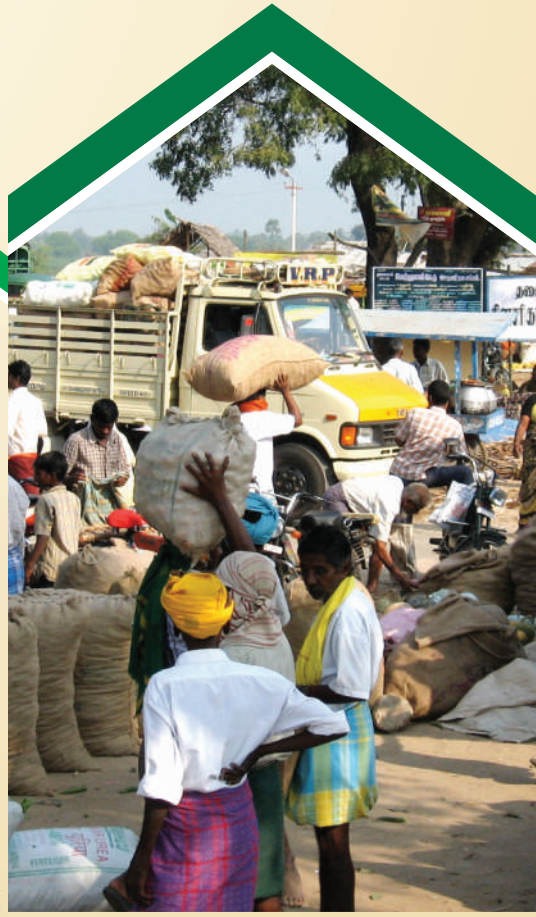
Silver Jubilee Year

भाकृअनुप
ICAR

# ANNUAL REPORT

## 2015-16

**ICAR – National Institute of Agricultural Economics and Policy Research (NIAP)**
**Indian Council of Agricultural Research**
**New Delhi - 110 012**

# Annual Report

# 2015-16

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ICAR-NIAP Annual Report 2015-16


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*Editorial Team*
Naveen Prakash Singh
S. K. Srivastava
Deepak Tanwar

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Acting Director
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# PREFACE

The year 2015-16 has been a momentous year for the ICAR-National Institute of Agricultural Economics and Policy Research (NIAP). The Institute entered into its Silver Jubilee year. The celebrations started with joining of Prof. Ramesh Chand as full-time Member, NITI Aayog, Govt of India. This has been the rarest achievement for the fraternity of agricultural economists. Another feat came when Dr. Pratap Singh Birthal was selected as Director, Institute of Development Studies (IDS), Jaipur. NIAP family feels proud of their achievements. Following this, many renowned personalities were invited to interact with NIAP staff for creating awareness and accumulation of intellectual wealth for enriching their personal and professional lives. The Institute faced increasing expectations of stakeholders and enhanced its participation in policy advisories. The NIAP is committed to strengthen agricultural economics and policy research. The NIAP also aims to strengthen the international linkages to augment its research capacity. This report provides the glimpse of achievements of the Institute during the year 2015-16. It is pertinent to mention that 3 network projects undertaken in partnership with other institutes have received lot of attention of stakeholders. The network projects include market intelligence, regional crop planning for improving resource use efficiency and sustainability, and impact assessment of agricultural research and development. Besides, network project, the Institute conducted 13 other studies during the year 2015-16 out of which 5 were funded by external agencies.

The network project on market intelligence provides advance information about prices to aid decision making of the farmers. The network project on regional crop planning proposes to develop optimal crop plans for the selected regions that are sustainable in terms of natural resources. The impact of frontier agricultural technologies is being assessed under the network project on impact assessment. Besides these, the Institute did valuable research work in the areas like climate change, nutritional security, livestock services, water management, production cost, gender issues, ICT, etc. The studies done by the Institute have enormously helped ICAR in addressing issues related to agricultural R&D. The Institute has been involved in agricultural policy debates and decisions and also contributed in preparing reports of important committees. Three scientists made visits abroad for academic purposes. NIAP scientists received 6 awards during the year. The Institute organized several trainings, workshops and capacity building programmes for officers' of Indian Economic Services and scientists of NARS of India. During the year, the Institute published 42 research article and 1 policy paper.

The Institute received overwhelming support from the Indian Council of Agricultural Research (ICAR) in accomplishing its targets. We are grateful to Dr. S. Ayyappan, Former Director-General and Secretary, and T. Mohapatra, Director-General, ICAR, and Secretary, Department of Agricultural Research and Education (DARE), Government of India, for their continuous guidance and encouragement to take this Institute to new height. We would like to express our gratitude to Dr. N. S. Rathore, Deputy Director-General (Agricultural Education), and staff of

Agricultural Education Division of ICAR for support and motivation in achieving mandate of the Institute.

My colleague Dr. Naveen Prakash Singh, Principal Scientist, rendered hard work and undertook the responsibility of compiling, editing and bringing out this annual report in the present form. Dr S. K. Srivastava and Shri Deepak Tanwar provided help in processing and formatting the manuscript. I sincerely acknowledge their incredible contributions in bringing out this report. I also acknowledge the contributions and team efforts of all the staff of the Institute for their overwhelming support in fulfilling the Institute's mandate.

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

(Usha Ahuja)
Acting Director

# LIST OF ACRONYMS

| | |
|---|---|
| AERR | Agricultural Economics Research Review |
| AI | Artificial Insemination |
| AKMU | Agricultural Knowledge Management Unit |
| ARS | Agricultural Research Service |
| ATFC | Agricultural Technology Foresight Centres |
| BGREI | Bringing Green Revolution in Eastern India |
| BHU | Banaras Hindu University |
| BIRD | Bankers Institute of Rural Development |
| BISA | Borlaug Institute for South Asia |
| BSI | British Standard Institute |
| BVICAM | Bharti Vidyapeeth's Institute of Computer Applications and Management |
| CABI | Centre for Agriculture and Bioscience International |
| CAFT | Centre for Advanced Faculty Training |
| CAS | Current Awareness Service |
| CAZRI | Central Arid Zone Research Institute |
| CCARI | Central Coastal Agricultural Research Institute |
| CCDCPHF | Centre for Chronic Disease Control and Public Health Foundation of India |
| CeRA | Consortium for e-Resources in Agriculture |
| CGG | Centre for Good Governance |
| CGIAR | Consultative Group on International Agricultural Research |
| CGWB | Central Ground Water Board |
| CIMMYT | International Maize and Wheat Improvement Centre |
| CPIAL | Consumer Price Index for Agricultural Labourers |
| CSIR | Council of Scientific and Industrial Research |
| DAC | Department of Agriculture and Cooperation |

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|---|---|
| DARE | Department of Agricultural Research and Education |
| DBT | Department of Biotechnology |
| DDG | Deputy Director General |
| DDS | Document Delivery Service |
| DEA | Data Envelopment Analysis |
| EFC | Expenditure Finance Committee |
| EPW | Economic and Political Weekly |
| ERNET | Education and Research Network |
| ERP | Enterprise Resource Planning |
| FAO | Food and Agriculture Organization of the United Nations |
| FLD | Field Level Demonstration |
| GAMS | General Algebraic Modelling System |
| GB | Governance Board/ Governing Board |
| GBPUAT | Govind Ballabh Pant University of Agriculture and Technology |
| GDP | Gross Domestic Product |
| GEDs | Groundwater Extraction Devices |
| GIS | Geographic Information System |
| GoI | Government of India |
| GPF | General Provident Fund |
| HRD | Human Resource Development |
| HRMS | Human Resource Management System |
| HYPM | Half Yearly Progress Monitoring |
| IABM | Institute of Agri Business Management |
| IARI | Indian Agricultural Research Institute |
| IASRI | Indian Agricultural Statistics Research Institute |
| ICAR | Indian Council of Agricultural Research |
| ICARDA | International Centre for Agricultural Research in the Dry Areas |
| ICMR-NIN | Indian Council of Medical Research – National Institute of Nutrition |

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| ICRIER | Indian Council for Research on International Economic Relations |
| ICRISAT | International Crops Research Institute for the Semi-Arid Tropics |
| IEG | Institute of Economic Growth |
| IFPRI | International Food Policy Research Institute |
| IGIDR | Indira Gandhi Institute of Development Research |
| IHDS | India Human Development Survey |
| IIHR | Indian Institute of Horticulture Research |
| IIPA | Indian Institute of Public Administration |
| ILL | Inter Library Loan |
| ILRI | International Livestock Research Institute |
| IMC | Institute Management Committee |
| IPR | Intellectual Property Rights |
| IRC | Institute Research Committee |
| IRRI | International Rice Research Institute |
| ISTM | Institute of Secretariat Training and Management |
| IT | Information Technology |
| IVRI | Indian Veterinary Research Institute |
| IWMI | International Water Management Institute |
| JAU | Junagadh Agricultural University |
| JNKVV | Jawaharlal Nehru KrishiVishwaVidyalaya |
| JSC | Joint Staff Council |
| KAU | Kerala Agricultural University |
| KVK | Krishi Vigyan Kendra |
| LAN | Local Area Network |
| MGNREGS | Mahatma Gandhi National Rural Employment Guarantee Scheme |
| MIS-FMS | Management Information System - Financial Management System |
| MOA&FW | Ministry of Agriculture and Farmers Welfare |
| MPI | Malmquist Productivity Index |

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|---|---|
| MPKV | Mahatma Phule Krishi Vidyapeeth |
| NAAS | National Academy of Agricultural Sciences |
| NARS | National Agricultural Research System |
| NASC | National Agricultural Science Centre |
| NBPGR | National Bureau of Plant Genetic Resources |
| NCAER | National Council of Applied Economic Research |
| NCAP | National Centre for Agricultural Economics and Policy Research |
| NCSCM | National Centre for Sustainable Coastal Management |
| NFSM | National Food Security Mission |
| NHRDF | National Horticulture Research & Development Foundation |
| NIANP | National Institute of Animal Nutrition and Physiology |
| NIAP | National Institute of Agricultural Economics and Policy Research |
| NIAS | National Institute of Advanced Studies |
| NIFM | National Institute of Financial Management |
| NISCAIR | National Institute of Science, Communication and Information Resources |
| NISTADS | National Institute of Science, Technology and Development Studies |
| NITI | National Institution for Transforming India |
| NPL | National Physical Laboratory |
| NPS | New Pension Scheme |
| OTA | Over Time Allowance |
| OUAT | Odisha University of Agriculture and Technology |
| PAU | Punjab Agricultural University |
| PDKV | Punjabrao Deshmukh Krishi Vidyapeeth |
| PERMISNET | Personnel Management Information System Network |
| PGCAP | Post Graduate Certificate in Agricultural Policy |
| PGDPM | Post Graduate Diploma in Plantation Management |
| PIMS | Personnel Information Management System |
| PJTSAU | Professor Jayshankar Telangana State Agricultural University |

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|---|---|
| PME | Priority Setting, Monitoring and Evaluation |
| PRA | Participatory Rural Appraisal |
| QRT | Quinquennial Review Team |
| R&D | Research and Development |
| RAC | Research Advisory Committee |
| RDAs | Recommended Dietary Allowances |
| RFD | Results Framework Document |
| RGP | Research Grade Pay |
| RPF | Request for Proposal |
| RTI | Right to Information Act |
| SAARC | South Asian Association for Regional Cooperation |
| SAFTA | South Asian Free Trade Area |
| SAH | Survey of Agricultural Households |
| SAUs | State Agricultural Universities |
| SC/ST | Scheduled Caste / Scheduled Tribe |
| SKUAST | Sher-E-Kashmir University of Agricultural Science and Technology |
| SSN | Social Science Network |
| TAAS | Trust for Advancement of Agricultural Sciences |
| TDS | Tax Deducted at Source |
| TE | Triennium Ending |
| TFP | Total Factor Productivity |
| UASB | University of Agricultural Sciences, Bangalore |
| VBU | Vinoba Bhave University |
| ZTM-BPD | Zonal Technology Management & Business Planning and Development Unit |

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# EXECUTIVE SUMMARY

The ICAR-National Institute (earlier Centre) of Agricultural Economics and Policy Research (NIAP) continued its efforts towards achieving excellence in agricultural economics and policy research in the country. The Institute serves as a policy think tank and helps ICAR through credible evidence-based feedback in agricultural policy debates and decisions, and in monitoring and interpreting the research impacts systematically. The Institute sensitizes policy planners and research managers about the emerging changes and concerns related to farmers and farming. Besides, the Institute also provides policy inputs to several other public sector bodies, departments, ministries and state governments.

The staff of the Institute comprised of 20 scientists, 17 other staff members and the research project staff. The total expenditure of the Institute, including that from external sources was Rs. 816.69 lakh during the year 2015-16.

A high-powered Research Advisory Committee chaired by Prof. S. Mahendra Dev, distinguished economist and Director and Vice Chancellor, Indira Gandhi Institute of Development Research (IGIDR), Mumbai, guides the Institute on its research programmes, and a Management Committee administers its overall functioning. Besides, a number of internal committees like academic planning and policy committee, PME cell, publication committee, budget committee, purchase committee, etc. facilitate decentralized management of the Institute. Research studies of topical importance are conducted at the Institute under three broad themes, viz. Technology and Sustainable Development, Agricultural Growth and Development, and Markets, Trade and Institutions.

Each theme is supervised by a senior faculty. Research programmes within and a cross themes are so designed as to achieve the mandate of the Institute. During the year the Institute undertook 16 research projects and completed one consultancy project. The Institute has not only maintained but also increased the linkages and collaborations with many institutions in India and abroad. The Institute organized number of workshops, trainings and policy advocacy programmes. A glimpse of research achievement of the Institute during 2015-16 are given below:

1. The study assessing the impact of droughts on rice production revealed that severe droughts have become less frequent, but the frequency of moderate droughts has increased. On an average, over 31 per cent of the rice area was found to be drought affected. However rice yield loss has registered a decline under both moderate and severe drought conditions indicating increasing resilience of rice production to droughts which is attributed in expansion of irrigation and adoption of new technologies and practices.

2. The study on regional crop planning indicated that remunerative and assured prices, subsidy and government policies favor cultivation of wheat and rice, which is causing shortage of other cereals, pulses and oilseeds in the country. In order to meet the demand of growing population, India is importing these commodities particularly oilseeds and pulses. Pulses, being more risky and less profitable, are

shifting to marginal and rain-fed lands and registering decline in their share over time. Although the shift from coarse cereals to high value crops is likely to increase farm output and farmer's income in dry land regions, it will expose cultivators to serious weather risks because high value crops have a high water requirement.

3. The study to assess effectiveness of BGREI programme found that productivity of rice and wheat in eastern states is low as compared to states of western regions due to constraints like poor irrigation, abiotic stresses of flood/submergence, drought and salinity, poor infrastructure, etc. Although, yield increase has accelerated rice output in eastern region of India during 2010-11 to 2013-14, but there is a considerable variation in yield across states. Yield of *Rabi* rice is higher than *kharif* rice across states of eastern India, except Jharkhand.

4. The study on mainstreaming climate adaptation agenda into development plan identified twenty four ministries and 161 developmental schemes/ programmes associated with the development-adaptation continuum. These were disaggregated into sub groups and categories in consonance with the stated objectives of the identified schemes/ programmes. This approach envisages sensitizing policy makers towards program duplication issues and in ensuring effective utilization of the available financial resources for enhancing the resilience of Indian agriculture/ vulnerable sections or regions.

5. The study on mapping socio-economic and socio-personal patterns across regions revealed that average agricultural household in India earns monthly income of Rs. 6427 and 54.46 per cent of total agricultural households in rural India are living below poverty line. Among different income sources, farm business (cultivation + livestock) accounts for nearly 60 per cent of the household income. Farmer's income from agriculture is lowest (less than Rs. 3017/- per month) in the Eastern region as compared to other regions of the country. The Eastern region is characterized as low input-low productivity region and thus targeting this region would bring a greater impact on Farmer's income than focusing on the states where agricultural productivity is already at relatively higher level.

6. The study on groundwater irrigation in Punjab showed that the state is facing dual challenges of excessive groundwater depletion in north-central part along with rising groundwater level in south-west region. The evidences reveal increasing reliance on groundwater as irrigation source, dominance of paddy and free electricity as major contributors to emerging groundwater crisis in the state. Punjab farmers incurred Rs. 0.46 for extracting one cubic metre of groundwater and small and marginal farmers incur 2-3 time higher groundwater cost as compared to large farmers. Depleting groundwater level further increases the groundwater cost and the effect of such cost escalation is borne more adversely by the small and marginal farmers.

7. The study on agricultural biotechnology and crop productivity indicates that the technological breakthroughs and policy reforms in the Indian seed sector have resulted in ten-fold increase in cotton production during the past six decades. During the past 12 years (2002–03 to 2012–13) cotton yield has increased by 152 per cent compared to only 117 per cent increase during the preceding 53 years. There is a structural change in cotton yield growth in the

post-Bt period which led to reversal in India's position from a net importer to a net exporter of cotton, impressive growth in agro-biotech industry and narrowing down of difference between average cotton yield of India and the world.

8. The study on cost of cultivation revealed sustained rise in real production cost of crops during the recent years and present level of yield improvement is not enough to negate rising cost of cultivation. The results showed that average cost inflation during 2007-08 to 2012-13 was 14 per cent and among different factors of production, labour alone contributed 52 per cent share in total increase in cost of cultivation of crops in India. Thus, managing this single factor of production will bring a substantial improvement in farm income. The adverse effects of rising production cost can also be lessened by technological development in crop cultivation.

