor, Tamil Nadu Agricultural Univesity, Coimbatore- 641 003

Dr P.G. Chengappa, Vice Chancellor, University of Agricultural Sciences, GKVK, Bangalore- 560 065

Dr A.K. Upadhyay, Additional Secretary (DARE) & Secretary, Indian Council of Agricultural Research, Krishi Bhawan, New Delhi – 110 014

Dr August B. Temu, Director of Partnerships, World Agroforestry Centre, United Nations Avenue, Nairobi, Kenya

Sh Gerald H. Smith, Attache for Agricultural Affairs, American Embassy, Chanakyapuri, New Delhi 110 021

Sh S.K. Khosla, Vice President-Corporate Affairs, Syngenta India Limited, Bahadur Shah Zafar Marg, New Delhi- 110 002

Dr Christopher L. Delgado, Senior Economic Adviser, World Bank, Washington, DC, USA

Dr Greg Johnson, Horticulture for Development, Jamison ACT 2614.

Dr D.A. Somayajulu, Deputy Chairman, Agriculture Technology Mission and Advisor to Government of Andhra Pradesh, Hyderabad

Dr Emile Frison, Director General, Biodiversity International, Rome, Italy.

Dr Mauricio Bellon, Programme Director, Biodiversity International, Rome, Italy.

Dr Koichi Fujita, Professor, Centre for East and South-East Asian Countries, Kyoto University, Kyoto, Japan.

Dr William Janseen, Lead Agricultural Specialist, The World Bank, Washington DC, USA.

Dr N.S. Jodha, Senior Consultant, ICAMOD, Nepal.

Dr Pasca Kaumbuth, CEO Kendat, Crop and Grassland Service, AGPC, FAO, Rome.

XVI PERSONNEL

Name	Designation	Area of Specialization
P. K. Joshi	Director	Technology Policy Sustainable Agricultural Systems
Ramesh Chand	ICAR National Professor	Markets and Trade Agricultural Growth and Modelling
B. C. Barah	Principal Scientist	Agricultural Growth and Modelling Sustainable Agricultural Systems
K. K. Datta	Principal Scientist	Sustainable Agricultural Systems Agricultural Growth and Modelling
Suresh Pal	Principal Scientist	Technology Policy Institutional Change
Pratap S. Birthal	National Fellow	Technology Policy Agricultural Growth and Modelling
Usha Rani Ahuja	Principal Scientist (since 26 May 2007)	Technology Policy Institutional Change
Smita Sirohi	Principal Scientist (since 20 December 2007)	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	Markets and Trade Institutional Change
Rajni Jain	Senior Scientist	Markets and Trade
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 Systems Institutional Change
B. Ganesh Kumar	Senior Scientist (since 16 April 2007)	Agricultural Growth and Modelling Sustainable Agricultural Systems
Shiv Kumar	Senior Scientist (since 8 November 2007)	Institutional Change
P. A. Lakshmi Prasanna	Scientist (Sr. Scale)	Institutional Change Markets and Trade
P. Shinoj	Scientist (since 20 October 2007)	Agricultural Growth Modelling Markets and Trade

* On deputation to ANGRAU, Hyderabad

Technical

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

Administrative

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

* on deputation to DMR, New Delhi

XVII TRAININGS ATTENDED

Scientists

Name	Topic	Duration	Institution
Rajni Jain	Perspectives and Current Trends in Bio-informatics	12 -18 September 2008	CCMB, Hyderabad
	Women Empowerment/ Rights	4 February 2008	NASC Complex, New Delhi
Sant Kumar	Food & Agri Business Management Program: Accessing Global Markets	15-20 April 2007	Sathguru Management Consultants Pvt Limited, Hyderabad
	Food & Agri Business Management Program: Accessing Global Markets	2-9 May 2007	Cornell University, New York, USA
Harbir Singh	IP and Technology Management in ICAR System	28-30 May 2007	NAARM, Hyderabad
	Intelligent Reporting System	10-11 September 2007	IASRI, New Delhi
	Classification and Segmentation Technique Using SPSS 16.0 Version	28 February 2008	Institute for Integrated Learning, New Delhi

Administration and Others

Name	Topic	Duration	Institution
Prem Narayan	Rajbhasha Karyashala: Sansdiya Prashnavali evam Anuvad	31 August to 1 September 2007	Rajbhasha evam Prabandhan Vikas Sansthan, Delhi
Mangal Singh Chauhan	Networking Essentials for Information Management in Agriculture	16-25 October 2007	NAARM, Hyderabad
Sonia Chauhan	Agricultural Statistics and Computing	3 July-29 December 2007	IASRI, New Delhi
	Women Empowerment /Rights	4 February 2008	NASC Complex, New Delhi
Khyali Ram Chaudhary	Rajbhasha Paripraikshya: Kathinaiyan evam Samadhan	7-9 May 2007	Rajbhasha evam Prabandhan Vikas Sansthan, Delhi
	Knowledge, Library and Information Networking	20-23 November 2007	Developing Library Network (delnet), New Delhi
Vinod Kumar	Rajbhasha Paripraikshya: Kathinaiyan evam Samadhan	7-9 May 2007	Rajbhasha evam Prabandhan Vikas Sansthan, Delhi
Inderjeet Sachdeva	Purchase Policy and Procedures in Government Departments, Autonomous Bodies and Public Sector Undertakings	14-16 June 2007	Centre for Training and Social Research, New Delhi
Ajay Tanwar	Rajbhasha Paripraikshya: Kathinaiyan evam Samadhan	7-9 May 2007	Rajbhasha evam Prabandhan Vikas Sansthan, Delhi
	Improving Efficiency and Effectiveness of Personal Secretaries	11-13 October 2007	ISERA, New Delhi
Satinder Singh	Rajbhasha Karyashala: Sansdiya Prashnavali evam Anuvad	31 August to 1 September 2007	Rajbhasha evam Prabandhan Vikas Sansthan, Delhi
A.K. Jha	Rajbhasha Paripraikshya: Kathinaiyan evam Samadhan	7-9 May 2007	Rajbhasha evam Prabandhan Vikas Sansthan, Delhi

XVIII OTHER INFORMATION

Participation in ICAR Sports Meet

NCAP Sports Team comprising B.C. Barah, Pratap S. Birthal, Rajni Jain, Harbir Singh, Vinod Kumar, S.K. Yadav, Seema Khatter, Sonia Chauhan, Mangal Singh Chauhan, Prem Narayan, Khyali Ram Chaudhary, Inderjeet Sachdeva, Sanjay Kumar, Ajay Tanwar, Satinder Singh, Mahesh Khokhra, and Mahesh Pal participated in ICAR Zonal Tournament at Indian Agricultural Research Institute, New Delhi, during 24-28 April 2007. The small team brought laurels to the Centre by winning five medals. Mrs Sonia Chauhan bagged medals in 100-metre race, chess, and long jump; and Mrs Seema Khatter bagged medals in 100-metre and 200-metre races.

NCAP Annual Day

The NCAP Annual Day was celebrated on 1 May 2007 in the premises of the Centre. The programme was organized in two sessions of morning and evening. In the morning session, Professor V.S. Vyas, Chairman, Institute of Development Studies, Jaipur, who was the Chief Guest, delivered the Annual Day lecture on 'Growth Opportunities and Challenges in Indian Agriculture'. The function was chaired by Shri A.K. Upadhyay, Secretary, Indian Council of Agricultural Research, New Delhi. The lecture was followed by a lively discussion on the issues constraining agricultural growth and areas to be harnessed for future growth in agriculture.

