





ANNUAL REPORT 2010-11

राष्ट्रीय कृषि आर्थिकी एवम् नीति अनुसंधान केन्द्र

NATIONAL CENTRE FOR AGRICULTURAL ECONOMICS AND POLICY RESEARCH

Annual Report
2010-11

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नई दिल्ली

National Centre for Agricultural Economics and Policy Research
New Delhi

NCAP Annual Report 2010-11

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Editorial Team
S.S. Raju
Rajni Jain
Ajay Tanwar

Published by
Ramesh Chand
Director, NCAP, New Delhi

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

PREFACE

National Centre for Agricultural Economics and Policy Research has completed 20 glorious years of its existence. During these years the Centre has emerged as a policy think tank and it has carved a special place for it in the Indian Council of Agricultural Reserach (ICAR). This could happen due to hard work and strong commitment of the staff in the Centre. The Centre is committed to strengthening agricultural economics and policy research in the country through credible empirical research, dissemination and advocacy of its research outputs, capacity strengthening in National Agricultural Research System (NARS) and networking with other institutes related to NARS.

This report provides the glimpses of achievements of the Centre during the year 2010-11. During this year the Centre worked on 19 research projects and three contract and consultancy studies with maximum faculty strength of 19 scientists. Some noteworthy research studies undertaken during the year include contribution of total factor productivity in agriculture, impact of improved technologies, visioning for rainfed agriculture, dairy sector and hill farming, new seed policy, water management policies, village level studies on poverty, commodity outlooks, the coping strategies for tackling climate change, implications of biofuels, export performance of meat products, marketing models of horticulture, dairy and fisheries, risk assessment and agricultural insurance, impact of the global recession on Indian agriculture and agricultural growth. These studies have enormously helped the ICAR in participating in agricultural policy debates and decisions.

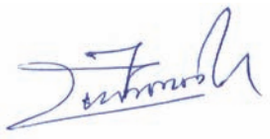
Five faculty members made fifteen visits abroad for project work, for equipping themselves with latest developments in the field and for participation in high level meetings and conferences. Eight scientists received different kinds of recognitions during the year. The Centre organised training courses for capacity strengthening in policy analysis. In addition, the Centre organised policy advocacy activities, seminars and workshops. During the year, NCAP scientists have published a large number of papers on issues of topical interests.

The best infrastructural facilities are being provided to entire staff with a congenial working environment to deliver quality work. The Centre has developed a well furnished two-room guest house to cater to pressing need for accommodation of NCAP visitors.

The year saw a number of promotions. Dr S S Raju and Dr Anjani Kumar got selected to Principal Scientist position at the Centre and all the four technical officers got promoted to next scale. Sh A K Aggarwal joined as first administrative officer at the Centre. Two ARS probationers, one each in the discipline of agricultural economics and agricultural extension joined the Centre.

In accomplishing its targets, the Centre received overwhelming support from ICAR. We are especially grateful to Dr S Ayyappan, Director-General, ICAR, and Secretary, Department of Agricultural Research and Education, Government of India, for his continuous guidance and encouragement to take this Centre to new heights. Sh Rajiv Mehrishi, Secretary, ICAR and Additional Secretary DARE has taken keen interest in the activities of this Centre and helped in numerous ways to improve visibility of the Centre. We would like to record our gratitude to him. We offer our sincere thanks to Dr Arvind Kumar, Deputy Director-General (Education), Dr R K Mittal, Assistant Director General (EQR) for their continued support and motivation in fulfilling the mandate of the Centre.

My colleagues, Dr S S Raju and Dr Rajni Jain rendered hard work and undertook responsibility of compiling, editing and bringing out the report in the present form. Dr Sant Kumar helped in Hindi translation of the relevant portion. Mr Ajay Tanwar patiently processed and formatted the manuscript. I am thankful to all of them for their contributions in bringing out this report. I also acknowledge the outstanding contributions and team efforts of all the staff of NCAP for their support in fulfilling the Centre's mandate.



(Ramesh Chand)
Director

LIST OF ACRONYMS

ANN	Artificial Neural Network
APMC	Agricultural Produce Market Committee
ARIS	Agricultural Research Information System
ASRB	Agricultural Scientists Recruitment Board
BCR	Benefit-Cost Ratio
Bt	Bacillus thuringiensis
DT	Decision Tree
CACP	Commission for Agricultural Costs and Prices
CBDA	Chhattisgarh Biofuel Development Authority
CeRA	Consortium for e-Resources in Agriculture
CSPro	Census and Survey Processing System
CVaR	Conditional Value at Risk
DARE	Department of Agricultural Research and Education
DPSIR	Driving Force Pressure State Impact Response
ERNET	Education and Research Network
ESI	Environmental Sustainability Index
ESM	Economic Surplus Model
ETL	Extraction, Transformation, Loading
FAPRI	Food and Agricultural Policy Research Institute
FDI	Foreign Direct Investment
FPR	Female Participation Rate

GDD	Growing Degree Days
GDP	Gross Domestic Product
GoI	Government of India
GR	Green Revolution
ICAR	Indian Council of Agricultural Research
ICT	Information and Communication Technology
IGR	Income Gap Ratio
IIVR	Indian Institute of Vegetable Research
IMC	Institute Management Committee
IMPS	Integrated Microcomputer Processing System
INR	Indian Rupees
IP	Intellectual Property
IPM	Integrated Pest Management
IRC	Institute Research Council
IRR	Internal Rate of Return
ISSA	Integrated System for Survey Analysis
LST	Large-Scale field Trial
MAD	Mean Absolute Deviation
MC	Management Committee
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MSP	Minimum Support Price
M-V	Mean-Variance

NARP	National Agricultural Research Project
NARS	National Agricultural Research System
NISCAIR	National Institute of Science, Communication and Information Resources
NISTADS	National Institute of Science, Technology and Development Studies
NPV	Net Present Value
NRAA	National Rainfed Area Authority
NSA	Net Sown Area
PGR	Poverty Gap Ratio
PPVFRA, 2001	Protection of Plant Varieties and Farmers' Rights Act, 2001
QRT	Quinquennial Review Team
R&E	Research and Education
RAC	Research Advisory Committee
RSMML	Rajasthan State Mines and Mineral Limited
SACs	South Asian Countries
SAUs	State Agricultural Universities
SCI	Science Citation Index
SLSI	Sustainable Livelihood Security Index
SRI	System of Rice Intensification
SST	Sea Surface Temperature
TCA	Total Cropped Area
TE	Triennium Ending
TFP	Total Factor Productivity

VaR	Value at Risk
VDSA	Village Dynamics in South Asia
V-PAGe	Visioning, Policy Analysis and Gender
WEF	World Economic Forum
WIGISAT	Wine Grape Insurance Structuring Automation Tool
WSTs	Water-Saving Technologies

CONTENTS

LIST OF TABLES

Executive Summary

The National Centre for Agricultural Economics and Policy Research (NCAP) is continuing its efforts towards achieving excellence in agricultural economics and policy research in the country. The research studies of the Centre have enormously increased the participation of the ICAR in agricultural policy debates and decision making. Besides, serving ICAR the Centre also provides policy input to other public sector organisations and various Ministries and Departments.

The Centre had 19 scientists and 15 other staff in the year 2010-11. The total expenditure of the Centre during 2010-11 was Rs. 772.82 lakh.

A high-powered Research Advisory Committee chaired by Prof V S Vyas guides the Centre in 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 decentralised management of the Centre.

Research studies of topical nature are conducted at the Centre under five broad themes, viz. technology policy; sustainable agricultural systems; markets and trade; institutional change; and agricultural growth and modelling. Research programmes within and across the themes are so designed as to accomplish the mandate of the Centre. During the year 2010-11, the Centre has conducted 35 research studies. Three 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 organised quite a good number of workshops, seminars, brainstorming sessions, and policy advocacy programmes. The research achievements and a glimpse of activities undertaken during 2010-11 are reported below.

Technology Policy

- The study on "Revitalising Agricultural Growth through Improved Technology" revealed that the common sources of growth in agriculture are increase in area or number of livestock; higher use of inputs like fertiliser, agro-chemicals, seeds, and energy; expansion of irrigation, improved technology. Improvement in technical efficiency, changes in product mix from low to high value, product integration, more intensive use of resources like land (crop intensity) are the other sources for raising agriculture output. There is a need to achieve 4 per cent growth in agriculture to meet demand of rising population growing at the rate of 1.4 per cent per annum and to cope up with changing dietary pattern towards costly energy food.
- A study on Bt brinjal analysed that 15 per cent of adoption results in Rs. 11,029 per ha annual addition in net returns. It would benefit consumers by reduction in price of brinjal to the tune of 3 per cent to 15 per cent. The total economy would gain between Rs. 577 crore and Rs. 2,387 crore annually, corresponding to 15 per cent and 60 per cent adoption levels, respectively.

LIST OF FIGURES

- A study on secondary and micronutrients on the economy of the state of Karnataka proved that balanced fertiliser management augments food grains production and enhances returns to the economy as a whole. Promotion of balanced fertilization can address the issues of yield stagnation and food security.
- In-depth study on proposed Seed Bill 2010 recommended that the seed quality standards may be specifically defined in the proposed Bill. One of the effective ways to ensure a reasonable seed price would be to create conditions for competition among the seed producers, and allow seed companies to compete with one another and in some cases, even with the public sector for delivering quality seeds to the farmers. It may be worthwhile to link the registration of seed to varieties which are protected under Protection of Plant Varieties and Farmers' Rights Act.
- Visioning exercise in rainfed agriculture addressed mainly four scenarios of growth (i) business as usual, (ii) developmental approaches, (iii) climate change, and (iv) public-private partnership.Visioning study for dairy sector in India revealed that growth in milk production during last 10 years was 3.63 per cent, out of which 53 per cent come from growth in number of in-milk animals and 47 per cent from growth in productivity per animal. The study concluded that during 2035 milk supply in the country will fall short of demand by 4.5 million tonnes. The study on hill agriculture highlighted diminishing size of holding. Average yields are below potential yields. The deteriorating state of the support lands has resulted in the loss of niche production advantage for many farmers. The study emphasised that hill farmers tend to accept labour saving technologies. Alternatively farmers may be compelled to opt for contract or cooperative farming under specialised management.
- The findings of the study on TFP and contribution of research reveal that incremental production of 10.4 million tonnes of wheat, 6.3 million tonnes of rice, 1.1 million tonnes of maize and 0.64 million tonnes of pearl millet was attributable to research. The findings clearly showed that agricultural research has contributed very significantly to attainment of food self-sufficiency in the country. The study also provides estimates of TFP by crop and by state.
- Impact study on Bt cotton showed that, the impending elimination of varieties' cultivation has implications for biosecurity and biodiversity resulting in pan genetic vulnerability.
- There is a clear positive trend towards diversification of the rural economy. Major factors underlying diversification are technology-led yield improvement, assured price, irrigation and shifts in consumption pattern. Diversification towards horticultural crops were found to depend upon agro-climatic suitability, technology and relative profitability, growth in per-capita income, and access to roads and market. Diversification in favour of livestock depends largely on the availability of fodder and grazing land, dairy co-operatives, veterinary care and to some extent road connectivity.
- A study on high value agriculture revealed that the share of high-value commodities (fruits & vegetables, livestock products, fisheries) increased from 37.3 per cent in TE 1983-84 to 41.3 per cent in TE 1993-94 and reached a level of 47.4 per cent in total value of output during TE 2007-08. The trade in high-value products has also increased during the last decade.

- The review of water demand management policies concludes that their actual effects on water saving and use efficiency are too meagre and also very thinly spread to have any major change. The main problems are their low area coverage and operational effectiveness, both of which are due to the lack of concerted policies and supporting institutions.

Sustainable Agricultural System

- For building a sustainable and viable bioethanol industry in the country, it is recommended to look for improved technology and management practices that would bring down costs and complement ethanol production using alternative feed stocks like sweet sorghum, tropical sugar beet etc. Focusing research efforts on commercial production of ethanol from second-generation feed stocks like bagasse, cereal crop residues, forest thinning, saw-dust, paper etc. is equally important in ensuring the long-term environmental sustainability and benefits of biofuels.
- Assessment of jatropha based biodiesel value chain in India revealed that jatropha cultivation is economically viable in the long run but initial support in the form of subsidised seedlings, inputs, technical assistance, buy-back assurance, minimum support price (MSP) etc. is crucial to sustain the interest of the farmers. Viability can be ensured through stable supply of feedstock and consistent market demand of biodiesel and its byproducts. Proper backward and forward integration at each level of the supply chain is also crucial to bring in stability in the value chain.
- A study to achieve improved livelihood security through resource conservation and diversified farming systems in Mewat assessed impact of zero tillage and goatry. Zero tillage reduces cost of cultivation of wheat by 15 per cent and increase the crop yield by 7 per cent. The preliminary results regarding impact of goatry revealed that on an average a poor farm family can improve its livelihood by getting 1-2 litres milk per day.
- A study on small ruminants revealed that population of the small ruminants (goat and sheep) during 1970-2007 witnessed annual growth rate of 1.98 per cent. At national level, the number of small ruminants per one lakh population has declined from 21 in 1982 to 18 in 2001, which would create sharp supply-demand gap in small ruminant meat.

Markets and Trade

- Efforts are on to build grains outlook model covering major cereals like rice, wheat, maize, pigeon pea and chick pea; and an oilseed model consisting of soybean, groundnut, rapeseed and mustard. The framework has been developed by incorporating time series data on relevant variables, technical parameters and elasticties. Expertise for building the model was acquired thorough training programme in USA.
- A study on milk market chains in Bihar recommended that the traditional milk market channels need to be addressed in a constructive manner in view of its continued dominance in marketing and value addition of milk. The quality gap can be addressed to a large extent by

popularising training and certification programmes for small-scale milk traders and processors to improve their performance, including quality control.

- Indian meat production has increased from 2.7 million tonnes in 1970 to 5.9 million tonnes in 2009. During this period, the share of India in global meat production changed from 2 per cent to 1.6 per cent. Analysis of the commodity diversification of meat products export revealed that it is gradually specialising towards bovine meat.

Institutional Change

- Analysis of land use dynamics vis-à-vis population dynamics revealed that (i) during 1951-61, annual compound growth rate of net sown area was 1.06 per cent which declined to 0.38 per cent during 2001-08 as against population growth rate of 1.58 per cent. Cropping intensity after 1950-51 has increased from 113.45 per cent during 1951-61 to 135.77 per cent during 2001-08. Share of smallholders in irrigated area, area treated with fertilizer and fertilizer consumption, area treated with pesticides, and quantity of agricultural credit increased over the years.
- In a study on Risk Assessment and Insurance Products for Agriculture, Wine Grape Insurance Structuring Automation Tool (WIGISAT) has been developed. The tool was tested in stakeholders interface dialogue meet along with application of "Money Mobile".
- An analysis of risk in Andhra Pradesh agriculture brought out that instability in agriculture at the disaggregate level presents a picture different from that at the aggregate level. For example for paddy crop, decline in instability was witnessed by 36 per cent districts in area, 41 per cent districts in production and 50 per cent districts in yield, whereas the state level estimates showed increase in instability. It is concluded that the state level analysis does not reflect complete picture of shocks in agriculture production and shocks in production underestimates shocks in farm income. There is a need for addressing risk in farm income by devising area-specific crop insurance or other suitable mechanisms.
- An Innovative Data Management System for Agricultural Commodity Market Outlook (called CMOS) is under development. It integrates existing data of crops, agricultural resources, inputs, stocks, trade and consumption etc. from various secondary sources. The CMOS has been planned to provide reliable, accurate and updated data on agricultural and socio-economic aspects upto district level.
- A study on multivariate forecast of winter monsoon rainfall in India compared ANN and exponential regression based approaches. The study revealed the better predictive potential of ANN over exponential regression approach.
- A study on ICT reported that there is immense potential for ICTs to create new employment opportunities and empowering rural women. Therefore, efforts are needed to bridge the different types of digital divide (rural-urban, men-women) and strengthening the ICT initiatives.

- Female participation rate in agriculture based on different parameters demonstrates an increase in participation of women. Among all social groups work participation rate is more among deprived women as compared to higher-class women.
- In Kerala, more than 50 per cent of the fisherwomen were not sharing their income at all with their husbands. However, 28.50 per cent partially shared and 20 per cent fully shared their income with their husbands. Conversely, in Tamil Nadu, about 76 per cent partially shared and the rest 24 per cent fully shared the income with their husbands. The study used social empowerment indicators, political empowerment indicators and legal empowerment indicators and recommended that creation of awareness can help farm women in exercising their rights on economic, social, political and legal aspects.

Agricultural Growth and Modelling

- A study analysing feasibility and constraints on achieving 4 per cent growth rate in Agriculture during XI Plan concluded that growth in GDP agriculture can be accelerated if the momentum in growth of fertiliser use, seed, irrigation, power supply, and public investments is maintained as in past four years. Concerted efforts are being made to harness potential of low productivity region by taking improved technology to these areas and price environment for farmers is becoming remunerative. Some constraints are supply of institutional credit, power supply to agriculture, supply and quality of inputs, progress in technology, resource allocation for agriculture, favourable institutional and regulatory environment, extension system, shrinking natural resource base and improvement in rural infrastructure.
- A study on next agricultural transition in the heartland of green revolution in India found that agricultural production system of North West India has turned away from the path of sustainable growth. Natural resources base that sustained highly productive agriculture for about four decades is under serious threat. Agriculture production and growth is being maintained with heavy support in terms of subsidies for fertilizer and water which in turn are the worsening situation.
- Pattern of agricultural growth and economic convergence in Indian agriculture affirms that the benefits of economic reforms started by the Government of India have shown no visible impact on convergence process of per hectare NSDP agriculture among Indian states. Indian agriculture has its own intrinsic power to generate growth in per hectare NSDP agriculture causing convergence among Indian states.
- A slowdown in agriculture growth during 2008-09 was caused by behaviour of rainfall and not because of transmission effect of global recession. Measures and strategies put by the government have been effective in decoupling India's agriculture sector from rest of the world and in minimising effect of severe shocks in global economy on this sector. Important recommendations for policies to deal with the global crisis to ensure sustainable growth in Indian agriculture are (i) strengthening analytical capabilities (ii) development of a road map and its perusal (iii) increasing credit and insurance support to farmers and (iv) strengthening of safety net programmes.

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

As a part of the dissemination of research output, the Centre has published one policy paper, three policy briefs, thirty journal articles, eighteen book chapters/popular articles and four reports during the current year. The Centre's staff has been involved in a number of professional and policy interactions and projects. It organised ten workshops and several meetings in and outside the Centre. It also collaborated with a number of national and international research organisations. These activities could facilitate achieving of greater impact and wider visibility of the Centre during the year.

I. PROFILE OF NCAP

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

Location

The Centre is located in the Pusa campus in New Delhi. It has in its close vicinity several institutes of ICAR and CSIR like Indian Agricultural Research Institute (IARI), Indian Agricultural Statistics Research Institute (IASRI), National Physical Laboratory (NPL), National Institute of Science, Technology and Development Studies (NISTADS), National Institute of Science, Communication and Information Resources (NISCAIR) 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. The Centre thus has locational advantage in terms of multidisciplinary studies, inter-institutional interactions and research linkages, library facilities, etc.

Vision

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

Mission

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

Mandate

The mandate of the Centre includes:

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

- (i) technology generation, diffusion and impact assessment,
- (ii) sustainable agricultural production systems,
- (iii) interaction between technology and other policy instruments like incentives, investments, institutions, trade, etc.
- (iv) agricultural growth and modelling with focus on the role of technology;

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

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

Research Activities

Research activities of NCAP are broadly covered under five major themes: technology policy, sustainable agricultural systems, markets and trade, institutional change and agricultural growth and modelling. The significant study areas of the Centre include research investment, agricultural growth and development, research resource allocation, WTO and trade in agriculture, private sector participation in agricultural extension, food policy, monitoring and evaluation of agricultural research and O&M reforms, impact assessment, institutional aspects and agriculture risk.

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

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

Management

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

The functioning of the Centre is supervised by a Institute Management Committee (IMC) which is constituted and mandated by the ICAR. A number of internal committees, such as Institute Research Council, Budget Committee, Academic Planning & Policy Committee, Purchase Committees, Official

Language Committee, Library Committee, Publications Committee, Maintenance and Landscape Committee, PME Cell, Technical Cell, ARIS Cell, Consultancy Processing Cell, Grievance Cell, and Women Cell are operating at the Centre for decentralisation of management. The Joint Staff Council of the Centre promotes healthy interaction and the congenial work environment.

Infrastructural Facilities

NCAP Website

The NCAP website (http://www.ncap.res.in) has been providing latest information about activities of the Centre, particularly about its staff, infrastructure, research projects, publications and linkages. The Centre's website is hosted through ERNET, New Delhi and is being updated at regular intervals. Most of the NCAP activities are showcased on the Centre's website. All NCAP publications like policy papers, policy briefs, working papers, PME notes, workshop proceedings, etc. have been uploaded on the website and are available in the form of PDF files. Data on access to NCAP publications have revealed increasing popularity of its publications (Figure 1). Among the publications, workshop proceedings, policy papers and policy briefs were the most referred ones. These observations reveal wider acceptance and visibility of the Centre across the world. NCAP website was regularly updated in terms of data as well as coding in the year 2010-11. Data revealed that the USA visitors are more in number than those from India during the year 2010-11. About 80.8 per cent visitors to NCAP website were collectively from India (31.9%) and USA (48.93%). Centre's website was also accessed in Australia (5%), China (2%), Germany (1.95%), France (1.78%) and other countries (8.3%). Overall, the website was accessed by 1,16,877 users from 142 countries (Figure 2). Some other important performance parameters of the NCAP website like average sessions per day, average hits per day, average number of pages viewed per session, average sessions per IP address, average time spent per session are shown in (Table 1).

Figure 1: Access to NCAP publications

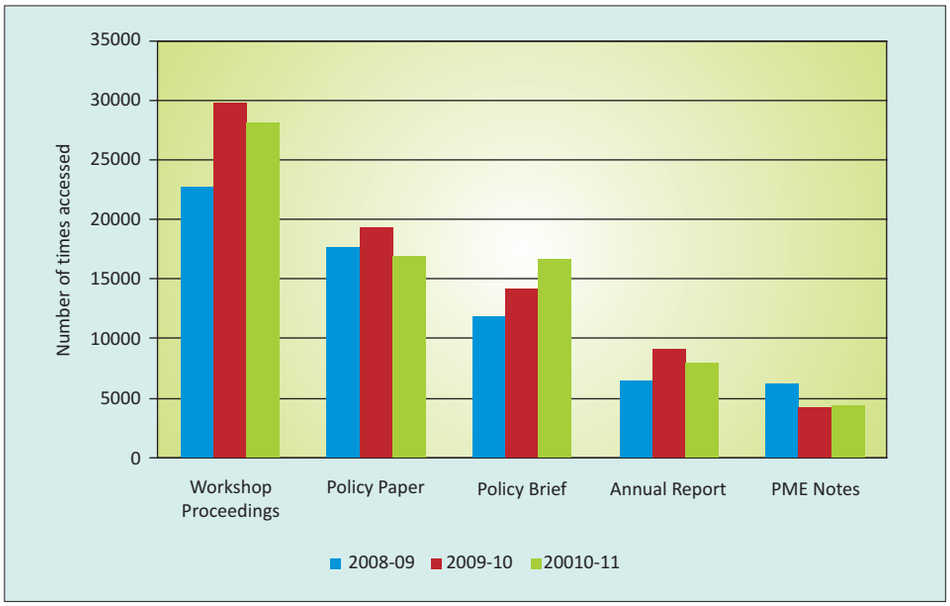


Figure 2: Access to NCAP website across countries

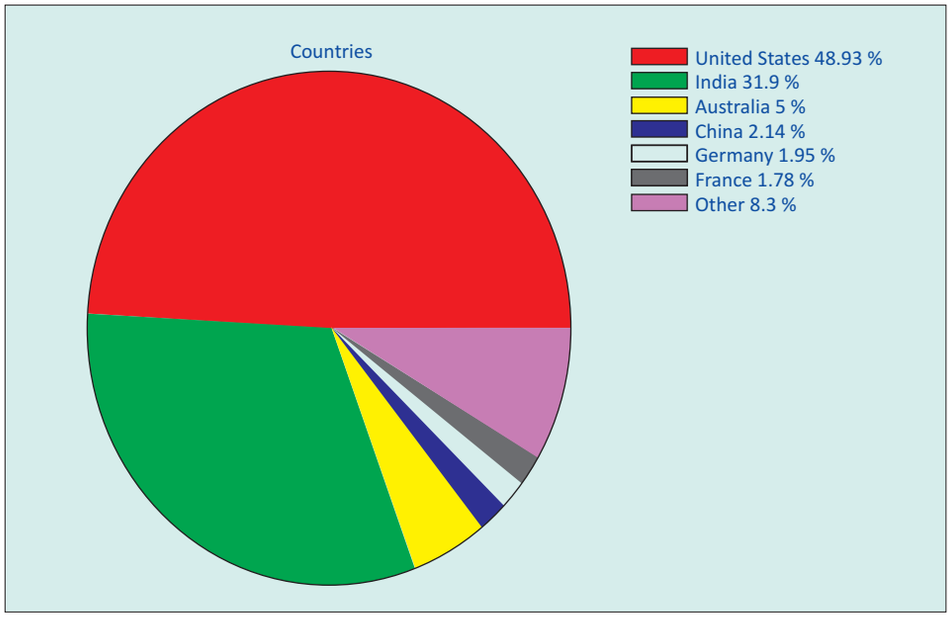


Table 1: Some performance parameters of NCAP website

Average sessions per day	500	Average sessions per IP address	2.44
Average hits per day	4445	Average visitors at one moment	2.02
Average number of pages viewed per session	1.59	Average time spent per session	349 seconds

Agricultural Research Information System Lab

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

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

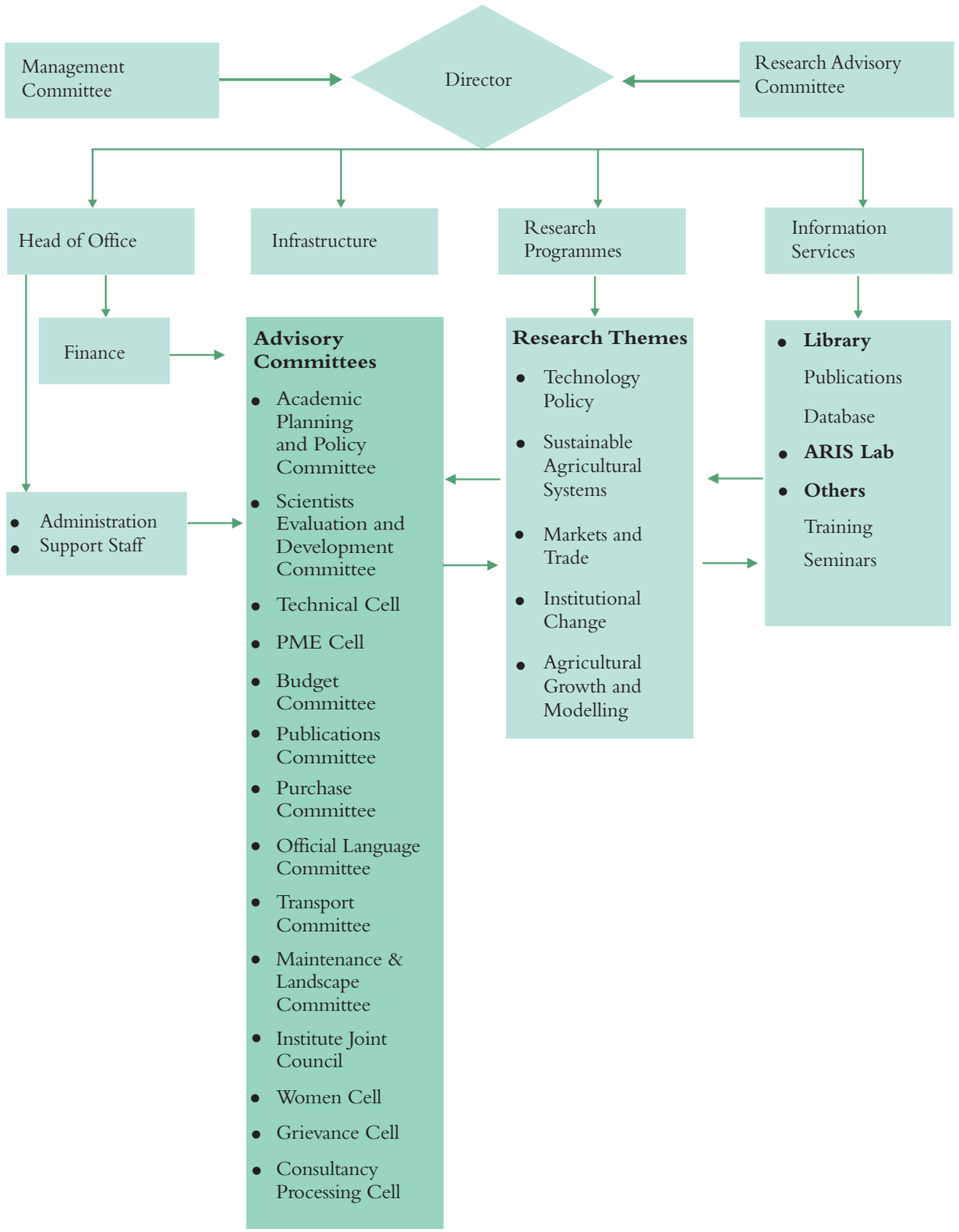
To cater to these objectives ARIS cell at NCAP is presently well equipped with latest computers for visitors, servers, switches, 2 MBPS dedicated leased lines, Email server, security softwares like firewall and centralised antivirus server and analytical softwares like SPSS, EVIEWS, LIMDEP, GIS, GAMS, Stella, Stata. For data management and development of in-house software, SQL server 2005, Visual Studio. Net and windows server 2005 are available. ARIS has created LAN capacity for connecting more than 100 computers. Each NCAP employee is provided with individual email account, latest desktop computing facility along with latest windows software and bilingual Microsoft office. ARIS has been instrumental in providing access to NCAP researchers as well as publications throughout globe via email and NCAP website. During the year 2010-11, ARIS has been upgraded with latest SUN Java Messaging Server 10, three servers, 15 desktop computers, two work stations, installation of SAS, digital signatures and extension of LAN nodes.