9. The study on documentation of varietal output and perceived adoption rates of wheat and maize crops in India showed that despite the release of several high yielding varieties, some of the old varieties still rule the farmer's fields. The major popular old wheat varieties cultivated by the farmers include, Lok 1, PBW 343, Raj 3077, Raj 3765, Raj 1482, HUW 234, WH 711, HD 2687, HD 2733 and GW 322. Maize cultivation in the traditional maize growing states and tribal belts is mainly dominated by the cultivation of traditional/local varieties and composites mainly due to high cost of the hybrid seeds. JM 216, JVM 421, Narmada moti, Ganga safed are popular maize composites in farmer's field. Among the public sector maize varieties JM-216, JVM-421, African Tall, Narmada Moti and GM6 were found to be widely cultivated.

10. The study on yield gap indicated wide gaps in the average crop yield at state level as compared to the potential yield obtained under the front line demonstration (FLD) experiments. The extent of yield gap-II ranged from 32-76 per cent in rice, 7-53 per cent in wheat, 29-69 per cent in maize, 6-60 per cent in gram, 21-63 per cent in rabi groundnut, 21-71 per cent in kharif groundnut 17-80 per cent soybean and 18-48 per cent in rapeseed & mustard across major states during the TE 2009-2011. Among various factors, age of the family-head, household size, number of fragments of land-holdings and biotic & abiotic stresses had a negative effect on efficiency of crop production whereas, crop diversification and farmer's education improved efficiency of crop production. There was a positive association between size of land holding and efficiency in crop production, implying that large farmers achieved higher yield due to scale effects.

11. A comparison of cultivation of basmati and non-basmati rice in Punjab revealed higher yield of non-basmati. This signifies that basmati has less comparative advantage over non-basmati. However, despite comparatively less yield than non-basmati, per hectare gross return from basmati is about 6 per cent higher than non-basmati. Comparative assessment of resource use revealed that basmati paddy requires significantly higher resources per unit of output as compared to non-basmati paddy except fertilizer. In terms of physical quantity, mean technical efficiency of basmati and non-basmati was estimated as 48 per cent and 84 per cent, respectively. On the other hand, estimated mean economic efficiency of basmati and non-basmati was 79 and 77 per cent, respectively.

12. More than 40% farmers dislike farming as a profession because of low profits, high risk and lack of social status. The dislike for farming is more pronounced among

smaller farmers, among those who are relatively younger and less educated, have fragmented landholdings with low irrigation and less diversified farming system, and among those with lower uptake of information on technologies, institutional finance, and risk-mitigating instruments.

13. India is the second largest producer of potatoes after China with higher productivity than world average. Nearly three fourth of Indian potato production is contributed by Uttar Pradesh, West Bengal and Bihar states. During the past decade Bihar has experienced largest growth rate in potato production and productivity. Malmquist Productivity Index (MPI) of potato cultivation in these three states during 1997 to 2013 has shown positive change in efficiency growth in Bihar against stagnation in two other states.

14. The study on total factor productivity (TFP) showed that contribution of input growth in TFP followed a declining trend over time. On the other hand, contribution of TFP growth in output growth followed upward trend indicating the sustainability of agricultural productivity in India. These trends are similar at both economic and market price and thus negates the argument of presence of technology fatigue in Indian agriculture. At economic prices, overall, TFP growth contributed 88 per cent in output growth of crop sector during recent period.

15. The gross value of output of chickpea, pigeon pea, black gram, green gram and lentil was decomposed into (i) area effect, (ii) yield effect, and (iii) price effect. The area effect for these pulses, except black gram and green gram, was stronger especially after the interventions through National Food Security Mission (NFSM) and Accelerated Pulses Production Programme (A3P). The yield effect exhibited a varied picture. The price effect indicated that farmers are not aligned to prices, and their decisions are influenced more by non-price factors such as technologies or improved varieties, infrastructure and market access.

16. The study on disadvantaged agricultural regions revealed that improvement in agricultural productivity through technological and policy interventions, and employment diversification away from agriculture towards non-farm sectors contributes positively in reducing poverty among rural households. Based on determinants of rural poverty and agricultural productivity, out of total 487 districts covered by the study, 206 districts were found to be disadvantaged. Total disadvantaged area in the country has been estimated as 56.2 Mha which is about 42 per cent of the net sown area. The low cropping intensity, poor irrigation coverage and groundwater use, low fertilizer use, and large area under problematic soils across the districts of this cluster result into low agricultural productivity. The expansion of water storage capacity and expansion of irrigation network would go a long way in improving agricultural productivity in the region.

17. The study on nutritional insecurity and consumption patterns found a reduction in the actual calorie intakes across locale and expenditure classes between 1993-94 and 2011-12. The calorie deficiency was starker for middle income population residing in urban households than those in the rural households. The under-nourishment was also present even among richer households which can be termed as 'voluntary hunger'. The results again hint towards the fact that income

enhancement alone might not always be a good predictor of food and nutritional insecurity.

18. The study on role of livestock in improving women's bargaining power in intra-household resource allocation and its effects on children's nutritional status revealed that with an additional illiterate female worker a household realizes more than 7 per cent higher income from livestock activities. The study found a strong association between ownership of large ruminants and child nutritional status. The finding suggests that it is now critical to put on a gendered lens to all the livestock related interventions and activities. Such interventions would help in directly enhancing the diet quality of the household members besides providing more livelihood opportunities and enhanced incomes.

19. It has been observed that between 2004-05 and 2011-12, about 34 million workers left agriculture. The important factors behind such changes are confinement of female workforce in household activities, expanding opportunities in non-farm sectors, improvement in economic conditions of households, improvement in literacy and rise in reservation wages due to Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS). Mechanization in farming and improvement in productivity are the plausible ways to mitigate the labour crisis.

20. The study on role of women in agriculture in Eastern India revealed that participation of women is maximum in domestic activities followed by livestock and nonfarm activities outside the house to earn wages. On the other hand, men are devoting their maximum time to earn income from non-farm activities followed by livestock and farm activities. The results indicate that male out-migration has a significant impact on the lives of the farm women. However, the nature and extent of the impact depends on the pattern of out-migration and many other factors. Allocation of resources related to the practical and strategic interests of rural women should be integrated into rural development programmes.

21. The study on crop insurance in Madhya Pradesh suggests that in spite of various schemes launched from time to time, agriculture insurance has served very limited purpose. The coverage in terms of area and number of farmers is very small, payment of indemnity based on area approach miss the affected farmers outside the compensated area, and most of the schemes are not viable. Expanding the coverage of crop insurance would therefore increase government costs considerably. Unless the programme is restructured carefully to make it viable, the prospects of its future expansion to include and impact more farmers are remote. This requires renewed efforts by government in terms of designing appropriate mechanisms and providing financial support for agricultural insurance. Insurance products for the rural areas should be simple in design and presentation so that they are easily understood.

22. The study on role of information on net farm income concludes that those who use information realize 12 per cent more returns per hectare than those who do not. The impact of information is higher in the case of diversified systems (cash crops along with foodgrains) as compared to farms specialized in foodgrains. Under-investment in public extension may limit realization of the potential gains in agricultural productivity from spending more on agricultural research. Results

suggest that returns on investment in extension services are quite attractive, and there is a scope for increasing outreach of this information for spread of agricultural technology in a fragmented society.

23. The study on trends in agricultural wages observed that real wages for agricultural labourers have risen by 19 per cent between 2003-04 and 2008-09, and nearly 37 per cent between 2008-09 and 2013-14. Moreover the study also found rising trend in real wages (using CPIAL deflator) per person per day to undertake farm activities across states and at all-India.

24. The study on institutional innovations for enhancing outreach and inclusiveness of livestock services emphasizes need to strengthen the livestock service delivery system in the country. A survey conducted in Haryana and Rajasthan shows positive relationship between herd size and income level of dairy farmers. The average fees and expenses for getting livestock health services was about Rs. 536.25 per animal and the private practitioner and local healer were preferred choice due to their easy accessibility and comparatively economical charges. There is need to create awareness among farmers towards health management of dairy animals.

25. Under the Network Project on Market Intelligence, price forecasts for major agricultural commodities are disseminated to farmers before sowing and during harvest from 14 centres across the country to enable them to make informed production and marketing decisions, which in turn could lead to higher profitability. Till date 136 pre-sowing and 220 pre-harvest price forecasts have been disseminated to the farmers.

26. Computation of an infrastructure development index for the fifteen markets of Uttarakhand revealed that Haldwani followed by Kashipur are the most equipped markets while Sitarganj and Khatima score quite low in the combined index. The analysis revealed that arrivals in the selected markets are driven by the infrastructure facilities like trade, storage and support services.

27. The analysis of agricultural trade of SAARC nations revealed that SAARC is the net exporter because of the three major economies of the region - India, Pakistan and Sri Lanka which constitute more than 95 per cent of agricultural exports. The study revealed that India is the largest economy contributing maximum to the total as well as agricultural trade in SAARC but suffers from very high volatility. Cotton, cereals, fish & crustaceans, tea and beverages were the top four exported items while Animal or vegetable fat, Cotton, and Rubber & articles were the top three imported items of SAARC from the world during TE 2013.

28. The study examining price transmission across six major onion markets namely, Azadpur, Lasalgaon, Pune, Solapur, Bangalore and Hubli and the onion export prices found that the markets at Delhi, Bangalore, Pune and Lasalgaon have shown a higher speed of adjustment as compared to other markets. This might depend on inter-linkages across the markets, backward linkages within the value chain, infrastructural condition and linkages with global markets.

29. Another study on onion revealed that onion price crisis has become a recurrent phenomenon. Maharashtra is the highest onion producing state in India contributing about 30 per cent of the total production in the country, followed by Karnataka. Close to 50-60 per cent of the

onions are produced in *rabi* season and remaining 40-50 per cent are produced in *kharif* and late *kharif* in the country. The study revealed a very strong and significant association between the production of Maharashtra and market arrivals in the state but with the lagged relationship, which indicates that market arrivals in the current year are determined by the supply of onion during the previous year. Further the study found that the price crisis is triggered from the climatic and production shocks and generates from the primary onion markets and spreads throughout the markets in the country.

# विशिष्ट सारांश

राष्ट्रीय कृषि आर्थिकी एवम् नीति अनुसंधान संस्थान (पूर्व में केन्द्र), देश में कृषि अर्थशास्त्र तथा नीति अनुसंधान में उत्कृष्टता बनाये रखने के लिए सतत प्रयासरत है। यह संस्थान एक नीति थिंक–टैंक के रूप में सेवा करता है और भारतीय कृषि अनुसंधान परिषद् को विश्वसनीय एवं साक्ष्य–आधारित सुझावों द्वारा कृषि नीति संबंधी विचार–विमर्श तथा निर्णयों में सक्रिय रूप में भाग लेने तथा अनुसंधान प्रभावों के योजनाबद्ध तरीके से मूल्यांकन एवं विवेचन में मदद करता है। यह संस्थान देश में किसानों तथा खेती में आ रहे बदलावों एवं समस्याओं से नीति–निर्माताओं तथा अनुसंधान प्रशासकों को अवगत कराता है। इसके अतिरिक्त यह संस्थान अन्य सार्वजनिक निकायों, विभागों, मंत्रालयों तथा राज्य–सरकारों को नीति संबंधी जानकारी उपलब्ध कराता है।

इस संस्थान में 20 वैज्ञानिक, 17 अन्य कर्मचारी तथा अनुसंधान परियाजनाओं के अन्तर्गत कर्मचारी कार्यरत हैं। वर्ष 2015–16 में वाह्य वित्तपोषित परियोजनाओं सहित संस्थान का कुल व्यय 816.69 लाख रूपये था।

प्रोफेसर महेन्द्र देव, प्रख्यात अर्थशास्त्री एवं निदेशक (कुलपति), इंदिरा गांधी विकास अनुसंधान संस्थान (IGIDR), मुम्बई की अध्यक्षता में अनुसंधान परामर्श समिति इस संस्थान के अनुसंधान कार्यक्रमों का निर्धारण एवं मार्गदर्शन करती है, तथा प्रबंध समिति इसकी प्रशासनिक एवं आर्थिक गतिविधियों पर निगरानी रखती है। इसके अतिरिक्त, केन्द्र के विकेन्दीकृत प्रबंधन एवं संचालन के लिए कई अन्य आन्तरिक समितियाँ जैसे कि शैक्षणिक योजना व नीति समिति, पीएमई सेल, प्रकाशन समिति, बजट समिति, खरीद समिति, आदि गठित की गई हैं। संस्थान में सामयिक महत्व के विषयों पर अनुसंधान कार्य व्यापक विषयों यथा प्रौद्योगिकी एवं टिकाऊ विकास, कृषि प्रगति एवं विकास, तथा बाजार, व्यापार एवं संस्थान पर किया जाता है।

प्रत्येक व्यापक विषय की निगरानी एक वरिष्ठ संकाय द्वारा की जाती है। अनुसंधान कार्यक्रमों की रूपरेखा विषय के अंतर्गत इस प्रकार बनाई जाती है ताकि संस्थान के अधिदेशों को हासिल किया जा सके। वर्ष 2015–16 के दौरान, संस्थान द्वारा कुल 16 अनुसंधान परियोजनाओं पर कार्य किया गया और एक परामर्शी परियोजना को पूरा किया गया। इस वर्षावधि में संस्थान ने विभिन्न भारतीय एवं विदेशी संस्थाओं के साथ अपने अनुसंधान संबंधों एवं अनुबंधों को न केवल बनाये रखा बल्कि इन्हें और भी अधिक सुदृढ़ तथा व्यापक बनाया। इस वर्ष भी संस्थान ने अनेक कार्यशालाओं, संगोष्ठियों, प्रशिक्षण कार्यक्रमों तथा नीति–चर्चाओं का आयोजन किया। वर्ष 2015–16 की अवधि में संस्थान की मुख्य अनुसंधान उपलब्धियों तथा गतिविधियों की झलक का विवरण निम्नवत है:–

1. चावल उत्पादन पर सूखे के प्रभाव का आकलन करने वाले अध्ययन में पता चला कि सूखे की आवर्ती में कमी आई है लेकिन संतुलित सूखे की आवर्ती बढ़ी है। औसतन, 31 प्रतिशत से अधिक चावल खेती क्षेत्र सूखा प्रभावित पाया गया। हालांकि, संतुलित एवं गंभीर सूखा परिस्थितियों दोनों में चावल की उपज के नुकसान में गिरावट दर्ज की गई जिससे सूखे के प्रति चावल उत्पादन की बढ़ रही अनुकूलनता का पता चलता है।

2. क्षेत्रीय फसल नियोजन पर किए गए अध्ययन में पता चला कि लाभप्रद एवं सुनिश्चित मूल्य, सब्सिडी और सरकारी नीतियां गेहूं व चावल की खेती को बढ़ावा दे रही हैं जो कि देश में अन्य अनाज, दलहन व तिलहन की कमी का एक कारण है। लगातार बढ़ रही जनसंख्या की मांग को पूरा करने के लिए भारत द्वारा इन जिंसों विशेषकर तिलहन और दलहन का आयात किया जा रहा है। दलहन की खेती अधिक जोखिम भरी और कम लाभप्रद होने के कारण अब सीमांत व बारानी भूमि में बोई जाने लगी है और समय के साथ–साथ इनकी भागीदारी में गिरावट दर्ज की जा रही है। तथापि, मोटे अनाजों से उच्च मूल्य वाली फसलों की ओर बदलाव से फार्म आउटपुट और किसानों की आय बढ़ने की संभावना है, शुष्क भूमि क्षेत्रों में किसानों को मौसम के कारण उत्पन्न होने वाले गंभीर जोखिमों का सामना करना

पड़ेगा क्योंकि उच्च मूल्य वाली फसलों में जल की अधिक आवश्यकता होती है।

3. पूर्वी भारत में हरित क्रान्ति लाना (BGREI) कार्यक्रम की प्रभावशीलता का आकलन करने पर यह पाया गया कि पूर्वी राज्यों में चावल व गेहूं की उत्पादकता देश के पश्चिमी क्षेत्र के राज्यों की तुलना में कम है। इसका कारण कम सिंचाई बाढ़/जलमग्नता, सूखा तथा लवणता के अजैविक दबाव, तथा घटिया बुनियादी सुविधा विकास आदि हैं। तथापि, वर्ष 2010–11 से 2013–14 के दौरान भारत के पूर्वी क्षेत्र में उपज वृद्धि से चावल आउटपुट में तेजी आई है लेकिन अभी भी राज्यों के बीच उपज में व्यापक भिन्नता विद्यमान है। विचाराधीन अवधि के दौरान झारखण्ड को छोड़कर पूर्वी भारत के राज्यों में खरीफ के मुकाबले रबी मौसम में चावल की उपज आमतौर पर ज्यादा होती है।

4. विकास योजना में जलवायु अनुकूलन एजेन्डा को मुख्य धारा में लाने पर किए गए अध्ययन में विकास–अनुकूलन सातत्य के साथ सम्बद्ध 24 मंत्रालयों व 161 विकास योजनाओं/कार्यक्रमों की पहचान की गई। इन्हें चिन्हित योजनाओं/कार्यक्रमों के वर्णित उद्देश्यों के साथ जुड़े 24 उप–समूहों और 52 श्रेणियों में बांटा गया। इस युक्ति में नीति निर्माताओं का ध्यान कार्यक्रम के दोहरेपन की ओर ले जाना और भारतीय कृषि/संवदेनशील वर्ग अथवा क्षेत्र की अनुकूलनता बढ़ाने की दिशा में उपलब्ध वित्तीय संसाधनों की प्रभावी उपयोगिता सुनिश्चित करना शामिल है।