The function was followed by the release of NCAP Policy Paper No. 23, on Research Resource Allocation in Indian Agriculture, authored by late Professor Dayanatha Jha and Sant Kumar. Two other publications, Workshop Proceedings No. 14 on Smallholder Livestock Production in India: Opportunities and Challenges, authored by Pratap S. Birthal, V.K. Taneja and W. Thorpe; and first issue of NCAP eNews were also released on the occasion.

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

Promotion of Official Language

A Committee on Official Language is in place at the Centre to promote the use of official language Hindi among staff of the Centre. The Committee monitors the progress of various actions being taken and suggests measures for improvement. It coordinates and helps in executing the Council's orders and reports from time to time.

The Committee on Official Language organized a series of events during 'Hindi Pakhwara' (14-28 September 2007) to generate awareness among staff about the use of Hindi. The activities which were organized during the 'Hindi Pakhwara' included debate, essay writing, knowledge of administrative words, extempore speeches, antakshari, quiz, etc. in Hindi. The participation of staff in these activities was overwhelming. In addition, a workshop on 'Use of Computer in Hindi' was also organized on 7-8 September 2007 to promote the use of computers in day-to-day official notings.

Shri H.C. Joshi, Director (Rajbhasha), Indian Council of Agricultural Research, New Delhi, was the Chief Guest on the occasion of prize distribution. Scientists from the Centre and other neighbouring institutions served as judges during different events to select the winners.

The details of events organized and prize winners are as follows:

S. No.	Events	Prize Winners
1	Essay writing	Sonia Chauhan Sushil Kumar Yadav A.K. Jha
2	Debate	Amit Jaiswal Sonia Chauhan Sushil Kumar Yadav
3	Ashubhashan	Rashi Mittal Sant Kumar A.K. Jha
4	Dictation	Sushil Kumar Yadav Prabha Singh A.K. Jha
5	Translation in Hindi	A.K. Jha Ajay Tanwar Sonia Chauhan Khyali Ram Chudhary Harvinder Singh
6	Poem Recitation	Mangal Singh Chauhan Amit Jaiswal Prabha Singh

In Memory of Professor Dayanatha Jha

The Centre observed the 68th birth anniversary of late Professor Dayanatha Jha, the former Director of NCAP and ICAR National Professor. In this connection, the Centre organized an inhouse meet to pay homage and tributes to Dr Jha on 10 March 2007.

During the meet, NCAP Staff recalled the contributions of Dr Jha to the Centre. They recalled the great visionary power and professional wisdom of Dr Jha in nurturing the agricultural economics discipline and policy research both in the Council and NARS.

Afterwards, a debate on Union Budegt 2008-09 was organized where participants from NCAP, IARI and IASRI participated.

Among other activities, the Centre organized a Sports Meet of table tennis and badminton in the memory of Dr Dayanatha Jha.

Dr Jha was a great lover of nature and he always emphasized on the importance of planting trees. A number of trees of different varieties were planted by the staff of NCAP on this occasion.

Recruitment of Staff

During the year, five new scientists joined the Centre. These were: Dr Smitha Sirohi, Dr Usha Rani Ahuja, Dr B. Ganesh Kumar, Dr Shiv Kumar, and Dr P. Shinoj. Dr Smitha Sirohi, before joining the Centre as Principal Scientist, was Senior Scientist at National Dairy Research Institue, Karnal. Dr Usha Rani Ahuja joined the Centre as Senior Scientist and was promoted as Principal Scientist under career advancement scheme. Before joining NCAP, she was Senior Scientist at Central Arid Zone Research Institute, Jodhpur. Two other scientists, Dr B. Ganesh Kumar and Dr Shiv Kumar, who joined the Centre as Senior Scientist during the year, were serving as Scientist at Central Agricultural Research Institute, Andamans, and Indian Agricultural Research Institute, New Delhi, respectively. Dr P. Shinoj has joined the Centre as Scientist after successfully completing the FOCARS training at NAARM, Hyderabad.

fof'kf"V lkjka'k

राष्ट्रीय कृषि आर्थिकी एवम् नीति अनुसंधान केन्द्र ने कृषि अर्थशास्त्र तथा नीति अनुसंधान में उत्कृष्टता कायम रखने के अपने प्रयासों को वर्ष 2007–08 में भी जारी रखा। इस केन्द्र द्वारा किये गये अनुसंधान कार्यों से भारतीय कृषि अनुसंधान परिषद् को कृषि–क्षेत्र से सम्बन्धित नीति चर्चाओं एवम् निर्णयों में एक सक्रिय भूमिका निभाने में मदद मिलती है। वर्ष 2007–08 में केन्द्र में 20 वैज्ञानिक (एक राष्ट्रीय प्राध्यापक तथा एक राष्ट्रीय अध्येता सहित) तथा 15 अन्य कर्मचारी कार्यरत थे। वर्ष 2007–08 में केन्द्र का कुल बजट 445.95 लाख रूपये था।

एक उच्च स्तरीय अनुसंधान सलाहाकार समिति इस केन्द्र के अनुसंधान कार्यक्रमों का निर्धारण एवं मार्गदर्शन करती है। केन्द्र की प्रशासनिक एवम् आर्थिक गतिविधियों पर एक प्रबन्धन समिति निगरानी रखती है और सुझाव देती है। इसके अतिरिक्त, केन्द्र के विकेन्द्रीय प्रबन्धन तथा संचालन के लिए कई आंतरिक समितियों जैसेकि बजट समिति, क्रय समिति, प्रकाशन समिति, आदि का भी गठन किया गया है।

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 बदलाव तथा कृषि वृद्धि एवं मॉडलीकरण। प्रत्येक क्षेत्र में एक लघु वैज्ञानिक समूह, एक वरिष्ठ कृषिअर्थशास्त्री के मार्गदर्शन में कार्य करता है। केन्द्र के विभिन्न अनुसंधान क्षेत्रों में शोध अध्ययनों का इस प्रकार परस्पर समन्वय किया जाता है जिससे कि केन्द्र के निर्धारित उद्देश्यों की प्राप्ति की जा सके। वर्ष 2007–08 में केन्द्र में 40 शोध–अध्ययनों पर कार्य किया गया। इस अवधि में केन्द्र ने पाँच परामर्शी परियोजनाओं को भी पूरा किया। इस वर्षावधि में केन्द्र ने विभिन्न भारतीय तथा विदेशी संस्थाओं के साथ अपने शोध सम्बन्धों और अनुबंधों को न केवल बनाए रखा वरन् उन्हें और भी अधिक सुदृढ़ एवं व्यापक बनाया। इस वर्ष भी केन्द्र द्वारा अनेक कार्यशालाओं, संगोष्ठियों, ब्रेनस्टार्मिंग सैशनों, तथा नीति समर्थन कार्यक्रमों का आयोजन किया गया। केन्द्र की मुख्य शोध उपलब्धियों तथा गतिविधियों की एक झलक का विवरण निम्नवत है:–