Library

NCAP has a specialised library collection of print, electronic databases like Statistical Abstracts, Economic Survey, Agricultural census, Input surveys, Livestock census, NSSO CD ROMs, CSO, other Government of India publications and some state Government publications also. The library facility of Centre is being developed as an efficient information service unit. At present library houses a total of 5366 publications, 2881 reference books, 95 CD ROMs, 2170 database publications, 156 reports, 64 SAARC publications and other references materials. Library references are computerized using library software package with quick search facility. The library has subscription to 15 national journals, 23 international journals and online subscription to CMIE database services and EPW archives. It also has a repository of FAO, CGPRT and CGIAR reports. Library has separate section of Hindi books. NCAP researchers have access to many journals through CeRA (Consortium for e-Resources in Agriculture), the website created by IARI under NAIP project.

The library is playing active role in timely dissemination of scientific and technical information for research via Current Awareness Service and Newspaper Clipping Service. Library has played facilitating role in NCAP scientists becoming members of IARI and IASRI libraries also. Further, three computers, one printer and one scanner are placed in library with connectivity to internet for library user's convenience.

Figure 3: Organogram of NCAP



Budget

The expenditure of NCAP for the year 2010-2011 is presented in Table 2 and its staff position is presented in Table 3.

Table 2: Expenditure during 2010-2011

(Rs in lakhs)

Head of Account	Plan	Non-Plan	Total
Pay and allowances	-	263.45	263.45
Over Time Allowance (OTA)	-	0.19	0.19
Travelling expenses	1.48	0.96	2.44
Works	2.58	-	2.58
Other charges including equipments	135.75	5.00	140.75
Human Resource Development (HRD)	0.17	-	0.17
Library	10.00	-	10.00
Pension/Retirement benefits	-	42.98	42.98
Loans & Advances	-	9.99	9.99
Sub-Total	**149.98**	**322.57**	**472.55**
National Agricultural Innovation Project	139.76	-	139.76
National Professor Project	-	1.97	1.97
Total	**289.74**	**324.54**	**614.28**
Externally Funded Projects	-	-	**158.54**
Grand Total	**289.74**	**324.54**	**772.82**

Staff Position

Table 3: Staff position during 2010-11

S. No.	Name of the Post	Sanctioned	In position	Vacant
1.	Director	1	1	-
2.	Principal Scientist	6	4	2
3.	Senior Scientist	6	4	2
4.	Scientist	13	10	3
5.	Technical (T-3)	4	4	-
6.	Technical (T-1)	1	1	-
7.	Administrative Officer	1	1	-
8.	Assistant Administrative Officer	1	1	-
9.	Assistant Finance and Accounts Officer	1	1	-
10.	Private Secretary	1	1	-
11.	Assistant	3	2	1
12.	Stenographer Grade-III	1	-	1
13.	U.D.C.	1	-	1
14.	L.D.C.	2	2	-
15.	Skilled Supporting Staff	2	2	-

II. RESEARCH ACHIEVEMENTS

TECHNOLOGY POLICY

Revitalising Agriculture Growth through Improved Technology

S Ayyappan and Ramesh Chand

The need to achieve 4 per cent growth in agriculture arises from several factors. One, India's population is currently growing at more than 1.4 per cent per annum and we are adding more than 18 million new mouths each year. The present level of per capita consumption of most of the food items is much below the minimum requirement of a healthy diet, and thus there is a need to raise per capita consumption to reduce under nutrition and hunger in the country. Further, dietary pattern is changing towards costly energy food and protein-rich food, which implies more output to derive given level of nutrition. All these factors necessitate that to meet the future requirement of agri-food products and to eliminate malnutrition, under nutrition and hunger from the country in a reasonable time period agri-food production should increase at around 4 per cent per year.

Various indicators suggest that vast potential exists for growth of agriculture output in the country. This follows from (a) inter-and intra-regional range of variations in agricultural productivity (b) gap between actual yield at farmer's field and the yield that can be obtained from improved technology and (c) potential of technology to break ceilings in productivity.

Inter-state comparison of productivity reveals tremendous variation in almost all crops and enterprises. Range of agriculture productivity of selected crops in major producing states and average productivity for the whole country are presented in Table 4. It can be seen from the table that rice yield in Madhya Pradesh is less than one fourth of the yield level in Punjab. The gap is larger in wheat. Maize yield in Madhya Pradesh is less than one-third of the yield in Andhra Pradesh. Likewise, productivity of sugarcane in Bihar is one third of Tamil Nadu. Among the major producing states highest state yield for most of the crops is more than three times the lowest state yield.

Table 4: Range of crop productivity in major producing states 2007-08

(Yield - kg./ha)

Crops	Highest (H)		Lowest (L)		National Average	Ratio H/L
	State	Yield	State	Yield		
Rice	Punjab	4019	Madhya Pradesh	938	2202	4.285
Wheat	Punjab	4507	Karnataka	946	2802	4.764
Jowar	Andhra Pradesh	1420	Haryana	453	1021	3.135
Bajra	Haryana	1843	Jammu & Kashmir	595	1042	3.097
Sugarcane	Tamil Nadu	107484	Bihar	35496	68877	3.028
Maize	Andhra Pradesh	4607	Madhya Pradesh	1288	2335	3.577
Gram	Andhra Pradesh	1448	Rajasthan	466	762	3.107
Arhar	Gujarat	1109	Andhra Pradesh	652	826	1.701
Masur	Bihar	793	Madhya Pradesh	440	622	1.802
R/mustard	Gujarat	1635	Assam	523	1001	3.126
Groundnut	Tamil Nadu	1957	Uttar Pradesh	598	1459	3.273
Cotton	Punjab & Haryana	663	Madhya Pradesh	233	467	2.845

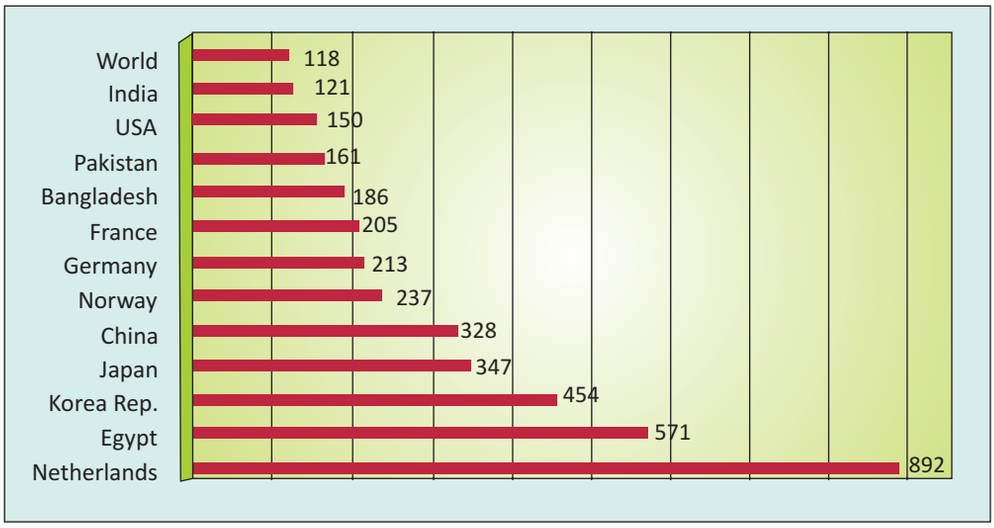
Source: Agricultural Statistics at a Glance 2009, Ministry of Agriculture, GOI.

The common sources of growth in agriculture are increase in area or number of livestock; higher use of inputs like fertiliser, agro chemicals, seeds and energy; expansion of irrigation, improved technology. Improvement in technical efficiency, changes in product mix from low to high value, product integration, more intensive use of resources like land (crop intensity) are the other sources for raising agriculture output. Despite high pressure on land, cropping intensity in India has remained low. Within an agriculture year, second crop is taken on less than 38 per cent of the cultivated area. This implies that about 90 million hectare cultivable area remains fallow in kharif or rabi season. This is a very substantial source of growth in agriculture output in future.

There is vast scope to increase use of yield enhancing inputs and to improve efficiency in input use to raise agriculture output. For instance, fertiliser use in India is much lower than many other agricultural countries despite tremendous growth in fertiliser use. Comparable data on fertiliser show that India used 121 kg NPK per hectare of arable land during 2005-07, which, though close to the world average, is far below the fertiliser use in major agricultural countries. Fertiliser consumption in China in the same period was 328 kg per hectare of arable land (Figure 4). Thus, China uses 2.7 times the fertiliser use in India per hectare of arable land. This is an important factor behind productivity differentials between India and China.

Figure 4: Fertiliser use per hectare of arable land in selected countries during 2005-07

Unit: kg NPK



Source: World Bank (2010).

Per hectare fertiliser use in Egypt and Netherland is 4.5 to 7.4 times the average fertiliser use in India. Fertiliser use in India is lower than in Pakistan and Bangladesh also. The above comparison of fertiliser in India and other countries shows that there is considerable scope to increase crop productivity through higher use of fertiliser in India.

Except a few crops, productivity of almost all the crops is quite low in most of the states in India. On the other hand, Institutes under Indian Council of Agricultural Research and State Agricultural

Universities have developed varieties and technologies which are capable of giving much higher output per unit of resources. The higher growth can well be realised through adoption of available technologies that minimise the gap between attainable yield as demonstrated in various experimental farms and farmers' fields. Adopting these technologies promises yield gains of 40-100 per cent (ICAR, 2007).

Assessment of Potential Economic Benefits of Bt Brinjal in India

Sant Kumar and P A Lakshmi Prasanna

Brinjal production faces a number of problems which cause enormous yield losses. Fruit and shoot borer (FSB) is the most devastating insect-pest of brinjal, which causes 60-70 per cent yield loss, besides deteriorating product quality. The chemical method to control FSB is most popular among farmers, despite having its several problems. Recently transgenic/genetically modified (GM) technology has emerged as an alternative to chemicals in controlling insect-pests, reducing herbicides and related problems, and providing some other benefits. However, the use of GM technology has raised some apprehensions like safety of food, affordability of technology, impact on biodiversity, and safeguarding of environment. Nevertheless, first GM food crop (viz. Bt brinjal) has been developed in India and it can be readily taken for field cultivation. This research study aims to contribute to debate on potential benefits of Bt brinjal.

(i) Yield gain and reduction in insecticide-use

Analysis has revealed that use of Bt technology could result in a significant reduction in insecticide use. Overall, the quantities of insecticides used against FSB were reduced by 77.2 per cent, which amounted to 41.8 per cent reduction in the total insecticide use in brinjal (Table 5). Also, yield gain was 37.3 per cent over non-Bt hybrids (refers to hybrids used for incorporating Bt) and 54.9 per cent over popular hybrids. This difference in yield indicated that Bt gene in brinjal was much more effective than use of chemicals in controlling FSB and the consequent low yield loss.

Table 5: Reduction in insecticide-use and increase in fruit yield due to Bt brinjal hybrids

Year	Reduction in insecticide-use* (%)		Increase in marketable fruit yield (%) over	
	Against FSB	Against all insect-pests	Hybrids used to develop Bt	Popular hybrids
2007-08	80.0	40.4	32.1	51.6
2008-09	74.5	43.2	45.2	58.9
Average	77.2	41.8	37.3	54.9

**Relates to the years 2004-05 and 2005-06.*

(ii) Benefits to brinjal producers

Farmers could be benefited at multiple levels. Corresponding to the assumed adoption levels of Bt hybrids, 30 thousand tonnes to 119 thousand tonnes of brijnal output can be added to total

production from the existing area under brinjal (Table 6). The Bt technology would also generate large savings (Rs 47 crore to Rs 87 crore) due to reduction in insecticide use to control FSB, and in turn, large increase in net returns. Analysis has revealed that reduction in pesticide use due to Bt variety could save 4-8 per cent of labour used in production of brinjal in major producing states.

Table 6: Potential annual economic benefits of Bt brinjal to farmers and consumers under different scenarios at all-India level

Particulars	Adoption level		
	Low (up to 15%)	Medium (up to 30%)	High (up to 60%)
Benefits to farmers			
i. Increase in production ('000 tonnes)	29.70	59.40	118.80
ii. Saving from insecticides for FSB (Rs in crore)	46.80	93.60	187.20
iii. Increase in net returns (Rs in crore)	623.15	1246.30	2492.60
iv. Increase in net returns (Rs /ha)	11029	22058	44117
Benefits to consumers			
i. Likely reduction in price (%)	3.00	7.00	15.00

(iii) Benefits to consumers

Analysis has revealed that adoption of Bt hybrids would benefit consumers in terms of reduction in price of brinjal to the tune of 3 per cent to 15 per cent (Table 6), which may lead to increase in its consumption. Also, additional production of brinjal (30-119 thousand tonnes) would improve the food and nutritional security of resource-poor consumers as well as the environmental security of the country.

Impact of Secondary and Micronutrients on the Economy of the State of Karnataka

Diana S

Till recently fertiliser use in India focused mainly on the primary nutrients as the requirement for other nutrients were assumed to be met from other sources like organic manures, contaminants, etc. This created a sort of hidden hunger in the soil which has become a limitation in achieving growth in productivity. Therefore, application of secondary and micronutrients is now considered very important to raise agricultural production. This study estimates returns to producers, consumers and society with the increased application of micro nutrients by using data for the state of Karnataka. The data on yield of selected crops with and without the balanced doses of nitrogen (N), phosphorus (P), potassium (K), boron (B), sulphur (S) and zinc (Zn). The doses used were obtained from the database records of on-farm field trials of the International Crop Research Institute for Semi-Arid Tropics (ICRISAT), Hyderabad. The trials were conducted in six districts of Karnataka viz. Haveri, Dharwad, Chitradurga, Chikkaballapur, Tumkur and Kolar during 2005-08.

The economic surplus model was used for estimating the benefits of increase in yield of selected crops to the economy as a result of better nutrient management. The change in the total surplus in the economy was decomposed into change in consumer surplus and producer surplus. In the present study "producer surplus" includes only the quasi-rents accruing to inputs used in farming; quasi-rents accruing to off-farm processing and marketing inputs are included along with final consumer surplus in "consumer surplus". Primary analysis showed that there was an average increase in grain yield during 2005 to 2008 by 45, 47 and 51 per cent in maize, finger millet and groundnut, respectively, with the treatment of balanced doses of secondary and micronutrients. The state accrued a total surplus of Rs. 10 crore, Rs. 13 crore and Rs. 9 crore with the secondary and micronutrient intervention in groundnut, maize and fingermillet, respectively. In all the three crops, consumer surplus was higher than the producer surplus indicating that consumer benefitted more than producer. In maize and fingermillet, consumer surplus accounted for 69 per cent of the total surplus while in groundnut it accounted for 62 per cent of the total surplus.

Balanced fertiliser management thus not only augments food production but also enhances returns to the economy as a whole. At a time when yield stagnation is becoming a major issue and food security a big concern, promotion of balanced fertilisation can serve as one of the means to effectively address the said issues.

The Seeds Bill, 2010 – Some Reflections

Harbir Singh and Ramesh Chand

The recently proposed Seeds Bill aims to regulate the quality of seed and to facilitate production and supply of quality seed. The Bill proposes mandatory registration for seeds of any kind or variety for the purpose of sowing or planting by any person. The study discusses important provisions of the proposed Bill.

Although the central aim of the proposed Bill is to regulate the quality of seed for sale, import and export and to facilitate production and supply of quality seeds, the Bill nowhere defines what a quality seed is. To remove such ambiguity, the seed quality standards may be specifically defined in the proposed Bill. Strengthening of institutional capacity and infrastructural facilities with advanced technical know-how would be critical for monitoring and implementing the seed quality standards.

The new intellectual property (IP) regime will most likely add to the transaction cost of utilisation of plant genetic resources by the seed industry. It may lead to consolidation in seed industry through mergers and acquisitions. If there are only a few firms in the seed sector, they might be tempted to raise seed prices for realising their R&D investments in the shorter period. The moot question, therefore, is whether the proposed Bill should have provisions for regulating seed price? If the public sector alone can meet farmers' demand for quality seed, price regulation would not be a serious concern. As far as private sector is concerned, it will invest in seed development and delivery

only when it envisages a favourable institutional and policy environment for seed development and delivery. Past experiences show that the private sector has been more proactive in meeting the seed demand for hybrids as well as open-pollinated crops whereas the public sector has a strong IP portfolio. Therefore, both the public and private sectors should focus on their distinct roles. One of the effective ways to ensure a reasonable seed price would be to create conditions for competition among the seed producers and allow seed companies to compete with one another and in some cases, even with the public sector for delivering quality seeds to the farmers.

IP protection to plant varieties in the country is provided under the 'Protection of Plant Varieties and Farmers' Rights Act (PPVFRA), 2001' with a provision for compulsory licensing (Section 41) in the event of non-availability of seed at reasonable price. Therefore, it may be useful if registration of seed is linked to varieties which are protected under PPVFRA.

Visioning, Policy Analysis and Gender (V-PAGe)

A large number of studies were conducted in the area of Technology Policy under NAIP-funded project V-Page in-house and in partnership mode with other Institutes/researchers.

Visioning Rainfed Agriculture

Y S Ramakrishna and P Ramasundaram

The visioning exercise aims at designing of strategic interventions, programme planning and policy support mechanism to cope with various challenges. The study visualises four scenarios of growth and change in rainfed agriculture namely: (i) business as usual, (ii) developmental approaches, (iii) climate change, and (iv) public-private partnership.

The business as usual scenario focuses mainly on fine cereals cultivated in irrigated areas with inclusion of coarse cereals (millets) under public distribution system. This would not only improve the security of food, nutrition and fodder, but also improve management of surface and ground water and environment. Otherwise, many of the coarse millets will lose their area to other land uses or crops, as is happening now. The land under cotton in rainfed areas is showing an increasing trend mainly at the cost of pulses and oilseeds because of push and pull from market forces.

Watershed approach as a 'developmental scenario' has made a mark in enhancement of productivity of crops in most of the regions in India. So far, GoI has made massive investment of Rs. 1,94,706 million on implementation of watershed programme with an average investment of Rs. 3,444/- ha till the end of X Plan period. This is essential to boost the growth of rainfed agriculture and minimise the risk. Though state-supported programmes have led to increase farm growth, Mahatama Gandhi National Rural Employment Guarantee Scheme (MGNREGS) has inadvertently impacted the rainfed agriculture by affecting labour supply during the peak season.

'Climate change scenario' has created twin challenges of increased frequency of droughts and floods and enhanced thermal regime impacting on the performance of agriculture in general and rainfed agriculture in particular. The adaptation and mitigation strategies are grouped into three sub-categories namely strategic research, technology demonstration and capacity building. The study emphasises identification of promising crop genotypes and livestock breeds with greater tolerance to different stresses.

Although there are apprehensions about public-private partnerships, contract farming is becoming popular. Contract farming is a risk management instrument but its coverage so far is limited to a few commodities as private sector participation tends to be limited to profitable crops and enterprises undertaken by the resource-rich farmers in well-endowed regions. The recognition and promotion of partnership between public and private organisations in agricultural development under various policy documents has set the stage for new institutional collaboration.

Visioning Dairy Sector

B S Chandel and P Ramasundaram

The dairy development in the country has been divided into six phases on the basis of growth in milk production, productivity, and in-milk animals. These phases of development are Low growth phase (upto 1969-70), Pick-up stage (1970-76), Moderate growth stage (1976-80), Very high growth phase (1980-91), Deceleration phase (1991-06) and Recovery phase (post 2006).

The deceleration in growth in milk yield during the last ten years ending 2007-08 is a matter of serious concern. The growth in milk production during this period was 3.63 per cent, 53 per cent of it has come from the growth in in-milk animals and on 47 per cent from the growth in milk productivity. The study estimated milk supply for the years 2021 and 2035 based on factors affecting yield (Table 7). It was observed that milk supply is not going to keep pace with the demand for liquid milk. The projections for the year 2035 indicate a deficit of approximately 4.5 million tonnes between demand and supply.

Table 7: Milk supply projections based on factors affecting milk yield

(million tonnes)

Production Systems	Existing	2021	2035
Buffalo Production System	42.39	77.65	111.89
	(44.24)	(46.79)	(49.36)
Cow Production system	30.99	54.12	71.73
	(32.34)	(32.61)	(31.64)
Mixed Production system	22.44	34.18	43.07
	(23.42)	(20.60)	(19.00)
Total	95.82	165.95	226.69
Demand of liquid milk	56.00	103.47	231.18
Milk available for processing	39.82	62.48	-4.49

Note : Figures in paretheses indicate percentages

Visioning Hill Agriculture

Y S Negi and P Ramasundaram

While the historical trends in important components of farming in the hills have been analysed for visualising the process of agricultural development, the visioning process is based both on the past trends and the primary information with respect to Western Himalayas particularly Himachal Pradesh as a test case. The data reveal that the size of agricultural holdings, on an average, has decreased overtime while the number of holdings has increased. The average landholding size now stands at 1.03 ha compared to 1.53 ha during 1970-71. The proportion of marginal farmers has increased to 67.3 per cent as compared to about 58 per cent in 1970-71. Along with these changes, it is also noted that the land under the categories of cultural wastes, current and other fallow lands also recorded increase during recent past, with increase in the category of other fallow lands as high as 18.52 per cent.

The area under fruits and vegetables has increased over time, indicating thereby people's preference towards cash crops. At present, the average yields are below the potential yields. In case of maize, the gap is to the tune of about 5 quintals per hectare while in vegetables the gap ranges from 4 to 55 quintals. Another important issue brought out by the respondent is their decreased access to the support lands from which farmers were getting material for supplementing farming activities and fodder for animals. The deteriorating state of the support lands or the CPRs has resulted in the loss of niche production advantage for many farmers.

The rise in temperature in general has shifted the suitable production niche for temperate fruits to higher altitudes. Consequently, farmers expect the hill farming to be a specialised venture in future, where emphasis would be on labour saving technologies. Protected or polyhouse cultivation of high value crops would be more prominent on small holdings, provided the policy emphasis on enabling small and marginal farmers for the same continues. Small and marginal holdings may become uneconomical and hence be put under tree crops. In long run farmers may be compelled to opt for contract or cooperative farming under specialised management.

Total Factor Productivity and Contribution of Research Investment to Agricultural Growth in India

Ramesh Chand, Praduman Kumar and Sant kumar

The main objective of this study was to assess the contribution of public sector investments in agricultural research and extension to growth of output of agriculture sector as a whole and for major crops, based on total factor productivity (TFP) analysis. These results were then used to estimate incremental value. The estimates of average annual TFP growth for the major crops cultivated in India are shown in Table 8. Among cereals, wheat experienced the highest growth in TFP index during the three decades from 1975 to 2005. The annual rate of growth in wheat TFP was 1.9 per

cent, compared to 1.4 per cent for maize and barley, 1 per cent for bajra, 0.7 per cent for rice and 0.6 per cent for jowar.

The TFP growth (TFPG) in oilseed sector varies in the range of 0.7 per cent to 0.8 per cent per annum. Among pulses, the TFP growth is estimated to be 0.5 per cent for moong, followed by gram (0.2%). TFP for arhar and urad crops display decline over past three decades.

Table 8: Annual growth rate (%) in total factor productivity for crops, India: 1975-2005

Crop	1975-85	1986-95	1996-05	1975-2005
Rice	0.90	0.74	0.40	0.67
Wheat	1.60	2.51	1.61	1.92
Maize	2.00	0.67	1.64	1.39
Jowar	1.15	0.74	-0.42	0.63
Bajra	1.22	0.39	1.50	1.04
Barley	2.68	0.44	0.61	1.38
Gram	0.06	0.09	0.34	0.16
Moong	-	-0.59	1.70	0.53
Arhar	-	0.21	-0.54	-0.69
Urad	-	-0.22	-0.73	-0.47
Soybean	-	0.83	0.63	0.71
Groundnut	0.49	0.55	1.30	0.77
Rapeseed and mustard	1.88	0.74	0.08	0.79
Sugarcane	1.38	-1.32	-0.65	-0.41
Cotton	2.84	0.92	0.80	1.41
Jute	1.88	1.59	0.25	1.28
Onion	-	2.37	-1.62	-0.49
Potato	-	1.20	-1.28	-0.76

Among fibre crops, TFP index has risen at an annual rate of 1.4 per cent for cotton and 1.3 per cent for jute during the period 1975-2005. The TFP growth rates in sugarcane, onion and potato have been found negative (-0.4% to -0.7%). It is interesting to point out that TFP in the case of sugarcane increased during 1975-1985 but declined in the next two decades. In the case of onion and potato TFP improved during 1985 to 1995 but declined thereafter.

Except wheat and groundnut, TFP during 1986-95 was lower than 1975-85. Similarly, TFP during 1996-2005 was also lower than the first decade in the case of rice, maize, jowar,

barley, rapeseed & mustard and all the cash crops. TFP of wheat witnessed substantial increase during 1986-95 with growth rate of 2.51 per cent per annum. Though growth in TFP followed a mixed pattern over time there are some noteworthy changes. After mid 1990's TFP growth of maize and bajra witnessed sharp increase. Growth in TFP of moong during this period was as high as 1.7 per cent per annum which is a complete reversal of TFP trend in the previous decade. Out of 18 crops selected for the study, one-third exhibited decline in TFP after mid 1990's. The TFP of onion and potato declined by more than 1 per cent per year after 1996.

The incremental production was multiplied with the share of research in production growth to arrive at the incremental production due to research. It was observed that in absence of research, production would have been lower by 10.4 million tonnes in wheat and by 6.3 million tonnes in rice in the country in 2005-06. The contribution of research to incremental production of maize and pearl millet was estimated to be 1.09 million tonnes and 0.64 million tonnes, respectively. The cumulative effect of agricultural research on output of gram has been estimated at 80 thousand tonnes. In oilseeds, groundnut production would have been lower by 80 thousand tonnes and rapeseed & mustard production lower by 5.2 lakh tonnes without the contribution of agricultural research.