5. क्षेत्रों के बीच सामाजिक–आर्थिक तथा सामाजिक–निजी पैटर्न के मानचित्रण पर किए गए अध्ययन में पता चला कि भारत में औसत कृषि परिवार की आय रुपये 6,427/– प्रति माह है तथा ग्रामीण भारत में कुल कृषि परिवारों में से 54.46 प्रतिशत परिवार गरीबी रेखा से नीचे रह रहे हैं। विभिन्न आय स्रोतों में, परिवार की आय में फार्म व्यवसाय (खेती + पशुधन) की हिस्सेदारी लगभग 60 प्रतिशत है तथा खेती से किसान की आय देश के अन्य क्षेत्रों के मुकाबले पूर्वी क्षेत्र में सबसे कम (रुपये 3,017/–प्रति माह से कम) है। पूर्वी क्षेत्र का लक्षणवर्णन कम निवेश–कम उत्पादकता क्षेत्र के रूप में किया गया है और इसीलिए अन्य राज्यों जहां कृषि उत्पादकता पहले से अपेक्षाकृत उच्चतर स्तर पर है, की तुलना में इस क्षेत्र को लक्षित करने से किसानों की आय पर व्यापक प्रभाव पड़ेगा।

6. पंजाब में भूजल सिंचाई पर किए गए अध्ययन में प्रदर्शित हुआ कि राज्य दक्षिण–पश्चिम क्षेत्र में बढ़ रहे भूजल स्तर के साथ उत्तर–मध्य भाग में भूजल के अत्यधिक दोहन की दोहरी चुनौतियों से जूझ रहा है। साक्ष्यों से सिंचाई स्रोत के रूप में भूजल पर बढ़ रही निर्भरता, धान की बहुलता तथा मुफ्त बिजली, राज्य में भूजल संकट को बढ़ाने वाले प्रमुख कारक हैं। पंजाब के किसान जमीन से एक घन मीटर पानी निकालने के लिए मात्र रुपये 0.46 खर्च करते हैं तथा टीई 2010–11 के दौरान बड़े किसानों की तुलना में छोटे तथा सीमान्त किसानों ने 2–3 गुणा अधिक भूजल लागत वहन की है। भूजल स्तर में आई गिरावट से भूजल लागत बढ़ती है और इस प्रकार की लागत वृद्धि का छोटे तथा सीमान्त किसानों पर अत्यधिक प्रभाव पड़ता है।

7. कृषि जैव प्रौद्योगिकी एवं फसल उत्पादकता पर आयोजित अध्ययन में पता चला कि भारतीय बीज क्षेत्र में प्रौद्योगिकीय ब्रेकथ्रू तथा नीति सुधारों के परिणामस्वरूप पिछले छः दशकों के दौरान कपास उत्पाद में दस गुणा वृद्धि देखने को मिली है और वर्ष 2002–03 के बाद हालिया दशक के दौरान कपास उपज में उल्लेखनीय सुधार आया है। पिछले 12 वर्षों (2002–03 से 2012–13) के दौरान, कपास की उपज में 152 प्रतिशत तक की वृद्धि देखी गई है जबकि पिछले 53 वर्षों में यह वृद्धि केवल 117 प्रतिशत थी। बीटी–कपास अवधि के उपरान्त कपास उपज में यह एक बुनियादी परिवर्तन है जिससे कपास के मामले में भारत की स्थिति शुद्ध आयातक राष्ट्र के स्थान पर शुद्ध निर्यातक राष्ट्र बनाने में मदद मिली है जो कि कृषि बायोटेक उद्योग में और भारत तथा विश्व की औसत कपास उपज के बीच अंतराल को कम करने में एक सराहनीय प्रगति है।

8. खेती की लागत पर किए गए अध्ययन में पता चला कि हालिया वर्षों के दौरान फसलों की वास्तविक उत्पादन लागत में लगातार वृद्धि हुई है और उपज सुधार का वर्तमान स्तर खेती की बढ़ रही लागत को निष्फल करने में पर्याप्त नहीं है। परिणामों में प्रदर्शित हुआ कि वर्ष 2007–08 से 2012–13 के

दौरान औसत लागत वृद्धि 14 प्रतिशत थी और उत्पादन के विभिन्न कारकों में, भारत में फसलों की खेती लागत में कुल वृद्धि में श्रम की अकेली हिस्सेदारी 52 प्रतिशत थी। अतः उत्पादन के इस एकल कारक का उचित प्रबंधन करने से कृषि आय में पर्याप्त सुधार आएगा। बढ़ रही उत्पादन लागत के प्रतिकूल प्रभावों को फसल खेती में प्रौद्योगिकीय विकास के माध्यम से भी कम किया जा सकता है।

9. भारत में गेहूं व मक्का फसलों के किस्मीय आउटपुट और प्रेक्षित अनुकूलन दरों के प्रलेखन पर किए गए अध्ययन में प्रदर्शित हुआ कि अनेक उच्च उपजशील किस्में खेती के लिए जारी किए जाने के बावजूद अभी भी किसानों के खेतों पर कुछ पुरानी किस्में ही प्रयोग में लाई जा रही हैं। गेहूं की पुरानी प्रमुख किस्मों में लोक–1, पीबीडब्ल्यू 343, राज 3077, राज 3765, राज 1482, एचयूडब्ल्यू 234, डब्ल्यूएच 711, एचडी 2687, एचडी 2733 तथा जीडब्ल्यू 322 शामिल हैं । पारम्परिक रूप से मक्का की खेती करने वाले राज्यों तथा आदिवासी इलाकों में मक्का की खेती में संकर किस्मों के बीजों की अधिक लागत के कारण मुख्यतः पारम्परिक/स्थानीय किस्मों व कम्पोजिट का प्रभुत्व है। किसानों के खेतों में जेएम 216, जेवीएम 421, नर्मदा मोती, गंगा सफेदा लोकप्रिय मक्का कम्पोजिट हैं। सार्वजनिक क्षेत्र की मक्का किस्मों में, जेएम–216, जेवीएम–421, अफ्रीकन टॉल, नर्मदा मोती तथा जीएम–6 की खेती व्यापकता में पाई गई।

10. उपज अंतराल पर किए गए अध्ययन में अग्रिम पंक्ति प्रदर्शन (FLD) परीक्षणों के तहत हासिल उपज क्षमता के मुकाबले राज्य स्तर पर औसत फसल उपज में व्यापक अंतराल देखने को मिला। टीई 2009–2011 के दौरान प्रमुख राज्यों के बीच उपज अंतराल–II की सीमा चावल में 32–76 प्रतिशत; गेहूं में 7–53 प्रतिशत; मक्का में 29–69 प्रतिशत; चने में 6–69 प्रतिशत; रबी मूंगफली में 21–63 प्रतिशत; खरीफ मूंगफली में 21–71 प्रतिशत; सोयाबीन में 17–80 प्रतिशत तथा तोरिया व सरसों में 18–48 प्रतिशत पाई गई। विभिन्न कारकों में, परिवार के मुखिया की आयु, परिवार के आकार, कृषिजोत के विखण्ड़नों की संख्या तथा जैविक व अजैविक दबावों का फसल उत्पादन की प्रभावशीलता पर नकारात्मक प्रभाव था जबकि फसल विविधीकरण एवं किसान की शिक्षा से फसल उत्पादन में प्रभावशीलता सुधार हुआ। कृषिजोत के आकार तथा फसल उत्पादन की प्रभावशीलता के बीच एक सकारात्मक सम्बद्धता थी जिससे पता चलता है कि बड़े किसानों ने कहीं उच्चतर उपज हासिल की।

11. पंजाब में बासमती एवं गैर–बासमती चावल की खेती की तुलना करने पर बासमती की तुलना में गैर बासमती की उच्चतर उपज का पता चला। इससे यह प्रतिपादित हुआ कि भौतिक उत्पादकता की दृष्टि से बासमती में गैर–बासमती की तुलना में तुलनात्मक रूप से कम लाभ है। हालांकि, गैर–बासमती से तुलनात्मक रूप से कम उपज होने के बावजूद बासमती से मिलने वाला प्रति हेक्टेयर समग्र लाभ गैर बासमती किस्मों के मुकाबले लगभग 6 प्रतिशत अधिक है। संसाधन उपयोग के तुलनात्मक आकलन से पता चला कि उर्वरकों को छोड़कर गैर बासमती धान के मुकाबले बासमती धान में उल्लेखनीय रूप से कहीं अधिक संसाधन प्रति इकाई आउटपुट की जरूरत होती है। भौतिक मात्रा के मामले में, बासमती तथा गैर बासमती की औसत तकनीकी दक्षता क्रमशः 48 प्रतिशत व 84 प्रतिशत आंकी गई। वहीं दूसरी ओर, बासमती तथा गैर–बासमती की अनुमानित औसत आर्थिक दक्षता क्रमशः 79 व 77 प्रतिशत होने के कारण लगभग समान है।

12. कम लाभ, अधिक जोखिम और सामाजिक रूतबे के अभाव के कारण 40 प्रतिशत से भी अधिक किसान कृषि पेशे को नापसंद करते हैं। छोटे किसानों और ऐसे किसानों जो कि अपेक्षाकृत युवा और कम शिक्षित हैं, जिनके पास कम सिंचाई सुविधा वाली विखण्ड़ित कृषिजोत और कम विविधीकृत कृषि प्रणालियां हैं और ऐसे किसानों जिनके पास प्रौद्योगिकियों, संस्थागत वित्त तथा जोखिम कम करने वाले तरीकों अथवा उपकरणों के बारे में कम जानकारी है, के बीच कृषि पेशे को कहीं अधिकता में नापसंद किया जाता है।

13. विश्व औसत के मुकाबले अधिक उत्पादकता के साथ भारत, चीन के बाद आलू का दूसरा सबसे बड़ा उत्पादक राष्ट्र है। भारत के कुल आलू उत्पादन में लगभग तीन चौथाई योगदान उत्तर प्रदेश, पश्चिम

बंगाल तथा बिहार राज्यों का है। पिछले दशक के दौरान, बिहार राज्य में आलू उत्पादन तथा उत्पादकता में सबसे अधिक वृद्धि दर देखने को मिली। वर्ष 1997 एवं 2013 के दौरान इन तीनों राज्यों में आलू खेती का मॉमक्विस्ट उत्पादकता सूचकांक (MPI) में दो अन्य राज्यों में उपज ठहराव के मुकाबले बिहार में प्रभावशीलता वृद्धि में सकारात्मक बदलाव प्रदर्शित हुआ।

14. कुल कारक उत्पादकता (TFP) पर किए गए अध्ययन में पता चला कि कुल कारक उत्पादकता (TFP) में निवेश वृद्धि दर के योगदान में समय के साथ गिरावट प्रवृति देखने को मिली। वहीं दूसरी ओर, आउटपुट वृद्धि में कुल कारक उत्पादकता वृद्धि के योगदान में उपरिगामी प्रवृति देखने को मिली जिससे भारत में कृषि उत्पादकता की संधारण ीयता का पता चलता है। ये रूझान आर्थिक तथा बाजार मूल्य दोनों पर एकसमान हैं और इसलिए भारतीय कृषि में प्रौद्योगिकी क्लांति की मौजूदगी की बहस को नकारते हैं। आर्थिक मूल्यों पर, समग्र रूप में कुल कारक उत्पादकता वृद्धि द्वारा हालिया अवधि के दौरान फसल क्षेत्र की आउटपुट वृद्धि में 88 प्रतिशत का योगदान किया गया।

15. चना, अरहर, उड़द, मूंग तथा मसूर के आउटपुट के समग्र मूल्य को इस प्रकार विघटित किया गया यथा (i) क्षेत्र प्रभाव; (ii) उपज प्रभाव; तथा (iii) मूल्य प्रभाव। उड़द और मूंग को छोड़कर इन दालों के लिए विशेषकर राष्ट्रीय खाद्य सुरक्षा मिशन (NFSM) और त्वरित दलहन उत्पादन कार्यक्रम (A3P) के माध्यम से किए हस्तक्षेपों के बाद क्षेत्र प्रभाव कहीं ज्यादा मजबूत था। उपज प्रभाव में अलग–अलग तस्वीर प्रदर्शित हुई। हालांकि समय के साथ मूल्य प्रभाव में गिरावट आई जिससे पता चलता है कि किसान मूल्यों के साथ संरेखित नहीं हैं और उनके निर्णय प्रौद्योगिकियों अथवा उन्नत किस्मों, बुनियादी सुविधा व बाजार पहुंच जैसे गैर–मूल्य वाले कारकों से कहीं अधिक प्रभावित हैं।

16. वंचित अथवा गैर–लाभप्रद कृषि क्षेत्र पर किया गया अध्ययन दर्शाता है कि प्रौद्योगिकीय एवं नीति हस्तक्षेपों के माध्यम से कृषि उत्पादकता में सुधार और रोजगार विविधता का कृषि क्षेत्र से गैर कृषि क्षेत्र की ओर जाने से ग्रामीण परिवारों के बीच गरीबी को कम करने में सकारात्मक योगदान पड़ेगा। ग्रामीण गरीबी और कृषि उत्पादकता के निर्धारकों के आधार पर अध्ययन में कुल 487 जिले शामिल किए गए जिनमें से 206 जिले वंचित अथवा गैर–लाभप्रद पाए गए। देश में कुल वंचित अथवा गैर–लाभप्रद क्षेत्र का 56.2 मिलियन हेक्टेयर का अनुमान लगाया गया है जो कि निवल बुवाई क्षेत्र का लगभग 42 प्रतिशत है। इस क्लस्टर के जिलों में कम फसलचक्र सघनता, घटिया सिंचाई कवरेज व भूजल उपयोग, उर्वरकों का कम उपयोग तथा समस्याग्रस्त मृदा के अंतर्गत व्यापक क्षेत्र के परिणामस्वरूप कम कृषि उत्पादकता पाई गई। जल भण्डारण क्षमता का विस्तार और सिंचाई नेटवक्र का विस्तार करने से क्षेत्र में कृषि उत्पादकता को सुधारने में व्यापक मदद मिलेगी।

17. पोषणिक असुरक्षा और खपत पैटर्न पर किया गया अध्ययन दर्शाता है कि वर्ष 1993–94 एवं 2011–12 के बीच स्थानीय तथा व्यय करने वाले वर्गों में वास्तविक कैलोरी अन्तर्ग्रहण में कमी पाई गई। ग्रामीण परिवारों के मुकाबले शहरी परिवारों में रह रहे मध्यम आय वर्ग की जनसंख्या में कैलोरी की कमी कहीं ज्यादा देखने को मिली। यहां तक कि अमीर परिवारों में भी अल्प–पोषण देखने को मिला जिसे 'स्वैच्छिक भूख' कहा जा सकता है। परिणामों से पुनः यह संकेत मिला कि अकेली आय वृद्धि ही हमेशा खाद्य व पोषणिक असुरक्षा का एक बेहतर भविष्यवक्ता नहीं हो सकती।

18. अंतरा–परिवार संसाधन आवंटन में महिलाओं की मोल–भाव करने की शक्ति में सुधार लाने में पशुधन की भूमिका तथा बच्चों की पोषणिक स्थिति पर इसके प्रभावों पर किए गए अध्ययन में पता चला कि एक अतिरिक्त निरक्षर महिला कामगार से पशुधन गतिविधियों के माध्यम से परिवार में 7 प्रतिशत से भी अधिक आय मिली। अध्ययन में बड़े जुगाली वाले पशुओं के स्वामित्व और बच्चों की पोषणिक स्थिति के बीच एक मजबूत सम्बद्धता पाई गई। परिणामों से सुझाव मिला कि सभी पशुधन संबंधी हस्तक्षेपों व गतिविधियों पर अब लिंग के आधार पर देखना जरूरी हो गया है। ऐसे हस्तक्षेपों से कहीं अधिक आजीविका अवसर प्रदान करने और बढ़ी हुई आय के साथ–साथ परिवारिक सदस्यों की खान–पान गुणवत्ता को सीधे तौर पर बढ़ाने में मदद मिलेगी।

19. वर्ष 2004–05 एवं 2011–12 के बीच लगभग 34 कामगारों ने कृषि क्षेत्र को छोड़ा। ऐसे बदलावों के पीछे महत्वपूर्ण कारक पारिवारिक गतिविधियों में महिला कार्यबल की रोक में गिरावट, गैर–फार्म क्षेत्रों में अवसरों में वृद्धि, परिवार की आर्थिक स्थिति में सुधार, साक्षरता में सुधार और महात्मा गांधी राष्ट्रीय ग्रामीण रोजगार गारंटी योजना (MGNREGS) के कारण आरक्षित मजदूरी में वृद्धि शामिल है। उत्पादकता में सुधार और कृषि प्रणाली में यांत्रिकीकरण श्रम संकट को कम करने के प्रशंसनीय तरीके हैं।

20. पूर्वी भारत में कृषि उत्पादन और अन्य सामाजिक–आर्थिक गतिविधियों में महिलाओं की भूमिका पर किया गया अध्ययन दर्शाता है कि महिलाओं की भागीदारी सबसे अधिक घरेलू गतिविधियों में और तदुपरान्त क्रमशः पशुधन तथा मजदूरी कमाने के लिए घर से बाहर गैर–फार्म गतिविधियों में थी। वहीं दूसरी ओर, पुरूष अपना अधिकतम समय गांव में गैर–फार्म गतिविधियों से आय अर्जित करने एवं तदुपरान्त क्रमशः पशुधन तथा अपने फार्म पर खेत गतिविधियों में व्यय करते हैं। परिणामों से पता चला है कि कृषिरत महिलाओं के जीवन पर पुरूषों के देशान्तरण का उल्लेखनीय प्रभाव पड़ता है। हालांकि, प्रभावों की प्रकृति और सीमा, देशान्तरण और अनेक अन्य कारकों के पैटर्न पर निर्भर करती है। ग्रामीण महिलाओं के व्यावहारिक एवं रणनीतिपरक हितों से संबंधित संसाधनों के आवंटन को ग्रामीण विकास कार्यक्रमों में समेकित किया जाना चाहिए।