पिछले कई वर्षों में कृषि की धीमी वृद्धि दर के कारण भारतीय कृषि में संकट की स्थिति उत्पन्न हो गई है। कृषि–वृद्धि दर में तेजी से सुधार लाना वैज्ञानिकों एवं नीति–निर्माताओं के समक्ष एक कठिन चुनौती है। केन्द्र ने कृषि में वृद्धि की स्थिति, अस्थायित्व एवम् जोखिमों पर कई अध्ययन किये हैं।

- कृषि में हुई वृद्धि के अध्ययन से ज्ञात हुआ है कि वर्ष 1995–96 से पहले कृषि वृद्धि में प्रगति संतोषजनक थी, परन्तु उसके पश्चात् वृद्धि दर धीमी पड़ गई। ऐसा वर्ष 1995–96 के पश्चात् उर्वरक–प्रयोग, सिंचाई–उपयोग, फसल–सघनता उच्च–मूल्य वाली फसलों की ओर झुकाव तथा कृषि व्यापार शुल्कों में होने वाली वृद्धि दर के धीमा हो जाने से हुआ था। इस अध्ययन में भारतीय कृषि में उत्पन्न संकट से निपटने के लिए जो महत्वपूर्ण सुझाव दिये गये हैं उनमें कृषि अनुसंधान व विकास में सार्वजनिक निवेश को बढ़ावा देना, सिंचाई सुविधाओं का विकास, उपयुक्त संस्थागत सुविधाओं का विकास, उर्वरक–प्रयोग को प्रोत्साहन, बिजली–उपलब्धता में बढ़ोत्तरी, कृषि उत्पादों तथा आदानों हेतु प्रतिस्पर्धात्मक बाजारों की स्थापना तथा खेती के जोखिमों का शमन करने हेतु समुचित प्रावधानों का विकास, आदि प्रमुख हैं।

- भारतीय कृषि में अस्थायित्व पर किये गये एक अध्ययन ने दर्शाया है कि भारतीय कृषि में अब इतनी क्षमता आ गई है कि वह मौसमी एवं अन्य कारकों द्वारा उत्पन्न आघातों को सहन कर सकती है। भारतीय कृषि में जोखिमों का आंकलन करने हेतु किये गये अध्ययन में चौबीस वर्षों (1981–2004) के आंकड़ों के आधार पर विभिन्न फसलों के उत्पादन पर इन जोखिमों का मिला–जुला प्रभाव मिला है। अध्ययन में कृषि उत्पादन में जोखिम कम करने के लिए सिंचाई सुविधाओं में बढ़ोतरी, मृदा–संरक्षण उपायों को प्रोत्साहन तथा फसलों की नई किस्मों के विकास जैसे उपायों को अपनाने का सुझाव दिया गया है। आंध्र प्रदेश में जिला स्तर पर प्राप्त आंकड़ों से ज्ञात हुआ है कि धान के उत्पादन तथा सकल आय से जुड़े जोखिमों में कमी आई है परन्तु

मूंगफली उत्पादन के जोखिमों में बढ़ोत्तरी हुई है। इस अध्ययन में सुझाव दिया गया है कि उत्पादन सम्बन्धित जोखिमों के समाधान के लिए फसल–आधारित तथा क्षेत्र–आधारित बीमा विन्यासों का विकास किया जाना चाहिये।

देश की बढ़ती जनसंख्या की खाद्य–माँग को पूरा करना ही कृषि विकास का मुख्य उद्देश्य रहा है। पिछले कुछ वर्षों में खाद्यान्नों की मांग एवं आपूर्ति में आये असंतुलन के कारण मुख्य खाद्य–पदार्थों की कीमतों में न केवल भारत में वरन् पूरे विश्व में भी भारी उछाल आया है। इस महत्वपूर्ण विषय पर केन्द्र ने कई अध्ययन किये गये।

- खाद्यान्नों की भावी माँग पर किये गये अध्ययन में देश में आनाजों की मांग वर्ष 2012 में 2190 लाख टन तथा वर्ष 2020 में 2610 लाख टन आंकी गई है। उपरोक्त वर्षों में दलहनों की मांग क्रमशः 160 लाख टन और 190 लाख टन होगी। इस प्रकार खाद्यान्नों की कुल मांग वर्ष 2012 में 2350 लाख टन और वर्ष 2020 में 2810 लाख टन आंकी गई है।

- पिछले दो वर्षों (2005–06 तथा 2006–07) में गेहूँ की मांग एवं आपूर्ति में उत्पन्न असंतुलन अनुसंधानकर्ताओं और नीति–निर्धारकों के समक्ष एक चुनौती है। इस अवधि में गेहूँ की कीमतें काफी बढ़ी हैं। इसका प्रमुख कारण गेहूँ के उत्पादन में कमी तथा सरकार द्वारा गेहूँ की कम खरीद कर पाना है। गेहूँ का उत्पादन बढ़ाने तथा खरीद सुनिश्चित करने के लिए सरकार ने समर्थन मूल्य की एक नीति अपनाई है जिसका परिणाम अच्छा रहा है। गेहूँ का घरेलू उत्पादन बढ़ाने में उन्नत प्रौद्योगिकियों का व्यापक प्रचार एक मुख्य भूमिका निभा सकता है।

- गेहूँ की कमी तथा इसकी बढ़ती कीमतें न केवल भारत वरन् पूरे विश्व के समक्ष एक कठिन चुनौती है। इस सम्बन्ध में केन्द्र में किये गये एक अध्ययन से ज्ञात हुआ है कि गेहूँ की कीमतों पर नियन्त्रण रखने में सरकारी खाद्यान्न भंडार की भूमिका महत्वपूर्ण होती है। बाजार में खाद्यान्नों की कीमतों में उतार–चढ़ाव पर कई अन्य कारकों के अलावा इसकी अच्छी भंडारण स्थिति द्वारा काबू रखा जा सकता है। इस अध्ययन में सुझाव दिया गया है कि सरकार को अपने पास गेहूँ का 20 लाख टन बफर स्टाक रखना चाहिये ताकि वह व्यापारियों द्वारा कीमतें बढ़ाने की मंशा से आपूर्ति में कमी लाने की स्थिति में बाजार में हस्तक्षेप कर सके और सार्वजनिक वितरण प्रणाली (पीडीएस) की अपनी वचनबद्धता को भी पूरा कर सके।

कृषि क्षेत्र की समस्याओं का दीर्घकालीन समाधान, अनुसंधान व विकास (आर एण्ड डी) द्वारा ही उपलब्ध हो सकता है। प्रतिवेदन वर्ष में केन्द्र में कृषि अनुसंधान और विकास से जुड़े कई विषयों पर शोध–कार्य किये गये जैसेकि शोध संसाधन निर्धारण, सार्वजनिक एवं निजी भागीदारी, कृषि क्षेत्र में आए संकटों के समाधान में अनुसंधान एवं विकास की भूमिका, कृषि जैवप्रौद्योगिकी, मत्स्य अनुसंधान में निवेश, आदि।