Similarly for all the commodities, the domestic demand during 2005-06 was much higher than what would have been their total production in the country in the absence of research and country would have been far from attainment of food self-sufficiency. A comparison of domestic demand with domestic production adjusted for trade and change in stock has shown that the domestic production of wheat in the year 2005-06 was enough to meet 98 per cent of the counry's demand. Without contribution of research, self-sufficiency in wheat would have been only 83.4 per cent. This implies that India would have been a net importer of wheat to the tune of 9.8 million tonnes in the absence of research during past three decades. In rice, India exports about 5 per cent of its domestic production and thus the ratio of production to demand is 105.14 per cent. This ratio declines to 97.9 per cent when incremental output due to research is not counted. Thus, without contribution of research to rice production, India would have been forced to import 1.77 million tonnes of rice, after wiping out the export of 4 million tonnes of rice.

The agricultural research has not made a significant difference in the level of self-sufficiency in gram and groundnut. In the case of rapeseed and mustard, import dependency of India would have increased from 34 per cent to 38 per cent without the contribution of public sector research to growth of output of rapeseed and mustard (Table 9). Thus, study findings have clearly shown that agricultural research has contributed for attainment of food self-sufficiency in the country.

Table 9: Contribution of agricultural research to production and attainment of self-sufficiency in major food crops in India

Sl. No.	Particulars	Paddy	Wheat	Maize	Sorghum	Pearl millet	Gram	Groundnut	Rapeseed & mustard
1	Incremental production during 1975-2005 (TE) (million tonnes)	46.00	44.00	8.30	-2.90	3.10	0.70	0.80	5.80
2	Share of research and education (R&E) in production growth (%)	13.60	23.60	13.10	6.60	20.60	11.00	9.80	8.90
3	Actual production in 2005-06 (million tonnes)	91.79	69.35	14.71	7.24	7.68	5.60	7.99	8.13
4	Incremental production due to R&E in million tonnes	6.26	10.38	1.09	-	0.64	0.08	0.08	0.52
5	Likely production without contribution of R&E in million tonnes	85.53	60.90	13.60	7.40	7.40	5.70	6.50	7.20
6	Domestic demand in 2005 (million tonnes)	87.30	70.70	14.15	7.24	7.68	6.36	12.05	12.28
7	Self-sufficiency (%)								
	Actual (2005-06)	105.14	98.08	103.95	100.00	100.00	88.02	66.29	66.19
	Without contribution of R&E	97.97	83.40	96.27	-	91.68	86.81	65.64	61.99
	Contribution of R&E to self-sufficiency attainment	-	14.69	7.68	-	8.32	1.21	0.65	4.20
8	Dependence on import without contribution of R&E (million tonnes)	1.77	8.90	0.55	-	0.28	0.66	5.55	5.08

Impact of Bt Cotton Technology and Policy on Indian Cotton Production and Trade

P Ramasundaram, A Suresh and Josily Samuel

Cotton cultivation till the end of 1960s (the pre-hybrid phase) was dominated by cultivation of open pollinated local varieties. In the early hybrid phase during 1970s and 1980s, public sector hybrids along with varieties dominated the landscape. The late hybrid phase starting in 1990 was dominated by the entry of private seed companies developing and releasing only hybrids. The production growth was insignificant or negative in most of the states during pre-hybrid phase of cotton cultivation. It was followed by positive and significant growth rates across the states during early hybrid phase, dominated by public sector research. The late hybrid phase witnessed stagnation in production in most of the states, mainly because of the biotic constraints. The Bt phase exhibited sudden spurt in yield growth, both at national level and at state levels. This trend in production was in tandem with the trend in yield increase. The yield of cotton production almost stagnated during pre-hybrid phase, followed by significant growth during the early hybrid phase, non-significant or negative growth during late hybrid phase and sharp growth during the Bt hybrid phase.

The growth rate of expenditure towards seed cost during Bt cotton phase ranged between 2.1 per cent in Punjab to 33.2 per cent in case of Madhya Pradesh. Compared to this, the expenditure under the insecticide-use posted non-significant and negative growth for most of the states during the Bt period, as opposed to the general trend observed during earlier periods.

The area under Bt hybrids has increased from 29,000 ha in 2002-03 to 8.5 lakh ha in 2010-11. India is the only country in the world cultivating commercial hybrids in cotton. At the dawn of independence 90 per cent of the Indian cotton area was under desi (indigenous) varieties. By 1970 the area of *desi* reduced to 10 per cent, with corresponding increase in the American cotton to 35 per cent. After the advent of hybrids in 1970s, the American cotton varieties and hybrids area rapidly increased to 75 per cent in 2000. After the introduction of Bt hybrids, more than 90 per cent of Indian cotton area seem to be under hybrid cotton. The impending elimination of varieties' cultivation has implications for bio security and bio diversity resulting in pan genetic vulnerability.

Horizontal and Vertical Diversification in India's Rural Economy

T Haque and P Ramasundaram

There is a clear positive trend towards diversification of the rural economy. The available NSS data reveal that the share of non-agricultural workforce in rural India increased from 13.5 per cent in 1972 to 27.8 per cent in 2007-08. Besides, crop farming accounted for only 45.8 per cent of the total household income, while non-crop sources contributed about 54.2 per cent. Within the agricultural sector, the shares of horticulture, livestock and fisheries in the total value of output increased quite significantly overtime. Also within the crop sub-sector, the contribution of foodgrains to total cropped area as well as value of total crop output declined. The share of foodgrains in total cropped

area declined from 73.5 per cent in 1950-53 to 64.1 per cent in 2005-08, while in value terms, it declined from 62.5 per cent in 1962-65 to 48.2 per cent in 2003-06. However, the share of pulses in total area increased from 7.7 per cent in 1962-65 to 12.0 per cent in 2003-06 and that of oilseeds improved from 10 per cent in 1962-65 to 13.8 per cent in 2003-06. The area under coarse cereals declined from 26.2 per cent in 1962-65 to 15.5 per cent in 2003-06.

In the case of shift from food to non-food commercial crops or from coarse cereals to rice and wheat, the major determinants were technology-led yield improvement and assured price, supported by irrigation facility. Diversifications towards horticultural crops depend not only on agro-climatic suitability, technology and relative profitability, but also on growth of per capita income, access to roads and market. Small size of farm also has played a positive and significant role in horticultural diversification. Diversification in favour of livestock depends largely on the availability of fodder and grazing land, dairy co-operatives, and veterinary care and to some extent, on road connectivity. It was observed that high rainfall areas were averse to diversification towards livestock rearing. As regards non-farm diversification, rural literacy, land productivity, road connectivity and per centage of marginal farms turned out to be the major determinants. Besides, legal and institutional factors such as co-operatives, contract farming, retail chains, e-choupal, etc and appropriate policies facilitate non-farm diversification although research materials are thin in this respect.

High Value Agriculture

Vijay Pal Sharma and P Ramasundaram

The findings reveal a structural shift in consumption pattern away from cereals to high-value agricultural commodities, both in rural and urban areas, in the last two decades between 1987-88 and 2007-08. The results reveal a relatively strong and growing demand for livestock products and fruits and vegetables in both the rural and urban areas. The expenditure on livestock products exceeded that of cereals in 2007-08 in the urban areas, while in rural areas it was lower than expenditure on cereals. Estimated income elasticities of demand for livestock products and fruits at the mean were well above one in rural areas and much higher in low income households. In case of urban areas, the elasticity was higher than one for fruits in all income groups while in case of livestock products it was greater than one for low income households. For all income levels, households indicate comparatively lower income elasticities for staple products such as cereals than for high-value products such as milk and milk products, eggs, fish and meat, and fruits and vegetables in both rural and urban areas. The increased demand for high-value products will continue to be an important driver for food markets in India, creating many oportunities to producers and processors but recent increase in food prices especially high-value products might have adverse impact on its growth.

Due to shift in demand pattern towards high value crops, the farmers have also responded to market signals. They are gradually shifting production-mix to meet the growing demand for high-value commodities. This is reflected in the changing share of high value crops in total value of output from

agriculture. There is a clear shift from foodgrains towards fruits and vegetables, livestock products and fisheries. The share of high-value commodities/products (fruits and vegetables, livestock products, fisheries) increased from 37.3 per cent in TE 1983-84 to 41.3 per cent in TE 1993-94 and reached a level of 47.4 per cent in TE 2007-08. The trade in high-value products has also increased during the last decade.

Water Policy in India: Context, Issues, and Reforms

Maria Saleth and P Ramasundaram

If the method and level of water rates are such as to capture and convey scarcity value of the resource, it is possible to achieve water use efficiency and full cost recovery at the same time. In the absence of these institutional and technical conditions, water pricing policy remains ineffective in playing both the economic and financial roles.

Groundwater regulations are ineffective due to the lack of organisational arrangements for enforcement and monitoring. While the manipulation of energy tariff and supply provides some regulatory respite, it is of little consequence in the face of large pumps and multiple wells. Although groundwater markets improve efficiency and equity, they could cause aquifer depletion when individual water rights are limited.

Over-investment on private irrigation assets (i.e., wells and pumpsets) by some farmers and non/under-investment on the same by others due to various constraints has led to the emergence of rental markets for irrigation assets. Since about 63 per cent of these rentals occur with dugwells/tubewells with electrically powered and permanently fitted pumps, it seems that the majority of the rentals also involve water transfers or groundwater markets.

The review of the status and effectiveness of options such as water pricing, water rights system, energy regulations, water markets, water saving technologies and user/community organisations suggests that their actual effects on water saving and use efficiency are too meagre and also very thinly spread to have any major impact. The main problems are their low area coverage and operational effectiveness, both of which are due to the lack of concerted policies and supporting institutions.

Although India is expected to get 10 to 20 per cent more rainfall as a consequence of climatic change, there is likely to be a general reduction in run-off level in most river basins of India, with the exception of those relying on the Himalayan system. Since evaporation will be increasing throughout India, there will be a major pressure on available water, especially during the non-monsoon periods. With varying run-off and increasing evaporation, net recharge is expected to get reduced, affecting groundwater level in many regions in India.

Policy for Water Sector Reforms: Although there have been *ad hoc* efforts to reform specific aspects of the water sector, there is no comprehensive attempt to reform and reorient water institutions and policies to meet the current and future challenges of the water sector. Obviously, a comprehensive

reform policy will involve not only a major reorientation of all the policies noted above but also the restructuring of current legal and organisational framework of the water sector. Although political resistance and technical difficulties continue to pose a major challenge, the increasing economic loss associated with inappropriate institutions and policies will eventually turn the political economy calculus in favour of reforms.

SUSTAINABLE AGRICULTURAL SYSTEMS

Bioethanol in India: Future Challenges

S S Raju, P Shinoj and Siwa Msangi

With increasing per capita income, urbanisation, infrastructure development and resultant increase in vehicular density, the demand for petrol in India increased at the rate of 8.5 per cent during the five-year period 2004-05 to 2008-09. This growth is expected to continue over the next several years to come. With the government planning to bring into effect 20 per cent blending of petrol with bioethanol by 2017, it is important to anticipate the ethanol demand for the same, so that necessary measures can be undertaken to achieve the targets. Keeping this in view, the demand for fuel ethanol and other alternative uses were projected using simple trend projection methods and are presented in Table 10.

Table 10: Projected ethanol demand in India for various uses

(million tonnes)

Year	Petrol Demand	Fuel ethanol demand			Potable demand	Industrial and other uses demand	Total ethanol demand		
		5%	10%	20%			5%	10%	20%
2008-09	11.25	0.56	1.13	2.25	0.65	0.60	1.81	2.37	3.49
2011-12	14.37	0.72	1.44	2.87	0.71	0.65	2.08	2.80	4.24
2016-17	21.61	1.08	2.16	4.32	0.84	0.76	2.68	3.76	5.92
2020-21	29.94	1.50	2.99	5.99	0.96	0.85	3.31	4.80	7.80

Note: The compound annual growth rates during the last five years ending with 2008-09 for petrol demand (8.5%), ethanol demand for industrial and other uses (3%) and potable use (3.3%) were used for trend projections.

It is clear from the above analysis that to attain 20 per cent blending without compromising on the industrial, potable and other requirements, India has to either increase its ethanol production nearly 3 times that of the present levels or go for massive imports of ethanol. There are several constraints for increasing ethanol production to such levels, given the fact that sugarcane yield in the country has been stagnant at around 60-65 tonnes per hectare for the past several years. It also does not look wise to increase area under sugarcane as this will be at the cost of diverting land from other staple food crops. Sugarcane being a crop that consumes about 20,000-30,000 cubic meter of water per hectare

per crop, over-exploiting the groundwater for energy production would not be a sustainable option. Production of ethanol directly from sugarcane juice, a more efficient method, would constrain sugar production for the food market. Moreover, occasional shortage of molasses bids up the cost of ethanol production rendering its blending an uneconomical proposition. Import of ethanol for fuel purposes is currently restricted through policy and even if made free, would cost the exchequer very dearly as the international markets for ethanol is already very tight due to demand from other biofuel-consuming countries.

The country has to look for improved technology and management practices that would bring down costs of bio ethanol. Several ethanol plants are operating below their full production capacity that leads to diseconomies of scale and needs interventions. Long-term technological targets like biotechnological applications to increase sugar content in sugarcane, commercial use of membranes and microbes for enhancing ethanol recovery from molasses etc. can also be thought of. Another option is to complement ethanol production using alternative feed stocks like sweet sorghum, tropical sugar beet, etc. that can yield higher ethanol at lower costs as compared to molasses-based production. Focusing research efforts on commercial production of ethanol from second-generation feed stocks like bagasse, cereal crop residues, forest thinning, saw-dust, paper etc. is equally important in ensuring the long-term environmental sustainability and benefits of biofuels.

Assessing the Jatropha-based Biodiesel Value Chain in India

P Shinoj, S S Raju, Praduman Kumar and Siwa Msangi

A study was conducted to assess the value chain of jatropha-based biodiesel value chain in India based on primary data collected from three major jatropha growing states viz., Rajasthan, Uttarakhand and Chattisgarh.

The farm survey brought to light that jatropha cultivation is economically viable in the long run but initial support in the form of subsidised seedlings and other inputs, technical assistance, buy-back assurance, minimum support price (MSP) etc. is crucial to sustain the interest of the farmers. To address the constraint of low yield of existing cultivars, identification of superior germplasm with high-yield potential through systematic varietal improvement programmes is a pre-requisite to large scale planting. A centrally coordinated breeding programme that replaces the current piecemeal approach in research can pay high dividends. It is also widely felt that jatropha is not a fully domesticated crop and cannot be grown successfully in all kinds of marginal lands. Unscrupulous planting irrespective of the geographical and climatic contours can only sabotage the programme. On the seed processing front, biodiesel can compete with petro-diesel if the processing plants are operated at sufficient economies of scale. However, in certain parts of the country, jatropha cultivation turns out to be quite unprofitable owing to high seed prices, involvement of middlemen, less demand for biodiesel etc. and is illustrated in Table 11.

Table 11: Cost of production of biodiesel in Rajasthan and Chhattisgarh- A comparative study

Inputs	RSMML plant		CBDA plant	
	Quantity/day	Value (Rs.)	Quantity/day	Value (Rs.)
Jatropha seeds	1 tonne	12000	10 tonnes	65000
Labor	4 man days	1000	11 man days	2920
Chemicals		680		7140
Electricity	25 units	250	250 units	2500
Interest on fixed capital	@10%	650	@10%	6800
Depreciation on fixed assets	@4%	710	@4%	4440
Incidentals		350		6500
Total cost		15640		95300
Revenue from by-products		5580		44024
Net cost incurred		10060		51276
Net cost/kg of biodiesel		40.24		18.78

Viability can be ensured through stable supply of feedstock and consistent market demand of biodiesel and its byproducts. Proper backward and forward integration at each level of the supply chain is also to crucial to bring in stability in the value chain. So far, the participation of corporate sector in developing the processing infrastructure and distribution channels has been found feeble. The reluctance of corporate players to participate in processing and distribution activities further delays the programme to take off. The study cautions that unless proactive orientation of all the stakeholders is ensured, the programme would fail to meet its objectives, at least in the medium-term.

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

Usha Ahuja

In the series of assessing the impact of interventions to be given to the selected farm families of the study area, socio economic impact of two interventions namely Zero tillage and goatry has been assessed.

Zero tillage in wheat was introduced for 100 farmers in 10 villages of Mewat district. It has been observed that this intervention can reduce cost of cultivation by 15 per cent, increase crop yield by 7 per cent and enhance net income by 45 per cent (Table 12). Further it has also contributed towards the savings in inputs, energy, water, labour and irrigation. There are other intangible benefits of non-tillage also like reduction in soil loss, particularly restoration of soil cover.

Table 12: Impact of zero tillage in the selected villages of Mewat district

Indicator	Particulars	Before	After	Net change (%)
Efficiency	Reduction in cost	Rs.10192	Rs. 8716	Rs. 1476(14.48)
	Production yield	16.1Qt./acre	17.2Qt./acre	1.1Qt./acre (6.8)
	Reduction in tractor fuel	18.5 litre	2.5 litre	16 litre (85)
	Increase in Income			
	1. Gross Income	Rs. 21251	Rs. 23708	Rs. 2457 (11.56)
	2. Net Income	Rs. 11026	Rs. 15992	Rs. 4966 (45)
Equity	Employment (mandays)	16	12	4 (25)
Sustainability	Pumping hours	11.6	9	2.6 (24)
	Soil loss	More soil loss	Less soil loss	Soil conservation

Impact of Goatry

To increase the income of landless resource poor farmers of the study area livestock interventions were introduced in the 5 villages of Mewat district. In this regard 3 goats per household were given. The preliminary results of its impact revealed that on an average a poor farm family improved its livelihood by getting 1-2 litres milk per day. They are not selling goat milk but certainly it is improving their nutritional security and appreciation in animals will add to their income. It is evident from the results, a farm family can get milk valued at Rs. 1080 (Table 13) in a period of 5 months (per lactation). In addition to this, some money from sale of animals can also be earned.

Table 13: Average Income of a farm family from Goat milk

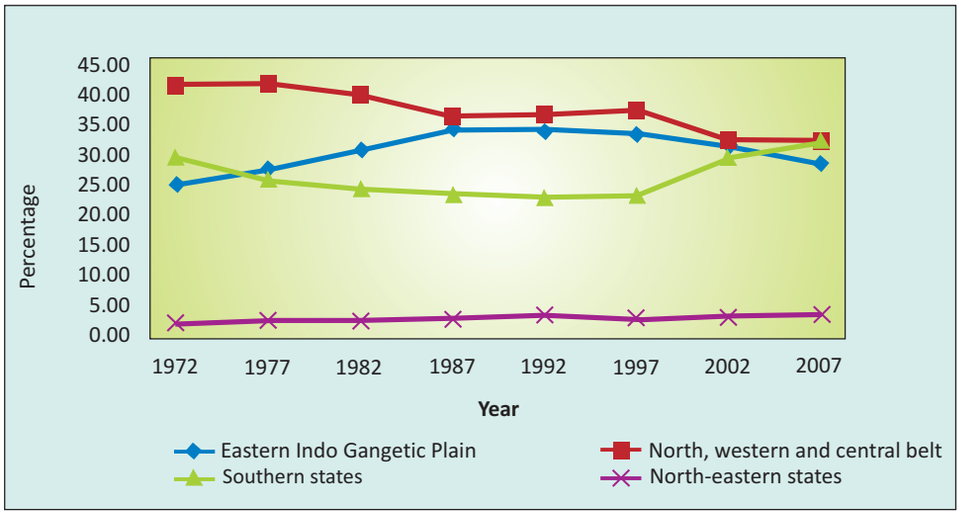
Villages	Average number of goats	Number of milk days (d/g/y)	Milk production (kg/day/goat)	Average milk production (kg/lac/goat)	Local rate (Rs/kg)	Average income (Rs/lac)	Total income (Rs/hh)
Jharpedi	3	99	1	99	7.1	702.9	2108.7
Singleheri	3	55.5	0.67	37.46	6.6	247.25	741.75
Morada	3	49.27	1	49.25	7.1	349.81	1049.43
Badarpur	3	39	0.52	20.47	6.85	140.25	420.75
Average	3	60.69	0.8	61.62	6.91	360.05	1080.15

Growth and Sustainability of Small Ruminant Population in India

A Suresh

The present study examined the growth and regionalisation of the small ruminant population and its sustainability. The population of the small ruminants (goat and sheep) in India increased from the level of 107 million heads to 213 million heads between 1970 livestock census and 2007 census at a growth rate of 1.98 per cent per year. The sheep population constituted almost one-third of total population during most of the periods. As per 1972 livestock census, Rajasthan accounted for about 17 per cent of the total small ruminant population in India, followed by Andhra Pradesh (11.84%) and Tamil Nadu (8.70%). However, these figures drastically changed as per 2007 livestock census, wherein Andhra Pradesh emerged as the state having highest proportion of small ruminants (16.6%) followed by Rajasthan (15.41%) and West Bengal (7.85%). This indicated that there is regional shift in the small ruminant population over a long period of time (Figure 5). The regions comprising the Northern, Western and Central India accounted for almost 42 per cent of the total small ruminant population as on 1972 census, which declined to 33 per cent by 2007 census. On the other hand southern regions gradually increased the share from 30 per cent to 33 per cent. The eastern Indo-Gangetic plain including Orissa increased the share from around 25 per cent in 1972 to 34 per cent in 1992 and subsequently reduced to about 29 per cent by 2007. The regional shift is becoming sharper in case of sheep population, wherein southern region registered an increase from around 46 per cent to 60 per cent, with sharp decline in all other major regions. Similar pattern was observed in case of goat also, with lesser sharpness. The change in the small ruminant composition has implication on both supply of meat products and grazing resources. At national level, the number of small ruminants per one lakh population has declined from 21 in 1982 to 18 in 2001, which would create sharp supply-demand gap in small ruminant meat. On the other hand, given the extensive production system and shrinking of grazing lands, increasing geographical concentration of small ruminants may lead to excessive pressure on natural resources.

Figure 5: Regional shift of small ruminant population



MARKETS AND TRADE

Developing Commodity Outlook Model for Major Agricultural Commodities

Anjani Kumar, P Shinoj, Shiv Kumar and Rajni Jain

Commodity outlook models serve as an important tool to provide advance information on important variables like demand, supply, trade and prices of major agricultural commodities. They are also being used as policy simulation models to deduct possible impacts of alternative policy decisions. Based on the review of various existing models and taking into consideration the time and resources available, a dynamic multi-commodity model under partial equilibrium framework was found to be suitable for onward work. With expertise gained through a 45-day training at Food and Agricultural Policy Research Institute (FAPRI), Iowa State University, USA the study team decided to build two separate models viz., grains outlook model covering major cereals like rice, wheat and maize and pulses like pigeon pea and chick pea and an oilseed model consisting of soybean, groundnut, rapeseed and mustard. The modelling framework for both these models was developed by incorporating time series data on relevant variables, technical parameters and elasticities. The developed models are capable of generating outlook information till the year 2025. The study team is presently involved in calibration and validation of the models by updating and fine tuning the technical coefficients and baseline data so that credible estimates can be generated.

Marketing Efficiency of Horticultural Commodities under Different Supply Chains in India

M B Dastagiri, B Ganesh Kumar, C V Hanumanthaiah, P Paramsivam, M Sudha, R S Sidhu, Khem Chand, Basanta Singh, Subhasis Mandal and Ritika Sharma

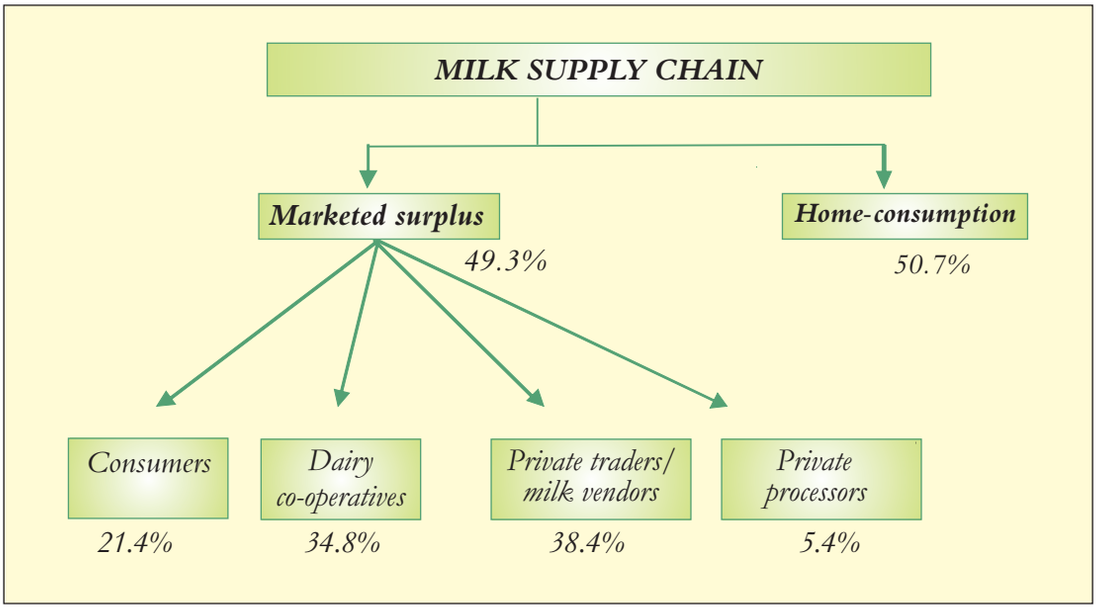
The study was conducted by NCAP with seven research partners in 8 states viz. Andhra Pradesh, Karnataka, Tamilnadu, Punjab, Rajasthan, West Bengal, Manipur and Mizoram during April 2009- August 2010. In total, 30 crops were studied, each based on a sample of 120 farmers.

Marketing efficiency estimated by following Acharya's modified method for different crops for the most efficient channels show that marketing efficiency is more than 1. In Tamilnadu and Punjab the marketing efficiency is very high for all crops studied compared to crops in other states i.e. Andhra Pradesh Karnataka, West Bengal, Manipur (except cabbage) and Rajasthan. In Tamilnadu, the efficiency ratio is highest for tapioca for supply chain of producer to consumer. In Punjab, the efficiency rate is high for all crops for the direct supply chain of producer and consumer. In Manipur the efficiency ratio is high for cabbage. The highest marketing efficiency channels are found to be producer to consumer. Hence, government policies should promote direct marketing models for horticultural marketing.

Milk Market Chains in Bihar

Anjani Kumar

The study has observed dominance of landless, marginal and smallholders in milk production. The continued preference for and strong role of unorganised milk consumers, has been observed. The private traders appeared to be the biggest buyer of milk, closely followed by the milk co-operatives. The study has also suggested that informal raw milk trading and processing offers good opportunities for milk market agents, the majority of whom were operating at small scale. This informal trading and processing is an economically viable proposition. The study has demonstrated that the informal milk market does not appear to be exploitative and the presence of multiple players in the milk market ensures better price for the milk producers.



The value addition to milk offers more lucrative options for milk market agents. Skill upgradation and improvement in education level of milk marketing agents facilitate their entry in value addition activities. There has been no evidence that milk co-operatives other than modern milk supply chain are explicitly favouring large scale producers. The traditional milk markets need to be addressed in a constructive manner in view of its continued dominance in marketing and value addition of milk. However, the increased attention to quality and safety by the growing middle class may work against these markets. The quality gap can be addressed to a large extent by popularising training and certification programmes for small-scale milk traders and processors. These measures would allow informal players to improve their performance, including quality control, which would serve the interests of both small producers and consumers. The data on costs and returns of milk processing, value addition and trading is given in Table 14.

Table 14: Costs and returns of raw milk trading, processing and value addition

Sl. No.	Particulars	Milk trading (Rs/day)	Milk processing and value addition (Rs/day)
1	Milk handled per day (litres)	59.8	71.4
2	Cost on marketing and processing	63.70	377.70
3	Gross expenditure	731.00	1360.70
4	Gross revenue	878.20	2103.40
5	Net revenue	155.20	803.40
6	Unit cost of milk marketing/processing (Rs/litre)	1.10	5.30
7	Net revenue (Rs/litre)	2.30	11.20

Source: Milk Market Agents Survey, 2007

Production and Export of India's Meat and Meat Products with Emphasis on Small Ruminant Meat

A Suresh

Indian meat production has increased from 2.7 million tonnes in 1970 to 5.9 million tonnes in 2009. During this period, the share of India in global meat production changed from 2 per cent to 1.6 per cent. As on 2009 Indian meat production sector is dominated by buffaloes to the extent of about 29 per cent. The period witnessed sharp reduction in the share of the small ruminants in total meat production. While small ruminant meat production increased from 0.39 million tonnes in 1970 to 0.82 million tonnes in 2009, its contribution as a percentage share declined from 19 per cent to 14 per cent.