21. मध्य प्रदेश में फसल बीमा पर किया गया अध्ययन दर्शाता है कि समय–समय पर प्रारंभ की गईं अनेक योजनाओं के बावजूद, कृषि बीमा द्वारा बहुत सीमित प्रयोजन सिद्ध हुआ है। क्षेत्र तथा किसानों की संख्या के संबंध में कवरेज बहुत कम है, क्षेत्र युक्ति पर आधारित मुआवजे के भुगतान में क्षतिपूर्ति क्षेत्र से बाहर के प्रभावित किसान शामिल नहीं हैं, तथा अधिकांश योजनाएं व्यावहारिक नहीं हैं। फसल बीमा के कवरेज को बढ़ाने से सरकारी लागत में उल्लेखनीय वृद्धि होगी। जब तक इसे व्यावहारिक बनाये जाने के लिए कार्यक्रम को सावधानीपूर्वक दोबारा से तैयार नहीं किया जाता, तब तक कहीं अधिक किसानों को इसमें शामिल करने व प्रभावित करने के इसके भावी विस्तार की संभावनाएं दूरवर्ती बनी रहेंगी। इसमें कृषि बीमा के लिए समुचित क्रियाविधि की डिजाइनिंग एवं वित्तीय सहयोग प्रदान करने के संबंध में सरकार द्वारा समीक्षित प्रयास किए जाने की जरूरत है। ग्रामीण इलाकों के लिए बीमा उत्पाद डिजाइन व प्रस्तुतीकरण सरल होने चाहिए ताकि उन्हें आसानी से समझा जा सके।

22. शुद्ध फार्म आय पर सूचना की भूमिका के संबंध में किया गया अध्ययन दर्शाता है कि ऐसे किसान जो कि सूचना प्रौद्योगिकी का उपयोग करते हैं, द्वारा इसका प्रयोग नहीं करने वाले किसानों की तुलना में प्रति हेक्टेयर 12 प्रतिशत अधिक लाभ हासिल किया जाता है। खाद्यान्नों में विशिष्टीकृत फार्म की तुलना में विविधीकृत प्रणालियों (खाद्यान्न के साथ नकदी फसलें) के मामलें में सूचना का प्रभाव कहीं ज्यादा देखने को मिला। सार्वजनिक प्रसार में अल्प निवेश के कारण कृषि अनुसंधान पर कहीं अधिक खर्च करने से कृषि उत्पादकता में हासिल की जा सकने वाली क्षमताशील वृद्धि की वास्तविकता सीमित हो सकती है। परिणामों से पता चला कि प्रसार सेवाओं में निवेश पर मिलने वाला लाभ बेहद आकर्षक है और एक विखण्डित समाज में कृषि प्रौद्योगिकी के विस्तार के लिए इस सूचना की पहुंच को बढ़ाने हेतु अवसर अथवा संभावनाएं मौजूद हैं।

23. कृषि मजदूरी में रूझान पर किया गया अध्ययन दर्शाता है कि वर्ष 2003–04 और 2008–09 के बीच तथा वर्ष 2008–09 व 2013–14 के बीच कृषि मजदूरों के लिए वास्तविक मजदूरी में क्रमशः 19 प्रतिशत एवं 37 प्रतिशत तक वृद्धि हुई है। अध्ययन में यह भी पाया गया कि राज्यों तथा अखिल भारतीय स्तर पर फार्म गतिविधियों को करने में प्रतिदिन प्रति व्यक्ति वास्तविक मजदूरी (CPIAL deflator का उपयोग करके) में वृद्धिशील रूझान देखने को मिला।

24. पशुधन सेवाओं की आउटरिच और समग्रता को बढ़ाने हेतु संस्थागत नवोन्मेश पर किया गया अध्ययन दर्शाता है कि देश में पशुधन सेवा आपूर्ति प्रणाली को मजबूती प्रदान करने पर बल दिए जाने की जरूरत है। हरियाणा तथा राजस्थान राज्यों में किए गए सर्वेक्षण में पशुओं के झुण्ड आकार और डेयरी किसानों के आय स्रोत के बीच सकारात्मक

सम्बंध प्रदर्शित हुआ। पशुधन स्वास्थ्य सेवा हासिल करने हेतु औसत फीस एवं व्यय लगभग प्रति पशु रूपये 536.25 था तथा निजी प्रैक्टिशनरों और स्थानीय चिकित्सकों को उनकी आसान पहुंच और तुलनात्मक किफायती खर्चों के कारण कहीं ज्यादा पसंद किया जाता था। नर पशुओं सहित सभी पशुओं के स्वास्थ्य प्रबंधन की दिशा में किसानों के बीच जागरूकता उत्पन्न करने की जरूरत है।

25. बाजार बुद्धिमत्ता पर नेटवक्र परियोजना के अंतर्गत प्रमुख कृषि जिंसों के लिए मूल्य पूर्वानुमानों को देश के कुल 14 केन्द्रों से बुवाई से पहले तथा कटाई के दौरान किसानों को प्रसारित किया जाता है ताकि किसान उत्पादन एवं मार्केटिंग निर्णय करने में समर्थ बन सके जिससे उन्हें उच्चतर लाभप्रदता मिल सकेगी। अभी तक, किसानों में बुवाई–पूर्व 136 एवं कटाई–पूर्व 220 पूर्वानुमान प्रसारित किए गए।

26. उत्तराखंड राज्य में बाजार की बुनियादी सुविधा की स्थिति तथा प्रभाव पर किए गए अध्ययन के तहत, कुल पंद्रह बाजारों के लिए एक बुनियादी सुविधा विकास सूचकांक की गणना करने पर पता चला कि सर्वाधिक सुसज्जित बाजार हलद्वानी और उसके उपरान्त काशीपुर है जबकि सितारगंज और खाटिमा का स्कोर सम्मिलित सूचकांक में बहुत ही कम है। समाश्रयण विश्लेषण के माध्यम से पुनः किए गए अध्ययन में पता चला कि चुनिन्दा बाजारों में आवक अथवा आगमन बाजार में उपलब्ध व्यापार, भण्डारण तथा सहायी सेवाओं जैसी बुनियादी सुविधाओं से संचालित हो सकते हैं।

27. सार्क देशों के कृषि व्यापार का विश्लेषण करने पर पता चला कि कृषि व्यापार के मामले में क्षेत्र की तीन प्रमुख अर्थव्यवस्थाओं यथा भारत, पाकिस्तान व श्रीलंका के कारण साक्र शुद्ध निर्यातक है क्योंकि इन तीनों देशों का कृषि निर्यात में 95 प्रतिशत से भी अधिक योगदान है। अध्ययन दर्शाता है कि साक्र में कुल के साथ–साथ कृषि व्यापार में अधिकतम योगदान देने में भारत सबसे बड़ी अर्थव्यवस्था है लेकिन यहां अति उच्च उतार–चढ़ाव भी है। टीई 2005 एवं टीई 2013 में सबसे अधिक निर्यात की जाने वाली चार वस्तुओं में कपास, अनाज, मत्स्य व क्रस्टाशियन, चाय और पेय पदार्थ शामिल थीं जबकि विश्व के अन्य देशों से साक्र में तीन प्रमुख आयातित वस्तुएं पशु अथवा वनस्पति वसा, कपास, एवं रबर व वस्तुएं थीं।

28. प्याज के छः प्रमुख बाजारों नामतः आजादपुर, लासलगांव, पुणे, शोलापुर, बंगलुरू तथा हुबली के बीच मूल्य परिवर्तन और प्याज निर्यात मूल्यों की जांच करने वाले अध्ययन में पता चला कि दिल्ली, बंगलुरू, पुणे तथा लासलगांव के बाजारों में अन्य बाजारों की तुलना में व्यवस्था की कहीं अधिक गति प्रदर्शित हुई। यह शायद बाजारों के बीच स्थित अंतर–सम्पर्कों, मूल्य श्रृंखला के भीतर बैकवर्ड सम्पर्कों, बुनियादी सुविधा परिस्थिति और साथ ही वैश्विक बाजारों के साथ सम्पक्र पर निर्भर करता है।

29. प्याज पर किए गए एक अन्य अध्ययन में पता चला कि प्याज का मूल्य संकट लगभग प्रत्येक दूसरे वर्ष में एक आवर्ती घटना बन गया है। भारत में प्याज का सबसे बड़ा उत्पादक राज्य महाराष्ट्र है जिसका देश के कुल प्याज उत्पादन में लगभग 30 प्रतिशत का योगदान है जबकि इसके बाद कर्नाटक का स्थान है। देश में रबी मौसम में प्याज का लगभग 50–60 प्रतिशत उत्पादन और शेष 40–50 प्रतिशत खरीफ तथा पछेती खरीफ में होता है। अध्ययन दर्शाता है कि महाराष्ट्र में प्याज उत्पादन और राज्य के बाजारों में प्याज की आवक के बीच एक अति मजबूत और उल्लेखनीय सम्बद्धता है लेकिन खराब संबंधों के कारण जो कि वर्तमान वर्ष में बाजार आवक को दर्शाता है, का निर्धारण पूर्ववर्ती वर्ष के दौरान प्याज की आपूर्ति द्वारा निर्धारित किया जाता है। अध्ययन में पुनः देखने में आया कि जलवायु तथा उत्पादन आघात के कारण भी मूल्य संकट को बढ़ावा मिलता है जो कि प्याज के प्राइमरी बाजारों में उत्पन्न होकर देश के सभी बाजारों तक फैल जाता है।

# I PROFILE OF NIAP

The National Institute (earlier Centre) of Agricultural Economics and Policy Research (NIAP), established in 1991 by the Indian Council of Agricultural Research (ICAR), is committed to strengthen agricultural economics and policy research in the National Agricultural Research System (NARS) of the country. The Institute acts as a think tank of the ICAR and helps the Council through credible research to actively participate in policy debates and decision making. It serves as the nodal agency of the ICAR in monitoring and interpreting the research implications of changes at grassroot level and macroeconomic environment at national and international levels.

## Location

The Institute 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), and National Institute of Science, Communication and Information Resources (NISCAIR). The institute is very close to the National Agricultural Science Complex (NASC) which houses National Academy of Agricultural Sciences (NAAS), regional offices of nine Consultative Group on International Agricultural Research (CGIAR) Centers and offices of many professional societies. Thus, the Institute has the 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 Institute is:

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

   (a) Technology generation, diffusion and impact assessment,

   (b) Sustainable agricultural production systems,

   (c) Interaction between technology and other policy instruments like incentives, investments, institutions and trade, and

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

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

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

## Research Activities

Research activities of NIAP are broadly covered under the following three major theme areas:

(1) Technology and Sustainable Development

(2) Agricultural Growth and Development

(3) Markets, Trade and Institutions

As a part of policy advocacy, the Institute organizes workshops and participates actively in policy debates and interactions where issues of major policy interests are discussed by the policymakers, academicians and stakeholders etc. The Institute also organizes events where distinguished scholars and policymakers debate policy issues for developing a deeper understanding of various developments. Trainings and capacity building in frontier areas of agricultural economics and policy research are accorded high priorities by the Institute.

The Institute maintains close linkages with several national and international organizations involved in agricultural economics research, development and policy issues. Collaborative research projects, seminars, workshops, publications and participation in policymaking bodies are the usual modes of policy interface which help improve the outreach of the Institute. The Institute regularly brings out publications like Policy Paper, Policy Brief, Conference Proceedings, and Working Papers, besides publication of research articles in journals of national and international repute. These serve as the main agents for dissemination of its research findings. The Institute has succeeded in integrating social science research into agro-biological research, and through its credible policy research and communication has come to the expectation of its sponsors and stakeholders. Currently the Institute is implementing three mega network project (ICAR-SSN) in the areas of Market Intelligence, Regional Crop Planning and Impact Assessment of Agricultural R&D collaborating with various ICAR institutes and SAUs across the country.

## Management

A high-powered Research Advisory Committee (RAC) comprising eminent professionals, mostly from outside the ICAR system, guides the Institute on its research activities. Prof. S. Mahendra Dev, Director and Vice Chancellor, Indira Gandhi Institute of Development Research (IGIDR), Mumbai, is the Chairman of present RAC. Prof. V. S. Vyas, Member, Prime Minister's Economic Advisory Council, was the Chairperson of the previous RAC. The RAC provides guidance to the Institute in planning research thrusts and strategies. Initiatives in human resource development, approaches towards improving policy dialogues and evaluation are some other areas in which Institute receives guidance from the RAC.

The functioning of the Institute is supervised by the Institute Management Committee (IMC) which is constituted and mandated by the ICAR. Besides, a number of internal committees and cells, including those mandated by the ICAR, are operating for an efficient and decentralized management of the Institute. The Joint Staff Council (JSC) promotes healthy interaction and congenial work environment at the Institute. Director conducts regular meetings with staff, mostly every month, to discuss problems and difficulties, if any, faced by the staff and to elicit their suggestions for the cordial functioning of the Institute. The organogram of the Institute is illustrated in Figure 1.

The achievements and functioning of the Institute are periodically evaluated by the Quinquennial Review Team (QRT), constituted by the ICAR. The last QRT for the evaluation of Institute for the period 2006-2010 was chaired by Dr. S. S. Acharya, Honorary Professor, Institute of Development Studies, Jaipur. The QRT submitted its report to the Council in January 2012.

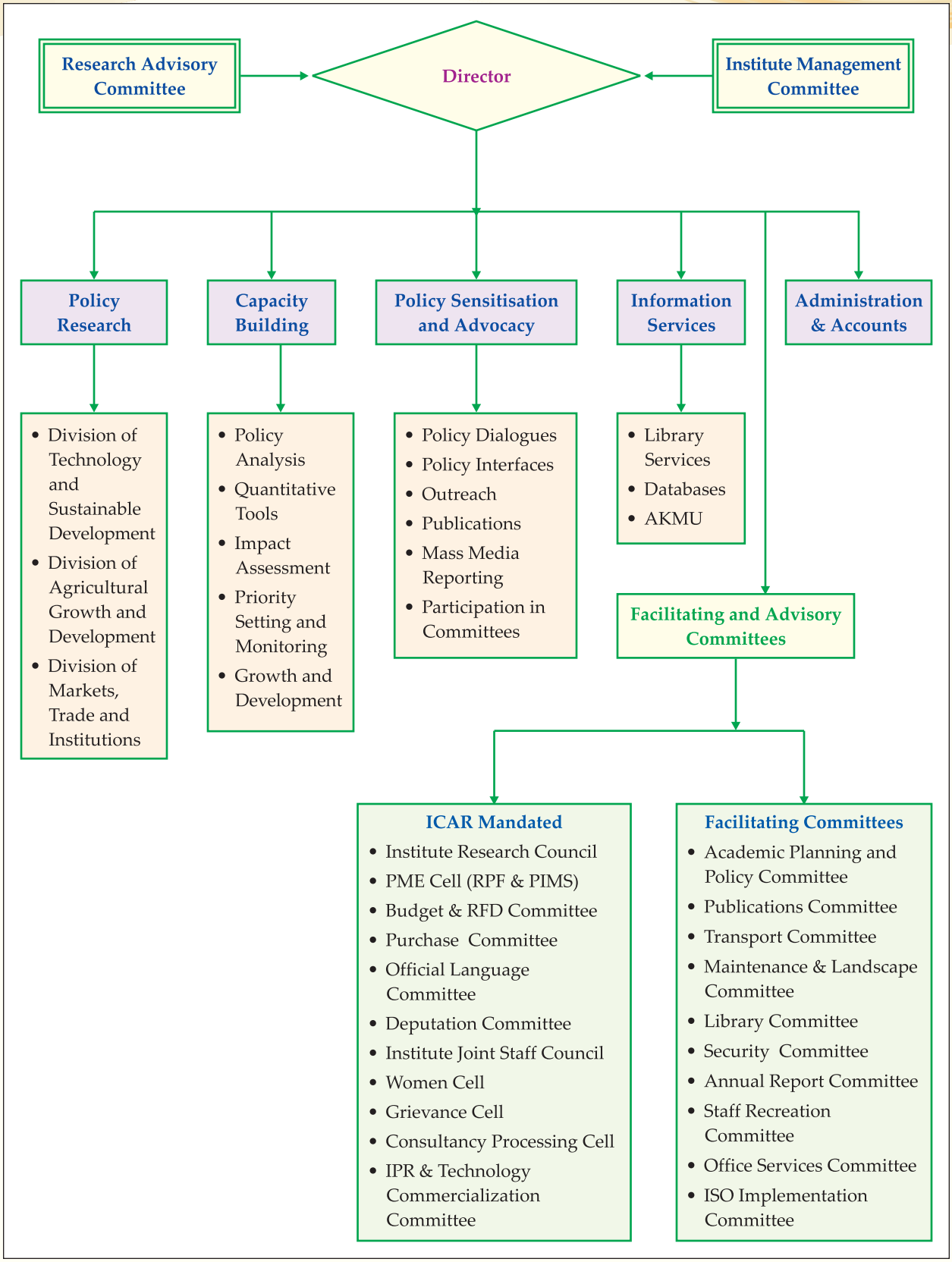



**Figure 1 : Organogram of NIAP**

# Infrastructural Facilities

## NIAP Website

The Institute website (http://www.ncap.res.in) provides the updated information and activities, particularly about its staff, infrastructure, research projects, publications, employment, tenders, RTI information and linkages (Figure 2). The Institute's website is hosted through Education and Research Network (ERNET), New Delhi, and is updated on a regular basis. All the NIAP publications like Policy Papers, Policy Briefs, Working Papers, PME Notes, Workshop Proceedings, etc. are available on the website in the form of PDF files. The website is published both in English and Hindi.