- सार्वजनिक एवं निजी भागीदारी, कृषि विकास प्रक्रिया का एक अभिन्न अंग बन गया है। पिछले कुछ वर्षों में परिषद् द्वारा शुरू की गई नीति चर्चा तथा लिये गये निर्णय कई मायनों में सराहनीय रहे हैं। सार्वजनिक–निजी भागीदारी व्यवस्था के अंतर्गत कई प्रौद्योगिकियाँ विकसित की गई हैं जोकि अनेक तरह से लाभदायक पाई गई हैं; इनमें संकर (हाइब्रिड) धान, जुताई–विहीन खेती, समन्वित कीट नियन्त्रण (आई पी एम), आदि प्रमुख हैं। इस सहभागिता को बढ़ावा देने के लिए परिषद् ने अपने बाह्य–पोषित कार्यक्रमों के अन्तर्गत धन उपलब्ध कराया है। अध्ययन दर्शाता है कि नई बौद्धिक सम्पदा अधिकार व्यवस्था में अनेक राष्ट्रीय शोध एवं विकास संस्थाएं बहुराष्ट्रीय कम्पनियों की शोध एवं विकास संस्थाओं से प्रतिस्पर्द्धा नहीं कर पायेंगी तथा उन्हें अनुसंधान व विकास करने के लिए सार्वजनिक व्यवस्था से सहायता लेनी पड़ेगी, चाहे इसके लिए उन्हें मूल्य भी चुकता करना पड़े।

- भारतीय कृषि अनुसंधान परिषद् ने राज्य कृषि विश्वविद्यालयों के साथ मिलकर खेती के विभिन्न कार्यों के लिए कई उन्नत प्रौद्योगिकियाँ विकसित की हैं। इन प्रौद्योगिकियों मे कृषि कार्यों में सुगमता, प्राकृतिक संसाधनों में बचत, व फसलों के नुकसान में कमी लाने तथा खाद्य–पदार्थों के उत्पादन में बढ़ोतरी और अनुरक्षण–काल में वृद्धि, तथा कृषि आय को बढ़ाने की अपार क्षमता है। आवश्यकता इस बात की है इनमें प्रयुक्त अपार क्षमता का उपयोग करने के लिए समुचित प्रोत्साहन का मार्ग प्रशस्त किया जाये।

- जैवप्रौद्योगिकी की अपार संभावनाओं का लाभ उठाने के लिए भारत सरकार ने इस क्षेत्र में एक बड़ी राशि का निवेश किया है। फसल प्रौद्योगिकी के क्षेत्र में ऊतक संर्वधन, जैविक (कीटाणु, रोग, आदि) और अजैविक (नमी, लवणता, आदि) समस्याओं से छुटकारा तथा उत्पादों की गुणवत्ता और अनुरक्षण–काल में वृद्धि जैसे विषयों पर बल दिया जा रहा है। जैवप्रौद्योगिकी में निजी–क्षेत्र में अनुसंधान अत्यन्त सीमित हैं। इस अध्ययन में जैव–प्रौद्योगिकी अनुसंधान में निजी क्षेत्र द्वारा निवेश बढ़ाने के लिए उपाय सुझाए गए हैं।

- मत्स्य उत्पादन में सतत् वृद्धि इस क्षेत्र को मिले शोध संसाधनों के प्रभाव का द्योतक है। इस केन्द्र में किये गये एक अध्ययन से ज्ञात हुआ है कि विभिन्न पंचवर्षीय योजनाओं में मत्स्य विकास के लिए निर्धारित राशि में निरन्तर वृद्धि हो रही है। ग्यारहवीं पंचवर्षीय योजना में यह राशि प्रथम पंचवर्षीय योजना की तुलना में 400–गुनी है। इस क्षेत्र में वृद्धि दर को सतत् बनाये रखने के लिए प्रौद्योगिकी विकास, ढाँचागत सुविधाओं का विकास तथा विपणन व्यवस्था अत्यन्त महत्वपूर्ण कारक हैं। ढ़ाँचागत सुविधाओं जैसेकि छोटे बंदरगाहों, अवतरण क्षेत्रों, मत्स्य नौकाओं तथा यांत्रिक पोतों का निर्माण, जालों की उपलब्धता, आदि पर निवेश करने से मछली–पकड़ने तथा इससे प्राप्त आय में वृद्धि होगी।

सघन खेती पद्धतियों को अपनाने से कृषि संसाधनों पर दबाव अधिक बढ़ा है जिससे सीमित संसाधनों का उपयोग तेजी से हो रहा है और मृदा तथा जल की गुणवत्ता में कमी आई है। संसाधनों की उपलब्धता कृषि विकास में एक बड़ी बाधा बनती जा रही है। इसीलिए प्राकृतिक संसाधनों का समुचित प्रबन्धन बहुत महत्वपूर्ण हो गया है। इस केन्द्र में संसाधन–प्रयोगों में अधिकतम कुशलता प्राप्त करने पर कई अध्ययन किये गये।

- इस केन्द्र द्वारा भारत के दक्षिणी प्रदेशों (आंध्रप्रदेश और तमिलनाडु) में किए गए एक अध्ययन में यह पाया गया है कि 'चावल की सघन प्रणाली' (एसआरआई) इसकी पारम्परिक खेती की अपेक्षा अधिक लाभकारी है। इस प्रणाली में चावल की 2–3 गुना अधिक ऊपज (देश की औसत ऊपज 2 टन/हेक्टेयर) प्राप्त होती है और पानी की कम आवश्यकता (सामान्य पद्धति की तुलना में 20–40: कम) पड़ती है तथा बीज और खाद की मात्रा में भी बचत होती है। चावल उत्पादन की यह नवीन पद्धति वास्तव में उपयोगी सिद्ध हो सकती है यदि इसे उपयुक्त नीति समर्थन दिया जाये।

- पानी, खेती–बाड़ी का एक प्रमुख घटक है और इसकी कमी को देखते हुए कई प्रकार की जल–बचत प्रौद्योगिकियों का विकास किया जा रहा है। यह देखा गया है कि जल–बचत प्रौद्योगिकियाँ अधिकांशतः उद्यान–कृषि में प्रयोग की जाती हैं। सूक्ष्म–सिंचाई प्रणालियों पर किये गये प्रयोगों के आधार पर सर्वाधिक झुकाव ड्रिप प्रणाली की ओर है क्योंकि उद्यान–कृषि में भी इसका उपयोग बहुत अधिक है। इस केन्द्र में किये गये अध्ययन में सुझाव दिया गया है कि जल–बचत प्रौद्योगिकियाँ की प्राथमिकता सुनिश्चित करने तथा आर्थिक अनुदान देने के लिए उन पर किये गये निवेश से प्राप्त लाभ और फसलों में उनके उपयोग का आंकलन करना चाहिये। जल–बचत प्रौद्योगिकियों को लोकप्रिय बनाने के लिए उपयोगकर्त्ताओं में इनके विषय में व्यापक रूप से जागरूकता फैलाने की आवश्यकता है।

- खाद्य–पदार्थों की बढ़ती मांग को पूरा करने में बारानी कृषि में अपार क्षमता है बशर्ते इसके लिए एक व्यावहारिक योजना विकसित की जाए। प्रौद्योगिकी विकास की दृष्टि से ऐसी आधुनिक तकनीक विकसित की जानी चाहिए जिसमें उत्तम मृदा–जल प्रबन्धन के साथ–साथ आदानों की कम मात्रा में उपयोग की आवश्यकता पड़ती हो। विभिन्न सेवादायी संस्थानों के मध्य एक प्रभावी तालमेल होना भी बहुत महत्वपूर्ण कड़ी है। ढांचागत विकास के लिए दीर्घकालीन निवेश की भी आवश्यकता है। इस प्रकार की व्यवस्था बारानी खेती–बाड़ी को मात्र जीवन–यापन के साधन से एक लाभकारी व्यवसाय में बदल सकती है और बारानी क्षेत्रों पर जीविका के लिए निर्भर रहने वालों किसानों को खाद्य एवं आय सुरक्षा प्रदान कर सकती है।