About 85 per cent of Indian meat export is constituted by fresh and chilled bovine meat. Bulk of Indian meat export is targeted to Asian markets, notably in Arab and East Asian countries. The growth performance of the Indian meat export indicated that it is highly variable in terms of geographical concentration, commodity concentration and export volume. The annual average growth rate of meat export in rupees was around 15 per cent during 1991-92 to 1999-00 and it marginally declined to 14 per cent during 2000-01 to 2009-10. This might be due to high domestic demand for meat and products. The instability of the meat export increased from 9 per cent during 1991-92 to 1999-2000 to 14 per cent during 2000-01 to 2009-10 (Table 15). Diversification of Indian meat products export revealed that it is gradually specialising towards the export of bovine meat. The Simpson index of diversification declined from 0.52 in 1991-92 to 0.21 in 2009-10.

Table 15: Growth and instability of export of live animals, meat and meat products from India

(per cent)

	1982-83 to 1989-90	1990-91 to 1999-00	2000-01 to 2009-10	1982-83 to 2009-10
Growth	- 4.27	15.43	14.13	10.51
Instability	1.74	6.30	13.24	43.38

The commodity composition of Indian small ruminant meat export basket has been dominated by sheep and sheep products, with little representation of goat products. High positive growth was observed for export of fresh or chilled sheep and boneless mutton. Small ruminat export is marked by falling growth and high instability.

Prospects of Upscaling Broiler Production in Northern Region

B Ganesh Kumar

Poultry production systems in India are characterised by the simultaneous existence of the traditional extensive system of backyard production and the modern intensive system of production. The organised sector of poultry industry is contributing nearly 70 per cent of the total output and the rest 30 per cent is in the unorganised sector. The broiler industry is concentrated in southern states in our country with nearly 60-70 per cent total output coming from these states. Andhra Pradesh, Tamil Nadu and Maharashtra produce nearly 70 per cent of the country's egg production. About two-third of the total output (in value terms) from poultry is realised from the meat and one-third from egg production. While many studies are conducted in the southern region on poultry farming, there are relatively few for the northern region. The present study investigates reasons for relatively sluggish growth in poultry farming in Punjab and Haryana for devising appropriate policy measures for faster growth of poultry in this region.

The cost structure per bird in broiler farming for different categories of farms in the study area is presented in Table 16. Among the various components the variable costs, the feed costs and the chick costs were the main items of expenditure. In Karnal, the total costs of producing a batch size in small and large farms worked out to be Rs. 4,12,507 and Rs.19,75,379 respectively. The cost of production per broiler was found to be Rs. 86.58 and Rs. 83.65 for small and large farms, indicating economy of scale in broiler production. Similarly in Ludhiana, the total cost of producing a batch in small and large farms worked out to be Rs.4,88,534 and Rs. 8,09,305 respectively. The cost of production per broiler was worked out to be Rs. 81.63 and Rs. 81.12 for small and large farms. The details about total returns and net returns per batch and the net profit per bird were also worked out. It was found that the efficiency and profitability of broiler production in Karnal was better than in Ludhina. Profitability was found higher at large-sized unit.

Table 16: Cost of production of broilers in northern states

(Rs./per production cycle)

Items	Karnal		Ludhiana	
	Small (<10,000)	Large (>10,000)	Small (<8,000)	Large (>8,000)
Fixed cost	4143 (1.00)	15704 (0.79)	10006 (2.05)	13950 (1.72)
Variable cost	408364 (99.00)	1959675 (99.21)	478528 (97.95)	795355 (98.28)
Total cost	412507 (100.00)	1975379 (100.00)	488534 (100.00)	809305 (100.00)
Average farm size	4764	23615	5985	9977
Cost per bird	86.58	83.65	81.63	81.12
Total returns	**444085**	**2191350**	**517461**	**859944**
Net profit/batch	31578	215971	28927	50639
Net profit/bird	6.63	9.15	4.83	5.08

Note : Figures in parentheses indicate percent to total cost.

INSTITUTIONAL CHANGE

Land Use Dynamics in India: Preliminary Insights from State Level Analysis

P A Lakshmi Prasanna, Sunetra Ghatak, P Ramasundaram, Sant Kumar and Aruna Singh

Analysis of land use dynamics in India vis-à-vis population dynamics revealed that (i) during 1951-61, annual compound growth rate of net sown area was 1.06 per cent which declined to 0.38 per cent during 2001-08. In contrast to this, cropping intensity increased from 113.45 per cent during 1951-61 to 135.77 per cent during 2001-08.

Analysis of state level land use during 1951-2008 shows negative growth in land under non-agricultural uses in three states viz. Jammu & Kashmir, Orissa and Punjab. Three states namely Bihar, Punjab and Tamil Nadu show negative annual rate of change in both Net Sown Area (NSA) and Total Cropped Area (TCA). Andhra Pradesh and Maharashtra followed declining trend in net sown area (Table 17). The details of periods in which this negative trend has started with respect to the three key land use pattern dimensions in different states are presented in the table 17. Further probe into population dynamics during these different periods in different states along with focus on other key economic variables like food grain productivity, per capita income, population density, urbanisation, irrigation development etc. will yield more insights regarding drivers of land use change in different states and will help in planning for arresting decline in land under agriculture.

Table 17: States showing negative annual rate of change

	1951-61	1961-71	1971-81	1981-91	1991-01	2001-08	1951-2008
In both NSA and TCA	-	Bihar, Karnataka, Punjab	Andhra Pradesh, Rajasthan	Gujarat, Rajasthan, Tamil Nadu	Himachal Pradesh, Karnataka, Kerala, Orissa, Tamil Nadu	Assam, Bihar, Kerala	Bihar, Punjab, Tamil Nadu
In NSA alone	Bihar	Assam	Bihar, Madhya Pradesh, Uttar Pradesh, West Bengal	Andhra Pradesh, Bihar, Haryana, Jammu & Kashmir, Maharashtra, Punjab, Uttar Pradesh, West Bengal	Rajasthan Maharashtra	Himachal Pradesh, Jammu & Kashmir, Maharashtra, Madhya Pradesh, Orissa, Punjab, Uttar Pradesh, West Bengal	Andhra Pradesh, Maharashtra
In TCA alone	-	Tamil Nadu	Haryana, Kerala	-	Gujarat	-	-
In land under Non-Agricultural uses	Jammu & Kashmir, Tamil Nadu, West Bengal	Orissa, Punjab	Kerala, Orissa	Haryana, Jammu & Kashmir, Punjab	Punjab	Haryana	Jammu & Kashmir, Orissa, Punjab

Smallholders in Indian Agriculture: Input Use Pattern

P A Lakshmi Prasanna and Aruna Singh

In Indian agriculture the share of smallholders (holdings with operational holdings area less than 2 hectares) in number of operational holdings increased from 70 per cent to 83 per cent between 1970-71 and 2005-06. During the same period share of smallholders in operational area increased from 21 per cent to 42 per cent. In this backdrop, concern is being raised regarding implications of this structural change in landholdings on efficiency and equity in agriculture more specifically in input use. Some of these issues are examined at all India level using secondary data from input use surveys. The results showed that smallholders are more efficient in terms of land use as indicated by their higher as well as increasing cropping intensity and irrigation intensity (Table 18). Further, over the years the share of area treated with fertilizers and pesticides in total smallholders GSA increased. Further probe revealed that smallholders used more fertiliser per hectare and their fertiliser imbalance index was lower compared to that of other category farmers.

Analysis of overall share of smallholders in different inputs (Table 19) indicated that their share in inputs like irrigated area, area treated with fertiliser and fertiliser consumption, area treated with pesticides, and quantity of agricultural credit increased over the years. However, smallholders' share

in total number of holdings that availed institutional credit and total quantum of institutional credit showed fluctuating trend. These changes can be both due to changes in accessibility due to various input pricing/supply policies and partly due to changes in cropping pattern of smallholders compared to other category farmers. Hence more disaggregated state level analysis together with focus on cropping pattern changes of smallholders vis-à-vis other categories and changes in various input pricing/supply policies over the years will yield more insights.

Table 18: Smallholders - some input use extensity/intensity parameters

Entity	1981-82	1986-87	1991-92	1996-97	2001-02
Cropping intensity (%)	131	131	133	137	133
Share of goss irrigated area in GSA (%)	36	39	42	49	48
Share of net irrigated area in NSA (%)	37	40	43	51	46
Share of area treated with fertilisers in total GSA (%)	47	53	63	63	76
Share of area treated with FYM in total GSA (%)	35	39	37	26	32
Share of area treated with pesticides in total GSA (%)	9	14	17	17	32
Share of holdings availing institutional credit (%)	20	17	16	11	17
Fertiliser consumption (kg/ha of treated area)	83	115	109	147	150
Fertiliser imbalance index	0.11	0.04	0.06	0.03	0.01

Table 19: Smallholders' share in different inputs in Indian agriculture (%)

Entity	1981-82	1986-87	1991-92	1996-97	2001-02
Total no. of holdings	75	76	77	80	81
No. of holdings availed institutional credit	65	64	72	68	69
Total holdings area	28	30	33	36	39
Total NSA	38	40	46	50	54
Total GCA	24	25	28	28	31
Total GIA	36	37	42	42	46
Total net irrigated area	37	38	42	42	45
Area treated with fertilisers	37	36	39	41	45
Area treated with FYM	37	38	44	43	46
Area treated with pesticides	32	29	33	45	42
Consumption of N	39	38	42	45	50
Consumption of P	33	39	39	44	50
Consumption of K	39	47	50	59	62
Total fertiliser consumption	37	39	42	46	51
Quantity of FYM used	44	39	54	63	53

Risk Assessment and Insurance Products for Agriculture

B C Barah, S Diana and S S Raju

Agricultural insurance is considered an important mechanism to effectively address the risk to output and income resulting from various natural and manmade events. However, notwithstanding these initiatives, there is not much success in protecting the vulnerable section. So addressing the various issues of farming community at different levels and properly designing and implementing specific crop insurance programme will protect the numerous vulnerable farmers from hardship, bring stability in farm income and increase farm production.

Various agricultural risk assessment models like Mean-Variance (M-V) model of Markowitz, Freund's M-V model, Mean Absolute Deviation (MAD) model, Hazell's MOTAD Model, Safety-First Models, Target MOTAD Model, Chance-Constrained Programming, Just and Pope's production function, and recent risk models like Value at Risk (VaR), Conditional Value at Risk (CVaR) are studied for methodological development.

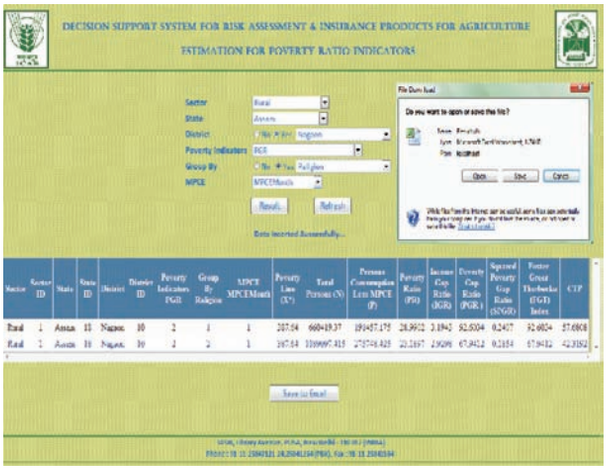
Instability analysis and mapping of districts according to the instability indices of maize, potato, sugarcane and cotton in Punjab; rice, ground nut and cotton in Andhra Pradesh; and cotton, maize, sorghum for Tamil Nadu has been completed. Instability is much higher in crops like sugarcane and cotton when compared to food grains and other crops. So crop insurance should be focused more on the crops and districts with high instability index.

Detailed farm surveys are undertaken for constraint analysis regarding adoption of insurance products in Tamil Nadu and Andhra Pradesh. Awareness is more among the marginal farmers (about 74%). Correlation between developmental indicator and implementation of the insurance scheme shows that at current level, better areas are benefitting more from the schemes as compared to poor areas. Village level surveys have also been conducted for rice-wheat system (200 farmers), baby corn (50 farmers) and potato (150 farmers) in Punjab. Declining rainfall and over exploitation of groundwater resources are serious emerging risk in Punjab agriculture. The risk is found to have adverse socio-economic impacts like increased expenditure on diesel oil/irrigation, requirement of frequent deepening of borewells, etc. Production risk appears to have increased in cotton as compared to paddy and wheat. Production and marketing risk in vegetable crops as well as fruits seems to be very high.

Wine Grape Insurance Structuring Automation Tool (WIGISAT) has been developed (Figure 6), which is tested in stakeholders interface dialogue meet along with application of "Money Mobile". For developing a prototype on-line decision support system for generalised applicability, extraction module of NSSO data, logical architecture of DSS is completed (Figure 7). Probabilities of individual households falling in various risk classes are also calculated based on important household characteristics. Three modules i.e. ETL (Extraction, Transformation and Loading) household risk profiling and administrators' profile completed. Estimation module of various poverty measures such as PGR (Poverty Gap Ratio), Squared PGR, Income Gap Ratio (IGR), Foster-Geer-Thorbecke (FGT) index etc. has been completed.

Figure 6: Wine Grape Insurance Structuring Automation Tool (WIGISAT)

Figure 7: Online Decision Support System (DSS)



Risk in Andhra Pradesh Agriculture — A Disaggregate Analysis

S S Raju and Ramesh Chand

Instability in farm production is causing serious shocks to supply and farm income and there is a growing concern about increased volatility in farm production, prices and farm income. The study has estimated instability in three major crops before (1981-95) and after (1995-09) at the state and district levels in Andhra Pradesh. Instability in area, production and yield of rice, cotton and groundnut experienced at the state level in Andhra Pradesh during 14 years before and after 1994-95 has been presented in Table 20.

Table 20: Instability in area, production, yield, farm harvest prices and gross returns from important crops in Andhra Pradesh, 1980-81 to 2008-09

(%)

Crop	Period	Area	Production	Yield	Farm harvest price	Gross returns
Rice	1980-81 to 1994-95	10.6	15.3	8.3	7.3	20.0
	1994-95 to 2008-09	14.4	20.0	8.5	10.5	19.7
Groundnut	1980-81to 1994-95	8.1	25.7	21.7	14.4	28.6
	1994-95 to 2008-09	9.8	47.7	40.8	9.6	48.4
Cotton	1980-81 to 1994-95	16.6	23.9	27.9	23.9	36.8
	1994-95 to 2008-09	20.2	27.7	23.6	25.0	35.5

To see if instability in agriculture at the disaggregate level presents a different picture than that at the aggregate level, instability in selected dimensions was estimated for each district in the state. It shows the distribution of districts in Andhra Pradesh which have seen increase or

decrease in instability in area, production, yield, farm harvest prices and gross revenue, and those which did not see any 'significant' change in the level of instability. The significant change was defined as the change of more than one per centage point.

A perusal of Table 21 shows that for rice, decline in instability was witnessed by 36 per cent districts in area, 41 per cent district in production and 50 per cent districts in yield, whereas the state level estimates showed only increase in instability. Similarly, in groundnut, compared to the increase at the state level, only 59 per cent of the districts showed increase in instability in gross return. The state level data indicated a decline in instability in cotton yield, but district level data indicated an increase in 22 per cent of the districts. The most striking variation in state and district level data was found in the case of instability in gross return from cotton which showed very low change at the state level but a decline in 83 per cent districts.

It has revealed that in a large state like Andhra Pradesh and which is the case for most states of India, the instability status as perceived through the state level data may be vastly different from that experienced at the disaggregate level. The study concluded that the state level analysis does not reflect complete picture of shocks in agriculture production and further, shocks in production underestimates shocks in farm income. It has suggested the need for addressing risks in farm income by devising area-specific crop insurance or other suitable mechanisms.

Table 21 : Distribution of districts based on Significant* changes in level of instability

(in per cent)

Category	Crops	Area	Production	Yield	Farm harvest price	Gross return
i. Districts experienced increase in instability	Rice	54.5	54.5	40.9	54.5	45.5
	Groundnut	59.1	63.6	72.7	22.7	59.1
	Cotton	27.8	33.3	22.2	16.7	11.1
ii. Districts experienced decrease in instability	Rice	36.4	40.9	50.0	18.2	45.5
	Groundnut	36.4	36.4	27.3	50.0	31.8
	Cotton	61.1	66.7	77.8	66.7	83.3
iii. Districts experienced change less than one percentage point	Rice	9.1	4.5	9.1	27.3	9.1
	Groundnut	4.5	0.0	0.0	27.3	9.1
	Cotton	11.1	0.0	0.0	16.7	5.6

**A change of more than one percentage point was taken as a significant change.*

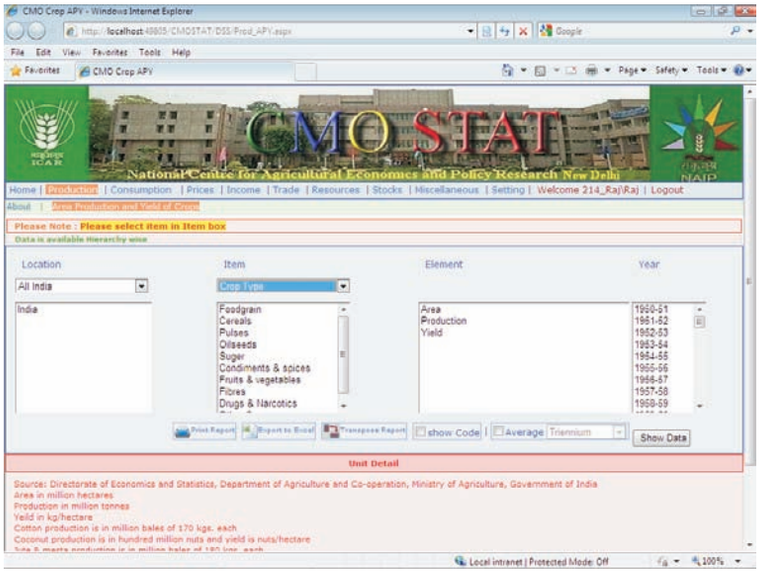
CMOS: An Innovative Data Management System for Agricultural Commodity Market Outlook

Rajni Jain, Raj Kumar Rai, Anjani Kumar, P Shinoj and Shiv Kumar

Development of an efficient and effective DSS requires analysis and model development by domain experts who further require sharing the common but updated datasets at any

point of time. CMOS is an innovative scheme for efficient data sharing for development of decision support system for agricultural commodity market outlook. It integrates existing data of crops, agricultural resources, inputs, stocks, trade and consumption etc. from various secondary sources. Accessing data from CMOS does not require high-end technologies except an internet browser (Figure 8). CMOS is flexible enough to manage data for different spatial dimensions like district, state, country, agro-eco regions for a selected variable. Data downloading facilities are also available for different temporal dimensions required by a user. The CMOS has been planned to provide reliable, accurate and updated data at any time. CMOS has been designed to take care of massive datasets from heterogeneous sources, bifurcation or merging of districts and states, multiple names for a single commodity, different spellings or names of a single district, variation of year definition in different sources and missing values for some data items.

Figure 8: User interface of CMOS presenting selection of variables



Multivariate Forecast of Winter Monsoon Rainfall in India using Sea Surface Temperature Anomaly as a Predictor: Neurocomputing and Statistical Approaches

Goutami Chattopadhyay, Surajit Chattopadhyay and Rajni Jain

The complexities in the relationship between rainfall and sea surface temperature (SST) anomalies during the winter monsoon over India were evaluated statistically using scatter plot matrices and autocorrelation functions. Linear as well as polynomial trend equations were obtained and it was observed that the coefficient of determination for the linear trend was very low and it remained low even when polynomial trend of degree six was used. An exponential regression equation and an artificial neural network with extensive variable selection were generated to forecast the average winter monsoon rainfall of a given year using the rainfall amounts and the SST anomalies in the

winter monsoon months of the previous year as predictors. The regression coefficients for the multiple exponential regression equation were generated using Levenberg-Marquardt algorithm. The artificial neural network was generated in the form of a multilayer perceptron with sigmoid non-linearity and genetic algorithm-based variable selection. Both of the predictive models were judged statistically using the Willmott's index, per centage error of prediction, and prediction yields. The statistical assessment revealed the potential of artificial neural network over exponential regression (Table 22).

Table 22: Values of statistical parameters to assess the prediction potential of regression and artificial neural network (ANN) based models

Models	Willmott's index	Per centage error of prediction	Prediction yield for			
			15% error	20% error	25% error	30% error
Regression	0.67	30.96	0.23	0.30	0.45	0.51
ANN	0.72	27.16	0.30	0.45	0.55	0.62

ICT and Empowerment of Indian Rural Women

Rasheed Sulaiman and P Ramasundaram

The present study has been undertaken to explore the role of Information and Communication Technologies (ICTs) in empowering Indian rural women, through a review of ICT initiatives in India. The study was based on a desk review followed by interactions with key stakeholders of ICT experiments with rural women. There has been a lot of interest during the last two decades in employing ICTs for achieving development. The study found that most of the ICT initiatives (Radio, television, print media, internet, telecommunication networks, telecentres, mobile phones, community radio, personal computers and data base) are disseminating new information and knowledge useful for rural women. However, many rural women are unable to use it, due to lack of access to complementary sources of support and services. Among the varied tools, the knowledge centres and the community radio were found to have the greatest potential in reaching women with locally relevant content since they have an explicit intention to target and have an agenda and mechanism for addressing the information needs of rural women. There is immense potential for ICTs to create new employment opportunities for rural women and to contribute significant gains in efficiency and effectiveness in rural women enterprises. While ICTs can play an important role in empowering rural women, their access to, and use of ICTs and empowerment clearly depends on the vision and operational agenda of the organisation applying the ICTs. Therefore, strengthening the ICT initiatives of such organisation can go a long way in empowering rural women. Besides generating locally relevant content and enhancing the capacities of rural women in accessing ICTs, efforts are also needed to bridge the different types of digital divide (rural-urban, men-women).

Female Participation Rate in Agriculture

Usha Ahuja and Prem Narayan

To see the effect of different factors on Female Participation Rate (FPR), the data has been analysed based on farm size, education and caste. The results revealed that the highest rate of participation of women during selected years, i.e. 1983-84, 1994-95 and 2004-05, was in landless group (45.69, 44.82 and 45.17%) followed by marginal farms (38.65, 37.95 and 39.26 %) in marginal farmers. The overall average rate of female participation was 37.72, 37.53 and 38.85 per cent during the study period (Table 23).

According to social groups the highest FPR at 45.68, 45.33 and 46.59 per cent was in scheduled tribe followed by 39.90, 39.42 and 40.58 per cent in scheduled caste during 1983-84, 1994-95 and 2004-05 respectively (Table 24). So, lower caste women are participating more as compared to upper caste. FPR in agriculture was found higher among literate as compared to illiterate women.

Table 23: Female participation rate in agriculture according to farm size (%)

Year	Landless	Marginal	Small	Medium	Large	Mean
1983-84	45.69	38.65	34.22	34.83	34.99	37.72
1994-95	44.82	37.95	34.26	33.94	34.04	37.53
2004-05	45.17	39.26	35.72	35.31	35.56	38.85

Table 24: Female rate of participation in agriculture according to social group

Year	Scheduled tribe	Scheduled caste	Others	Mean
1983-84	45.68	39.90	35.39	40.32
1994-95	45.33	39.42	35.20	39.98
2004-05	46.59	40.58	29.83	39.00

Empowering Women through Fish Processing and Marketing

B Ganesh Kumar, Shyam S Salim, R Suresh and P Ramasundaram

Two case studies were conducted to examine the empowerment of fisherwomen involved in the processing and marketing of fish and fishery products in two southern states of Kerala and Tamil Nadu. The specific objectives of these studies were to analyse the role of fisherwomen in processing and marketing of fish and fishery products as a source of income generation and livelihood option; to compare the levels of employment and income between fisherwomen involved in low value fish processing vis-à-vis value-added fishery products and between fisherwomen as retailers and vendors;

to estimate the social, political and economic empowerment of fisherwomen; and to suggest policy options for empowerment of fisherwomen through fisheries oriented activities.

In Kerala, more than 50 per cent of the fisherwomen were not sharing their income at all with their husbands, while 28.50 per cent partially shared and only 20 per cent fully shared their income. Conversely, about 76 per cent partially shared and the rest 24 per cent fully shared the income with their husbands.

Kerala fisherwomen were able to enjoy better freedom (about 78%) to spend their money for their parents across all occupational groups than their counterparts of Tamil Nadu (72%), except in case of retailers. Further results revealed that the fisherwomen were spending more than 50 per cent of the total household expenditure, which includes food items, cloth, education, health care, buying of gifts for social functions, etc. Overall, it indicated that the fisherwomen had considerable economic empowerment in these states and Kerala was found better than Tamil Nadu.

Social empowerment indicators like participation in the social events, networking among the fisherwomen community, decision making ability of the fisherwomen, level of knowledge about health and nutritional aspects etc., political empowerment indicators like choice of voting, knowledge about the political representatives, etc. and legal empowerment indicators such as knowledge about the women police station, domestic violence, human rights and women rights were also analysed.

The study calls for creation of awareness about their freedom in exercising their rights on economic, social, political and legal aspects so that they are evenly placed with their men counterparts. Affording comprehensive care for these women is correct in principle and a practical necessity if India's fisheries sector is to be satisfactorily sustained and the fisherwomen are empowered on all these aspects.

AGRICULTURAL GROWTH AND MODELLING

Achieving 4 per cent Growth Rate in Agriculture during XI Plan: Feasibility and Constraints

Ramesh Chand

India fixed a target of 4.5 per cent growth in agriculture during 9th Plan (1992-1997) and achieving 4 per cent growth rate in agriculture became a part of almost all official pronouncements on growth since then. National Agriculture Policy (2000) and 10th Five-Year Plan (2002 to 2007) reiterated to achieve 4 per cent growth in agriculture. 11th Five-Year Plan also focus on the same rate of growth. The 11th Plan put lot of thrust on agriculture and recognise that agriculture growth is key to achieve the target of 9 per cent growth in total GDP. This study assesses plausibility for achieving 4 per cent growth and discusses various constraints to improve performance of agriculture sector.

Output of agriculture sector is affected by a large number of factors. Some of those are exogenous and some are further affected by other factors. Simultaneous equation model was used to quantify

impact of various factors on GDP agriculture during early 1980s to the recent years. The GDP equation also includes index of technology as one of the variables. The estimates of elasticities derived from the model are presented in Table 25.

Table 25: Estimates of elasticity of GDP agriculture with respect to various factors

Factor	Elasticity
Technology	0.308
Public investment	0.174
Private investment	0.128
Area under fruits/vegetables	0.458
Fertiliser	0.122
Rainfall	0.186
Terms of trade	0.265

Note: *This model which takes overall GDP agriculture and overall investment was found satisfactory out of set of equations which included value of crop output as dependent variables and irrigation as explanatory variables.*

Based on the estimated contribution of various factors, the possibilities of output growth during the 11th Plan period are explored in Table 26. Assuming that use of fertiliser during 11th plan increase annually by 3 per cent; area under fruits and vegetables increase by 2 per cent; and technology frontier increase by 1 per cent per annum they can contribute 0.32 per cent, 0.92 per cent and 0.30 per cent growth in output. A 0.5 per cent growth in TOT for agriculture would lead to 0.13 per cent growth in GDP agriculture. This leaves a gap of 2.33 per cent growth in output to reach target of 4 per cent growth rate and the options are growth in private and public investments.