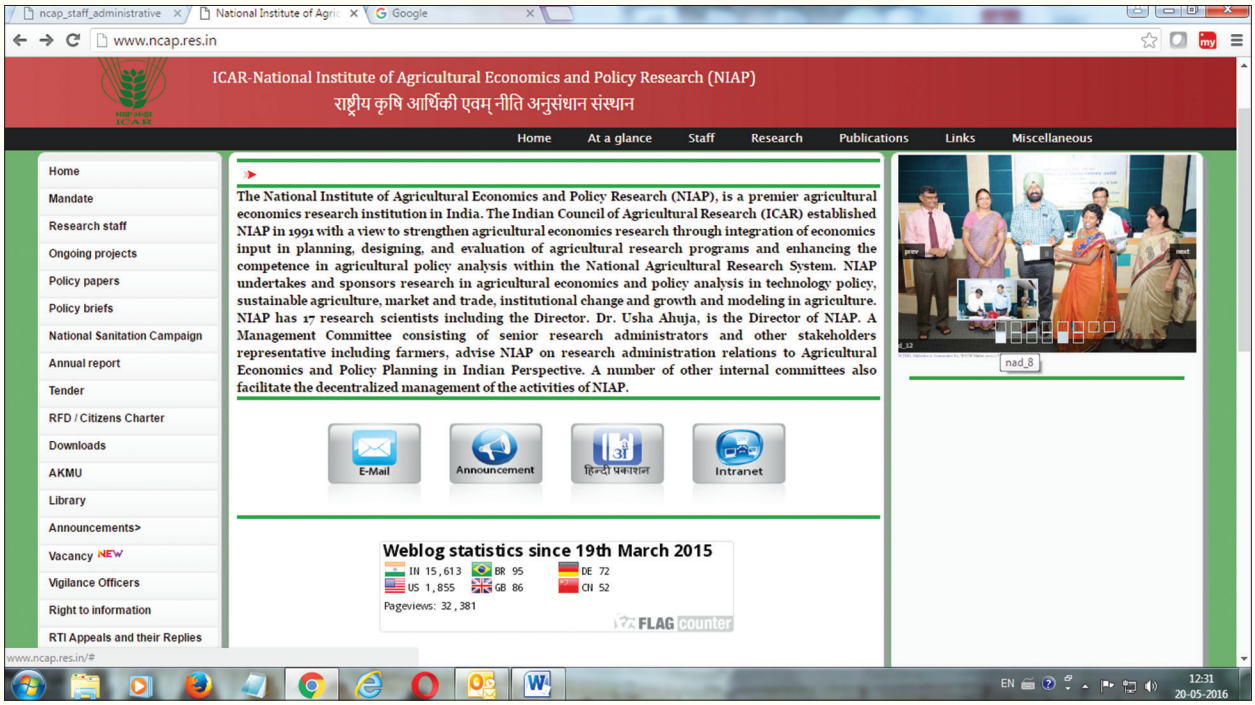



**Figure 2 : Homepage of NIAP website**

# Agricultural Knowledge Management Unit

AKMU at NIAP is delivering policy related research inputs, and providing other information through electronic and web mode. The goal of AKMU is to strengthen information management using modern technologies within NARS. The major objectives are:

1. To provide information to research managers and scientists,
2. To build capacity to organize, store, retrieve and use the relevant information,
3. To share information over NARS using NIAP website, and
4. To improve the capacity to plan, execute, monitor and evaluate research programmes.
5. To provide the technical assistance and instrumental support to the researchers on miniature basis.

To attain these objectives, the AKMU at NIAP is well equipped with latest computers, servers, firewall (Fort iGATE 80c), centralized antivirus server and analytical software like SPSS, STATA, LIMDEP, GIS, GAMS, Stella, Eviews and SAS. For data management and in-house

software development, SQL server and Visual Studio facilities have been installed. NKN leased line of 100 mbps has been functional to enhance quality and timeliness of the research work. Each individual staff of the Institute has been provided with latest computer and software, LAN, email account, internet facilities and required computational facilities. A blade server has been purchased to enhance the centralized server capacity of the Institute. Microsoft Exchange emailing solution has been established for smooth communication system at the Institute.

This unit facilitates use of many MIS developed and used within ICAR like PERMISNET, PIMS, HYPM, MIS-FMS and many others as required by the council.

Figure 3 : AKMU at NIAP

## Other relevant information

### ISO 9001:2008 Certification

The Institute was assessed for the purpose of ISO 9001:2008 Certification to (i) demonstrate its ability to consistently provide services that meet stakeholders requirements as well as statutory and regulatory needs, (ii) enhance consumer satisfaction through the effective application of system including process for continuous improvement, and (iii) to confirm the forward strategic plan. After assessment for ISO certification, certification agency recommended that the Institute meets the certification requirements. Thus ISO 9001:2008 certificate bearing number FS 615169 was awarded to NIAP by the British Standard Institute (BSI).

### MIS-FMS Implementation

MIS-FMS of ICAR has been initiated at the institute to enhance its efficiency and introduces best practices in the areas of Grants and Budgeting, Financial Management, Project Management, Procurement & Stores Management, Human Resource Management and Payroll. This system integrates internal and external management of information across the entire organization. ERP system


Figure 4 : ERP system implementation at NIAP

facilitate the flow of information across all business functions (like Finance, Admin, Scientific, Technical) inside the boundaries of the organization and manage the connections to outside stakeholders (like suppliers, banks etc.). It provides a platform in a most effective way to perform each business process without losing the process integrity.

Payroll and human resource management system are closely linked together and their utility can be optimized with an integrated approach. Payroll system has been successfully implemented on monthly basis at NIAP by Establishment and Personnel Section. The payroll system also takes care of handling of employee loans and advances, TDS Deductions, NPS, GPF and gratuity. Core HRMS through ERP system helps in maintenance of service books of employees, employee promotion and pay fixation, employee transfer and deputation, employee leave management. Some information can be updated directly by employees through self-service HRMS. Grants and Budgeting Process has also been under progress. Following has been achieved so far:

## Library

NIAP library provides reading materials to scientists, agricultural policy makers, students and other stakeholders in the NARS. It has a specialized collection of print, electronic, audio, audio-visual and digital resources. Presently, library subscribes Economic and Political Weekly (EPW) digital archives and databases like EPW Research Foundation and Indiastat. Electronic databases are made available through Institute network to the library users. Library is conducting innovative information literacy programme of Consortium for e-Resources in Agriculture (CeRA), J-Gate for NIAP staff.

The Institute library possesses total of 6816 publications, comprising of 3434 reference books, 125 CD-ROMs, 2321 database publications, 812 reports and 124 SAARC publications and other reference materials. The Institute's library has subscription to 15 international and 10 national journals. Library has reserved a separate section for books of official language (Hindi). Library is playing active role in timely dissemination of scientific and technical information for research via Document Delivery Service (DDS), Current Awareness Service (CAS), newspaper Clipping Service, Resource Sharing Activities in other sister institute's libraries like IARI, IASRI, NBPGR, Inter Library Loan (ILL) facility from the CGIAR institutes like IFPRI, IWMI, CIMMYT, IRRI, ILRI, ICRISAT etc.

## Exhibition and Record Room

The NIAP has created an exhibition cum record room to showcase the accomplishments of the Institute following the recommendations of the QRT. Accordingly, the record room showcases research and other achievements and activities, and displays all NIAP publications, annual report, and publications of individual scientist, recognitions and awards received by the Institute and by individual scientists. A photo gallery displays memories of all important events organized by the Institute.

## Budget

The expenditure of NIAP and staff position for the year 2015-16 is presented in Table 1 and Table 2, respectively.

## Table 1 : Statement of expenditure of ICAR-NIAP during 2015-16

(Rs. Lakh)

| Head of Account | Plan | Non-Plan | Total |
|---|---|---|---|
| Pay and allowances | - | 357.90 | 357.90 |
| Overtime allowance (OTA) | - | 0.01 | 0.01 |
| Travelling expenses | 4.61 | 0.11 | 4.72 |
| Office equipment | 6.85 | - | 6.85 |
| Library | 9.83 | - | 9.83 |
| Furniture | 0.38 | - | 0.38 |
| Minor works | 0.33 | - | 0.33 |
| Human Resource Development (HRD) | 1.23 | - | 1.23 |
| Network Project | 220.28 | - | 220.28 |
| Research & operational expenses | 25.78 | 3.00 | 28.78 |
| Administrative expenses | 108.43 | 2.74 | 111.17 |
| Misc expenses | 1.50 | 1.48 | 2.98 |
| Pension/Retirement benefits | - | 0.04 | 0.04 |
| P-Loans & advances | - | 2.91 | 2.91 |
| **Sub-Total** | **379.22** | **368.19** | **747.41** |
| Other projects | 25.04 | 44.24 | 69.28 |
| **Grand Total** | **404.26** | **412.43** | **816.69** |

## Table 2 : NIAP staff position during 2015-16

(Number)

| S. No. | Name of Posts | Sanctioned Strength | In Position | Vacancy |
|---|---|---|---|---|
| 1. | RMP | 1 | 0 | 1 |
| 2. | Principal Scientist | 6 | 5 | 1 |
| 3. | Senior Scientist | 6 | 3 | 3 |
| 4. | Scientist | 13 | 12 | 1 |
| 5. | Administrative Officer | 1 | 1 | 0 |
| 6. | Assistant Administrative Officer | 1 | 1 | 0 |
| 7. | Assistant Finance & Accounts Officer | 1 | 1 | 0 |
| 8. | Private Secretary | 1 | 1 | 0 |
| 9. | Assistant | 4 | 4 | 0 |
| 10. | Upper Division Clerk | 1 | 1 | 0 |
| 11. | Junior Stenographer | 1 | 1 | 0 |
| 12. | Lower Division Clerk | 2 | 0 | 2 |
| 13. | Technical Assistant | 4 | 4 | 0 |
| 14. | Technician | 1 | 1 | 0 |
| 15. | Skilled Supporting Officer | 2 | 2 | 0 |
| | **Total** | **45** | **37** | **8** |

**Table 3 : New Posts as per EFC**

| S. No. | Name of the posts | No. of posts | Scale of pay |
|---|---|---|---|
| **SCIENTIFIC** | | | |
| 1. | Principal Scientist | 2 | Rs. 37400-67000+10000 RGP |
| 2. | Senior Scientist | 3 | Rs. 37400-67000+9000 RGP |
| **TECHNICAL** | | | |
| 3. | T-1 | 2 | Rs. 5200-20200+2000 GP |
| 4. | T-3 | 3 | Rs. 5200-20200+2800 GP |
| **ADMINISTRATIVE** | | | |
| 5 | Finance and Accounts Officer | 1 | Rs. 15600-39100+5400 GP |
| 6. | Assistant | 3 | Rs. 9300-34800+4200 GP |
| 7. | Personal Assistant | 3 | Rs. 9300-34800+4200 GP |
| **SUPPORTING STAFF** | | | |
| 8. | Skilled Supporting Staff | 3 | Rs. 5200-20200+1800 GP |
| | **Total** | **20** | |

# II RESEARCH ACHIEVEMENTS

## TECHNOLOGY AND SUSTAINABLE DEVELOPMENT

### Role of irrigation and technology in enhancing resilience of agriculture to droughts

*P. S. Birthal, D. S. Negi, Md. Tajuddin Khan and Shaily Agarwal*

Drought is a recurrent phenomenon in India, affecting more than two-thirds of country's geographical area. Its probability of occurrence is 35% —once in three years, and ranges from 20% in dry-humid regions to 40% or more in arid regions. India experienced 13 major droughts since the beginning of the Green Revolution in 1966. A severe drought can affect food production adversely depleting productive assets; exacerbate rural poverty; force outmigration, and may reduce demand for non-agricultural goods. Drought management strategy of the country lately, however, has undergone a paradigm shift; from crisis management to risk management emphasizing on (i) preparedness; to develop location-specific contingency plans, based on the meteorological forecasts, and (ii) mitigation and adaptation through innovations in irrigation management and crop breeding for drought-tolerance to enhance resilience in agriculture.

Impact of droughts on rice production was examined using district-level data for the period 1969-2005 along with the role of adaptation strategies such as irrigation and crop varieties in mitigating their harmful effects. Most drought events in India were of moderate intensity. Severe droughts were less prevalent, but there was increase in frequency of moderate droughts (Figure 5).

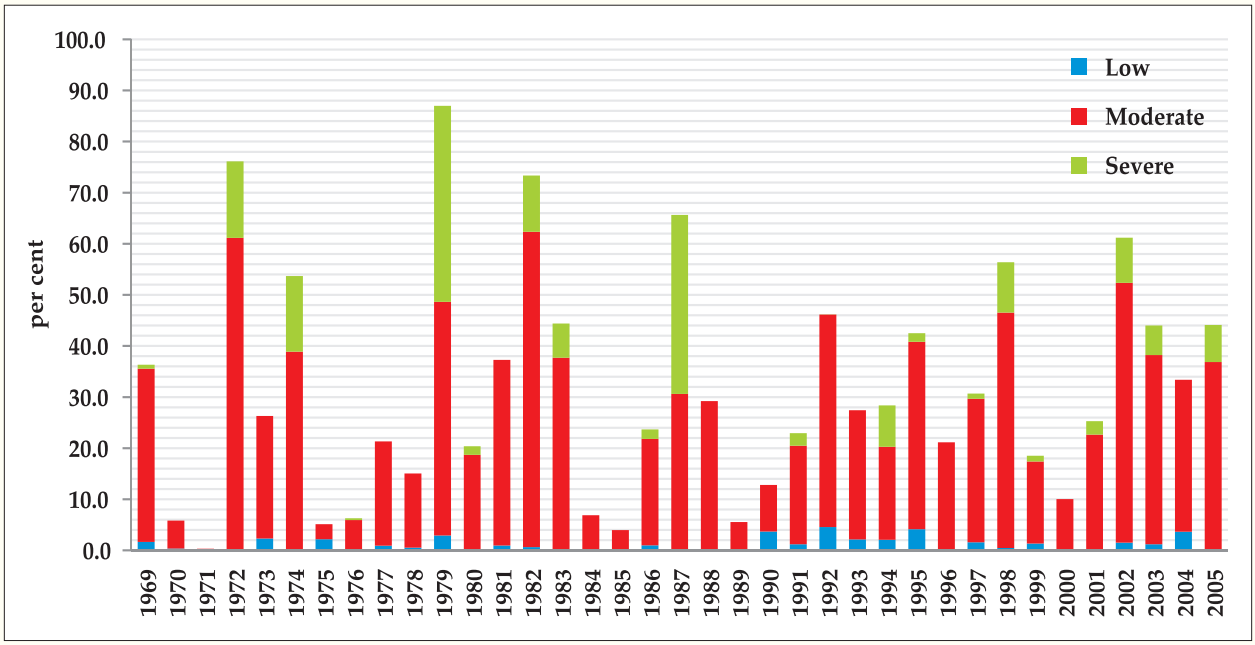



**Figure 5 : Year-wise rice area affected by droughts of different intensities, 1969 to 2005**

On an average, over 31 % rice area was affected by drought (Table 4). However, its effect was observed to be weakened on rice yield. The yield losses declined in absolute as well as relative terms under moderate and severe droughts; indicating that rice production has become resilient to droughts. Improvement in irrigation system played an important role in enhancing resilience (Figure 6). For rice irrigation coverage increased from 38% in 1969-70 to 59 % in 2010-11. Similarly, between 1988 and 2010, number of rice varieties released per annum for rainfed uplands and rainfed shallow lands increased by 193% and 141%, respectively, over corresponding annual releases during 1969 to 1987.

The study emphasizes the need to improve efficiency of existing irrigation systems and conserve water through innovative measures such as water harvesting, sprinkler irrigation, alternate wet-and-dry system, conservation tillage, laser land levelling, etc. There is also need for greater investment in drought-tolerance research and development of extension systems capable of providing farmers timely weather forecasts and seeds of varieties with tolerance levels to droughts.