- पूरे विश्व में मौसम में हो रहे बदलाव और कृषि पर उसके संभावित प्रभाव पर व्यापक चर्चा की जा रही है। इस बदलते जलवायु परिवेश में खेती–बाड़ी की ऐसी रणनीतियाँ जो सीमित चरराशियों (विशेषकर तापमान और नमी) पर आधारित

हैं अब ज्यादा प्रभावी नहीं हैं। इनके अच्छे परिणामों के लिए सामाजिक–आर्थिक चरराशियों को जैव–भौतिकी मॉडल में समाहित करने की आवश्यकता है। स्थानीय स्थिति के लिए विशिष्ट प्रौद्योगिकियाँ बदलते मौसम के सन्दर्भ में सहायक हो सकती हैं। मौसम परिवर्तन से जुड़ी आपदाओं को कम करने के लिए ऐसी ऋण तथा बीमा योजनाऐं बनाना आवश्यक है जोकि विभिन्न वातवरणीय परिस्थितियों के लिए उपयुक्त हों।

भारतीय कृषि में उभरती संस्थाओं, विशेषकर छोटे खेतिहारों से जुड़ी संस्थाओं के महत्व को देखते हुए इस केन्द्र में बदलती संस्थागत व्यवस्थाओं पर कई अध्ययन किये गये। इनमें अनुबंध–खेती, फसल बीमा, कृषि में सूचना की उपलब्धता, बीज व्यवस्था, आदि शामिल हैं।

- ऐसा माना जा रहा है कि अनुबन्ध–खेती छोटे किसानों की सामाजिक व आर्थिक परिस्थितियों में सुधार ला सकती है। इसकी सफलता इस बात पर निर्भर करती है कि यह कृषि आय में कितनी बढ़ोत्तरी और विपणन तथा उत्पाद–ढुलाई व्यय में कितनी कमी लाने में सक्षम होती है। गैर–कृषि कारक जैसेकि उत्पाद उठाने में नियमितता, आदानों व सेवाओं की उपलब्धता, मूल्य–भुगतान, आदि कम्पनी और किसानों के मध्य एक मजबूत सम्बन्ध विकसित करते हैं। अनुबन्ध–खेती की सफलता और स्थायित्व के लिए इनके भागीदारों के मध्य दीर्घकालीन वचनबद्धता और पारस्परिक विश्वास आवश्यक हैं।

- किसानों को सही समय पर आवश्यक सूचना की उपलब्धता कृषि विकास में एक प्रमुख कारक है। इस केन्द्र में उन्नत कृषि प्रौद्योगिकियों संबंधी सूचनाओं तथा इनके स्रोतों की किसानों तक पहुँच के सम्बन्ध में एक अध्ययन किया गया। इस अध्ययन से पता चला है सूचना स्त्रोतों की उपलब्धता जोत के आकार में बढ़ोतरी के साथ बढ़ जाती है। यह विभेद कई स्त्रोतों जैसे कि प्रसार कार्यकर्त्ताओं, दूरदर्शन तथा प्राथमिक सहकारी समितियों आदि के संदर्भ में अधिक मिला है। छोटे खेतिहारों को प्रगतिशील किसानों तथा आदान विक्रेताओं से उन्नत प्रौद्योगिकियों के विषय में जानकारी मिलती है।

- कृषि ऋण की उपलब्धता, ग्रामीण विकास के महत्वपूर्ण तथा प्रभावी कारकों में से एक है। इस केन्द्र में एक अध्ययन में उन कारकों की पहचान की गई है जिनके आधार पर ग्रामीण परिवार ऋण संस्था का चुनाव करते हैं। अध्ययन से ज्ञात हुआ है कि आयु में परिपक्वता, परिवार का आकार, शिक्षा का स्तर तथा जोत–आकार ऐसे कारक हैं जो ऋण लेने वाले को संस्थागत स्त्रोतों से ऋण लेने की प्रेरणा देते हैं। यह भी पता चला है कि गरीब तबके के लोगों को संस्थागत स्त्रोतों से ऋण मिलने की संभावनाएं सीमित होती हैं। स्वरोजगार से जुड़े लोग भी संस्थागत स्त्रोतों से ही ऋण लेना पसंद करते हैं जबकि मजदूर वर्ग का झुकाव असंस्थागत स्त्रोतों की ओर होता है।

- आंध्रप्रदेश, हरियाणा, हिमाचल प्रदेश और उत्तर प्रदेश में प्रचलित बीज प्रणालियों पर किये गये एक अध्ययन से पता चला है कि इन राज्यों में लगभग सभी किसान उच्च–मूल्य वाली फसलों जैसेकि कपास, टमाटर और मटर, आदि के बीज व्यवसायिक स्त्रोतों यथा निजी बीज विक्रेताओं, बीज निगमों अथवा सरकारी गोदामों से खरीदते हैं। वर्ष 2003–04 तथा 2004–05 में धान के 60 प्रतिशत और मूंगफली के 40 प्रतिशत बीज व्यवसायिक स्त्रोतों से खरीदे गये थे। यह एक सकारात्मक लक्षण है क्योंकि उत्तम गुणवत्ता वाले बीजों से फसल उत्पादकता बढ़ती है और कृषि–आय में वृद्धि होती है।

- ऐसी स्वपरागित फसलें जोकि प्रतिकूल परिस्थितियों में उगाई जाती हैं, के बीज उपलब्ध कराने में सार्वजनिक क्षेत्र एक अहम् भूमिका निभा रहा है। मूंगफली और आलू जैसी फसलों के लिए यह और भी महत्वपूर्ण है क्योंकि इनमें बीज की अधिक मात्रा की आवश्यकता होती है। निजी क्षेत्र की बीज कम्पनियाँ स्वपरागित फसलों के बीजों की आपूर्ति करने में महत्वपूर्ण भूमिका निभा सकती हैं। भारत सरकार ने विश्वव्यापार दौर में व्यापार–सम्बन्धित 'बौद्धिक सम्पदा मसौदे' की धाराओं का अनुपालन करने के लिए समस्त कानूनी प्रावधानों की व्यवस्था कर दी है, लेकिन नई बौद्धिक सम्पदा अधिकार व्यवस्था में आनुवंशिक पादप संसाधनों को प्राप्त करने की कीमत बढ़ सकती है जिसका पादप प्रजनन प्रयासों पर व्यापक प्रभाव पड़ेगा।

भारतीय कृषि में क्षेत्रवार एवं राज्यवार अभी भी वृद्धि की अपार संभावनाएँ हैं। कृषि के ज्ञात स्त्रोतों से होने वाली वृद्धि दर में ठहराव आ गया है। इसलिए कृषि वृद्धि के नए स्त्रोतों की पहचान करना जरूरी है। इस केन्द्र ने कृषि में वृद्धि प्राप्ति के नवीन स्त्रोतों की जानकारी हेतु कुछ अध्ययन किये हैं।