Table 26: Growth in various factors needed to achieve 4% growth rate in agriculture

Source	Implicit factor growth	Output elasticity	Output growth
Fertiliser	3.000	0.106	0.318
Technology	1.000	0.308	0.308
Area under fruits and veg	2.000	0.458	0.916
Public investment	10.500	0.174	1.827
Private investment	4.000	0.128	0.512
Terms of trade	0.500	0.265	0.133
All sources	-	-	4.014

If 4 per cent of GDP agriculture is ploughed back into agriculture by farmers, as was the case during the base year 2005-06, it would raise private investments by about 4 per cent, which can

provide 0.51 per cent growth in output. Still major contribution is required which can come from growth in public investment in agriculture. If level of public investment is raised close to 4 per cent of GDP agriculture, this would imply that public investment at 1999-2000 prices, would be raised annually by 11 per cent during 11th Plan. An increase in public investment of even slightly lower order (10.5%) could result in output growth of 1.827 percentage points which helps in realisation of 4 per cent growth in GDPA.

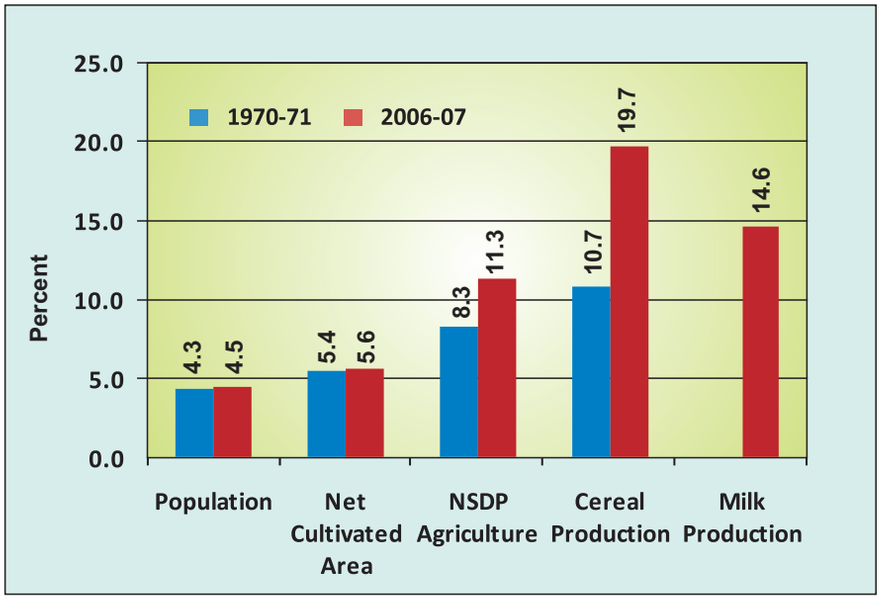
Growth in GDP Agriculture can be accelerated if the momentum in growth of fertiliser use, seed, irrigation, power supply, and public investment, as witnessed during the recent four years, is maintained, concerted efforts are made to harness potential of low productivity region by taking improved technology to these areas and price environment for farmers remain remunerative. However, several factors constrain this. Important among them are supply of institutional credit, power supply to agriculture, supply and quality of inputs, progress in technology, resource allocation for agriculture, favourable institutional and regulatory environment, extension system, shrinking natural resource base and improvement in rural infrastructure.

Understanding the Next Agricultural Transition in the Heartland of Green Revolution in India

Ramesh Chand

Green Revolution technology, consisting of high-yielding varieties of wheat and paddy (rice), accompanied by policy support, has provided a big boost to agricultural growth in regions which had reliable irrigation. The entire northwest region of the Indo-Gangetic Plains comprising states of Punjab, Haryana and Western part of state of Uttar Pradesh were the early adopter of green revolution technology and experienced rapid expansion of the area under new varieties of wheat and paddy. The favourable interplay of policies with high potential technology produced quick results and India witnessed more than doubling of annual wheat production from 11 million tonne during the triennium ending (TE) in 1966-67 to 23 million tonne during TE 1971-72. Rice production during the first five years of adoption of new technology increased by 30 per cent from 33 million tonne to 42 million tonne. About 44 per cent of this increase took place in the three states of Punjab, Haryana and Uttar Pradesh which were early adopter of green revolution technology and which accounts for only 18 per cent of area under cultivated in the country. The states of Punjab and Haryana representing green revolution belt accounts for around 5.5 per cent of agricultural land and around 4.5 per cent of total population of India. At the beginning of green revolution the share of these two states in net domestic product of agriculture of the country was 8.2 per cent, which was close to double their share in population and 60 per cent higher than their share in agriculture area. During the next three and a half decades share of Punjab and Haryana in NSDP of India increased to 11.3 per cent which is more than double their share in agricultural area of India (Figure 9). The achievement is much higher in the case of cereals. During 1970-71, these two small states produced a little more than one tenth of total output of cereals which are the staple food of India's large population. Their contribution almost doubled by the year 2006-07.

Figure 9: Share of Punjab and Haryana in all India resources and production (%)



During recent years some inimical trends have emerged in agriculture sector of this region. Productivity of rice and wheat which are the predominant crops of the region has almost plateaued and growth of agriculture sector has sharply decelerated. Crop intensification and input pricing policies have resulted in indiscriminate exploitation of land and water resources which have rendered even current level of production unsustainable. These trends, which are also called second generation problems of green revolution, have raised several issues related to growth model based on green revolution technology and future of agriculture sector in the region and sources of growth to meet food demand in the country. This study undertakes in-depth analysis of agriculture sector in the states of Punjab and Haryana and compares it with the country picture. It also suggests strategy and policy measures for future development of this region.

Per Capita Income

About five years before green revolution, per capita income (PCI) in the state of Punjab was almost same as the income level in rest of the country. Per capita income in the state of Haryana was 9 per cent lower than the national average. Within the six years of adoption of green revolution technology, per capita income in the state of Punjab turned 46 per cent higher than India's average. Likewise, Haryana, which had lower PCI than national average, reached income level 21 per cent higher than the country. Income level in Punjab continued to grow faster than the country till year 2002-03 after which the growth process in the state started lagging behind the country. However, Haryana continued to grow faster than the country and took a lead of 65 per cent over the country in terms of PCI in the recent years (Table 27).

Table 27: Per capita income in green revolution belt and in the country at current prices

(Rs./year)

Period	Punjab	Haryana	India	Punjab/India	Haryana/India
1960-61	366	327	361	1.01	0.91
TE 1972-73	1145	951	783	1.46	1.21
TE 1982-83	3058	2673	2012	1.52	1.33
TE 1992-93	9777	8440	6245	1.57	1.35
TE 2002-03	28752	26158	17976	1.60	1.46
TE 2008-09	45114	58970	35758	1.26	1.65

Punjab has done much better in agricultural performance as compared to its performance in non-agriculture sector. In fact growth of non-agriculture sector in Punjab after mid 1980s has been much lower than the country. Because of nature of the recent growth of Indian economy, though Punjab lags behind Haryana and the country in terms of growth in per capita income, the state still continues to be far ahead and doing better than the country in terms of income of rural population.

Input Subsidies and Natural Resource Degradation

Both the states in the green revolution belt provide large subsidies on power supply to agriculture for irrigation tubewells and on water charges for canal irrigation. Pricing policy for electric power used in irrigation, changes in crop pattern and increase in crop intensity have resulted in over exploitation of ground water resources in the green revolution belt (Table 28). Net annual ground water draft in Punjab exceeds availability by 45 per cent. In Haryana, extent of over exploitation of ground water is 9 per cent. For the country as a whole there is a scope to raise ground water draft by 42 per cent.

Table 28: Ground water exploitation (BCM)

Particulars	Punjab	Haryana	India
Annual replenishable groundwater resources	23.78	9.31	433.02
Net annual groundwater availability	21.44	8.63	399.25
Annual groundwater draft	31.16	9.45	230.62
Stage of groundwater development (%)	145	109	58

Source: Central Ground Water Board, Chandigarh

The green revolution belt of North West India, particularly the state of Punjab, which was considered as a model of agriculture growth led strategy for socio economic transformation, is at the crossroads today. Agriculture production system has turned away from the path of sustainable growth and the natural resources base that sustained highly productive agriculture for about four decades is under serious threat. Agriculture production and growth is being maintained with very heavy support in terms of subsidies for fertiliser and water which in turn are worsening situation.

Agricultural Growth and Economic Convergence in Indian Agriculture

Shiv Kumar

Some states have achieved rapid agricultural output growth in recent years, while others have languished. To process of convergence and its underlying causes are analysed using data for 15 major Indian states for the period 1980-81 to 1991-92, 1991-92 to 2006-07 and 1980-81 to 2006-07, representing periods before and after economic liberalisation and whole period.

The growth experience during post-reform period favoured agriculturally underdeveloped states more than the other states. The growth analysis shows that the growth rate of per hectare NSDP agriculture in most of low productivity states was much lower than national average in pre-reform period but in post-reform period these states show higher growth than national average. Also, the growth rate of per hectare NSDP agriculture in most of low productivity states was higher than that of pre-reform period. Unconditional convergence shows evidence of falling regional disparities in India after initiation of economic reforms in 1991, and more so in the initial years of reforms. The tendency of divergence was stronger in pre-reform period as compared to whole period but post-reform period displays convergence. Evidence of absolute ß convergence in per hectare NSDP agriculture levels across Indian states reveals tendency of states to converge to identical steady state level. The results are in consonance with Kuznets theory of economic development. The gap between potential productivity and realised productivity in Indian agriculture has narrowed down by performance of agricultural growth mainly due to spillover effects of agricultural technologies to agriculturally backward states. Human capital, public finance, agricultural bio-chemical technology, physical infrastructure and agricultural research and extension intensity were identified factors for causing conditional convergence. All these factors generate synergy in conditioning convergence. While framing policy and designing development programmes, all these conditioning factors should be essential ingredients as policy input for getting desired policy outcome. Finally, the outcome of study affirms that the benefits of economic reforms started by the Government of India have shown no visible impact on convergence process of per ha NSDP agriculture among Indian states. Indian agriculture has its own intrinsic power to generate growth in per hectare NSDP agriculture causing convergence among Indian states This might be due to spillover effect of agricultural technologies (like maize hybrids, Bt cotton etc). This envisages the potential states as further sources of agricultural growth in India.

Effect of Global Recession on Indian Agriculture

Ramesh Chand and SS Raju

Annual rate of change in agriculture output was more than 4 per cent during 2005-06 to 2007-08 and then dropped to less than 1 per cent during 2008-09 and 2009-10. These changes show that growth of agriculture output dropped very sharply when there was slow down in global economy. The pertinent question here is whether the slow down and decline in agriculture output during 2008-09 and 2009-10 can be ascribed to the affect of the global recession? The apparent answer may

be yes, but to arrive at credible inference on this there is need to look at what caused slowdown in agriculture growth.

The level of fertiliser use, seed supply, credit supply, public and private investments and agriculture prices, all of which are known to have positive effect on agriculture output, show improvement during 2008-09 over 2007-08. Various studies show that in addition to the factors mentioned above, agriculture production in India depend critically on distribution and amount of rainfall received in the country. Therefore, to find credible answer to the slowdown in agriculture growth during 2008-09 and decline in during 2009-10 there is a need to look at the rainfall pattern in these two years. This information is presented in Table 29, which shows that growth rate in India's agriculture output fluctuates according to level of rainfall received in the country. The rainfall was almost normal during 2005-06 and 2007-08 when India recorded growth rate of 5.25 and 4.73 per cent respectively. During 2006-07 rainfall was deficit by 5 per cent and India recorded growth rate of 3.7 per cent in GDP agriculture. During 2004-05 rainfall was deficit by 9 per cent and growth rate was 0.05 per cent. During 2008-09 rainfall was deficit to the extent of 10 per cent and growth rate decelerated to 1.6 per cent. In 2009-10 with rainfall deficiency exceeding 20 per cent agriculture output is expected to show marginal growth. Based on this it appears that slow down in agriculture growth during 2008-09 was caused by behavior of rainfall and not because of transmission of affect of global recession.

The performance of agriculture sector is closely monitored by the government and various measures and strategies are put in place to counter adverse effects of various factors on this sector from time to time. These measures and strategies include several instruments like regulation of import and export, monetary policy, public investments, minimum support prices, input subsidies, credit supply, direct intervention into market, regulation of market and private trade, special packages for the sector etc. These instruments have been effective in decoupling India's agriculture sector from rest of the world and in minimising effect of severe shocks in global economy on the sector. It is concluded that the apprehension about impact of the global recession on Indian agriculture was not well founded and the anticipated effect was overstated.

Table 29: Growth Performance of agriculture sector (%)

Product Category	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
GDP Agriculture at 2004-05 prices	0.05	5.25	3.68	4.73	1.58	0.40
Value of agriculture output at 2004-05 prices	0.54	5.37	4.04	5.16	0.94	na
Value of crop output at 2004-05 prices	-0.95	5.92	3.96	5.39	-0.53	na
Value of livestock output at 2004-05 prices	4.69	3.91	4.24	4.51	4.94	na
Departure of actual rainfall from normal, June to May (%)	-9.3	-1	-5.2	-1.2	-10.1	-23@

Source: Computed from National Accounts Statistics 2010, CSO.
@ Refers to monsoon rainfall only

RESEARCH ON EASTERN REGION

Dynamics of Agricultural Development in Eastern Region

Anjani Kumar, Harbir Singh and Neha Atri

Eastern region (comprising Bihar, Jharkhand, Chhattisgarh, Eastern UP, Orissa and West Bengal) has high potential of agricultural growth but except West Bengal, it could not reap the fruits of first phase of Green Revolution (GR). In the beginning of the GR, the share of Bihar, Jharkhand, Orissa and West Bengal in Net Domestic Product of Agriculture (Ag NDP) of the country was 12 per cent which increased to 18.1 per cent during the next three and half decades. Highest increase in state's share in national Ag NSDP was registered by Orissa (about 47%) while the share of Bihar and Jharkhand increased only marginally. The performance of West Bengal agriculture was phenomenal as its Ag NSDP increased about three-fold during 1970-71 and 2006-07 (Table 30).

Table 30: Changes in the share of Eastern region in population, area and agricultural production of India during the four decades of green revolution (%)

Particulars	Bihar		Orissa		West Bengal		Eastern Region	
	1970-71	2006-07	1970-71	2006-07	1970-71	2006-07	1970-71	2006-07
Population	10.3	10.7	4.0	3.6	8.1	7.8	22.4	22.1
Net cultivated area	6.0	5.2	4.3	4.1	3.9	3.8	14.3	13.1
Irrigated area	7.2	5.6	2.9	3.9	4.0	6.6	14.1	16.1
Cereal production	5.2	4.2	4.8	3.6	7.4	7.9	17.4	15.7
NSDP agriculture	7.3	7.5	1.7	2.5	2.9	8.1	12.0	18.1

Source: Compiled from various published data sources.

The pattern of agricultural growth in Eastern region shows that West Bengal witnessed high agricultural growth in GR phase, but Bihar and Jharkhand could not tap the full potential of the GR technologies. Agricultural growth in Orissa and West Bengal during the early stages of GR (1966-67 to 1985-86) was quite high in comparison to Bihar as well as the country as a whole. During 1985-86 to 1999-2000, Orissa registered a decline in agricultural growth (0.1%), while West Bengal maintained an impressive growth rate (5.1%). Surprisingly, agricultural growth rate in Bihar accelerated during recent period (1999-2008) surpassing the agricultural growth rate West Bengal, Orissa and the country as a whole (Table 31). Early indications point towards improvement in infrastructure and governance as the major factors for the turnaround in the performance of agriculture in Bihar.

Table 31 : Growth rate in Net State Domestic Product of agriculture sector during different phases since the adoption of green revolution technology in Eastern region

(percent)

Period	Bihar	Orissa	West Bengal*	Eastern Region	India
1966-67 to 1985-86	2.2	8.4	7.2	4.6	2.4
1985-86 to 1999-00	2.1	0.1	5.1	3.0	3.5
1999-00 to 2008-09	2.9	2.2	2.3	2.4	2.6
1966-67 to 2008-09	2.4	2.7	5.2	3.5	2.8

Source: National Accounts Statistics, CSO, Government of India (various issues)
** figure relates to the period 1970-71 to 1985-86.*

There are marked differences in agricultural productivity levels across the eastern states (Table 32). The value of crop output in West Bengal was more than double that of the Bihar and about three times more than that of Orissa. The livestock productivity in West Bengal was also substantially higher than that in Bihar and Orissa. The production of both rice and food grains in Orissa in the last decade has been subject to wide fluctuations. In the absence of adequate irrigation facilities in Orissa, nature plays a vital role in shaping the productivity of crops. Therefore, there is a need for further in-depth research to understand the development pathways in eastern region to realise the growth potential and to usher a rainbow revolution for this region.

Table 32: Agriculture productivity per unit of land in Eastern India, TE 2005-06

(Rupees)

Particulars	Bihar	Orissa	West Bengal	Eastern Region	India
Value of crop output per ha NSA	32890	28543	74475	43595	33728
Value of livestock output per ha NSA	16796	4967	22066	14644	12595
Value of fisheries output per ha NSA	2273	2486	16743	6478	2402
Value of agriculture output per ha NSA*	53121	35997	43285	64717	48725

Source: Compiled from various published data sources;

*Note : *Does not include forestry.*

III. BRIEF ACCOUNT OF THE XI PLAN

Technology Policy

- The Centre maintains a database on agricultural research, extension and education investments at the national and state levels. The Centre has highlighted contribution of public research by developing an estimate of public and private sector contributions in the total research spending.
- 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 are need of the hour.
- Impact of research on the NARS revealed an increasing trend in the total number of publications during 1990s as compared to that in 1980s. However, a majority of these publications (about 80%) have appeared in non-SCI (Science Citation Index) journals with zero impact factor.
- A high pay-off to investment in agricultural research has been observed and it is a 'win-win' option to improve total factor productivity (TFP) and alleviate rural poverty. Moreover, deceleration in agricultural growth since the mid-1990s, has underscored the need for acceleration of technology flow to farmers, which emphasised higher investment in R&D.
- Applications of improved technologies have increased productivity manifold in various crops and species. Analysis has revealed that 19.8 per cent gains in wheat yield were contributed by improved technologies during 1999-2000 to 2004-05. Technology-led growth in livestock sector contributed to annual growth rate of 2.3 per cent during the period 1970-71 to 2003-04. Adoption of pen culture of fish in Bihar has shown that average B:C ratio was 1.39.
- New Seed Policy and economic reforms have provided enormous opportunities to the private seed sector. At present, this sector shares a large proportion of seeds of cotton, rice, maize, and vegetables. However, their participation in crops of groundnut and potato has been very low.
- The study has reported that a majority of the farmers get information about new crop varieties from the fellow farmers/farm-input dealers. This shows the functional inefficiency of public extension and seed system, emphasising the need for technological backstopping, developing partnership with private and civil societies.
- The study on female participation in agriculture has revealed that over a period of twenty years (1983, 1993 and 2004) female participation in entire agricultural sector has increased barring fisheries, maximum increase being in livestock production and agricultural sector (12%).
- Adoption of food safety practices for milk production at farm level was observed to have significant positive relationship with herd size (0.93%) and milk price (0.3%). The effect of dairy-cooperatives on the compliance of food safety measures is found to be positive.

Sustainable Agricultural Systems

- A study on desertification in South Asia examines the impact of desertification on food production, livelihood securities and human development indicators. The study concluded that in sample districts cereal-based farming system is the most important livelihood strategy followed by livestock-based systems. Also due to subdivisions of land holdings into tiny pieces the livelihood strategy is undergoing a change towards cash crops and non-farm employment opportunities.
- 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 provisions of subsidies on WSTs, economic returns from investment and their use in crops should be estimated.
- The findings of a study on evaluating economic and ecological benefits and other impact of System of Rice Intensification (SRI) in Tamil Nadu outlined that SRI produces higher returns and conserve water to the tune of 22-39 per cent over the normal practice. It provided higher production at lesser cost along with fulfilling economic as well as environmental criteria.
- The coping strategies for tackling climate change 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.
- The national biofuel policy has been designed to harness the various environmental, social and economic benefits arising out of large scale development of biofuels. However, the success of the programme would largely depend on the readiness of the stakeholders and the government machinery to tackle the various challenges the programme faces from time to time. It becomes apparent that bioethanol production solely based on sugarcane molasses is neither economically viable nor sustainable in the long-run. Similarly, the Jatropha-based biodiesel production programme is bogged down with several obstacles like slow progress of planting, sub-optimal processing and marketing infrastructure, under developed distribution channels etc. Substantial research thrust on developing second and third generation feed stocks are crucially important to address the future bio-energy needs of the country.

Markets and Trade

- Evidence from studies undertaken at the Centre indicates that India is a major exporter of rice but export of wheat is marred with significant fluctuations. Export surpluses of wheat were

transitory in nature; and their disposal / exports were followed by huge imports subsequently, to stabilize its domestic prices and meet its domestic demand. Further, international prices are volatile; and if this volatility gets transmitted to farm level, it will destabilize the cropping pattern.

- Trade liberalisation was found to have a mixed impact. Liberalisation of imports had significantly negative impacts on rapeseed-mustard. Fisheries exports from India are very competitive. Dismantling of the protective barriers has improved the competitiveness of the dairy products.
- A study was conducted to assess the impact of trade liberalisation on self-reliance of food in South Asian Countries (SACs) during 1991-2002. The results revealed that dependency on imports in SACs has increased sharply for vegetable oils. Dependence on imports has also increased for pulses in all SACs, except Nepal. India has guarded effectively against the import of cereals, fruits and dairy products during the post-WTO period through tariff and non-tariff measures.
- A wide array of literature points out that India's edible oil sector is not competitive globally. Analysis has shown that during post-WTO period, India exported large quantities of vegetable oils and oilseeds (23% each), and oilcake and oilmeal (54%). Competitiveness in the edible oil sector depends on the production of oilseeds and their processing efficiency. Besides, country should aggressively promote export niche of other oilseeds like castor, sesamum, groundnut, etc. with specific attributes of consumers' preference.
- A study to identify the determinants of export performance of livestock products revealed that India's livestock export will increase by 0.21 per cent as a result of 1 per cent increase in the GDP of the destination countries. With 1 per cent increase in distance between India and the importing countries, India tends to decrease exports of dairy products, meat products and eggs by 0.74 per cent, 0.90 per cent and 0.28 per cent respectively. The study concluded that strengthening of export supply capacity domestically holds the key for enhancing export of livestock products.
- Analysis of marketing models of horticulture and fisheries in the WTO regime has revealed that a farmer is getting only one rupee out of every Rs. 3.50 paid by the consumer and the retailer is getting Rs. 0.75. The study also concluded that new models in fish retailing and private market models such as Reliance are better than their traditional counterparts in terms of operating hours, price advantage to consumers, hygiene and consumer acceptance.
- 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.

Institutional Change

- Studies on vertical integration have focused on dairying, poultry and vegetables and were aimed at assessing the costs and benefits of institutional linkages such as contract farming and producers' associations to the producers. The farmers associated with such institutions could save as much as 60-90 per cent in transaction costs, and earn 13-100 per cent more profit over their counterpart producers selling in the wet market.
- A study on impact of vegetable production on income and employment of smallholders revealed that vegetable production is not only more profitable and labour-intensive than cereals, but also more suitable to the needs and resource endowments of smallholders. The study has revealed that smallholders do participate in the diversification process towards high-value agriculture, though it is capital, technology and information-intensive.
- 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.
- A study on agricultural insurance revealed that despite various schemes launched from time to time in the country, agricultural insurance has served very limited purpose. The coverage in terms of area, number of farmers and value of agricultural output is very small, payment of indemnity based on the 'area approach' misses affected farmers outside the compensated area, and most of the schemes are not viable. This requires renewed efforts by government in terms of designing appropriate mechanisms and providing financial support for agricultural insurance. Providing similar help to private sector insurers would help in increasing insurance coverage and in improving the viability of the insurance schemes over time. With the improved integration of the rural countryside and communication networks, the unit area of insurance could be brought down to the village panchayat level. Insurance products for the rural areas should be simple in design and presentation so that they are easily understood. With increased commercialisation of agriculture, price fluctuations have become highly significant in affecting farmers' income. Accordingly, market risk is now quite important in affecting farmer's income.

Some successful models of ICT were studied for assessment of their costs and benefits from the farmers' perspective. With the availability of information on input-use, technology and market prices, the farmers could realise better yield, higher market price and could reduce costs on information search and acquisition.

Agricultural Growth and Modelling

- The performance of agricultural sector is closely monitored by the government and various strategies are put in place to counter adverse effects of various factors on this sector from time to time. These measures have been effective in decoupling India's agriculture sector from

rest of the world and in minimising effect of shocks in global economy on the sector. It is concluded that the apprehension about impact of the global recession on Indian agriculture was not well founded and the anticipated effect was overstated.

- A study comparing agricultural growth during the pre-and post-WTO periods has shown a significant deceleration in the post-WTO period, probably due to declining international prices of agricultural commodities, neglect of price intervention in the underdeveloped yet potential growth regions of the country, slow down in adoption of improved technologies and stagnation in public investment.
- Enhancing investment and diversification of agriculture were shown to have considerable potential to accelerate agricultural growth. Private investment was found to be more effective than the public investment in accelerating agricultural growth. Agricultural credit and subsidies were observed to have a positive impact on private investment.
- The share of high-value food commodities has increased considerably over the past 15 years. Studies on diversification have suggested a need for improving producers' access to markets, improved technology, quality inputs and information as well as credit and risk-coping mechanisms.
- Domestic demand for cereals has been projected to be 219 million tonne by the year 2012 and 261 million tonne by the year 2020. The demand for pulses by these years would be 16 million tonne and 19 million tonne, respectively. Thus, the overall foodgrain demand has been projected as 235 million tonne by the year 2012 and 280 million tonne by 2020.
- An analysis on various patterns, trends and successes achieved in diversification towards horticulture since 1970-71 at national and state level, revealed that higher returns relative to other crop groups is the main underlying factor for the diversification towards horticulture.
- Another study has revealed that the states of West Bengal, Tamil Nadu, Kerala, Karnataka, Haryana, Punjab and Maharashtra have performed better in both livestock production and poverty reduction during the period 1983-84 to 1997-98 as compared to Assam, Madhya Pradesh, Rajasthan and Uttar Pradesh. A study on factors affecting the growth of livestock sector shows that its growth can be accelerated by improving feed and quality and composition of livestock, veterinary facilities, output marketing and institutional interventions.

System of Monitoring and Control over the Performance of each scheme

The progress of all the plan projects is being reviewed regularly in the Institute Research Council (IRC) meeting held monthly, besides getting reviewed and advised by Research Advisory Committee (RAC) meeting held annually and Quinquennial Review Team (QRT) meeting held once in five years.

Apart from these, the externally funded projects are also reviewed regularly through their designated review committee meetings held either annually or biannually.

In addition, the Centre organises policy advocacy activities, training programmes and seminars/ workshops.

Plan Outlay and expenditure during the XI Plan in NCAP (Rs. lakhs)

Year	Outlay	Expenditure
2007-08	240.00	235.80
2008-09	180.00	179.96
2009-10	150.00	149.98
2010-11	150.00	150.00
2011-12*	357.00	--

* *Proposed allocation*

IV. POLICY INTERACTIONS

Dr Ramesh Chand, Director

- Chairman, Working Group on "Crop Husbandry, Agricultural Inputs, Demand and Supply Projections and Agricultural Statistics" for the 12th Five-Year Plan (2007-12), Planning Commission, Government of India.
- Special Invitee to the Audit Board on "Functioning of Food Corporation of India and its Impact on Food Subsidy" by Office of the Comptroller and Auditor General of India.
- Member of the Expert Group to work out the Methodological Details for the Pilot Survey on Estimation of Savings and Investment through Household Survey that NSSO would take up.
- Member of Expert Group of NREGA on Watershed Platform under Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA).
- Member of the Committee in the Department of Food & Public Distribution under the Chairmanship of Secretary (F&PD) to Review and Monitor Creation of Additional Storage Space for Storing Central Stock of Foodgrains, and for Prudent Management of Central Stock of Foodgrains.
- Member of the Core Working Group of the Development of Strategy and Strategic Plan 2010-15 of the DARE/ICAR.
- Member of the Technical Committee on Quinquennial Livestock Census 2012, under the Chairmanship of Animal Husbandry Commissioner, MOA to finalise subject coverage, methodology, time frame and all other details for the conducting the Livestock Census.
- Member, India's Delegation for G-20 Agriculture Deputies Meeting at Paris, France, 23-24 March 2011.