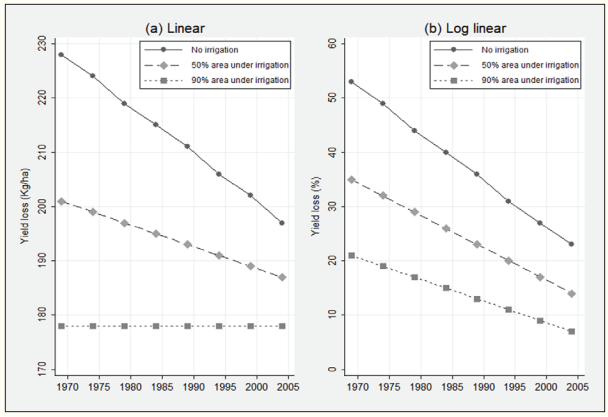



**Figure 6 : Predicted drought-induced yield loss under different irrigation levels at mean drought intensity**

**Table 4 : Deviation in rice yield from its historical trend at different severity levels of drought**

| Period | | Low | Moderate | Severe | All |
|---|---|---|---|---|---|
| 1969-1987 | **Drought** | | | | |
| | Mean drought index | 0.04 | 0.49 | 2.84 | 0.97 |
| | Frequency (%) | 2.3 | 76.8 | 20.9 | 100.0 |
| | Rice area affected (%) | 0.7 | 24.5 | 6.5 | 31.7 |
| | Impact on rice yield | | | | |
| | Mean yield (Kg/ha) | 1246.2 | 1259.0 | 1139.7 | 1234.1 |
| | Deviation from trend (Kg/ha) | +37.4 | -45.5 | -191.2 | -73.7 |
| | Deviation from trend (%) | +3.0 | -3.6 | -16.8 | -6.0 |
| 1988-2005 | **Drought** | | | | |
| | Mean drought index | 0.06 | 0.45 | 2.00 | 0.57 |
| | Frequency (%) | 3.1 | 88.4 | 8.5 | 100.0 |
| | Rice area affected (%) | 1.5 | 26.8 | 2.7 | 31.0 |
| | Impact on rice yield | | | | |
| | Mean yield (Kg/ha) | 1936.9 | 1900.3 | 1814.2 | 1894.6 |
| | Deviation from trend (Kg/ha) | +4.6 | -25.2 | -147.0 | -34.3 |
| | Deviation from trend (%) | +0.2 | -1.3 | -8.1 | -1.8 |

## Changes in cropping pattern towards cash crops

*S. S. Raju, Sonia Chauhan, Amrit Pal, Rajni Jain, S. K. Srivastava, Jaspal Singh and Kingsly Immaneulraj*

There are significant changes in growth of area under staple crops like wheat and rice. Area under rice in TE 1973 was 37.6 million hectares (Mha), which increased to 42.9 Mha during TE 2013. Similarly, area under wheat increased to 29 Mha from 18.6 Mha during the same period. These two crops substituted area under other minor cereals, pulses and oilseed crops. The increase in wheat cultivation has been at the cost of gram, rapeseed and mustard, while that of rice by substituting area under groundnut, millets and cotton. The remunerative and assured prices, subsidy and government policies favour cultivation of wheat and rice, which cause shortage of other minor cereals, pulses and oilseeds in the country. This has led to large- scale imports of oilseeds and pulses.

Area under total cereals, except under maize, has recorded decline over time. Pulses, being more risky and less profitable, are shifting to marginal and rain-fed lands and thus have registered decline in their share over time. In the past four decades, overall, area under foodgrains has registered decline of 10 percentage points. Area lost by foodgrains between TE 1973 and TE 2013 was utilized for cultivation of some oilseeds, fruits and vegetables, cotton and sugarcane. Although shift from coarse cereals to high-value crops would increase farm output and farmers income, but in dry lands, its likely to expose cultivators to serious weather risks because most high-value crops have a high water requirement.

Among oilseeds during TE 1973 to TE 2013, area increase was noticed only in rapeseed - mustard and soybean. In rapeseed-mustard increase was 2.09 per cent to 3.16 per cent, and in soybean area increase was tremendous, from 0.02 per cent to 5.06 per cent. Favorable market for refined oil and protein-rich soya food might have induced farmers to allocate larger areas to these crops. The area under groundnut came down from 4.47 per cent to 2.85 per cent. Sesame, however, sustained its share of more than 1 per cent in the total cropped area. The share of other oilseeds, safflower, sunflower seeds, linseed, castor seed and niger dropped over the time.

The area under commercial crops, like cotton and sugarcane increased. Although area under cotton decreased to 4.08 per cent during TE 1993, but introduction of Bt cotton, accelerated its share to 5.73 per cent till TE 2013. Sugarcane registered marginal increase from 1.51 per cent during TE 1973 to 1.90 per cent in TE 1993, which further increased to 2.42 per cent in TE 2013. And area under fruits and vegetables doubled in the past two decades. The study has revealed that Indian agriculture is experiencing diversification towards oilseeds, horticultural crops, cotton and sugarcane.

## Bringing Green Revolution to Eastern India (BGREI): State level analysis

*Sant Kumar*

With the objective of enhancing production and productivity of various crops, government of India initiated Bringing Green Revolution to Eastern India (BGREI) programme in 7 eastern states of Assam, Bihar, Chhattisgarh, Jharkhand, Odisha, Uttar Pradesh (eastern part), and West Bengal in the year 2010-11. The BGREI programme is intended to address constraints limiting productivity of 'rice-based cropping systems'. Because of constraints like poor irrigation, abiotic stresses of flood/ submergence, drought and salinity, poor infrastructure, etc. the productivity of rice and wheat in eastern region is low as compared to

western states of the country like of Punjab, Haryana, and western Uttar Pradesh.

The study analyses progress in production and yield of rice in eastern India after the launch of BGREI programme. During the launch year of BGREI (2010-11), eastern region was contributing about 60 per cent of total area under rice and 51 per cent of total rice production. Subsequently, rice production increased by 3 per cent upto 2013-14. Data shows that in past four years, rice production increased by 8 Mt, despite decline in area by 1.0 Mha. Analysis has shown that out of additional production of 8 Mt, about 4 Mt each was added in past two years of 2012-13 and 2013-14. Additional rice production was contributed by Uttar Pradesh (0.881 Mt), Bihar (0.801 Mt), West Bengal (0.774 Mt) and Jharkhand (0.566 Mt) states.

## *Rabi* rice in eastern India

During 2013-14, 2 Mha area of eastern region was 50 per cent of the total *rabi* rice area of India. *Rabi* rice in eastern India was mainly cultivated in West Bengal (61.2% area), Assam (19.3%), Odisha (13.3%) and Bihar (4.4%) (Table 5). The analysis revealed that area under *rabi* production increased by 1 Mt in spite of marginal decline in *rabi* rice area due to increased productivity during post BGREI period (2010-11 to 2013-14).

## Rice productivity levels in Eastern India

In *kharif*, average yield in Eastern India (EI) was about 1.7 tonnes/ha in 2010-11, which increased to 2.1 tonnes/ha in 2013-14. However, *kharif* level of Eastern India was 11 per cent less than all-India average. The main reason for lower yields was attributed to poor and erratic monsoon rainfall during 2010-11 to 2013-14. Highest increase in rice yield was observed in Bihar (803 kg/ha), followed by Jharkhand (494 kg/ha), Chhattisgarh (384 kg/ha), and lowest was in Odisha (90 kg/ha). Therefore, under uncertain and erratic rainfall, refining existing production technologies and releasing stress- tolerant (drought, flood/submergence, and salinity) improved varieties suiting to the region are possible remedial measures to improve rice productivity.

Yield of *rabi* rice was generally higher than *kharif* rice across the eastern states, except Jharkhand, during 2010-11 to 2013-14. There was a quantum jump in *rabi* yield even in eastern states during the period under consideration; 3 tonnes/ha yield in Odisha and West Bengal even equalled to all-India average. During 2010-11 to 2013-14, increase in *rabi* rice yield was highest in Odisha (577 kg), followed by Bihar (553 kg), Assam (481 kg), and lowest was in Uttar Pradesh (341 kg).

**Table 5 : Share of *rabi* rice area by states of eastern India, 2010-11 to 2013-14**

Per cent

| Year (TE) | Assam | Bihar | Chhattisgarh | Jharkhand | Odisha | Uttar Pradesh | West Bengal | *Rabi* rice area in EI (Mha) | Share of *rabi*rice area of EI in all-India (%) |
|---|---|---|---|---|---|---|---|---|---|
| 2010-11 | 16.60 | 4.30 | - | 0.59 | 13.18 | 0.75 | 64.59 | 2.25 | 5.2 |
| 2011-12 | 18.15 | 4.03 | - | 0.61 | 12.58 | 0.84 | 63.80 | 2.10 | 4.9 |
| 2012-13 | 19.09 | 4.27 | - | 0.62 | 13.02 | 1.02 | 61.98 | 2.05 | 4.8 |
| 2013-14 | 19.28 | 4.37 | - | 0.63 | 13.28 | 1.23 | 61.22 | 2.03 | 4.7 |

E I: Eastern India

Poor institutions, investments, input distribution and technological barriers explain much of the yield variations in eastern India. The results suggest high research priority needs to be given to rainfed uplands and lowlands.

## Mainstreaming adaptation policies in development planning to enhance resilience of Indian agriculture

*Naveen P Singh, Balaji S. J., Pavithra S, Jaya Jumrani, Md. Arshad Khan and Bhawna Anand*

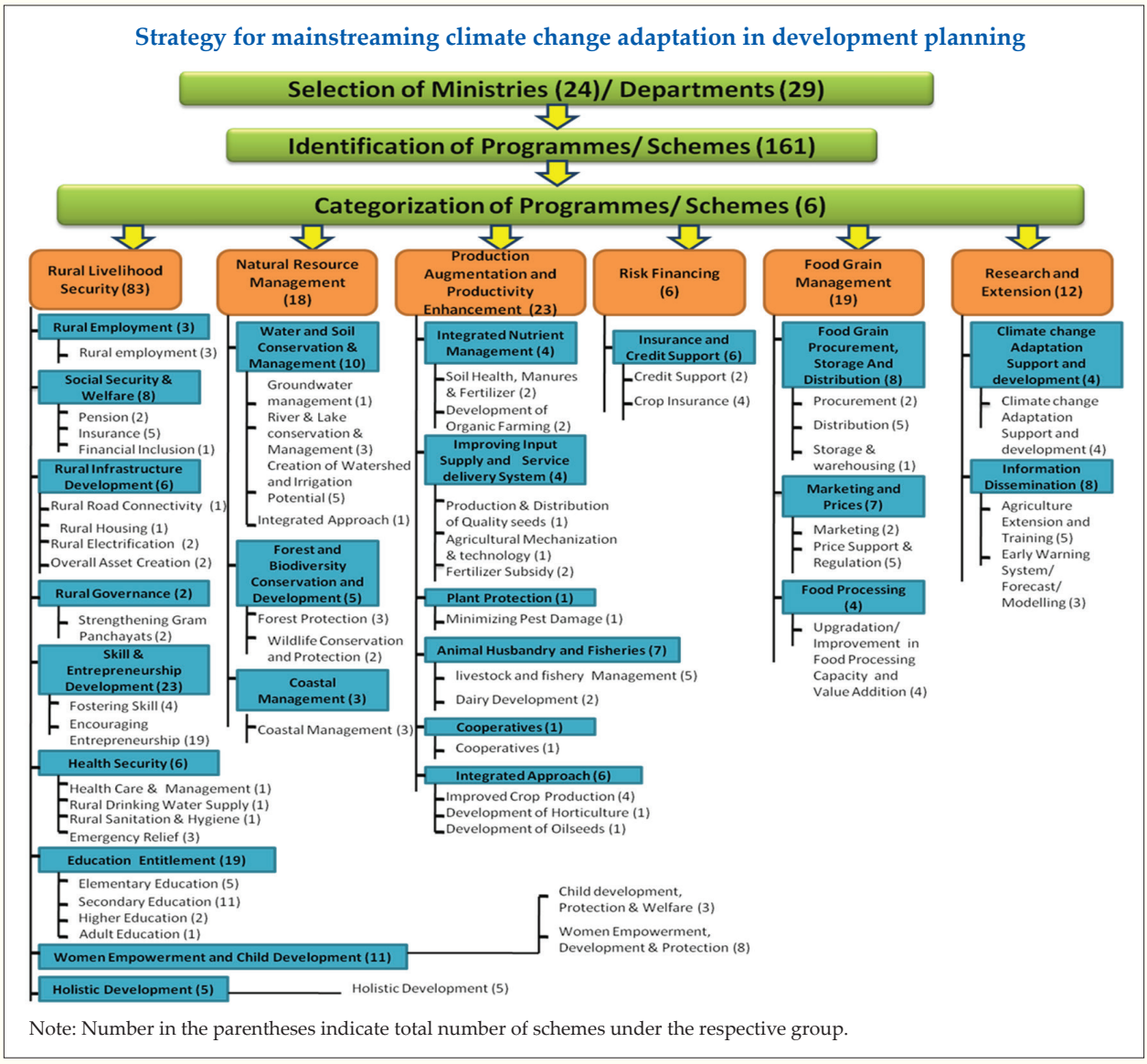
In view of the widespread awareness regarding climate change, its socio-economic impact and associated vulnerability, it has become imperative to review programmatic interventions by the Government of India in developmental planning, which would directly or indirectly enhance resilience of Indian agriculture. Of late, there has been an increasing consensus among planners and policy-makers to mainstream adaptation agenda into developmental plans. In this context, the study elicited grass- root observations through participatory rural appraisals (PRA) and focused group discussions in Mahbubnagar district of Telangana and Moga district of Punjab for understanding needs, problems and potential strategies adopted by farmers and also ascertained reach and awareness of schemes and programmes aimed at rural development or farmers welfare. The farmers during PRA mentioned about increase in annual temperature and reduction in total annual rainfall with increased phenomenon of erratic rainfall, especially during the past decade. They also highlighted late onset of monsoon, reduced number of rainy days, increased intensity of rainfall and increased summer and winter temperatures, which eventually caused disturbance in physiological and biological processes of the crops and thus affected crop production and their livelihoods.

At the farm level, farmers are struggling with lack of appropriate technology, non-availability of improved- and drought -tolerant seeds, difficulty in having supplementary irrigation, inadequate access to weather information, small size of farm, limited capacity for crop diversification and limited income source during stress period. While at the institutional level, they face constraints like poor access to institutional credit, difficulty in availing insurance policies for crops, unavailability of adequate compensation in case of natural calamities, inefficient co-operatives/association, and lack of efficient market access to sell their produce. Technological barriers comprise of lack of improved technology to recharge depleting groundwater and of information on water-efficient crops and technologies, etc. At the community level, there is labour shortage, population pressure, lack of collective approach and lack of education. Various coping mechanisms have been adopted by farmers to face climatic variability/change like shift to new suitable crops and varieties, changes in dates of operations to suit changed growing period, more dependence on non-farm activities and migration to places of higher labour demand.

It was noticed that not only farmers but also local institutions like KVKs were unaware about various welfare programmes / schemes formulated by the Government. Therefore concerted efforts to enhance awareness of climate change adaptation programmes among various stakeholders need to be made to ensure that intended benefits of the schemes reach targeted beneficiaries. There is a need to address issues in accessing government programmes/schemes and to create conducive environment for diversification of rural income and managing village resources through community participation.

The study after analyzing climate change associated risks in Indian agriculture, formulated 6 broad thematic groups— *Rural Livelihood Security; Natural Resource Management; Production Augmentation and Productivity Enhancement; Risk Financing; Food Grain Management;* and *Research and Extension.* Based on the pertinence to these groups, from the total of fifty-three ministries of the Government of India during 2015-16, the study identified twenty-four ministries associated with the development-adaptation continuum responsible for livelihood support to rural people. It has been observed that the Government is operationalizing a number of developmental programmes/schemes across these different ministries with the objective of outcome oriented holistic development of the targeted section or the region.

As shown in the Figure 7, against the backdrop of six identified thematic groups, a total of 161 developmental schemes/ programmes have been selected. The study has further




Note: Number in the parentheses indicate total number of schemes under the respective group.

**Figure 7 : Strategy for mainstreaming climate change adaptation in development planning**

disaggregated the thematic groups into 24 sub-groups and 52 categories. Thus an extended classification is in consonance with the stated objectives of identified schemes/ programmes across the ministries. Such a cross cutting and thematic/need based convergence of different programmes would ensure mainstreaming developmental agenda as per the relevance of the programme to climate change adaptation. This approach envisages sensitizing policy-makers towards the programme duplication issue and in ensuring effective utilization of available financial resources thereby bringing prudency, effective targeting and outcome oriented approach to enhance resilience of Indian agriculture.

## Identifying pathways of socio-economic and socio-personal attributes and study their influence on agricultural performance across different agro-ecosystems in India

*Naveen P. Singh, S. K. Srivastava and Balaji S. J.*

The role of socio-economic and demographic attributes of the population has not been given enough impetus while disseminating technologies and assessing their impacts. The study aims to enhance understanding of dynamics of rural settings and identify pathways for mapping socio-economic and socio-personal patterns in different agro-ecosystems.

For socio-economic and socio-personal profiling, various indicators on different dimensions have been identified. They are (1) demographic pattern (population, average age of household head, family size, education status, skilled training status, caste composition); (2) economic indicators (average income of the household, major source of income, poverty, cost and returns from crop and livestock production, level and pattern of consumption expenditure, assets and liability status of the household, land holding size, ownership pattern; (3) employment status (Labour force, workforce, unemployed population, sectoral composition of employment); (4) institutional and infrastructure related indicators (access to road, access to market, access to irrigation, access to electricity and energy, access to technical know- how and extension agencies).