- पशुपालन, भारतीय कृषि का एक अभिन्न तथा पूरक अंग है। पशुपालन क्षेत्र में 'कुल कारक उत्पादकता' पर किये गये एक अध्ययन से ज्ञात हुआ है कि 1971–2004 की अवधि में पशुपालन क्षेत्र में वार्षिक वृद्धि दर 2.3 प्रतिशत थी। 'कुल कारक उत्पादकता' की इस वृद्धि में समय के साथ तेजी आई। 1971–1981 की अवधि में यह वृद्धि 1.5 प्रतिशत थी जो 1981–1991 में बढ़ कर 2.6 प्रतिशत और 1981–2004 में 2.9 प्रतिशत हो गई।

- विश्व स्तर पर पशु–उत्पादों की बढ़ती मांग ने भारत को निर्यात का एक अच्छा अवसर दिया है। यह अवसर गोमॉस, जिसकी घरेलु मांग नगण्य है, के निर्यात के लिए विशेष महत्वपूर्ण है। पशु–उत्पादों के निर्यात को प्रभावित करने वाले कारकों पर केन्द्र द्वारा किये गये अध्ययन ने दर्शाया है कि घरेलू उत्पादन तथा खपत के अनुपात की भूमिका गोमॉस, भेड़–माँस तथा मुर्गी उत्पादों का निर्यात बढ़ाने में मुख्य होती है। अध्ययन से यह भी ज्ञात हुआ है कि देश में 1990 के दशक में मुद्रा अवमूल्यन तथा इसके उत्तरार्ध में विश्वव्यापार के लागू होने से पशु–उत्पादों के निर्यात पर काफी प्रभाव पड़ा है। मात्रात्मक प्रतिबंधों में ढील से भी पशु–उत्पादों के निर्यात पर काफी सकारात्मक प्रभाव पड़ा है।

- भारतीय कृषि में छोटी–जोत वाले किसानों का वर्चस्व है। कृषि विविधीकरण के अन्तर्गत उच्च–मूल्य वाली फसलें बोने में छोटी–जोत वाले किसानों की भूमिका पर किये गये अध्ययन से ज्ञात हुआ है कि विविधीकरण की धीमी प्रगति छोटे किसानों के लिए हितकारी है, क्योंकि फलों की अपेक्षा सब्जियाँ उगाने में इनका योगदान अधिक होता है। इसका मुख्य कारण इनके पास पारिवारिक श्रमिकों की पर्याप्त उपलब्धता है। यद्यपि फल–उत्पादन भी खाद्य–पदार्थ उत्पादन की अपेक्षा अधिक श्रम–आधारित है, लेकिन यह पूंजी–संघनित भी है। इसी कारण, छोटे किसान जिनके पास कम–पूंजी की व्यवस्था होती है, इसकी ओर कम ही उन्मुख होते हैं।

- भारतीय उद्यान क्षेत्र उपयुक्त बाजार व्यवस्था तथा ढाँचागत व्यवस्था के अभाव से ग्रसित है। केन्द्र द्वारा किए गए एक अध्ययन से ज्ञात हुआ है कि किसानों को उपभोक्ताओं द्वारा दिए गए मूल्य का मात्र एक–तिहाई भाग ही मिलता है। हैदराबाद में एक सर्वेक्षण में फलों तथा सब्जियों की विपणन प्रणालियों का अध्ययन किया गया जिसमें सार्वजनिक तथा निजि क्षेंत्रों की विपणन प्रणालियाँ सम्मिलित थीं। अध्ययन में प्राप्त आंकड़ों द्वारा ज्ञात हुआ है कि फलों तथा सब्जियों के विपणन में निजी क्षेत्र द्वारा अपनाई गई नई विधियाँ सार्वजनिक क्षेत्र द्वारा अपनाई जाने वाली विधियों की अपेक्षा किसानों को ज्यादा लाभ प्रदान करती हैं क्योंकि उनमें विपणन, माल–ढुलाई तथा अन्य मदों में व्यय कम होता है।

- भारत में मत्स्य क्षेत्र में हुई अभूतपूर्व वृद्धि के कारण इसे 'उगते हुए सूरज' क्षेत्र की उपमा दी गई है। केन्द्र द्वारा किए गए एक अध्ययन से ज्ञात हुआ है कि 1981 से 2006 की अवधि में इस क्षेत्र में 4.6 प्रतिशत वार्षिक की दर से वृद्धि हुई, यद्यपि यह मुख्यतः अंतः स्थलीय मत्स्यकी में वृद्धि के कारण हुई। आगामी दशकों में मत्स्य उत्पादन में एक्वाकल्चर का योगदान मुख्य होगा क्योंकि मत्स्य–पालक अपने जलाशयों के क्षेत्र में बढ़ोतरी के साथ–साथ उन्नत तकनीकों का प्रयोग भी कर रहे हैं। तथापि, मत्स्य उत्पादन में ऐसी बहुत सी चुनौतियॉ हैं जिनके समाधान खोजने होंगे।

- समुद्र–तटीय क्षेत्रों में रहने वाले लोगों की जीविका के समक्ष उभरती कठिनाइयाँ जैसे कि मत्स्यन दिनों में कमी, आय तथा रोजगार के अवसरों में गिरावट, खाद्य–पदार्थों के बढ़ते मूल्य, आदि बड़ी चुनौतियाँ हैं। केन्द्र द्वारा किए गए एक अध्ययन में समुद्र–तटीय क्षेत्रों में रहने वाले लोगों की जीविका में सुधार लाने के लिए समुचित उपाय तथा रणनीतियॉ सुझाई गई हैं। इस अध्ययन के अनुसार इसके लिए स्थानीय परिस्थितियों तथा उभरती चुनौतियों के बीच समन्वय बनाया जाना आवश्यक है।

- चावल उत्पादन की आर्थिकी पर किये गये एक अध्ययन से ज्ञात हुआ है कि 1983–84 से 2004–05 की अवधि में आंध्र प्रदेश, हरियाणा, मध्य प्रदेश, पंजाब, उत्तर प्रदेश तथा पश्चिमी बंगाल राज्यों में चावल की खेती में आदानों जैसे कि उर्वरक, मशीनरी और सिंचाई, के प्रयोग की मात्रा में काफी बढ़ोत्तरी हुई है। विभिन्न राज्यों में चावल उत्पादन में प्रयुक्त उर्वरकों की मात्रा में काफी असमानता देखी गई है। अध्ययन से यह भी ज्ञात हुआ है कि उर्वरक–प्रयोग की मात्रा बढ़ाने के बावजूद, अभी भी चावल के अधिक उत्पादन के लिए उर्वरकों और मशीनरी प्रयोग में बढ़ोतरी की काफी गुंजाइश है।