V. AWARDS/RECOGNITIONS

Dr S S Raju, Principal Scientist

- Rapporteur for the session on "Contemporary Issues (Legal and Financial) in Centre-State Systems in Agriculture in the National Workshop on 'Role of Centre-State Systems and Public-Private Interface in Agricultural R & D Extension and Marketing' held at NCAP, New Delhi, 24 August 2010.
- External Examiner for the course of Agricultural Production Economics, College of P G Studies, Barapani, 12 January 2011.
- Discussant for the session on 'Biofuels policy in Senegal and Potential Economic Impacts' in the Modelling Workshop III on Biofuels and Food security, IFPRI, Washington D C, 17 March 2011.

Dr Anjani Kumar, Principal Scientist

- Conducted session on "Global Meltdown and Its Impact on Agriculture-Critical Constructs and Remedial Measures" of 70th Annual Conference of The Indian Society of Agricultural Economics during 29 November-1 December 2010.
- Lead invited speaker under the Technical Session: Sustainable Development through Livestock Farming of ICONBHU, 21-23 January 2011.
- Member, National Advisory Committee Meeting, ICONBHU.
- Joint Secretary, Agricultural Economics Research Association, New Delhi.

Dr M B Dastagiri, Senior Scientist

- Rashtriya Gaurav Award, 2010 given by India International Friendship Society on 9 April 2010 for meritorious services, outstanding performance and remarkable role.
- Best Citizens of India Award, 2010 given by International Publishing House for excellent performance and scientific contribution.
- International Gold Star Award, 2010 given by India and Thailand Friendship Society (ITFS)for individual excellence in recognition of sterling merit, excellent performance and outstanding contribution for the progress of nation and worldwide.
- India-International Achievers Award, 2010 given by Indian Achievers Forum and Thailand.
- Rajiv Gandhi Excellence Award, 2010 by India International Friendship Society (received on 8 September 2010).

- Vikas Rattan Award, 2010 by International Institute of Success Awareness (received on 8 September 2010).
- Biography published in Who's Who in The World 2011, 28th edition, Marquis Who's Who, America.
- Pictorial Testimonial of Achievement and Distinction of Outstanding Intellectuals of the 21st Century-2011 Award. Given by IBC, Cambridge, London on 3 March 2011.
- Excellence in Economic Development Award 2011 by Economic Development Forum on 31 March 2011.

Dr Rajni Jain, Senior Scientist

- Invited lead Speaker, 2nd National Conference on Applications and Trends in Data Warehousing, Data Mining and Data Modelling organised by Computer Society of India, Thapar University, Patiala, 24 September 2010.
- Best Paper Award during the years 2008-2009 in the field of computer applications/ informatics by the Journal of Indian Society of Agricultural Statistics, 3 December, 2010.
- Invited Speaker, Technical Session on Dimensionality Reduction, 64th Annual Conference of Indian Society of Agricultural Statistics, BCKV, Kalyani, 3 December 2010.
- Invited Speaker for Technical Session on Research Priorities for ICT in Agriculture. 16th National Conference of Agricultural Research Statisticians, IASRI, New Delhi, 23-24 December 2010.

Dr Harbir Singh, Senior Scientist

- Rapporteur for the session on 'Crop-Specific Value Chains' in the 18th Annual Conference of the Agricultural Economics Research Association held at NAARM, Hyderabad, 18-20 November 2010.
- Rapporteur for the Annual Review Meeting of the project VDSA (Village Dynamics in South Asia), ICRISAT, Patancheru (AP), 22 November 2010.

Dr A Suresh, Senior Scientist

- Rapporteur, National Seminar on 'Methodological Issues in Assessing Impact of Watershed Programmes' organised jointly by the National Centre for Agricultural Economics and Policy Research (NCAP), New Delhi, and the National Rainfed Area Authority (NRAA), New Delhi, 6 August 2010.

Dr Ganesh Kumar, Senior Scientist

- ICAR Award 2009 for Outstanding Interdisciplinary Team Research for the biennium 2007-2008 in Social Sciences.

  (Team Leader: B Ganesh Kumar (NCAP-New Delhi); Associates: K K Datta (NDRI-Karnal), P K Katiha (CIFRI-Barrackpore), T Ravisankar (CIBA-Chennai), N K Barik (CIFA-Bhubaneswar), P S Ananthan (CIFE-Mumbai), R Suresh (FCRI-Thoothukudi) and G Vidya Sagar Reddy (CFSc-Nellore)

VI. PUBLICATIONS

(a) Policy Brief

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(b) Policy Paper

Chand, Ramesh, Praduman Kumar and Sant Kumar. 2011. *Total Factor Prdoductivity and Contribution of Research Investment to Agricultural Growth in India.* NCAP Policy Paper No. 25.

(c) Book Edited

Kumar, Anjani. 2010. *State of Indian Agriculture: The Indo-Gangetic Plain*. National Academy of Agricultural Sciences, New Delhi.

(d) Research Papers

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(e) Book Chapters/Popular Articles

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(f) Research Reports/ Working Papers

Kumar, Sant. 2010. National Agricultural Research System Management in India, Submitted to SAARC Agriculture Centre (SAC), Dhaka, Bangladesh.

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(g) TV Talks

Ramesh Chand. 2010. Discussion on "Inflation" on Lok Sabha TV in their programme 'Insight' at 6:00 PM on 15 December.

(h) Presentations in Conferences/Workshops/Symposia

Arora, Alka, Rajni Jain and Shuchita Upadhyaya. 2010. Reduct-driven approach for mining multiple patterns from clusters. In: *64th Annual Conference of Indian Society of Agricultural Statistics,* BCKV, Kalyani, 3-5 December.

Ganesh Kumar, B, K K Datta and G Vidyasagar Reddy. 2010. Supply chain system of Indian major carps in India: A case study of Kolleru Lake Area. *National Conference of Managing Agri-Food Supply Chain* held at Centre for Food & Agribusiness Management, Indian Institute of Management, Lucknow during 9-11 April.

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Suresh, A. 2010. Invited paper on participatory pasture management, In: *National Seminar on Issues in Land Resource Management*: *Land Degradation, Climate Changes and Land Use Diversification*. Indian Society of Soil Survey and Land Use Planning, Nagpur, 8-10 October.

VII. ON-GOING RESEARCH PROJECTS

Sl. No.	Title of Research Projects	PI / Co-PI
Technology Policy		
1.	Spatial and temporal changes in productivity and economics in crop sector	Sant Kumar
2.	Indian poultry sector in transition: Role of technology and institutions	B Ganesh Kumar
3.	Assessing implications of IPM technology on farm woman	Usha Ahuja B Ganesh Kumar
4.	Impact of secondary and micornutrients on selected crops in Andhra Pradesh and Karnataka	Diana S
Sustainable Agricultural Systems		
5.	Fertiliser application, uptake and imbalance	Diana S
Markets and Trade		
6.	Estimating marketing efficiency of horticultural commodities under different supply chains in India	M B Dastagiri B Ganesh Kumar
Institutional Change		
7.	Nature and extent of agricultural indebtedness in different states of India using data mining techniques	Rajni jain S S Raju P A Lakshmi Prasanna
8.	Smallholders in Indian agriculture: Past, present and future	P A Lakshmi Prasanna Rajni jain Shiv Kumar
Agricultural Growth and Modelling		
9.	Future sources of growth in agriculture in North-East India with reference to agricultural diversification in favour of high-value crops and livestock	B C Barah
National Agricultural Innovation Projects (NAIP)		
10.	Visioning, policy analysis and gender (V-PAGe)	P Ramasundaram Sant Kumar B Ganesh Kumar P A Laxmi Prasanna A Suresh Josily Samuel

11.	Developing decision support system for agricultural commodity market outlook	Anjani Kumar Rajni Jain Shiv Kumar P Shinoj
12.	Risk assessment and insurance products for agriculture	B C Barah S S Raju Rajni Jain Diana S
13.	Achieving improved livelihood security through resource conservation and diversified farming systems in Mewat	Usha Ahuja
Other Projects		
14.	Tracking change in rural poverty in household and village economies in South Asia (ICRISAT-funded)	Anjani Kumar Usha Ahuja Harbir Singh Rajni Jain
15.	Intellectual property management and transfer/ commercialisation of agricultural technology under ICAR headquarters scheme on management and information Services	Harbir Singh
16.	Economic impact of FMD and its control in the dairy and meat value chains of selected high potential regions of India: A pilot study (ICAR-funded)	B Ganesh Kumar
17.	Assessment of literacy, income and health status of fishers in India (CMFRI Network Project)	B Ganesh Kumar
18.	Machine learning approach for data mining in agricultural datasets (IASRI Project)	Rajni Jain
19.	Strengthening value chain for economic efficiency: The case of small ruminant meat marketing in India (ICAR-funded)	A Suresh

VIII. CONSULTANCY PROJECTS

Name of Scientist	Institution to which consultancy was provided	Area of consultancy/ contract research
S S Raju and P Shinoj*	IFPRI, Washington D C	Implications of Biofuels on Food Security, Social Welfare and Environment in India
Sant Kumar	SAARC Agriculture Centre (SAC), Dhaka, Bangladesh	National Agricultural Research System of India – An Analysis of System Diversity
Sant Kumar and P Shinoj	SAARC Agriculture Centre (SAC), Dhaka, Bangladesh	Public Support in Production and Marketing System in Agriculture of SAARC Countries

**Contract research*

IX. RESEARCH ADVISORY COMMITTEE (RAC)

The Research Advisory Committee (RAC) of the National Centre for Agricultural Economics and Policy Research (NCAP) was constituted for a period of three years w.e.f. 30 September 2010. The composition of RAC is as follows:

Dr V S Vyas Professor Emeritus Institute of Development Studies 396, Vasundhara Extension Gopal Pura Bye Pass, Tonk Road Jaipur – 302 018	Dr J V Meenakshi Professor Delhi School of Economics University of Delhi Delhi - 110 007
Dr Ramesh Chand Director NCAP Pusa, New Delhi – 110 012	Dr R K Mittal ADG (EQR), ICAR, Education Division KAB II, Pusa New Delhi - 110 012
Dr Mruthyunjaya Former NAIP Director Vasundhra Apartment Sector - 6, Plot No.- 16 Dwarka, New Delhi -110 045	Dr R K Bishnoi Director Directorate of Economics & Statistics Government of Haryana 30 - BES Building, Sector - 17 Chandigarh
Dr (Ms) Amita Shah Director Gujarat Institute of Development Research (GIDR), Gota, Ahmedabad - 380 060	Dr P Ramasundaram Principal Scientist NCAP, Pusa, New Delhi - 110 012
Dr V P S Arora Vice Chancellor Kumaon University Sleepy Hallow, Mallital Nainital - 263 001 Uttarakhand	

X. MANAGEMENT AND OTHER COMMITTEES

Management Committee (MC)

Dr Ramesh Chand Chairman & Director NCAP, Pusa New Delhi - 110 012	Dr B C Barah Principal Scientist NCAP, Pusa New Delhi - 110 012
Dr V P S Arora Vice Chancellor Kumaon University Sleepy Hallow, Mallital Nainital - 263 001 Uttarakhand	Dr D B S Sehera Principal Scientist ICAR Krishi Bhawan New Delhi – 110 114
Dr S L Goswami Joint Director (Research) National Dairy Research Institute (NDRI), Karnal - 132 001 Haryana	Sh R K Bishnoi Director Directorate of Economics & Statistics Government of Haryana 30 - BES Building, Sector-17 Chandigarh
Dr P K Aggarwal ICAR National Professor Division of Environmental Sciences Indian Agricultural Research Institure (IARI) Pusa, New Delhi - 110 012	Sh R P Chamola Finance & Accounts Officer National Bureau of Plant Genetic Resources (NBPGR) Pusa Campus, New Delhi - 110 012
Dr Suresh Pal Head Division of Agricultural Economics Indian Agricultural Research Institute (IARI) Pusa, New Delhi - 110 012	Shri Vinod Kumar Assistant Administrative Officer NCAP, Pusa New Delhi - 110 012

Meeting of the Management Committee

The meeting was held on 5 July 2010 at NCAP. The Director assured IMC that all efforts are being made to implement the suggestions made by the IMC like filling up of vacant positions and network projects with other institutes. IMC suggested to advise CPWD to use the funds deposited with it by NCAP to construct a boundary wall at the site for NCAP staff quarters. The IMC was informed about caretakers' room and adjoining room, shown as Guest room by CPWD, on the Southern corner of ground floor of NCAP building. It was proposed to make proper use of these

two rooms for meeting the requirement of official visitors to NCAP. The Committee members agreed with the proposal and recommended to make proper use of this facility by renovating these two rooms as a suite with provision for partition into two separate rooms. The proposed expenditure of Rs. 5 lakh was approved by the Committee for this purpose.

Meetings of the Institute Research Council (IRC)

Institute Research Council (IRC) of NCAP is composed of Director, NCAP and scientific staff of the Centre. Director, NCAP is the Chairman of IRC. During 2010-11, five meetings of IRC were held. A total of 17 presentations were made in all the IRCs, comprising 5 on research activities, 9 on deputation to foreign visits and 3 on other issues. During the IRC meetings, progress of the on-going projects of the institute as well as proposals of the new projects were discussed. Presentations were also made by those scientists who visited foreign countries on deputations about their learnings and experiences during their visit. Presentations on analysis of web log statistics and Internet every quarter by the scientist incharge, ARIS Cell of the Centre.

Other Committees

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

Academic Planning and Policy Committee

- Discuss theme area membership
- Strengthen internal planning, and functioning and provide policy directions
- Suggest steps for strengthening NCAP

Budget Committee

- Plan, review and monitor expenditure and resource generation including those for sponsored projects
- Ensure compliance of proper procedures

Office Management Committee

- Monitor and improve the functioning of office
- Introduce new office management tools and techniques as per ICAR guidelines

Purchase Committee

- Purchase material and services according to the prescribed official procedure and in accordance with the Budget committee guidelines/directions on utilization of funds. The Committee will undertake stock verification as per ICAR requirement on priority basis

Publication Committee

- Plan, format and make recommendations regarding Centre's publications
- Prepare guidelines for and arrange internal and external reviews and coordinate revisions
- Help and advice younger faculty on publication related matters

Annual Report

- Collect material form scientists/office for including in Annual Report 2010-11
- Edit the report and initiate process for publication

Maintenance and Landscape Committee

- Monitor maintenance of the office building and the landscape; and take suitable action for improving/rectifying problems
- Suggest innovative ideas for improving the office, utilities and landscape

Security

- Develop effective security system for the centre
- Identify efficient and effective security firm
- Monitor the security staff regularly

Consultancy Processing Cell

- Examine the proposals related to consultancy with reference to guidelines of the Council issued from time to time and recommend appropriate action

Technical Cell

- Maintain and update RPF of all the scientists and projects
- Prepare quarterly and half yearly reports of the Centre for Council

Women Cell

- Recommend measures for the welfare of the women employees; and redress grievances including those related to sexual harassment if any.

Grievance Cell

- Examine the grievance received and suggest follow-up action accordingly

Official Language Committee

- Monitor the progress of work done in official language from time to time and suggest relevant programs for improvement

- Organize Raj Bhasha week/day as intimated by the Council from time to time
- Report to the council and other agencies on progress from time to time
- Propose ways of increasing use of Raj Bhasha in the Centre

PME Cell

- Plan, promote and monitor PME activities of the center
- Report the progress of the PME activities

ARIS Cell

- Plan and monitor ARIS related activities
- Prepare computer and software up-gradation plan for the centre
- Plan for effective virus control system
- Propose effective maintenance plan for the Centre's computers
- Monitor, improve and update Centre's website

Library Committee

- Plan for procuring books, journals and other publications
- Improve library environment so as to make its effective use
- Plan for library modernization
- Share Centre's publications with partner and stakeholders

Transport Committee

- Develop an effective system of meeting the vehicle requirement for official activities
- Arrange vehicle for research and official activities
- Guide/suggest maintenance of official vehicle

IPR and Technology Commercialization Committee

- Take up issues related to IPR of products developed for commercialization
- Develop conditions for commercialization of products
- Suggest ways for resource generation

Staff Recreation Committee

- Plan indoor and outdoor recreational activities for the staff of the Centre
- Organize recreational activities for the centre's staff

SEMINAR/IRC

- Organize IRC/seminars
- Ensure projections and other logistics in the venue of the seminars and IRCs

Office Services Committee

- Look after office cleanliness and hygiene
- Communication and delivery of internal and external papers, mail.
- Ensure satisfactory office services.

XI. PARTICIPATION IN SCIENTIFIC ACTIVITIES

Name of Scientist	Topic and date(s)	Place
Ramesh Chand	Indian Agriculture: Four Decades of Development- served as a panelist on the theme, Contemporary Conditions in Indian Agriculture: Spatial Dimensions 8 April 2010	JNU, New Delhi
	Brainstorming session to contribute in building the document which will set the road map for ICAR for next 20 years 12 April 2010	NAARM, Hyderabad
	International Conference on Dynamics of Rural Transformation in Emerging Economies 14-16 April 2010	NAAS, New Delhi
	Regional Workshop on Understanding the Agricultural Transition in Asia 23 April 2010	FAO, Bangkok, Thailand
	Member of Delegation in South Asia Delegation to ICARDA 17- 21 May 2010	ICARDA, Syria
	One-Day Workshop on Preparation of Policy Briefs and Action Plan for the Implementation of Pro-Poor Policies 25 May 2010	ISEC, Bangalore
	Parliamentary Standing Committee Meeting on Agriculture on "Minimising Post-harvest Crop Losses of Ministry of Agriculture (Department of Agriculture Research and Education) 10 June 2010	Parliament House Annexe, New Delhi
	Food Security Issues in Inaugural Function of Refresher Training Programme for AGMs/DGMs 21 June 2010	FCI-IFS, Gurgaon
	Workshop on Pro-Poor Policy related studies in the session, Policy Analysis for Increasing Rural Non–Farm Employment for Farm Household in India 14 July 2010	New Delhi

	National Conference on Livelihood Security of Smallholder Farmers 19 August 2010	NASC, New Delhi
	Workshop on Policies for Ensuring Food Security in South and Southeast Asia organised by IFPRI and ADB 26-27 August 2010	NASC, New Delhi
	6th Meeting of Technical Committee on Agriculture and Rural Development (TCARD) of SAARC Countries 9–13 October 2010	Dhaka
	4th Meeting of the Governing Board of SAARC Agriculture Centre 24-25 October 2010	Dhaka
	National Consultation on Future Approaches in Agricultural Extension for the session on Massive Scientists – Farmer Linkage 1 November 2010	ICAR, New Delhi
	Final Workshop of the SAARC Initiatives on Regional Food Security 14-15 November 2010	Kathmandu, Nepal
	Technical Session on Value Chains in Fruits and Vegetables in 18th Annual conference of AERA 18-19 November 2010	Hyderabad
	Meeting of the Consultative Committee of the Ministry of Agriculture and Consumer Affairs, Food & Public Distribution 2 December 2010	Parliament House, New Delhi
	National Consultation on Role of NAARM in Changing R&D Perspective 5 – 6 January 2011	NAARM, Hyderabad
	Pre-Budget consultations with different stakeholders groups in connection with the forthcoming Union Budget 2011-12 with The Honourable Finance Minister 7 January 2011	Ministry of Finance, New Delhi

	21st Meeting of the ICAR Regional Committee including a session on Krishi Vigyan Kendras of the region under the Chairmanship of Secretary, DARE and Director General, ICAR 10 January 2011	CSSRI, Karnal
	Presented paper on Agriculture Sector in WTO Negotiations in Panel discussion on Trade and Investment in India–EU relations in Conference on India and European Union: Economic Relations organised by the Institute of Economic Growth at Delhi and Centre for Contemporary India Research and Studies 14 January 2011	Institute of International Relations, University of Warsaw
	Food Security Partners Meeting organised by USAID India 25 January 2011	New Delhi
	International Conference on Preparing Agriculture for Climate Change 2011 6–8 February 2011	PAU, Ludhiana
	IFPRI Conference on Leveraging Agriculture for Improving Nutrition and Health 10-12 February 2011	New Delhi
	Meeting of the Project on Bio-Fuel 14-18 March 2011	IFPRI, Washington, USA
P Ramasundaram	GM Food - Safety & Utility 24 July 2010	India International Centre, New Delhi
	Methodological Issues in Assessing Watershed Programmes organised by National Rainfed Authority and NCAP 5-6 August 2010	NASC, New Delhi
	Role of Centre-State Systems & Public-Private Interface on Agricultural R&D, Extension and Marketing organized by NCAP-YES BANK 24 August 2010	NCAP, New Delhi
	Dr Dharm Narain Memorial Lecture on Does Economic Theory Conform Policy by Dr Kaushik Basu, Chief Economic Advisor, GoI	India International Centre, New Delhi

	Indian consultative meeting on SAARC Initiatives for Regional Food Security 16-17 September 2010	NCAP, New Delhi
	ASRB Foundation Day Lecture on An Indian Inclusive Innovation Initiative:Vision and Strategy 3 November 2010	NASC, New Delhi
	SAARC Committee meeting to Review and Discuss Role of India in Agriculture and Rural Development Activities in SAARC Countries 12 November 2010	NCAP, New Delhi
	Attended the 18th Annual Conference of Agricultural Economics Research Association 18-20 November 2010	NAARM, Hyderabad
	Network of Agricultural Economists Meet organised by NCAP and NAARM under NAIP – VPAGe 19-20 November 2010	NAARM, Hyderabad
	Brain Storming Workshop on Prospects of Nanotechnology in Agri-value Chain 22 November 2010	NAARM, Hyderabad
	Indian Agriculture: Improving Competition & Markets- Efficiency of Supply Chains, Sponsored by Australian Centre for International Agricultural Research 16 February 2011	Calridges Hotel, New Delhi
	Meeting of Sub-Group III of Prof Y K Alagh Committee on Statistics of Agriculture and Allied Sector 18 February 2011	IASRI, New Delhi
	Discussion on Union Budget 2011-12 1 March 2011	NCAP, New Delhi
	Meeting of Parliamentary Consultative Committee attached to Ministry of Agriculture 17 March 2011	Krishi Bhavan, New Delhi
Usha Ahuja	Annual Review meeting of Tracking Change in Rural Poverty in Household and Village Economies in South Asia 22 November 2010	ICRISAT, Hyderabad

	Review meeting of NAIP Project on Achieving Improved Livelihood Security through Resource Conservation and Diversified Farming System Approach in Mewat 20 December 2010	IARI, New Delhi
	Review meeting of the Project Estimating Marketing Efficiency of Horticultural Commodities under Different Supply Chains in India 27 January 2011	NCAP, New Delhi
	VPAGe on Visioning of Dairy Sector 1 February 2011	NCAP, New Delhi
	CIC meeting of NAIP project on Achieving Improved Livelihood Security through Resource Conservation and Diversified Farming System Approach in Mewat 4 February 2011	Mewat Development Agency, Nuh, Mewat
	Workshop on Understanding Resource Use Dynamics, Creating Resource Use Consciousness and Participatory Decision Making for Alternative Interventions on Sustainable Resource Use/ Livelihood Opportunities 16 March 2011	Sohna, Mewat
S S Raju	NAAS Foundation Day Lecture on Space-An innovative Tool for Agriculture 5 June 2010	NASC, New Delhi
	Decision Support Tools for Agriculture Risk Management 2-5 August 2010	NCAP, New Delhi
	International Workshop on Climate Change: Extreme Events, Adaptation Practices and Technological Solutions 16-17 August 2010	NASC, New Delhi
	National workshop on Role of Centre-State Systems and Public-Private Interface in Agricultural R & D, Extension and Marketing 24 August 2010	NCAP, New Delhi
	Indian Consultative Meeting on SAARC Initiatives for Regional Food Security 16-17 September 2010	NCAP, New Delhi

	Information Technology and the 21st Century Food and Agricultural System 5 October 2010	NASC, New Delhi
	ASRB Foundation Lecture on An Indian Inclusive Innovation Initiative:Vision and Strategy 3 November 2010	NASC, New Delhi
	Policy Forum on Experiences and Policy Lessons from the Asia-Pacific Region in Dealing with the Global Food and Financial Crises 18-19 November 2010	ATPC, Beijing
	70th Annual Conference of Indian Society of Agricultural Economics 29 November - 1 December 2010	Jammu University, Jammu
	9th CIC meeting of the NAIP Project on Risk Assessment and Insurance Products for Agriculture (Component IV) 21 December 2010	NCAP, New Delhi
	Modelling Workshop III on Biofuels and Food Security 14-18 March 2011	IFPRI, Washington D C
	10th CIC meeting of the NAIP Project on Risk Assessment and Insurance Products for Agriculture (Component IV) 29 March 2010	NCAP, New Delhi
	6th CAC meeting of the NAIP Project on Risk Assessment and Insurance Products for Agriculture (Component IV) 30 March 2010	NCAP, New Delhi
Anjani Kumar	International Conference on Dynamics of Rural Transformation in Emerging Economies 14-16 April 2010	New Delhi
	Conference on Poverty in Bihar:Pattern,Dimensions and Eradication Strategies 18-20 April 2010	Institute of Human Development, Patna
	NAAS-NAARM-IFPRI Workshop on Livelihood Opportunities for Smallholders: Challenges and Prospects 7-8 September 2010	NAARM, Hyderabad

	Indian Consultative Meeting on SAARC Initiative for Regional Security 16-17 September 2010	NCAP, New Delhi
	18th Annual Conference of Agricultural Economics and Research Association 18-19 November 2010	NAARM, Hyderabad
	70th Annual Conference of Indian Society of Agricultural Economics 29 November-1 December 2010	Jammu University, Jammu
	Project Advisory Committee Meeting on Tracking Rural Poverty in Household and Village Economies in South Asia 11 January 2011	NCAP, New Delhi
	International Conference on Managing Sustainable Development of Rural Economy and Agri Business 21-23 January 2011	BHU, Banaras
	PMAC Review Meeting on Developing a Decision Support System for Agricultural Commodity Market Outlook 29 January 2011	NCAP, New Delhi
	National Workshop on Rainfed Agriculture in India 14-15 March 2011	ISEC, Bangalore
M B Dastagiri	Indian Consultative Meeting on SAARC Initiative for Regional Security 16-17 September 2010	NCAP, New Delhi
	3rd Agriculture Summit and Leadership Awards 2010 29-30 September 2010	NASC , New Delhi
	ASRB Foundation lecture on An Indian inclusive Innovation Initiative :Vision and Strategy 3 November 2010	NASC, New Delhi
	Indian Agriculture: Improving Competition, Markets and the Efficiency of Supply Chains 16 February 2011	Hotel Claridges, New Delhi
Rajni Jain	3rd Dayanatha Jha Memorial Lecture 1 May 2010	NCAP, New Delhi

	Hindi Meeting 19 June 2010	Ashoka Hotel, New Delhi
	National Workshop on Role of Centre State Systems and Public Private Interface in Agricultural R&D, Extension and Marketing 28 August 2010	NCAP, New Delhi
	National Conference on ICT: An Engine for Inclusive Social Growth 28 August 2010	Constitution Club, New Delhi
	Interactive Meet on Information and Communication Technology in ICAR 3-4 November 2010	NASC, New Delhi
	Annual Review Meeting of Village Dynamics in South Asia (VDSA) Project 22 November 2010	ICRISAT, Patancheru
	64th Annual Conference of Indian Society of Agricultural Statistics 3-5 December 2010	BCKVV, Kalyani
	9th CIC meeting of the NAIP Project on Risk Assessment and Insurance Products for Agriculture (Component-IV) 21 December 2010	NCAP, New Delhi
	16th National conference of Agricultural Research Statisticians 23-24 December 2010	IASRI, New Delhi
	Project Advisory Committee Meeting of BMGF-sponsored project on Tracking Change in Rural Poverty in Household and Village Economies in Eastern India 11 January 2011	NCAP, New Delhi
	International Conference on Managing Sustainable Development of Rural Economy and Agri-business, ICONBHU 21-23 January 2011	BHU, Banaras
	PMAC Review Meeting on Developing a Decision Support System for Agricultural Commodity Market Outlook Project, NAIP 29 January 2011	NCAP, New Delhi