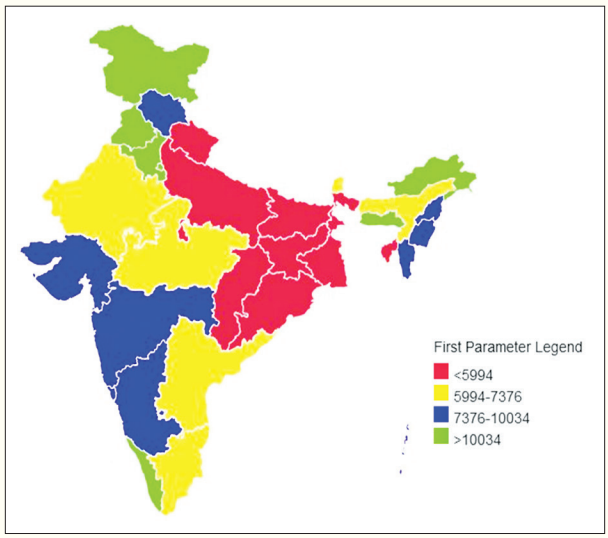



**Figure 8 : Monthly income from all sources**

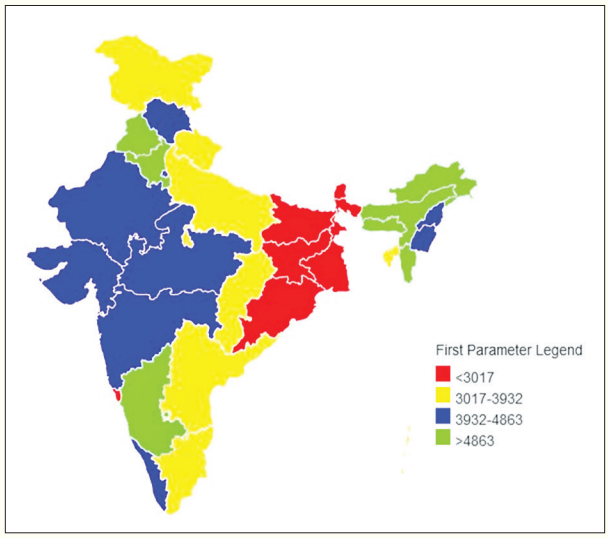



**Figure 9 : Monthly income from cultivation and livestock**

The latest available data from *Situation Assessment Survey of Agricultural Households (SAS), 2012-13* revealed that average agricultural household in India earns a monthly income of Rs 6427 and 54.46 per cent of the agricultural households in rural India are below poverty line. Among different income sources, farm business (cultivation + livestock) accounts for nearly 60 per cent of the income. Development in farm sector would have a direct impact on farmer's income. There exists a wide regional variation in income of agricultural households. A perusal of Figure 8 and 9 shows that farmer's income from agriculture (cultivation + livestock) is the lowest (less than Rs. 3,017 per month) in eastern region as compared to the other regions of the country. Among different states, income from all sources varied from Rs. 3540 in Bihar to Rs. 18,054 in Punjab. The eastern region is characterized as low input-low productivity region, and targeting this region would bring in greater impact on farmer's income than focusing in states where agricultural productivity is already at a relatively higher level.

## Revisiting groundwater depletion and its implications on farm economics in Punjab

*S. K. Srivastava, Ramesh Chand, Jaspal Singh, Amrit Kaur, Kingsley I., Rajni Jain and S. S. Raju*

The groundwater depth data of monitoring wells of the Central Ground Water Board (CGWB) have revealed that average groundwater level in Punjab has declined from about 8 metre below ground level (mbgl) before the year 2000 to about 15 mbgl during 2013 at the rate of about 43 cm per annum (Figure 10a). The cumulative distribution curve shows that about 80 per cent of the observation wells had less than 10 mbgl groundwater level during 1981 (Figure 10b). Subsequently, groundwater level has declined significantly, and lately only 35 per cent of the total wells in the state have less than 10 mbgl water level. The downward shift in cumulative distribution curve implies decline in groundwater level between 1981 and 2013.

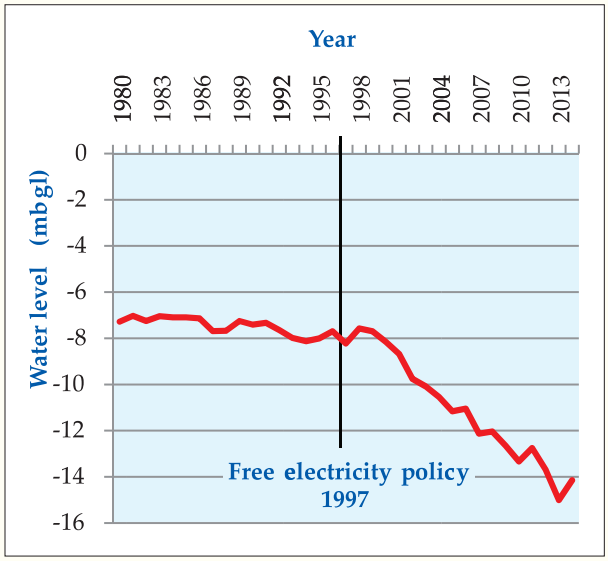



**Figure 10 (a) : Trend in average groundwater level**

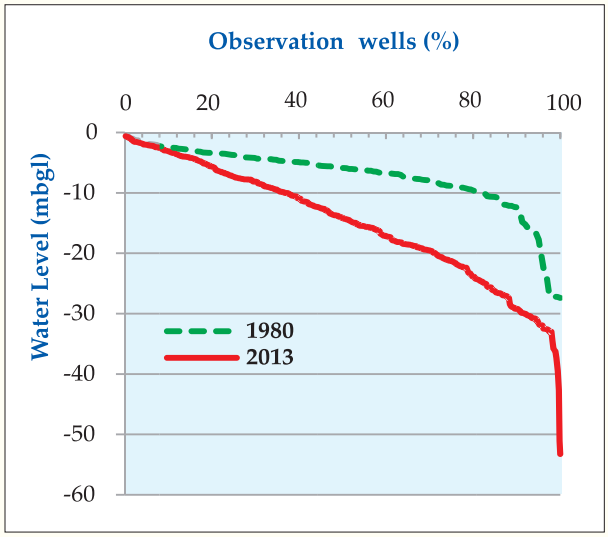



**Figure 10 (b) : Cumulative distribution curve of observation wells in Punjab**

It is to be noted that there exists a wide spatial heterogeneity in groundwater level in the state. According to the CGWB, groundwater level ranges from near surface to about 53 mbgl (Figure 10b). The district-wise

diagnosis revealed a decline in groundwater level primarily in the north-central region of the state. In the south-west region, average groundwater level was less than 10 mbgl; this region is facing problems of rising groundwater level due to extensive and prolonged use of surface water for irrigation without adequate drainage. Thus, the state suffers from excessive groundwater depletion in the north-central part and rising groundwater level in the south-west region.

Regression analysis revealed that monsoon rainfall and canal irrigation contributed positively to groundwater level through augmentation of groundwater supply. However, the direct association between monsoon rainfall and groundwater level was found weaker than the association between canal irrigation and groundwater level. This implies that rainfall alone cannot avert groundwater depletion and thus greater emphasis must be given to integrated water resources management for augmenting of groundwater resources.

Emerging dominance of water-guzzling paddy crop has accentuated groundwater crisis in the state. The assured groundwater irrigation along with comparative advantages such as higher yield, support prices, assured market infrastructure, subsidized farm inputs and free electricity have prompted Punjab farmers to cultivate non-traditional paddy crop. But paddy consumes 45 per cent more (than sugarcane) and 88 per cent more (than maize) exhibits lowest groundwater productivity (Rs/cubic metre) and large-scale inefficiencies in groundwater use than other crops. Though remunerative, paddy is ecologically a misfit in Punjab. The regression analysis also captured adverse effect of paddy cultivation on groundwater depletion. One of the major reasons for inefficient use of groundwater for crop production is availability of free electricity which gives no incentive to farmers to optimize use of groundwater resources. The estimated dummy coefficient for free power for agriculture indicated significant and catalytic effect of free electricity on groundwater depletion.

Punjab farmers incurred Rs 0.46 for extracting one cubic metre of groundwater and small and marginal farmers had to spend 2-3 time higher compared to large farmers. The inverse relationship between irrigation cost and size of land holding was because of over-capitalization of Groundwater Extraction Devices (GEDs) on smaller land holdings and presence of economies of scale on larger farms. The analysis further revealed that for marginal farmers groundwater extraction cost from family own GEDs (0.98 Rs/cum) was higher than cost incurred in purchasing groundwater (0.70 Rs/cum). This implies that for the farmers with less than one hectare of land holding it is not economical to install their own GEDs. Depleting groundwater further increases groundwater cost and effect of such cost escalation is borne by the small and marginal farmers. Therefore for welfare of smaller land holdings, installation of community based GEDs and promotion of groundwater market would be an economically viable alternative.

## Agricultural biotechnology and crop productivity: macro-level evidences on contribution of Bt cotton in India

*S. K. Srivastava and Deepthi Kolady*

The Technological breakthroughs and policy reforms in the Indian seed sector have resulted in ten-fold increase in cotton production during the past six decades (Figure 11). Cotton production has increased from just 3.04 million bales (1 bale = 170 kg) during 1950–51 to 36.10

million bales during 2012–13, at an annual growth rate of 3%. This was primarily due to improved cotton yield from 88 kg/ha during 1950–51 to 482 kg/ha during 2012–13 at the rate of 2.55% per annum. Much of the improvement in cotton yield took place during the recent decade after 2002–03. During the past 12 years (2002–03 to 2012–13), cotton yield has increased by 152% compared to only 117% in the preceding 53 years. It is worth mentioning that although hybrid technology was available since 1970 and seed policy reforms incentivized private sector participation in cotton seed sector, adoption rate of hybrids was only about 50% until 2002. With the introduction of *Bt* cotton in 2002, area under cotton and hybrid cotton has increased significantly.

Panel data regression analysis has revealed that there is a structural change in cotton yield growth during post-Bt period. The manifestations of this impact are reflected through reversal in India's position from a net importer to a net exporter of cotton, impressive growth in agro-biotech industry and narrowing down of difference between average yields of India and the world. Cotton yields even though have improved, but still are 31% lower than average world yield, and lately have stagnated due to a complex set of inter-related factors. Further, secondary pest infestation in cotton- crop is on a rise; raising concerns among farmers and researchers. This suggests that country needs to continue its R&D investments in technology and develop supportive policy for such investments from both public and private sectors.

## Changing structure of crop production cost and technological effects in India

*S. K. Srivastava, Jaya Jumrani, Jaspal Singh, Sumit Kumar*

The recent years have witnessed sustained rise in real cost of cultivation of crops (Figure 12). During the early years of twentieth decade, the increase in crop output was higher than the rise in real cost of cultivation which led to decline in per unit production cost till 2006-07. However, after the year 2006-07, sharp increase in real cost of cultivation has been witnessed compared to increased output, leading to rise in production cost. Thus, empirical evidences

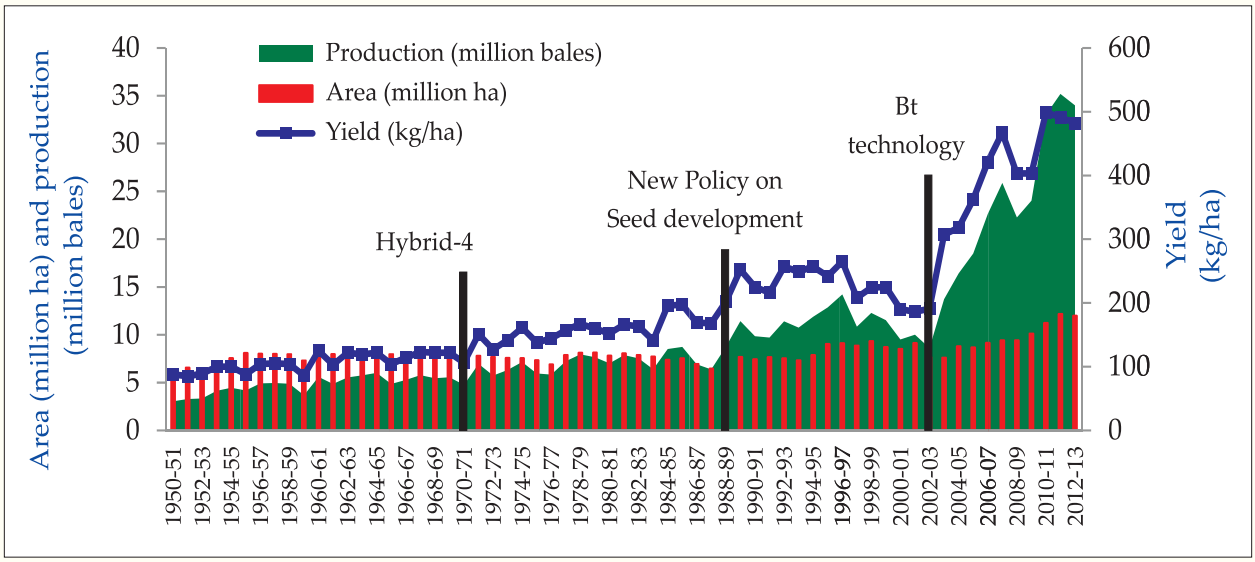



**Figure 11 : Trends in area, production and yield of cotton in India**

show that present level of yield improvement is not enough to negate rising cultivation cost. Consequences are declining net returns from crop cultivation.

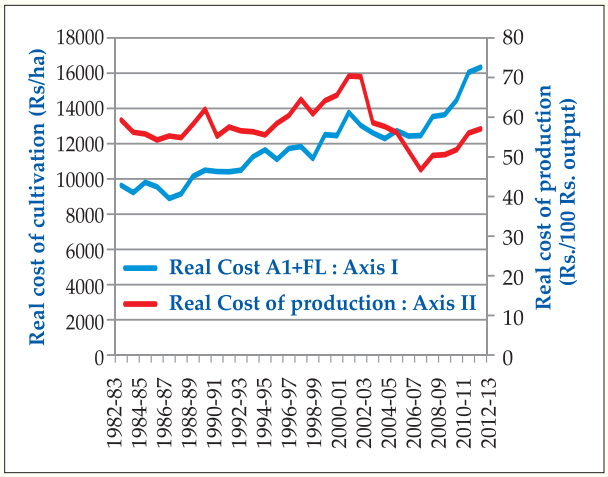



**Figure 12 : Trends in cost of production of crops in India**

The average cost inflation during 2007-08 to 2012-13 was 14 per cent and among different factors of production, labour alone contributed to 52 per cent in total increase in cost of cultivation (Table 6). Thus, managing this single factor of production would bring in substantial improvement in farm income through reduction in cost of cultivation. There are widespread concerns among farmers regarding rising wages of labour leading to labour scarcity, particularly during the peak agricultural season. As wages are the incomes for agriculture labour households, controlling wages may not be desirable for economic development of those households. An appropriate way would be to accelerate mechanization in farm operations. For smaller land holdings, efforts shall be extended to create facilities of custom -hiring centres at the community level.

Adverse effects of rising production cost can also be lessened by technological development in crop cultivation. The estimated coefficient of crop yield (an indicator of technological development) in log-linear cost function was negative which indicates inverse association between production cost and crop yield. However, yield elasticity of cost was not uniform across crops. As expected, effects of prices of different inputs on crop production cost were positive.

## Organize the collection of crop germplasm improvement research related direct outcomes in South, Southeast and East Asia

*Pavithra S., P. S. Birthal, Ramesh Chand, S. A. Shah and S. A. Bhatt*

The study documented the varietal output and estimated perceived adoption rates of wheat and maize crops in India using expert elicitation methodology. The study states for wheat included Haryana, Punjab, Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh. For

**Table 6 : Contribution of factors in rise in cost of cultivation in India**

(per cent)

| Period | Seed | Fertilizer | Labour | Machine | Animal | Insecticide | Others | Avg cost inflation |
|---|---|---|---|---|---|---|---|---|
| 1990-91 to 2001-02 | 7 | 11 | 47 | 10 | 9 | 2 | 15 | 10 |
| 2001-02 to 2007-08 | 12 | 8 | 36 | 21 | 3 | 2 | 17 | 6 |
| 2007-08 to 2012-13 | 8 | 10 | 52 | 14 | 2 | 3 | 11 | 14 |
| **1990-91 to 2012-13** | **9** | **10** | **46** | **14** | **4** | **2** | **6** | **10** |

maize along with the above states, additional states like Andhra Pradesh, Telangana, Maharashtra, Karnataka and Gujarat were selected. The National Agricultural System (NAS) has released about 452 wheat and 237 maize varieties in the country as per the latest documentation under the study.

It was noticed that wheat cultivation in India was completely dominated by public sector varieties. Wheat HD 2967, PBW343, PBW502 and PBW550 were most popular in terms of cultivation across the states. Despite release of several high- yielding varieties some of the old varieties, released more than 15 years back, still rule farmer's fields. Major popular old wheat varieties include, Lok 1, PBW 343, Raj 3077, Raj 3765, Raj 1482, HUW 234, WH 711, HD 2687, HD 2733 and GW 322. Yield stability, wide adaptability, suitability for late-sown conditions, lodging resistance, good chapatti-making quality, disease resistance and terminal heat tolerance are some of the key attributes of the popular wheat varieties cultivated in the major producing states.

In the traditional maize-growing states where seed-replacement rate is lower, farmers are cultivating composites more than 5 years old such as JM 216, JVM 421 and Narmada Moti. Ganga Safed, a maize composite released during 1960s. is still cultivated in some parts of the country. The modern varieties (MVs) cultivated widely across the states are P3501, NK6240, P3396 and NK30. The area under the top 5 maize MVs based on the perceived adoption rates provided by the experts ranged from 15.70 per cent of the gross cropped area (GCA) under maize in Bihar to 63.88 per cent of the GCA in Karnataka. Among the public sector maize varieties JM216, JVM421, African Tall, Narmada Moti and GM6 have been found widely cultivated and have emerged in the list of top 5 varieties of the states.

## An analysis of crop yield gaps in India

*Pavithra S. and S. K. Srivastava*

The front-line demonstration (FLD) experiments indicated wide gaps in the average crop yield at the state level as compared to potential yield obtained under the FLD experiments (yield gap II). The extent of yield gap II for rice ranged from 32 to 76 per cent across states during TE 2009-2011. Huge gap in yield was also noticed in wheat (7-53%), maize (29-69%), gram (6-60%), *rabi* groundnut (21-63%), *kharif* groundnut (21-71%) (21-71%), soybean (17-80%) and rapeseed -mustard (18-48%) across major producing states during the same period.

Using the concept of production efficiency, an alternate estimate on yield gap was also estimated as deviation of the estimated frontier yield from observed yield at farmer's fields. The frontier yield was estimated by fitting stochastic frontier function. It was observed that at a given level of input use, average yield gap varied from 3.11 q/ha in rapeseed-mustard to 5.75 q/ha in paddy. Wide variation in yield gap exists in each crop across states due to differences in input-use pattern and production environment.