- उत्तराखण्ड में औषधीय एवं सगंधीय पौधों की खेती पर केन्द्र द्वारा किये गये एक अध्ययन से ज्ञात हुआ है कि गन्ने जैसी व्यावसायिक फसलों की अपेक्षा औषधीय एवं सगंधीय वनस्पतियों की खेती आर्थिक रूप से अधिक लाभकारी है। यद्यपि इसमें बहुत सारी बाधाऐं हैं जैसेकि अपर्याप्त प्रसंस्करण सुविधाएँ, मूल्यों में भारी जोखिम और बड़े स्तर पर बुवाई के लिए पादप–पदार्थों की कमी। अध्ययन में बताया गया है कि किसानों को तकनीकी जानकारी उपलब्ध कराने और प्राथमिकता के आधार पर संस्थागत ऋण उपलब्ध कराने जैसे प्रयासों के द्वारा ग्रामीण क्षेत्रों में खाद्य प्रसंस्करण ईकाइयाँ लगाने को प्रोत्साहन मिल सकता है। साथ ही, बाजार सूचना तन्त्र का सशक्तीकरण और भावों में जोखिमों का समुचित प्रबन्धन ऐसे कारक हैं जिनका उत्तराखण्ड में औषधीय व संगधीय पौधों की खेती को प्रोत्साहन देने के दूरगामी प्रभाव होंगे।

- किसानों की आय के विभिन्न स्रोतों की क्षमता पर केन्द्र द्वारा किये गये अध्ययन से ज्ञात हुआ है कि कृषक परिवारों की कुल आय का एक बड़ा भाग गैर–कृषि स्रोतों से प्राप्त होता है। यह निष्कर्ष, आम मान्यता के विपरीत है जिसमें किसानों की आमदनी का मुख्य जरिया खेती–बाड़ी को माना जाता है। वर्ष 2003 में किसानों की कुल आय का 20 प्रतिशत भाग मजदूरी से तथा 24 प्रतिशत गैर–कृषि व्यवसाय से प्राप्त हुआ। यद्यपि ये गैर–कृषि स्रोत छोटे और मझोले किसानों की आय में बढ़ोत्तरी करने के लिए काफी महत्वपूर्ण हैं, विभिन्न कृषक परिवारों में इन तक पहुंच सीमित होने के कारण, एक बड़ा असंतुलन देखा गया है। मात्र 14 प्रतिशत कृषक परिवारों ने गैर–कृषि व्यवसाय से और 46 प्रतिशत ने मजदूरी से आमदनी प्राप्त की। इस अध्ययन में सुझाव दिया गया है कि किसानों की आय में बढ़ोतरी लाने के लिए ग्रामीण अर्थव्यवस्था को गैर–कृषि कार्यों की तरफ बढ़ाने में तेजी लानी होगी और कृषक परिवारों को इतना सशक्त बनाना होगा कि वे गैर–कृषि क्षेत्र के प्रवेश मार्ग में आने वाली सभी बाधाओं को पार कर सकें।

- किसान परिवारों की आय में असमानता लाने वाले कारकों का पता लगाने के लिए इस केन्द्र में भारत के चार पूर्वी राज्यों, यथा बिहार, झारखण्ड, उड़ीसा तथा पश्चिमी बंगाल में एक अध्ययन किया गया। जिन कारकों का कुल आय (कृषि तथा गैर–कृषि) से सकारात्मक सम्बन्ध मिला उनमें जोत का आकार, परिवार के मुखिया की आयु तथा शिक्षा, उत्पादन पूँजी, पशु–धन मूल्य, बाजार तक पहुँच और ऋण–क्षमता, आदि प्रमुख थे। परिवार के मुखिया का लिंग, कृषि–आय (खेती–बाड़ी तथा पशुओं से) तथा सड़कों तक पहुँच जैसे कारकों का आय–स्तर पर कोई विशेष प्रभाव नहीं देखा गया। गैर–कृषि आय पर जिन कारकों का अत्यधिक प्रभाव देखा गया उनमें परिवार का आकार, परिवार के मुखिया की आयु, शिक्षा तथा लिंग, जोत का आकार तथा सड़कों तक पहुंच, आदि प्रमुख थे। जोत के आकार का गैर–कृषि आय के साथ विलोमात्मक सम्बन्ध था अर्थात् जितना बड़ा जोत का आकार, उतनी कम गैर–कृषि आय।

- ग्रामीण परिवारों की आय में असमानता के कारकों का अनुमान लगाने के लिए केन्द्र द्वारा एक अध्ययन पूर्वी भारत (बिहार, झारखंड, उड़ीसा तथा पश्चिमी बंगाल राज्य) में किया गया। इससे ज्ञात हुआ है कि परिवार के मुखिया की शिक्षा का प्रभाव सबसे अधिक (8.3:) होता है। इसके बाद क्रमशः उत्पादन संसाधन (5:), भूजोत का आकार (3.7:), परिवार के मुखिया की उम्र (3:), बाजार तक पहुँच (1.4:) और पशु–धन मूल्य (1.3:), आदि कारक प्रभाव डालते हैं। कृषि आय में विषमता का मुख्य कारक 'जोत का आकार' था और उसके पश्चात् क्रमशः पशु–धन मूल्य, परिवार के मुखिया की आयु तथा शिक्षास्तर और सड़कों तक पहुंच जैसे कारक प्रभावी दिखे। गैर–कृषि आय में विषमता पैदा करने वाले कारकों में भी परिवार के मुखिया

की आयु तथा शिक्षा स्तर को महत्वपूर्ण पाया गया। इस अध्ययन में दर्शाया गया है कि कृषकों की आय में समानता लाने के लिए बाधक कारकों का समुचित समाधान ढूँढना होगा।

- भारत से विकसित देशों को खाद्य–पदार्थों के निर्यात में सुरक्षा नियमों का पालन एक मुख्य विषय है । गैर–शुल्कीय प्रावधनों (मुख्यतः एसपीएस तथा टीबीटी) की बढ़ती संख्या से देश के खाद्य–निर्यात पर काफी प्रतिकूल प्रभाव पड़ा है। वर्ष 2006–2007 (अप्रैल से मार्च) में भारत द्वारा निर्यातित खाद्य–उत्पादों की कुल कंसाइनमैंटों में से 54 प्रतिशित अमेरिका ने तथा 97 प्रतिशत जापान ने अस्वीकृत कर दी थीं। कंसाइनमैंट नकारने के मुख्य कारण थेः इनमें सूक्ष्मजीवी संक्रमण, मैलापन, अस्वच्छता तथा असुरक्षित योगजों का प्रयोग। इस अध्ययन में सुझाव दिया गया है कि पशु–उत्पादों के निर्यात में एसपीएस मानकों का सख्ती से पालन करना चाहिये ताकि देश को प्रति इकाई मूल्य अधिक मिल सके।

- ग्रामीण क्षेत्रों में स्वरोज़गार तथा मजदूरी के कार्य उपलब्ध कराने हेतु विशिष्ट रूप से तैयार किये गये गरीबी उन्मूलन कार्यक्रमों के सकारात्मक परिणाम देखे गये हैं। इन कार्यक्रमों के मुख्य रूप से तीन वर्ग हैं : (1) कृषि तथा श्रमिक की उत्पाकता और आय बढ़ाना, (2) गरीबों तक अनाज/नगदी पहुँचना, और (3) अनुदान द्वारा लागत तथा कीमतों को घटाना। इस अध्ययन ने सुझाव दिया है कि देश से गरीबी उन्मूलन के लिए बहुआयामी प्रबन्धन अपनाना चाहिये जिसमें कृषि उत्पादकता में सुधार, रोजगार गारंटी, महिलाओं और बच्चों की स्वास्थ्यसुरक्षा, ढांचागत व्यवस्था का विकास, स्वच्छता, बीमायोजना, आदि सम्मिलित हैं। इस अध्ययन के अनुसार गरीबी उन्मूलन कार्यक्रमों की योजना में आय बढ़ाने के साथ–साथ समाजिक विकास पर भी ध्यान दिया जाना चाहिये। पिछले अनुभवों से सीख लेते हुए हमें ऐसी संतुलित योजना बनानी चाहिये जो देश को सतत वृद्धि की ओर ले जा सके।