	Visioning of Dairy Sector under V-PAGe Project, NAIP 1 February 2011	NCAP, New Delhi
	Hindi Workshop on Rajbhasha Niyam 16 March 2011	NCAP, New Delhi
Sant Kumar	NAAS Foundation Day Lecture on Space: An Innovative Tool for Agriculture 5 June 2010	NASC, New Delhi
	National Workshop on Methodological Issues in Assessing Impact of Watershed Programmes 6 August 2010	NASC, New Delhi
	National Workshop on Quantitative Modelling Approaches for Economic Policy Analysis in Agriculture 12-13August 2010	NCAP, New Delhi
	National Workshop on Centre-State Systems and Public-Private Interface in Agricultural R&D, Extension and Marketing 24 August 2010	NCAP, New Delhi
	Indian Consultative Meeting on SAARC Initiative for Regional Food Security 17-18 September 2010	NCAP, New Delhi
	Information Technology and 21st Century Food and Agriculture System 5 October 2010	NASC, New Delhi
	Golden Jubilee Seminar on Agriculture and Environment for Inclusive Growth 14-15 December 2010	IARI, New Delhi
	Brainstorming Workshop on Impact Assessment of IARI Technologies 13 January 2011	IARI, New Delhi
	PMAC Review Meeting on V-PAGe 29 January 2011	NCAP, New Delhi
	41st LBS Memorial Lecture on Indian Agriculture in Perspectives: Tribute to Son and Soil 3 February 2011	IARI, New Delhi

Harbir Singh	Workshop on Quantitative Modelling Approaches for Economic Policy Analysis in Agriculture 12-13 August 2010	NCAP, New Delhi
	National Workshop on Role of Centre-State Systems and Public-Private Interface in Agricultural R&D, Extension and Marketing 24 August 2010	NCAP, New Delhi
	Indian Consultative Meeting on SAARC Initiative for Regional Food Security 17-18 September 2010	NCAP, New Delhi
	18th Annual Conference of Agricultural Economics Research Association 18-20 November 2010	NAARM, Hyderabad
	Annual Review Meeting of the project VDSA (Village Dynamics in South Asia) 22 November 2010	ICRISAT, Patancheru
	70th Annual Conference of the Indian Society of Agricultural Economics 29 November-1 December, 2010	University of Jammu, Jammu
	ICAR Zonal Technology Management and Business Planning and Development (Meeting-cum Workshop) North zone I 17-18 March 2011	IARI, New Delhi
Ganesh Kumar	National Conference of Managing Agri-Food Supply Chain held at Centre for Food & Agribusiness Management 9-11 April 2010	IIM, Lucknow
	National workshop on Methodological Issues in Assessing Watershed Programmes 6 August 2010	NASC, New Delhi
	Workshop on Quantitative Modelling Approaches for Economic Policy Analysis in Agriculture 12-13 August 2010	NCAP, New Delhi
	National workshop on Role of Centre-State Systems and Public-Private Interface in Agricultural R&D, Extension and Marketing 24 August 2010	NCAP, New Delhi

	NAAS-NAARM-IFPRI Workshop on Livelihood Opportunities for Smallholders: Challenges and Opportunities 7-8 September 2010	NAARM, Hyderabad
	Indian Consultative Meeting on SAARC Initiative for Regional Food Security 16-17 September 2010	NCAP, New Delhi
	18th Annual Conference of Agricultural Economics Research Association 18-20 November 2010	NAARM, Hyderabad
	Workshop on Results - Framework Document for responsibility centres organised by Performance Management Division, Cabinet Secretariat, Govt. of India 22 February 2011	Vigyan Bhawan, New Delhi
Suresh A	National Seminar on Methodological Issues in Assessing Impact of Watershed Programmes 6 August 2010	NASC, New Delhi
	National Seminar on Issues in Land Resource Management: Land Degradation, Climate Changes and Land Use Diversification 8-10 October 2010	Indian Society of Soil Survey and Land Use Planning, Nagpur
	Workshop on Vulnerability Assessment- Sharing Experiences 3 March 2011	CRIDA, Hyderabad
P Shinoj	Conference on Applied Commodity Price Analysis, Forecasting and Market Risk Management 19-20 April 2010	Hotel Crown Plaza, St. Louis, New York, USA
	Seminar on a Randomised Experiment with Maize Seed Vouchers in Kenya by Hugo de Groote 30 April 2010	Warren Hall, Department of AEM, Cornell university, Ithaca, New York
	Seminar on Crop Biotechnology: The Great Indian Event 5 May 2010	Cornell university, Ithaca, New York
	International workshop on Indian agriculture: Improving Competition, Markets and Efficiency of Supply Chains 16 February 2011	Hotel Claridges, New Delhi

Diana S	5th CAC meeting of the NAIP project on Risk Assessment and Insurance Products for Agriculture (Component IV) 6 August 2010	NCAP, New Delhi
	Workshop on Quantitative Modelling for Economic Policy Analysis in Agriculture 12-13 August 2010	NCAP, New Delhi
	Workshop on Centre-State Systems and Public-Private Interface in Agricultural R&D, Extension and Marketing 24 August 2010	NCAP, New Delhi
	Indian Consultative Meeting on SAARC Initiative for Regional Food Security 17-18 September 2010	NCAP, New Delhi
	9th CIC meeting of the NAIP Project on Risk Assessment and Insurance Products for Agriculture (Component IV) 21 December 2010	NCAP, New Delhi
	10th CIC meeting of the NAIP Project on Risk Assessment and Insurance Products for Agriculture (Component IV) 29 March 2011	NCAP, New Delhi
	6th CAC meeting of the NAIP Project on Risk Assessment and Insurance Products for Agriculture (Component IV) 30 March 2011	NCAP, New Delhi
Josily Samuel	National Workshop on Methodolocial Issues in Assessing Watershed Programmes 6 August 2010	NASC, New Delhi
	Workshop on Quantitative Modelling for Economic Policy Analysis in Agriculture 12-13 August 2010	NCAP, New Delhi
	Workshop on Centre-State Systems and Public-Private Interface in Agricultural R&D, Extension and Marketing 24 August 2010	NCAP, New Delhi
	Indian Consultative Meeting on SAARC Initiative for Regional Food Security 17-18 September 2010	NCAP, New Delhi

XII. VISITS ABROAD

Name of Scientist	Purpose	Place	Duration
Ramesh Chand	Regional workshop on Understanding the Agricultural Transition in Asia and present a country paper on Understanding the Next Agricultural Transition in the Heartland of Green Revolution in India at AITCC, Asian Institute of Technology.	Bangkok, Thailand	23 April 2010
	Member of South Asia Delegation to ICARDA	ICARDA, Syria	17-21 May 2010
	Conducting FAO RAP training on Food and Agricultural Policy Analysis, Capacity Strengthening	Siem Reap, Cambodia	30 August-5 September 2010
	Attending the 6th meeting of Technical Committee on Agriculture and Rural Development (TCARD) of SAARC	Dhaka	9-13 October 2010
	Participated in 4th Meeting of the Governing Board of SAARC Agriculture Centre	Dhaka	24-25 October 2010
	Chaired the Technical Session in the final workshop of the SAARC Initiatives on Regional Food Security	Kathmandu, Nepal	14-15 November 2010
	Regional Consultation and High-Level Roundtable on Pro-poor Policy and Emerging Issues	Bangkok, Thailand	30 November-1 December 2010
	Modelling Workshop III on Biofuels and Food Security	IFPRI, Washington D C	14-18 March 2011
	Second Meeting of the G20 Agricultural Deputies	Paris	22-25 March 2011

S S Raju	Policy Forum on Experiences and Policy Lessons from the Asia-Pacific Region in Dealing with the Global Food and Financial Crises	Beijing, China	18-19 November 2010
	Modelling Workshop III on Biofuels and Food Security	IFPRI, Washington D C	14-18 March 2011
Sant Kumar	Consultation Meeting on National Agriculture Research System (NARS) in SAARC Countries – An Analysis of the System Diversity	Dhaka, Bangladesh	22-23 December 2010
Shiv Kumar	Training in Outlook Modelling	Iowa State University, Arnes, FAPRI	6 October 2010-19 November 2010
P Shinoj	Training in Outlook Modelling	Iowa State University, Arnes FAPRI	6 October 2010-19 November 2010
	Modelling Workshop III on Biofuels and Food Security	IFPRI, Washington D C	14-18 March 2011

XIII. POLICY ADVOCACY ACTIVITIES

National Workshop on Methodological Issues in Assessing Impact of Watershed Programmes

National Centre for Agricultural Economics and Policy Research (NCAP) and National Rainfed Area Authority (NRAA) jointly organised a National Workshop on *Methodological Issues in Assessing Impact of Watershed Programmes* on 6 August 2010 at the National Agricultural Science Centre Complex, New Delhi. The specific objectives of the workshop were to: (i) document methodological issues in watershed impact assessment, (ii) finalise indicators, tools, techniques and approaches which may be useful for measuring overall watershed impact at micro, meso (district) and macro levels, and (iii) finalise a suitable methodological framework for monitoring and impact study of watershed programmes. The workshop was attended by about 100 delegates from various parts of India. The delegates represented agricultural professionals, policymakers of both central and state governments, research managers and representatives of NGOs.

The workshop was organised in three technical sessions. These were: (i) methodological issues in assessing impact of watershed programs, (ii) common indicators and framework to evaluate impact of watershed programmes, and (iii) concluding session devoted to building consensus on appropriate common minimum indicators and framing of guidelines for collating information for impact of watershed programmes.

Recommendations

The followings major recommendations were made in the workshop:

- The common minimum indicators should be selected under four sets of broad parameters, viz., biophysical, socioeconomic, institutional and environmental to develop indices. Some specific indicators may be used for evaluation of model watersheds.
- A comprehensive impact assessment model may be developed by incorporating essential indicators, and the weightage criteria for synthesising each component into an aggregated index. At least one model benchmark watershed should be undertaken in each district.
- The model watershed should be linked to some research institution or other such support organisation for a regular monitoring of data, their analysis and assessment.
- An Integrated Watershed Development Programme should be evaluated in three phases, viz., preparatory phase, watershed phase and protocol phase by the subject matter experts, for which a cadre of evaluators may be built, following objective and quality criteria.
- Guidelines may be provided for monitoring, weather hydrologic, sediment and other important parameters/ indicators for model watersheds.

- Manpower requirement for scientific monitoring and evaluation (M&E) of watershed should be addressed suitably. A post graduate diploma in watershed evaluation and monitoring may be started by the established institutions. For the budgetary support for this programme, Department of Land Resources, Ministry of Rural Development, Government of India, could be approached.
- Monitoring and evaluation mechanisms may be built, preferably by an outside agency. The existing budgetary support for M&E is inadequate and needs to be addressed promptly and properly.

Training Programme on Data Entry and Data Management using CSPro Software
14-16 December 2010

The Census and Survey Processing System (CSPro) is a freeware software package for entering, editing, tabulating, and disseminating data collected from censuses and surveys. CSPro combines the features of the Integrated Microcomputer Processing System (IMPS) and the Integrated System for Survey Analysis (ISSA). Development of the software was funded by the US Agency for International Development. The software is useful for individuals and institutions that collect, analyse, and publish census and survey data. CSPro and mainly comprises of three major modules (i) data entry applications (ii) batch edit applications and (iii) cross tabulation applications. There are different levels of training in CSPro namely (i) conceptual level training for data management (ii) user level training for development of CSPro application and (iii) data entry level training for data entry and data management. Data entry level training is for the persons who are responsible for digitisation of data. The focus of the 3-day long training programme was to develop capacity of data entry persons in digitisation of the data collected from the villages' households. The data collection in the project involves collecting data under 8 schedules and a village census schedule. For success of the project, it is necessary to have reliable and quality data. For improving the data collection quality, a project office has been set up at each village and a field investigator is posted at the village itself. For ensuring the quality of the data during digitalisation, CSPro was selected. Further to avoid data entry

based human errors, double entry system is employed. Each schedule is planned to be entered by two persons. Their data is compared and the discrepancies is removed by appropriate required interventions. Participants were asked to bring the actual data with them. The training had a total of 12 participants from collaborative centres as well as from NCAP. The three-day long data entry training programme organised under the BMGF-funded project on "Tracking Rural Poverty in South East Asia" covered all modules namely General Endowment Schedule, Transaction Module, Plot list module, Cultivation Module, Livestock Module, Employment Module and Monthly Price Module. Sufficient hands-on practice was provided using the actual data during the training.

Other Meetings Organised

5th CAC meeting of the NAIP project on Risk Assessment and Insurance products for Agriculture (Component IV) 6 August 2010	NCAP, New Delhi
Culmination workshop on Role of Centre-State System and Public-Private Interface in Agriculture Research and Development 24 August 2010	NCAP, New Delhi
Meetings of Dr S L Mehta Committee on Guidelines for Integration and Institutionalisation of PME cells in NARS meetings 30 August 2010, 29 September 2010, 5 and 10 October 2010	NCAP, New Delhi
Network of Agricultural Economists' Meet under NAIP - VPAGe 19-20 November 2010	NAARM, Hyderabad
9th CIC meeting of the NAIP Project on Risk Assessment and Insurance Products for Agriculture (Component IV) 21 December 2010	NCAP, New Delhi
PME Annual Workshop under VPAGe 28 January 2011	NCAP, New Delhi
National Training on Quantifying the Impact of Climate Change on Agriculture 21-25 March 2011	NCAP, New Delhi
10th CIC meeting of the NAIP Project on Risk Assessment and Insurance Products for Agriculture (Component IV) 29 March 2011	NCAP, New Delhi
6th CAC meeting of the NAIP Project on Risk Assessment and Insurance Products for Agriculture (Component IV) 30 March 2011	NCAP, New Delhi

XIV. LECTURES DELIVERED BY NCAP SCIENTISTS

Name of Scientist	Topic and Date	Venue
Ramesh Chand	Institutional & Technical Aspects of Indian Agriculture to the IES Probation Batch - XXXI, undergoing training 5 April 2010	IEG, New Delhi
	Factors affecting Food Security-Role of Price, Income, Stock and Trade 14 June 2010	IASRI, New Delhi
	National Congress on Emerging Trends in Agricultural Research 12 September 2010	PDFSR, Modipuram
	Challenges of Economic Liberalization for Agri-Entrepreneurs 10 November 2010	NDRI, Karnal
	Role of Agriculture in Economic Development 15 December 2010	FCI, Gurgaon
Usha Ahuja	Data Entry and Data Management using CSPro Software under Tracking Change in Rural Poverty in Household and Village Economies in Eastern India 16 December 2010	NCAP, New Delhi
Anjani Kumar	Livestock Sector: Plannning, Policy and Schemes Value Chain Analysis and Market Integration 30 December 2010	IIM, Lucknow
	WTO and Livestock Sector Trade : Challenges And Opportunities 19 February 2011	
Rajni Jain	Basics of Computer in Training of Field Investigators of ICAR-ICRISAT collaborative project 15 July 2010	NCAP, New Delhi
	Emerging Techniques of Data Mining in 2nd National Conference on Applications and Trends in Data Warehousing, Data Mining and Data Modelling organised by Computer Society of India 24 September 2010	Thapar University, Patiala

	Fuzzy Logic in Bioinformatics in sensitization training on Soft Computing Techniques in Animal Bioinformatics 10 November 2010	NBAGR, Karnal
	Dimensionality Reduction for Classification Using Rough Sets, 64th annual conference of Indian Society of Agricultural Statistics 3 December 2010	BCKVV, Kalyani
	Introduction to Data Mining Techniques, ICAR Winter School on Development of Expert Systems in Agriculture 13 December 2010	IASRI, New Delhi
	Rule Generation using Decision Trees, ICAR Winter School on Development of Expert Systems in Agriculture 13 December 2010	IASRI, New Delhi
	Classification using Decision Trees, ICAR Winter School on Data Mining Techniques for Farm Animal Management 20 December 2010	NDRI, Karnal
	Association Rule Mining, ICAR Winter School on Data Mining Techniques for Farm Animal Management 20 December 2010	NDRI, Karnal
	ICT and Research Priorities in NARS, XVI National Conference of Agricultural Research statisticians 23-24 December 2010	IASRI, New Delhi
	Framework for Database Development and Management, Project advisory committee meeting of BMGF-sponsored project on Tracking Change in Rural Poverty in Household and Village Economies in Eastern India 11 January 2011	NCAP, New Delhi
	Overview of Data Mining, Orientation Programme (OR - 65), Centre for Professional Development in Higher Education (CPDHE) 18 January 2011	University of Delhi, Delhi

	Online Data Repository System, PMAC Review Meeting of NAIP project on Developing a Decision Support system for Agricultural Commodity Market Outlook 29 January 2011	NCAP, New Delhi
	Nuts and Bolts of Data Mining Techniques in the Centre of Advanced Faculty Training 18 February 2011	IASRI, New Delhi
Harbir Singh	Intellectual Property Regime in Agriculture – An Overview and Intellectual Property Rights and Seed System Development in India in the training programme on Institutional Change for Inclusive Agricultural Growth 01 March 2011	IARI, New Delhi
P Shinoj	India's Agricultural Trade: Retrospect and Prospect 9 September 2010	NAARM, Hyderabad
	WTO and Indian Agriculture: Some perspectives for the participants of one day training programme on WTO in the context of agriculture for farmers and extension staff 23 March 2011	IARI, New Delhi
	7 Sessions on the module Globalisation and Indian Agriculture for MBA-value Management students 28 March-1 April 2011	KIIT, Bhubaneswar

XV. DISTINGUISHED VISITORS

Prof S S Acharya, Honorary Professor, Udaipur (Rajasthan).

Mr Will Martin, Research Manager, Agriculture and Rural Development Research Group, NW Washington, USA.

Mr Ganesh Thapa, Regional Economist and Country Programme Manager (DPRK) Asia and the Pacific Division Programme Management Department, International Fund for Agricultural Development, Italy.

Karl M Rich, Senior Research Fellow, Department for International Economics, Norwegian Institute of International Affairs, Oslo.

Dr Narpat Singh Jodha, Senior Associate Scientist, Sustainable Livelihoods, ICIMOD, Kathmandu Nepal.

Dr Guoying Dang, Professor, Rural Development Institute, Chinese Academy of Social Sciences, Beijing, China.

Mr Vinod Fonia, Secretary, Departments of Horticulture, Animal Husbandry, Dairy and Fisheries.

Gordon C McCord, Special Assistant to the Director, The Earth Institute at Columbia University, Columbia University in the City of New York.

Pablo Gottret, Lead Economist, Human Development, South Asia Region, Washington, USA.

Professor Dr Nobumasa Hatcho, Overseas Land Improvement Cooperation Offices of the Ministry of Agriculture, Forestry and Fisheries, JNCID, Department of Environment Management, School of Agriculture, Kinki University, Japan.

Prof Kenji Yoshinaga (Dr), Tokyo University, Regional Development Studies, Tokyo, Japan.

Siwa M Sangi, Senior Research Fellow, IFPRI, Washington D C.

XVI. PERSONNEL

Scientific

Name	Designation	Area of Specializations
Ramesh Chand	Director	Markets and Trade Agricultural Growth and Modelling
B C Barah	Principal Scientist (upto Nov 30, 2010)	Agricultural Growth and Modelling Sustainable Agricultural System
P Ramasundaram	Principal Scientist	Agricultural Growth and Modelling Markets and Trade
Pratap S Birthal	Principal Scientist (on deputation)	Institutional Change Sustainable Agricultural System
Usha Rani Ahuja	Principal Scientist	Technology Policy Institutional Change
S S Raju	Principal Scientist (from Nov 24, 2010)	Institutional Change Sustainable Agricultural System
Anjani Kumar	Principal Scientist (from Nov 24, 2010)	Technology Policy Markets and Trade
M B Dastagiri	Senior Scientist	Markets and Trade
P Adhiguru	Senior Scientist (on deputation)	Technology Policy Institutional Change
Rajni Jain	Senior Scientist	Institutional Change
Sant Kumar	Senior Scientist	Technology Policy Agricultural Growth and Modelling
Harbir Singh	Senior Scientist	Sustainable Agricultural System Institutional Change
B Ganesh Kumar	Senior Scientist	Markets and Trade Agricultural Growth and Modelling
Shiv Kumar	Senior Scientist	Institutional Change Agricultural Growth and Modelling

P A Lakshmi Prasanna	Senior Scientist	Institutional Change Sustainable Agricultural System
A Suresh Kurup	Senior Scientist	Sustainable Agricultural System
P Shinoj	Scientist	Agricultural Growth and Modelling Markets and Trade
Diana S	Scientist	Technology Policy Institutional Change
Josily Samuel	Scientist	Technology Policy
V K Sajesh	Scientist	Institutional Change

Technical

Name	Designation
Prem Narayan	Technical Officer (T 7-8)
Khyali Ram Chaudhary	Technical Officer (T-6)
Mangal Singh Chauhan	Technical Officer (T-6)
Sonia Chauhan	Technical Officer (T-6)
Satinder Singh	Driver (T-3)

Administrative

Name	Designation
A K Aggarwal	Administrative Officer
Vinod Kumar	Assistant Administrative Officer
T A Vishwanath	Assistant Finance & Accounts Officer
Umeeta Ahuja	Personal Secretary
S K Yadav	Assistant
Inderjeet Sachdeva	Assistant
Sanjay Kumar	
Ajay Tanwar	Lower Division Clerk
Mahesh Kumar	S S Gr II
Mahesh Pal	S S Gr I

XVII. TRAININGS ATTENDED

Name	Topic	Duration	Institution
Rajni Jain	SAS Programming I: Essentials	19-21 April, 2010	SAS India
	SAS Programming II: Essentials	22-24 April, 2010	SAS India
	SAS Installation	7-8 June, 2010	IASRI, New Delhi
	SAS: A Comprehensive overview (Part I)	23 June - 9 July, 2010	IASRI, New Delhi
	Data Entry and Data Management using CSPro Software	23-26 November, 2010	ICRISAT, Patancheru
Harbir Singh	Data Analysis using SAS	21-26 February, 2011	IASRI, New Delhi
Ganesh Kumar	Data Analysis using SAS	17-22 August, 2010	IASRI, New Delhi
Shiv Kumar	SAS Programming I: Essentials	19-21 April, 2010	SAS India
	SAS Programming II: Essentials	22-24 April, 2010	SAS India
P A Lakshmi Prasanna	Data Analysis using SAS	21-26 February, 2011	IASRI, New Delhi
A Suresh	Data Analysis using SAS	22-26 November, 2010	IASRI, New Delhi
P Shinoj	Quantitative Modelling Approaches for Economic Policy Analysis in Agriculture	12-13 August, 2010	NCAP, New Delhi
Diana S	Risk Assessment in Agriculture	27 – 29 March, 2010	TNAU, Coimbatore
Josily Samuel	Data Analysis using SAS	21-26 February, 2011	IASRI, New Delhi
V K Sajesh	Innovative Extension Models for Sustainable Agricultural Development	04-24 January, 2011	IARI, New Delhi
	Creative Writing in Agriculture	28 February to 4 March, 2011	Indian Institute of Mass Communication, New Delhi

Prem Narayan	Data Analysis using SAS	25-30 October, 2010	IASRI, New Delhi
Khyali Ram Chaudhary	National Conference on Knowledge Management in the Globalized Era	21-23 April, 2010	NASC, New Delhi
	International Symposium on Emerging Trends & Technologies in Libraries and Information Services	3-5 June, 2010	JIIT, Solan, H.P.
	National conference of Agricultural Librarians and User Community 2011 on Agricultural Libraries in the Knowledge Web	24-25 February, 2011	IARI, New Delhi
Sonia Chauhan	Quantitative Modelling Approaches for Economic Policy Analysis in Agriculture	12-13 August, 2010	NCAP, New Delhi
	Sensitization of PIMS-ICAR	15 November, 2010	IASRI, New Delhi
	Data Entry and Data Management using CSPro Software	14-16 December, 2010	NCAP, New Delhi

XVIII. OTHER INFORMATION

Participation in ICAR sports meet

A contingent of 8 employees from the centre participated in ICAR Central Zonal Sports Meet held at Directorate of Weed Science Research (DWSR), Jabalpur (MP) from 15-19 February 2011. Shri Vinod Kumar was the Chief de mission and Shri Mangal Singh Chauhan was the manager of the team. This small group won pride to the centre with 6 medals. Ms Sonia Chauhan won 3 Gold, 2 Silver and 1 Bronze medal. Gold medals were bagged in 100 m race, 200 m race and carrom, respectively. Silver medals were won in long jump and high jump respectively. Bronze medal was received in shot put throw.

NCAP Annual Day

The Centre celebrated its 19th Annual Day on 1 May 2010. Dr N S Jodha delivered Prof Dayanatha Jha Memorial Lecture. Dr Swapan K Datta, (DDG, Crop Science), Director IARI, Director IASRI, Director ILRI, Dr Mruthyunjaya and other dignitaries graced the function and conveyed their wishes for the overall growth and development of the Centre.

Rajbhasha and Hindi Pakhwara

For the implementation and extensive use of Rajbhasha among the staff of the centre, a committee on official language (Hindi) was established by Central Rajbhasha Department. The committee monitors the progress of various actions taken and suggests measures for implementation of official language. It coordinates and helps in executing the orders from the Council and Central Rajbhasha Department time to time and reports the progress. The Centre organised the monthly staff meeting and Timahi meeting in Rajbhasha regularly. The Rajbhasha Samiti submitted a five-yearly progress report to the Honorable Parliamentary committee on Rajbhasha on 19 June, 2010.

The Centre's Rajbhasha Samiti implemented all the guidelines, circulars and instructions issued by Council and Central Rajbhasha Department, Government of India. More than 80 per cent administrative work notings and draftings were made in Hindi in administrative files.

The committee also organised a series of events to celebrate "Hindi Pakhwara" during 14-30 September 2010 to generate more awareness on the use of Hindi. The activities which were organised during the 'Hindi Pakhwara' included, essay writing on topics i.e. *"Adhunik Samaaj Me Sanchaar Madhyamo Ki Bhumika"* and *"Kissano Par Badhate Karj Ki Samasya"* and a debate in Hindi on "Role of MGNREGA to solve rural unemployment problems" was also conducted. Opportunity was given to non-Hindi speakers also to present their views in Hindi on any topic of their interest. Dictation of administrative words in Hindi, translation from English to Hindi and extempore activities were also organised to improve the vocaubulary in Hindi and English. The quiz competition was arranged on general awareness in Rajbhasha and Antakachhari. The participation in these events was overwhelmingly more than eighty per cent. Hindi Pakhwara ended with poem recitation competition.

Dr Ramesh Chand, Director, NCAP, chaired the session, Shri Harish Joshi, Director (Rajbhasha), Indian Council of Agricultural Research, Krishi Bhavan, New Delhi was the chief guest. All the participants recited their poems very nicely. The chief guest appreciated all the poets and remarked the level of poems was very good. He also encouraged all to do more work in Hindi without hesitation. Dr Ranjana Agrawal, Head, Forecasting Division and Dr Sushila Kaul, Sr Scientist, IASRI, Pusa, New Delhi served the crucial role of Judges to decide the winners in poem recitation. At the last Dr Ramesh Chand and the Chief Guest distributed the prize to winners. The programme of Rajbhasha Pakhwara was organised by Mr Prem Narayan, Sachiv Rajbhasha. He also delivered a brief summary of Rajbhasha progress at Centre.

The details of events and prize winners were as follows:

S. No.	Events	Prize winners	S. No.	Events	Prize winners
1.	Essay writing	Sh. Ajay Tanwar Sh. Khyali Ram Sh. Sushil Kumar Yadav	6.	Antakchhari	Team B
2.	Debate (Hindi Bhashi)	Dr Anjani Kumar Dr Harbir Singh Sh. Khyali Ram	7.	Dictation	Sh. Sushil Kumar Yadav Sh. Mangal Singh Chauhan Sh. Inderjeet Sachdeva
3.	Debate (Non-Hindi Bhashi)	Dr Suresh A Dr Diana S Smt Josily Samuel Sh. T A Vishwanath	8.	Translation	Sh. Khyali Ram Sh. Ajay Tanwar Sh. Inderjeet Sachdeva
4.	Debate (Women cell)	Dr Usha Ahuja Km Sunita Rout	9.	Poem Recitation	Sh. Sushil Kumar Yadav Sh. Inderjeet Sachdeva
5.	General Knowledge	Team A	10.	Special Prize	Sh. Prem Narayan Sh. Ajay Tanwar

Rajbhasa committee also facilitated publishing two research publications in Hindi during the year. The two publications are:

1. डा. बराह बी. सी., एवं प्रेम नारायण, सरी पद्धति से धान की खेती का महत्व, कृषि विस्तार समीक्षा जनवरी–मार्च 2010, 5–9
2. प्रेम नारायण, मूँगफली की उपज बढ़ाने के लिये नवीनतम तकनीक अपनायें, कृषि विस्तार समीक्षा जुलाई–सितम्बर, 2010, 3–6

Besides, three publications NCAP Profile, The Seed Bill 2010 – A Critical Appraisal (बीज विधेयक, 2010–एक विवेकचनात्मक मूल्यांकन), Economic Benefits of Bt. Brinjal –

An Ex Ante Assessment (बीटी बैंगन के आर्थिक लाभ – एक संभावी विश्लेषण) were also translated and published in Hindi by Director, NCAP.

New Joining

Mrs Josily Samuel joined this Centre to the post of Scientist (Agricultural Economics) w.e.f. 24-4-2010.

Sh Sajesh V K joined this Centre to the post of Scientist (Agricultural Extension) w.e.f. 27-8-2010

Sh A K Aggarwal joined this Centre to the post of Administrative Officer w.e.f. 27-11-2010.

Promotions

Dr S S Raju, Sr Scientist was selected to the post of Principal Scientist (Agricultural Economics) w.e.f. 24-11-2010.

Dr Anjani Kumar, Sr Scientist was selected to the post of Principal Scientist (Agricultural Economics) w.e.f. 24-11-2010.

Sh Prem Narayan, T-6 was promoted in the next higher grade T (7-8) w.e.f. 12-9-2006.

Sh Khyali Ram Chaudhary, T-5, was promoted in the next higher grade T-6 w.e.f. 11-4-2009.

Sh Mangal Singh Chauhan, T-5 was promoted in the next higher grade T-6 w.e.f. 15-4-2009.

Smt Sonia Chauhan, T-5, was promoted in the next higher grade T-6 w.e.f. 26-5-2009.

Smt Umeeta Ahuja, P.A. was promoted to the post of Private Secretary w.e.f. 22-9-2010.

Sh Inder Jeet Sachdeva, promoted to the post of Assistant w.e.f. 10-12-2010.

Sh Mahesh Kumar, Skilled Supporting Staff got the 1st MACP w.e.f. 1-9-2008.

Retirement

Dr B C Barah, Principal Scientist superannuated on 30 November 2010 from NCAP.

विशिष्ट सारांश

राष्ट्रीय कृषि आर्थिकी एवम् नीति अनुसंधान केन्द्र देश स्तर पर कृषि अर्थशास्त्र और नीति अनुसंधान में उत्कृष्टता बनाये रखने में प्रयासरत है। केन्द्र द्वारा किये गये शोध–कार्यों से कृषि संबंधी नीतिगत विचार–विमर्श करने एवं निर्णय लेने में परिषद् की सहभागिता बढ़ी है। केन्द्र, परिषद् को सहयोग देने के अतिरिक्त, सरकारी क्षेत्र की अन्य संस्थाओं एवं मंत्रालयों को भी कृषि नीति संबंधी सूचनायें उपलब्ध कराता है। वर्षावधि 2010–11 (अप्रैल–मार्च) में केन्द्र में 19 वैज्ञानिक तथा 15 अन्य कर्मचारी कार्यरत थे और इसका कुल व्यय 772.82 लाख रूपये था।

प्रोफेसर विजय शंकर व्यास की अध्यक्षता में गठित एक उच्च स्तरीय अनुसंधान सलाहकार समिति (आर ए सी) केन्द्र के शोध कार्यक्रमों को मार्गदर्शन देती है, तथा प्रंबधन समिति केन्द्र के प्रशासनिक कार्यों को निर्देशित करती है। इसके अतिरिक्त कई आंतरिक समितियाँ, जैसेकि बजट समिति, भण्डार एवं क्रय समिति, आदि केन्द्र के विकेन्द्रीकृत प्रबंधन में सहयोग करती हैं।

केन्द्र में समसामयिक विषयों पर शोध कार्य पाँच प्रमुख क्षेत्रों – तकनीकी नीति, सतत् कृषि प्रणालियाँ, विपणन एवं व्यापार, संस्थागत बदलाव तथा कृषि वृद्धि एवं मॉडलीकरण–में किये जाते हैं। केन्द्र में विभिन्न क्षेत्रों में प्रतिपादित शोध–कार्यों का आपस में समन्वय इस प्रकार किया जाता है कि केन्द्र के उद्देश्यों की प्राप्ति की जा सके। वर्ष 2010–11 में केन्द्र में 36 शोध अध्ययन किये गये। तीन परामर्शी परियोजनाओं को भी पूरा किया गया। वर्षावधि में केन्द्र ने विभिन्न राष्ट्रीय एवं अन्तर्राष्ट्रीय महत्व की संस्थाओं के साथ अपने सहयोग को कायम् रखते हुए इसे आगे बढ़ाने की दिशा में भी प्रयास किये। केन्द्र ने अनेक कार्यशालाओं, सम्मेलनों, विचार–विमर्श बैठकों तथा नीति संबंधी कार्यक्रमों के आयोजन भी किये। वर्ष 2010–11 में केन्द्र द्वारा प्रतिपादित शोध अध्ययनों तथा अन्य गतिविधियों की प्रगति का सारांश प्रस्तुत हैः–

तकनीकी नीति

'उन्नत तकनीक द्वारा कृषि में वृद्धि का पुर्नजीवीकरण' विषय पर अध्ययन दर्शाता है कि कृषित क्षेत्रफल अथवा पशुओं की संख्या में वृद्धि, उत्पादन कारकों जैसेकि रसायनिक उर्वरकों, जीवनाशी रसायनों, उन्नत किस्मों के बीजों का प्रयोग, सिंचाई क्षेत्रफल में वृद्धि तथा नयी तकनीकों का प्रयोग, आदि कृषि वृद्धि के प्रमुख स्रोत हैं। कृषि वृद्धि के अन्य स्रोतों में तकनीकी दक्षता में सुधार, कृषि में अधिक मूल्य वाले उत्पादों का चयन तथा फसल सघनता में वृद्धि, आदि उत्तरदायी हैं। बदलते उपभोग परिवेश में देश की बढ़ती जनसंख्या की खाद्यान्न माँग को पूरा करने के लिए कृषि में 4 प्रतिशत की वृद्धि प्राप्त करना आवश्यक है।

एक अध्ययन में बीटी बैंगन के 15 प्रतिशत बुवाई–क्षेत्र में अंगीकरण से रूपये 11029 प्रति हेक्टेयर अतिरिक्त वार्षिक आय होने का अनुमान लगाया गया है। इससे उपभोक्ताओं को बैंगन के मूल्य में 3–15 प्रतिशत की गिरावट का लाभ मिलने की सम्भावना है। बीटी बैंगन के 15 प्रतिशत तथा 60 प्रतिशत अंगीकरण दर की स्थिति में, सम्पूर्ण अर्थव्यवस्था को क्रमशः 577 करोड़ रूपये तथा 2387 करोड़ रूपये वार्षिक आय होने का आकलन किया गया है।

कर्नाटक प्रांत में द्वितीयक एवं सूक्ष्म पोषक तत्वों के प्रयोग का अध्ययन दर्शाता है कि उर्वरकों का संतुलित प्रयोग खाद्यान्न उत्पादन तथा प्रति हेक्टेयर शुद्ध आय को बढ़ाने में महत्वपूर्ण है। उर्वरकों का संतुलित प्रयोग उत्पादन क्षमता को बढ़ाने तथा खाद्य सुरक्षा को मजबूत करने में भी उपयोगी है।

प्रस्तावित बीज विधेयक 2010 का गहन विश्लेषण दर्शाता है कि मौजूदा विधेयक में बीज की गुणवत्ता को विशेष रूप से परिभाषित किये जाने की आवश्यकता है। बीज मूल्यों को प्रतिस्पर्धी एवं पहुँच में बनाये रखने के लिए आवश्यक है कि बीज उत्पादकों तथा बीज वितरण करने वाली कम्पनियों के बीच प्रतिस्पर्धा बनी रहे। साथ ही में सरकारी क्षेत्र की कम्पनियों को भी प्रतिस्पर्धी बनाया जाना चाहिए, जिससे कि किसानों को गुणवत्ता परक बीज मिलता रहे। प्रस्तावित बीज विधेयक को और अधिक उपयोगी बनाने के लिए जातिवार बीजों का पंजीकरण 'पौध किस्म एवं कृषक अधिकार संरक्षण' अधिनियम के तहत किये जाने की संभावना तलाशी जानी चाहिए।

बारानी कृषि में संभावी वृद्धि हेतु चार परिदृश्यों की कल्पना की गयी जो इस प्रकार हैं: (1) वर्तमान स्थिति, (2) विकासोन्मुख विधियाँ, (3) जलवायु परिवर्तन, तथा (4) सरकारी–निजी सहभागिता। भारत में दुग्ध क्षेत्र के भावी प्रारूप का अध्ययन दर्शाता है कि पिछले 10 वर्षो में दुग्धोत्पादन में 3.63 प्रतिशत की वार्षिक वृद्धि में 53 प्रतिशत योगदान दुधारू पशुओं की सख्या के कारण तथा शेष 47 प्रतिशत इनकी उत्पादकता में बढ़ोत्तरी के कारण हुआ है। अध्ययन का निष्कर्ष है कि वर्ष 2035 तक देश स्तर पर दुग्ध उत्पादन उसकी कुल माँग से 45 लाख टन कम रहेगा। पर्वतीय कृषि का अध्ययन बताता है कि भू–जोत का आकार छोटा हो रहा है। औसत उत्पादकता संभावी उत्पादकता स्तर से कम है। घटती कृषि योग्य जमीन के कारण बहुत से किसानों ने उत्पादन क्षेत्रलाभ का आधार खो दिया है। अध्ययन दर्शाता है कि पर्वतीय किसान कम श्रम वाली तकनीकों को अपनाने के इच्छुक है। विकल्प के रूप में पर्वतीय किसान खेती के विशेष प्रबंधन के अन्तर्गत 'सहकारी' अथवा अनुबंध आधारित खेती को भी अपनाने पर विचार कर रहे हैं।

'कुल कारक उत्पादकता' तथा शोध की उपादेयता से संबंधित एक अध्ययन में पाया गया कि शोध का योगदान विभिन्न अनाजों के अतिरिक्त उत्पादन में क्रमशः गेहूँ (104 लाख टन), चावल (63 लाख टन), मक्का (11 लाख टन) तथा बाजरा (6.4 लाख टन) रहा। अध्ययन दर्शाता है कि देश को खाद्यान्न उत्पादन में आत्मनिर्भर बनाने में शोध का महत्वपूर्ण योगदान रहा। अध्ययन में 'कुल कारका उत्पादकता' संबंधी गुणांक का फसलवार तथा राज्यवार आकलन भी किया गया है। एक अन्य अध्ययन में सुझाव दिया गया है कि कपास की बहुल जातियों की खेती नहीं करने से जैव सुरक्षा तथा जैव विविधता जैसे मुद्दे भविष्य में आनुवंशिकता संरक्षण के लिए गंभीर चुनौती होंगे।

देश की ग्रामीण अर्थव्यवस्था में विविधीकरण की तरफ बढ़ने की स्पष्ट एवं सकारात्मक प्रवृति दिखाई पड़ती है। विविधीकरण के प्रमुख कारकों में तकनीकी जनित–उत्पादकता में वृद्धि, निर्धारित मूल्य, सिंचाई सुविधा तथा उपभोग पद्धति में बदलाव प्रमुख हैं। बागवानी फसलों की तरफ विविधीकरण प्रमुख रूप से उपयुक्त जलवायु, तकनीकी उपलब्धता तथा सापेक्ष लाभप्रदता, प्रतिव्यक्ति अधिक आय, तथा सड़कों और बाजारों की सुगम उपलब्धता पर निर्भर करता है। अर्थव्यवस्था का पशुपालन की तरफ झुकाव चारा एवं चरागाह की उपलब्धता, दुग्ध समितियों के गठन, पशुचिकित्सा एवं देखभाल तथा सड़कों से जुड़ाव पर निर्भर करता है।

अधिक–मूल्य वाली कृषि का अध्ययन दर्शाता है कि अधिक–मूल्य वाली खाद्य वस्तुओं (फलों तथा सब्जियों, पशु उत्पादों, मत्स्य उत्पादों) का कुल कृषि उत्पादों में हिस्सा वर्ष 1983–84 में 37.3 प्रतिशत से बढ़कर वर्ष 1993–94 में 41.3 प्रतिशत, तथा वर्ष 2007–08 में 47.4 प्रतिशत हो गया। पिछले दशक में अधिक–मूल्य वाली फसलों के व्यापार में भी वृद्धि हुई है।

जल प्रबंधन नीतियों का पुनरावलोकन दर्शाता है कि उनका वास्तविक प्रभाव जल संचयन तथा प्रयोग दक्षता पर कम असरदायी है। इसके प्रमुख कारणों में इसके कम क्षेत्रफल में प्रभावी होने तथा कार्यक्षमता के प्रभावी न होना सम्मिलित हैं।

सतत् कृषि व्यवस्था

देश में बायोइथेनॉल उद्योग को प्रभावी बनाने के लिये तकनीकी सुधार एवं प्रबंधन उपायों पर ध्यान दिये जाने की संस्तुति की जाती है जिससे उत्पादन लागत में कमी की जा सकेगी, और इसके अन्य उत्पादन कारकों जैसेकि मीठा ज्वार, चुकन्दर आदि को फीड स्टाक के रूप में अपनाया जा सके। ईथेनॉल के वाणिज्यिक स्तर पर उत्पादन हेतु इसकी दूसरी पीढ़ी के फीड स्टाक के रूप में खोई, अनाज फसलों के डंठल, जंगली पेड़–पौधों को भी अपनाने के प्रयास किये जाने चाहिये, जिससे कि दीर्घावधि में वातावरण सुरक्षित रह सके तथा जैव–ईंधन का उत्पादन लाभदायक हो सके।

जैट्रोफा आधारित जैव–ईंधन (बायोडीजल) के उत्पादन का आकलन दर्शाता है कि दीर्घावधि में जैट्रोफा की खेती आर्थिक दृष्टि से लाभदायी है लेकिन इसके सफल होने के लिए प्रारम्भ में किसानों को पौध उत्पादन में अनुदान, तकनीकी सहायता, विपणन की गारंटी तथा न्यूनतम समर्थन मूल्य, आदि सुविधाएं दी जानी चाहियें। जैव–ईंधन उद्योग को फीड स्टाक उपलब्ध कराकर तथा बाजार माँग की निरंतरता बनाये रखकर सफल बनाया जा सकता है। आपूर्ति श्रृंखला के प्रत्येक स्तर पर समन्वय की आवश्यकता है जोकि आपूर्ति श्रृंखला में स्थायित्व लाने के लिए महत्वपूर्ण हैं।

जुताईविहीन खेती तथा बकरी पालन से आजीविका सुरक्षा के सुधारने के सन्दर्भ में एक अध्ययन राजस्थान प्रान्त के मेवात जिले में किया गया। जुताईविहीन खेती को अपनाने से खेती की लागत में 15 प्रतिशत की कमी, फसलोत्पादकता में 7 प्रतिशत की बढ़ोत्तरी का अनुमान लगाया गया है। प्राथमिक नतीजों से पता चलता है कि बकरीपालन द्वारा प्रतिदिन 1–2 लीटर दूध प्राप्त कर एक औसत गरीब किसान परिवार अपनी आजीविका में सुधार कर सकता है।

एक अध्ययन से पता चला है कि देश स्तर पर छोटे पशुओं (बकरी तथा भेड़) की संख्या वर्ष 1982 में प्रति एक लाख जनसंख्या पर 21 से घट कर वर्ष 2001 में 18 रह गयी जोकि भविष्य में इनके उत्पादों की माँग–आपूर्ति के बीच खाई बढ़ने का संकेत है।

विपणन तथा व्यापार

केन्द्र द्वारा संचालित एक परियोजना के अन्तर्गत विभिन्न खाद्यान्नों जैसे चावल, गेहूँ, मक्का, अरहर तथा चना और तिलहनों जैसेकि सोयाबीन, मूंगफली और तोरिया/सरसों, आदि के संभावित मॉडल बनाने के प्रयास जारी हैं। खाद्यान्नों तथा तिलहनों के भावी मॉडल संबंधित श्रृंखलावद्ध आंकड़ों, तकनीकी प्राचालों तथा अन्य गुणांकों को समाहित कर बनाये जा रहे हैं। मॉडल बनाने के लिए आवश्यक जानकारी संयुक्त राज्य अमेरिका के एक संस्थान में एक प्रशिक्षण के दौरान प्राप्त की गयी।

बिहार प्रान्त में परम्परागत दूध विपणन चैनलों के सतत् प्रभावी रहने के कारण इसके रचनात्मक रूप में अधिक ध्यान देने की आवश्यकता है। प्रशिक्षण एवं पर्यवेक्षण कार्यक्रमों को छोटे स्तर के दूध विक्रेताओं/प्रसंस्कर्ताओं के बीच लोकप्रिय बनाकर तथा उनकी क्षमता में सुधार करके गुणवत्ता की बढ़ रही खाई को काफी हद तक दूर किया जा सकता है।

एक अध्ययन में पता चला है कि देश में मांस उत्पादन वर्ष 1970 में 27 लाख टन से बढ़कर वर्ष 2009 में 59 लाख टन हो गया। इसी अवधि में भारत का कुल वैश्विक मांस उत्पादन में हिस्सा 2 प्रतिशत से घटकर 1.6 प्रतिशत रह गया। विश्लेषण दर्शाता है कि मांस उत्पादों में विविधीकरण की प्रवृत्ति धीरे–धीरे निर्यातोन्मुख मांस उत्पादों की तरफ बढ़ रही है।

संस्थागत बदलाव

भूमि उपयोग तथा जनसंख्या वृद्धि में गत्यात्मकता का विश्लेषण प्रदर्शित करता है कि 1951–61 की अवधि में शुद्ध कृषित क्षेत्रफल की वृद्धि दर 1.06 प्रतिशत थी जोकि 2001–08 की अवधि में घटकर 0.38 प्रतिशत रह गयी, जबकि जनसंख्या में इसी अवधि में वृद्धि 1.56 प्रतिशत थी। उपरोक्त अवधि में फसल सघनता 113.45 प्रतिशत से बढ़कर 135.77 प्रतिशत हो गयी। इसके अतिरिक्त सिंचाई क्षेत्रफल, उर्वरक उपयोग तथा उर्वरकों के अन्तर्गत लाये गये क्षेत्रफल, और संस्थागत कृषि ऋण की मात्रा में लघु किसानों की हिस्सेदारी में काफी वृद्धि हुई है।

कृषि में जोखिम आकलन एवं बीमा–उत्पाद विषय पर अध्ययन में एक बीमा उत्पाद/तकनीक डब्लू आई जी आई एस ए टी (WIGISAT) विकसित किया गया है। उपरोक्त तकनीक को इसके संबंधित प्रतिभागियों के बीच एक विचार–विमर्श बैठक के दौरान जाँचा गया तथा इसके 'मनी–मोबाइल' प्रयोग पर भी विचार किया गया।

आंध्रप्रदेश की कृषि में जोखिम का विश्लेषण दर्शाता है कि प्रान्तीय स्तर पर कृषि में अस्थायित्व की दर जिला स्तरों से भिन्न थी। उदाहरणार्थ, चावल फसल की जिला स्तर पर अस्थायित्व का विश्लेषण बताता है कि 36 प्रतिशत जिलों में चावल कृषित क्षेत्र में, 41 प्रतिशत जिलों में इसके उत्पादन में तथा 50 प्रतिशत जिलों में इसकी उत्पादकता में अस्थायित्व में कमी आयी है। जबकि प्रान्तीय स्तर पर अस्थायित्व में वृद्धि दर्ज की गयी है। इससे निष्कर्ष निकलता है कि प्रान्तीय स्तर का विश्लेषण उत्पादन की सही एवं सटीक जानकारी नहीं देता। जिससे उत्पादन आधारित कृषि आय की गणना सही नहीं हो पाती है। इस प्रकार कृषि आय की गणना में जोखिम का आकलन क्षेत्र–विशेष के अनुरूप अथवा किसी दूसरी उपयुक्त तकनीक का प्रयोग करके करना चाहिए।

कृषि जिन्सों के विपणन परिदृश्य की जानकारी के लिए एक नवोन्मेषी आँकड़ा प्रबंधन प्रणाली को विकसित किया जा रहा हैं इसमें कृषि फसलों, संसाधनों, कारकों के प्रयोग, व्यापार तथा उपभोग, आदि विषयों पर द्वितीयक आँकड़ों का समावेश कर तैयार किया जा रहा है। इस आँकड़ा प्रबंधन प्रणाली के तहत जिला स्तर पर सामाजिक–आर्थिक एवं कृषि विषयों पर विश्वसनीय, तथा नवीन आँकड़ों को उपलब्ध कराने का प्रस्ताव है।

देश में मानसून वर्षा का पूर्वानुमान बहुचरीय एक्सपोनेंसियल विधि तथा ए एन एन विधि से किया गया, इसमें ए एन एन विधि द्वारा प्राप्त पूर्वानुमान आँकड़े काफी सटीक दिखे।

'सूचना संप्रेषण तकनीक' के एक अध्ययन में मिला है कि इस तकनीक में रोजगार के अवसर उपलब्ध कराने तथा महिलाओं को सशक्त बनाने की अपार संभावनायें हैं। इसलिए 'सूचना संप्रेषण तकनीक' संबंधी कार्यक्रमों को अधिक प्रभावी बनाने के लिए विभिन्न इलेक्ट्रानिक तकनीकों को अपनाने की आवश्यकता है।

विभिन्न प्राचालों द्वारा आकलित गुणाकों से पता चलता है कि कृषि में महिलाओं की सहभागिता बढ़ी है। सभी सामाजिक समूहों के बीच, आर्थिक रूप में कमजोर महिलाओं की कृषि में सहभागिता उच्चवर्गीय महिलाओं की अपेक्षा अधिक थी।

केरल प्रान्त में मत्स्य उद्योग में संलग्न 50 प्रतिशत से अधिक महिलायें अपनी आमदनी को अपने पतियों के बीच नहीं बाँटती हैं जबकि 28 प्रतिशत महिलायें आंशिक रूप में तथा 20 प्रतिशत महिलायें पूरी तरह प्राप्त आय अपने पतियों को घर निर्वाह के लिए देती हैं। इसके विपरीत तमिलनाडु में 76 प्रतिशत महिलायें आंशिक रूप में तथा शेष 24 प्रतिशत पूरी तरह अर्जित आय को अपने पतियों के साथ बाँटती हैं। अध्ययन दर्शाता है कि खेतिहर महिलाओं को जानकारी देकर इन्हें आर्थिक, सामाजिक, राजनीतिक एवं कानूनी रूप में सबल बनाया जा सकता है।

कृषि वृद्धि एवं मॉडलीकरण

ग्यारहवीं पंचवर्षीय योजनावधि में कृषि में 4 प्रतिशत की वृद्धि दर हासिल करने तथा संबंधित समस्याओं के संबंध में एक अध्ययन में मिला कि कृषि से प्राप्त सकल घरेलू आय में वृद्धि उर्वरकों के प्रयोग, बीज, सिंचाई, विद्युत आपूर्ति तथा सरकारी निवेश आदि में जारी वृद्धि को कायम् रखकर प्राप्त की जा सकती है। साथ ही किसानों को कृषि जिन्सों के उचित मूल्य दिये जाने की भी जरूरत है। कृषि में 4 प्रतिशत की प्रस्तावित वृद्धि दर हासिल करने के रास्ते में आने वाली समस्याओं–संस्थागत ऋण, कृषि कार्यों हेतु विद्युत आपूर्ति, गुणवत्तायुक्त कारकों की आपूर्ति, तकनीकी प्रगति, संस्थागत तथा वैधानिक वातावरण, प्रसार प्रणाली, प्राकृतिक संसाधनों का सिकुड़ता आधार, आदि पर ध्यान देने की आवश्यकता है।

भारत में हरित क्रांति के ह्दय क्षेत्र कहे जाने वाले उत्तर–पश्चिम भारत में दूसरी हरित क्रांति लाने के संदर्भ में एक अध्ययन में मिला है कि कृषि उत्पादन व्यवस्था अपने सही राह से भटक गई है। प्राकृतिक संसाधनों का आधार जिसने पिछले चार दशकों में कृषि वृद्धि को कायम रखा, अब काफी संकट में है। वर्तमान में कृषि उत्पादन में वृद्धि को विशेष रूप से उर्वरकों एवम् सिंचाई सुविधाओं पर अनुदान देकर कायम रखा जा रहा है जोकि भविष्य में स्थिति को और अधिक कठिनाई में डालेगा।

भारतीय कृषि में वृद्धि तथा आर्थिक समन्वय की प्रणाली का विश्लेषण दर्शाता है कि भारत सरकार द्वारा आर्थिक सुधारों से प्राप्त लाभ का प्रस्ताव विभिन्न प्रान्तों में एक समान नहीं मिला है। प्रति हेक्टेयर कृषि से प्राप्त शुद्ध आय का भी एक समान बंटवारा नहीं हुआ है। भारतीय कृषि में अपने आप में सामंजस्य बैठाने की क्षमता मौजूद है।

वर्ष 2008–09 की अवधि में भारतीय कृषि वृद्धि में गिरावट प्रमुख रूप से मानसून वर्षा के अनियमित होने के कारण हुई, जबकि वैश्विक आर्थिक संकट का भारतीय कृषि पर कोई विशेष प्रभाव नहीं दिखा। भारत सरकार द्वारा उठाये गये कदमों एवं रणनीतियों से कृषि क्षेत्र को वैश्विक आर्थिक संकट से बचाये रखने में काफी सफलता मिली। वैश्विक संकट से भारतीय कृषि को बचाने तथा इसकी सतत् वृद्धि को कायम रखने के नीतिगत उपायोंः (1) आकलन क्षमता में वृद्धि, (2) दिशाज्ञान का विकास तथा इस पर क्रियान्वयन, (3) कृषकों को ऋण एवं बीमा सुविधा में वृद्धि, और (4) प्रभावी कार्यक्रमों को सुदृढ़ बनाना, आदि शामिल हैं।

केन्द्र द्वारा स्थापित 'कृषि शोध एवं सूचना प्रणाली' केन्द्र के अधिकारियों एवं कर्मचारियों को ई–मेल तथा इन्टरनेट सुविधा उपलब्ध कराती है। इन सेवाओं को प्रभावी बनाने के लिए लीज लाइन की क्षमता को बढ़ा कर 2 मेंगाबाइट प्रति सेकेण्ड कर दिया गया है। केन्द्र का अपना ई–मेल सर्वर है जिसकी क्षमता का भरपूर उपयोग किया जा रहा है।

अपने शोध परिणामों के प्रसार हेतु इस वर्ष केन्द्र ने एक नीतिपत्र (Policy Paper), तीन नीति संक्षेप (Policy Brief), 30 शोध पत्र (Research Articles), 18 लेख पुस्तकों में (Book Chapters) तथा चार रिर्पोट प्रकाशित किये। केन्द्र के वैज्ञानिकों ने अनेक व्यावसायिक तथा नीति विषयक संबंधी कार्यक्रमों में भाग लिया। केन्द्र ने इस वर्ष 10 कार्यशालाओं तथा कई बैठकों का आयोजन किया तथा कई राष्ट्रीय तथा अन्तर्राष्ट्रीय महत्व की शोध संस्थाओं के साथ सहभागिता की। इन सभी प्रयासों से केन्द्र की ख्याति तथा अनुसंधान विश्वसनीयता में वृद्धि हुई है।


भाकृअनुप
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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