वर्ष 2007–2008 में केन्द्र ने देश के उतर–पूर्वी क्षेत्रों की समस्याओं एंव संभावानाओं के अध्ययन की ओर विशेष घ्यान दिया और इस क्षेत्र में उपलब्ध अवसरों का लाभ किसानों तक पहुँचाने का प्रत्यन भी किया। केन्द्र द्वारा इस क्षेत्र से जुड़े कई अध्ययन किये गये।

- उच्च–मूल्य वाली फसलों की ओर कृषि विविधीकरण पर किये गये एक अध्ययन से ज्ञात हुआ है कि इस क्षेत्र में फलों, सब्जियों, तिलहनों तथा पुष्पों की खेती की अपार संभावनाएं हैं। एक अन्य अध्ययन में उत्तर–पूर्वी क्षेत्र में पशुपालन में आय और रोजगार को प्रभावित करने वाले कारकों की पहचान की गई है। इस अध्ययन से पता चला है कि श्रमिक उपलब्धता, पारिवारिक व्यवसाय और जोत–माप का पशुपालन पर सकारात्मक प्रभाव पड़ता है, जो कृषि और पशुपालन के बीच एक मजबूत बन्धन को दर्शाता है। सिंचाई सुविधाओं तथा संस्थागत ऋण की उपलब्धता इस क्षेत्र में पशुपालन को प्रभावित करते हैं।

- उत्तर–पूर्वी क्षेत्र में किसान मिश्रित खेती करते हैं, जिसे जल संरक्षण प्रौद्योगिकियों के साथ समायोजित करके बहते जल का संरक्षण किया जा सकता है। इस क्षेत्र के सीढ़ीनुमा खेतों के ऊपरी भाग मक्का और ज्वार की खेती तथा निचले भाग चावल की खेती के लिए अधिक उपयुक्त होते हैं। अन्य सतहों पर चारा/घास तथा फलियों की खेती की जा सकती है जिससे मृदा–क्षरण को रोका जा सकेगा और पशुओं को चारा मिल सकेगा। अध्ययन में इस क्षेत्र में उत्पादों के विपणन के लिए विशिष्ट संस्थागत सुविधाएँ उपलब्ध कराने की आवश्यकता दर्शाई गई है।

- 'बर्ड–फलू' के फैलने के भय से पूरी दुनिया का ध्यान इसकी ओर गया था। केन्द्र द्वारा किये गये एक अध्ययन में जुलाई 2007 में हुए 'बर्ड–फलू' के प्रकोप के पश्चात् मणिपुर राज्य में इससे हुई आर्थिक हानि का आंकलन किया गया है। अध्ययन दर्शाता है कि मुर्गीपालकों को हुआ नुकसान 316 लाख रूपये आंका गया है जबकि सरकार द्वारा उन्हें केवल 99 लाख रूपये (लगभग 31:) का ही मुआवजा दिया गया। इस बीमारी के कारण मणिपुर में सूअर के माँस में 35 प्रतिशत तथा मछली के माँस में 85 प्रतिशत की वृद्धि देखी गई। इस अध्ययन के अनुसार कम मुआवजा मिलने के परिणाम गंभीर हो सकते हैं:

(1) इससे मुर्गीपालकों तथा उनके परिवारों की जीविका तथा जीवन निर्वाह प्रभावित होंगे, तथा (2) इससे संक्रमित मुर्गियों को मारने तथा निस्संक्रामण कार्यक्रमों में कमी आयेगी। परिणामस्वरूप, बीमारी के प्रकोप से बचाव प्रयासों में कमी आयेगी जिसके और अधिक भयावह परिणाम हो सकते हैं।

- इस केन्द्र में 'राष्ट्रीय कृषि नवोन्मेषी परियोजना' द्वारा पोषित एक उपपरियोजना 'संकल्पना, नीति विश्लेषण तथा लिंग' (विजनिंग, पॉलिसी एनालिसिस तथा जैन्डर, वीपीएजीइ) संचालित की जा रही है। इस वर्ष इस प्रोजैक्ट के अन्तर्गत चार कार्यशालाओं का आयोजन किया गया।

इस केन्द्र की वेबसाइट (http://www.ncap.res.in) का पुनर्निधारण किया गया तथा इसे अद्यतन भी किया गया। केन्द्र के सभी प्रकाशन पी डी एफ प्रारूप में उपलब्ध हैं तथा इन्हें डाउनलोड किया जा सकता है। उपलब्ध आंकड़ों के अनुसार इस वर्ष केन्द्र द्वारा प्रकाशित संक्षिप्त सार (Policy Brief), कार्यशाला वृत्ति (Workshop Proceedings) तथा नीति पत्र (Policy Paper) सर्वाधिक अवलोकित किये गए। केन्द्र द्वारा विकसित तथा संचालित वेबसाइट (http://www.agrieconet.nic.in) समाजशास्त्रियों के नैटवर्किंग में सहायता कर रही है तथा प्रणाली सम्बन्धित कठिनाइओं के निराकरण के लिए शोध एवं संसाधनों की सहभागिता में भी योगदान दे रही है।

इस केन्द्र द्वारा स्थापित 'कृषि शोध एवं सूचना प्रणाली' (एआरआइएस) इसके कर्मचारियों को ईमेल तथा इंटरनेट सुविधाएं उपलब्ध करा रही है। केन्द्र का अपना ईमेल सर्वर है जिसकी क्षमता का पूरा उपयोग किया जा रहा है।

केन्द्र ने अपने शोध परिणामों के प्रसारण के अन्तर्गत एक पुस्तक (Book), 24 शोध–पत्र (Research Paper), पुस्तकों में 26 लेख (Book Chapters) तथा 7 चर्चा पत्र (Discussion Papers) प्रकाशित किए। केन्द्र के वैज्ञानिकों ने अनेक व्यावसायिक तथा नीति संबंधी कार्यक्रमों तथा परियोजनाओं में सहभागिता की। केन्द्र ने इस वर्ष 10 कार्यशालाओं तथा कई बैठकों का आयोजन किया। इसने कई राष्ट्रीय और अन्तर्राष्ट्रीय शोध संस्थानों के साथ सहभागिता की । इस सभी प्रयासों से केन्द्र की ख्याति तथा अनुसंधान विश्वसनीयता में बढ़ोत्तरी हुई है।

राष्ट्रीय कृषि आर्थिकी एवम् नीति अनुसंधान केन्द्र
NATIONAL CENTRE FOR AGRICULTURAL ECONOMICS AND POLICY RESEARCH
(Indian Council of Agricultural Research)
P.B. No. 11305, Dev Prakash Shastri Marg, Pusa, New Delhi - 110 012, INDIA
Phone : 91-11-25847628, 25848731 Fax : 91-11-25842684 E-mail : director@ncap.res.in
http://www.ncap.res.in