The major factors behind comparatively less yield than the potential level were age, household size, education, number of fragments of landholdings, crop diversification, ownership of land, size of landholding and incidence of biotic and abiotic stresses. Except for a few cases, it was largely age of family-head, household size, number of fragments of land-holdings and biotic and abiotic stresses, which affected negatively on the efficiency of crop production, and crop diversification and

farmer's education improved efficiency of crop production. There was a positive association between size of landholding and efficiency in crop production, implying that large farmers achieved higher yields due to the scale effects. The effect of land ownership on the efficiency varied across crops. The study revealed large exploitable yield gaps and scope for improving crop yields even at the existing level of input-use by improving farm-level production efficiency.

## Trade-off between food and income security: A case of Basmati Rice in Punjab

*T. K. Immanuelraj, Rajni Jain, S. S. Raju and S. K. Srivastava*

In Punjab, paddy and wheat together occupied more than 80 per cent of the gross cropped area during TE 2013. Increased dominance of paddy-wheat cropping pattern and indiscriminate use of agricultural inputs led to several unsustainability issues in the state. Substitution of non-basmati paddy varieties with basmati varieties is advocated as one of the several measures to arrest overuse of water and depletion of soil health.

Using plot-level cost of cultivation data for the block year 2008-09 to 2010-11, the study explored desirability of promoting basmati rice from farmer's and state's perspective. The farmer preferred to ensure income security and hence tried maximizing value output, while emphasis of the state was to maximize food security and natural resource sustainability and thus opted to maximize physical quantity of output. Higher yield of non-basmati than basmati signified that physical productivity of basmati has less advantage over non-basmati (Table 7).

**Table 7 : Comparison of Basmati and Non-basmati**

| Variables | Basmati (B) | Non-basmati (NB) | Ratio (B/NB) |
|---|---|---|---|
| **Output** | | | |
| Yield (qtl/ha) | 32.95 | 66.35 | 0.50 |
| Gross return (Rs/ha) | 72981.8 | 68615.5 | 1.06 |
| Variable cost (Rs/ha) | 24870.3 | 22749.6 | 1.09 |
| Net Return (Rs/ha) | 48111.4 | 45865.9 | 1.05 |
| Price (Rs/qtl) | 2150.9 | 1025.1 | 2.10 |
| Variable cost (Rs/qtl) | 754.8 | 342.8 | 2.20 |
| **Technical Coefficients** (Input required to produce a quintal of output) | | | |
| Labour (Use Hours) | 15.9 | 6.0 | 2.6 |
| Machinery cost (Rs) | 147.1 | 72.5 | 2.0 |
| NPK qty (kg) | 4.6 | 3.0 | 1.6 |
| Seedling cost (Rs) | 42.9 | 16.9 | 2.5 |
| Insecticide cost (Rs) | 77.0 | 31.8 | 2.4 |
| Irrigation cost (Rs) | 51.7 | 25.5 | 2.0 |

However, basmati attracted premium price of Rs. 2,150/q, which was more than twice the price of non-basmati. Despite less yield, gross returns from basmati (Rs. 72,981) was 6 per cent higher than non-basmati. Basmati growing farmers obtained net returns Rs. 48,111/ha, which was Rs. 2,245 higher than non-basmati growing farmers. Relatively higher returns from basmati do not ensure national food security and sustainability of natural resources.

Comparative assessment of resource use revealed that basmati rice require significantly higher resources per unit of output as compared to the non-basmati rice

(Table 8). Basmati requires almost double inputs except fertilizer which implies that resources are being used inefficiently in cultivation of basmati rice. Further, the technical and economic efficiency scores were estimated using stochastic meta frontier production function approach instead of widely used stochastic frontier production function or DEA to account for heterogeneity in production technology. As basmati and non-basmati represents two different technologies, technical efficiency and economic efficiency scores were also estimated.

**Table 8 : Technical and economic efficiency score of basmati and non-basmati**

| Name | Mean | Median | Mini-mum | Maxi-mum |
|---|---|---|---|---|
| **Technical efficiency** | | | | |
| Basmati | 0.48 | 0.50 | 0.06 | 0.73 |
| Non-basmati | 0.84 | 0.86 | 0.34 | 0.97 |
| **Economic efficiency** | | | | |
| Basmati | 0.79 | 0.80 | 0.37 | 0.93 |
| Non-basmati | 0.77 | 0.79 | 0.17 | 0.92 |

In terms of physical quantity, mean technical efficiency of basmati and non-basmati was estimated as 48 per cent and 84 per cent, respectively. This showed large gap between two farms which led to higher physical productivity of non-basmati over basmati. On the other hand, estimated mean economic efficiency of basmati and non-basmati, was 79 and 77 per cent, respectively, being almost equal. Overall, the results indicated that in order to provide more revenue to farmers through promotion of basmati rice, state should forgo about 33 quintals of paddy per hectare from increased use of inputs, which raised concerns over food and natural resources sustainability.

# AGRICULTURAL GROWTH AND DEVELOPMENT

## Farmer's preference for farming

*Pratap S. Birthal, Devesh Roy, Md. Tajuddin Khan, and Digvijay Singh Negi*

Although as a profession, more than 40 per cent farmers disliked farming, yet they continued owing to lack of opportunities outside agriculture. The main reasons cited by the farmers for this was low profits, higher risk, and lack of social status in agriculture. The dislike was more pronounced among smaller farmers and those relatively younger and less educated, having fragmented landholdings with low irrigation and less diversified farming system, and also those who had lower uptake of information on technologies, institutional finance, and risk-mitigating instruments. The results showed that many factors such as irrigation, finance, and insurance are associated with perceptions of farming to be a viable profession. The findings are positive as opposed to normative.

The results point toward a tendency of possible decline in viability of agriculture as a profession. To the extent that farmers practicing high-value agriculture, including animal production, prefer farming as a profession can be a signal for a greater policy emphasis on the diversification toward these activities. Farmers also require improved availability of finances, inputs, information, and markets as to benefit from the technological change and diversification. Risk in farming is an important reason for disliking farming, especially smaller farmers; hence insurance agencies must target their efforts toward improving their outreach to smallholder farmers as at present only one-tenth of the farmers in India use insurance for risk management in agriculture.

Foremost priority for the government should be to facilitate transition of workers from farm to non-farm sectors. The findings bring out that alleviating skill and financial barriers of farmers for entering into rural non-farm sector would reduce employment pressure on agriculture and would provide them opportunities to diversify their income source.

## Status of potato production and TFP in India

*Rajesh K. Rana and Md. Ejaz Anwer*

Potato is an important food security option due to its ability to fight hunger and poverty rather than simply a vegetable. India is the second largest producer of potato after China, with average yield being higher than world average. Nearly three-fourths of Indian potato production is contributed by Uttar Pradesh, West Bengal and Bihar. During last decade, Bihar has experienced highest growth in potato production and productivity.

Malmquist Productivity Index (MPI) of potato cultivation during 1997 to 2013 indicated positive change in efficiency growth in Bihar against stagnation in Uttar Pradesh and West Bengal. Notwithstanding positive technical change has been in all these states. The overall total factor productivity (TFP) change in all the three states showed positive growth. Higher rate of growth was observed in input costs (variable+fixed) during 2003-04 to 2012-13 compared to 1996-97 to 2003-04. The positive development in potato production in Bihar may primarily be attributed to efficient implementation of infrastructural development projects in the state.

## Share of TFP and inputs in agriculture growth

*Rajni Jain and Ramesh Chand*

The contribution of growth of inputs and advancement of technology on agricultural productivity was computed using estimated TFP index during different phases (Table 9). The share of TFP in output is defined as the ratio of TFP growth rate over growth rate of output. The share of inputs in TFP growth is defined as the ratio of input growth rate over growth rate of TFP. It was observed that contribution of input growth rate in TFP followed declining trend, with phase II (1988-89 to 1995-96) being an exception. On the other hand, contribution of TFP growth in output growth followed an upward trend, indicating sustainability of agricultural productivity. These trends are similar at economic and market prices and thus refute argument of technology fatigue in Indian agriculture. At economic prices, overall growth in TFP contributed 88% to output growth during 2004-05 to 2011-12.

The Pearson correlation indicated positive association between TFP in agriculture and road length, number of regulated markets, research investment in agriculture, gross irrigated area, credit, rural literacy rate, crop intensity. Determinants of TFP were identified by fitting a multiple regression analysis in double log functional form. The results revealed that research expenditure, balanced use of nitrogen and phosphorus, rainfall and investment on rural roads, gross irrigated area and credit in agriculture positively and significantly affected TFP of the crop sector. Thus, TFP can be improved by increasing investment on research and infrastructure and balanced use of fertilizers in agriculture.

**Table 9 : Contribution of input growth in TFP growth and contribution of TFP in output growth (%)**

| Phases | Contribution at Economic Prices | | Contribution at Market Prices | |
|---|---|---|---|---|
| | Input growth in TFP growth | TFP growth in output growth | Input growth in TFP growth | TFP growth in output growth |
| 1980-81 to 1988-89 (Phase I) | 425.3 | 19.0 | 151.4 | 39.6 |
| 1988-89 to 1995-96 (Phase II) | -273.1 | -58.9 | -287.6 | -54.3 |
| 1995-96 to 2004-05 (Phase III) | 161.9 | 38.0 | 26.8 | 78.6 |
| 2004-05 to 2011-12 (Phase IV) | 13.1 | 88.0 | -21.9 | 130.1 |
| 1980-81 to 2011-12 (overall) | 209.5 | 32.1 | 78.8 | 55.6 |

## Methodology development for optimization of crop model

*Rajni Jain, S. S. Raju, Kingsly Immanuelraj, S. K. Srivastava, Amrit Pal Kaur and Jaspal Singh*

In different regions of India, cropping pattern is inefficient in terms of resource use and is unsustainable. This leads to serious mis-allocation of resources, efficiency loss, indiscriminate use of land and water resources, and thus would affect adversely long- term production prospects. India agriculture confronts with many challenges and problems. Some of them can be formulated as optimization problems.

The manual on "Methodological Approach for Developing Regional Crop Plan" has been developed under the ICAR Social Science Network project "Regional Crop Planning for Improving Resource Use Efficiency and Sustainability". The project has relied on the plot level data collected by the Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, under the Comprehensive Scheme for Studying the Cost of Cultivation of Principal Crops in India. The manual aims to provide methodological approach for developing regional crop plans. The modelling framework has been illustrated with a case study of Punjab.

The manual can be downloaded freely from NIAP website using the link http://www.ncap.res.in/upload_files/others/ManualRCP.pdf

## Decomposition of pulses growth in India

*Narayan Sharma Rimal, Shiv Kumar, D. R. Singh, V. P. Chahal, and Shaloo*

Using the approach outlined in Minot *et al.* (2006), sources of growth in pulses output were computed for 1990-2012 (Figure 13). The gross value of output of chickpea, pigeon-pea, blackgram, greengram and lentil was decomposed into *(i)* area effect (AE), *(ii)* yield effect (YE), and *(iii)* price effect (PE). The area effect for all pulses, except black- gram and greengram, was stronger especially after the initiation of the National Food Security Mission (NFSM) and Accelerated Pulse Production Programme (A3P). The area expansion accounted for 21% of the output growth in chickpea, 13% in pigeonpea and 15% in lentil during 2008-2012. This might be due to promotion of rainfed farming techniques in

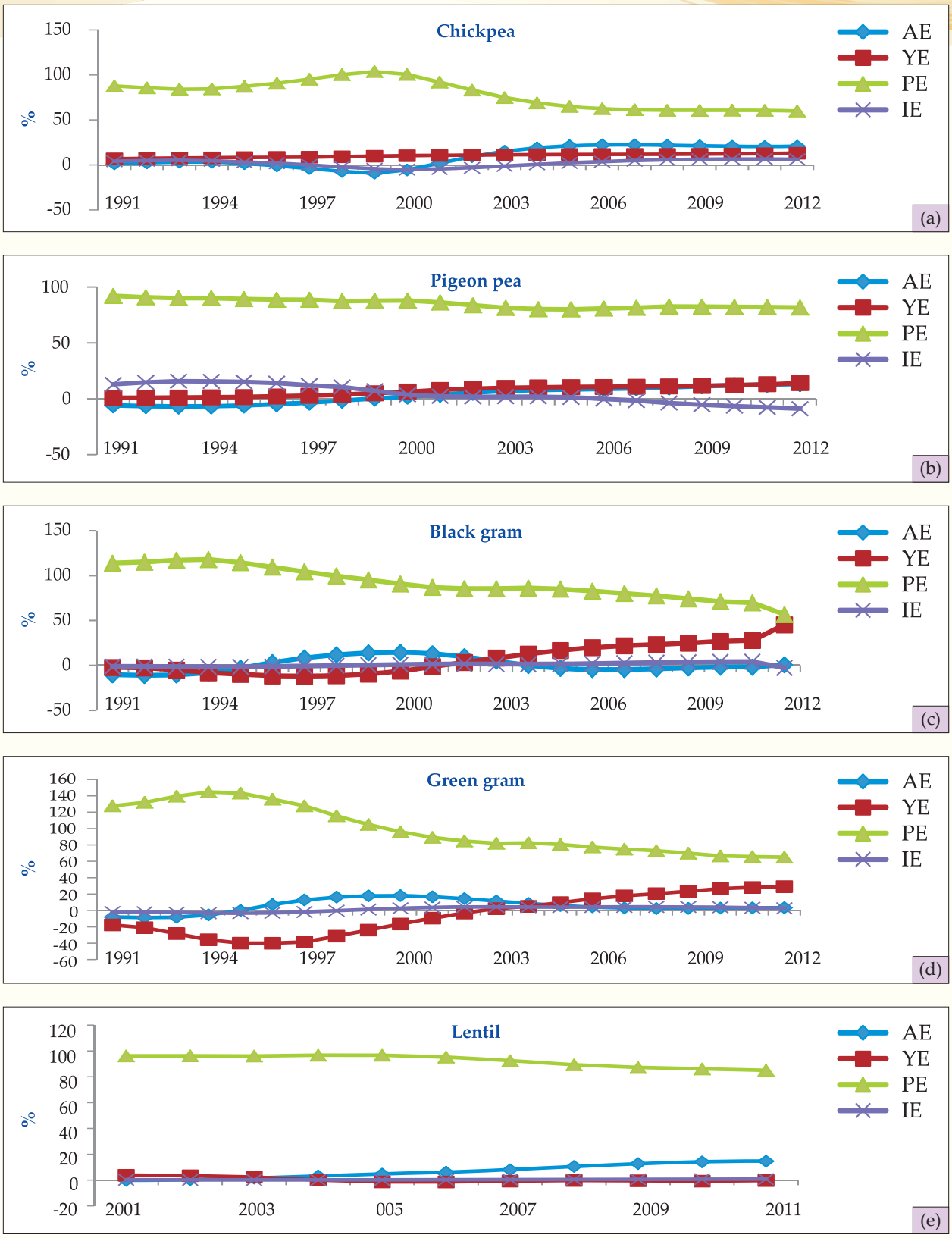



**Figure 13 : Decomposition of gross return of (a) chickpea (b) pigeon pea (c) black gram (d) green gram, and (e) lentil, respectively in India, 1991-2012**

right perspective and reallocation of resources in terms of finance and technological services corresponding with the requirement of production niches.

The yield effects, lately were prominently observed for blackgram and greengram. The effect of prices on growth showed continuous decline, particularly during 2000s. This showed that farmers are not aligned to prices, and their decisions influenced more by non-price factors such as technologies or improved varieties, infrastructure and market access. It could be inferred that production response to price of pulses, in general, was rather weak and non-price factors such as high-yielding /modern varieties, technology, better infrastructure including adequate procurement system, etc. were more important for accelerating pulses production.

## Disadvantaged agricultural regions: Is there a way forward?

*Ramesh Chand and S. K. Srivastava*

The study tests effects of agricultural productivity and demographic pressure (labour to land ratio) on rural poverty using two-stage simultaneous equations model. In the first stage, estimated coefficient of agricultural productivity appeared negative and significant, indicating an inverse association between improvement in agricultural productivity and rural poverty. Elasticity estimates showed that one per cent increase/decrease in land productivity would result in 0.80 per cent decrease/increase in rural poverty (Table 10). And a decline of one per cent in pressure of work-force on agricultural land resulted in 0.17 per cent decrease in rural poverty. These results indicate that improvement in agricultural productivity through technological and policy interventions and employment diversification away from agriculture sector towards non-farm sectors would contribute positively in reducing poverty among rural households. In the second stage of the model, determinants of agricultural productivity indicated significance and were as per the expectations. The estimated elasticity coefficients suggested that one per cent increase/decrease in fertilizer use, groundwater use, irrigation coverage, and rainfall would result in 0.20 per cent, 0.19 per cent, 0.18 per cent and 0.13 per cent increase/decrease in agricultural productivity, respectively.

**Table 10 : Estimated elasticity per hectare of agricultural productivity and rural poverty with respect to various factors**

| Elasticity of agricultural productivity | | Elasticity of agricultural productivity | |
|---|---|---|---|
| **Variable** | **Coefficient** | **Variable** | **Coefficient** |
| Per ha productivity | -0.80 | Cropping intensity | 1.08 |
| Agricultural worker/ha | 0.17 | Irrigation coverage | 0.18 |
| | | Fertilizer use | 0.20 |
| | | Rainfall | 0.13 |
| | | Extent of problem soil | -0.09 |
| | | Groundwater development | 0.19 |

The homogenous geographical regions exhibiting similarity in determinants of rural poverty and agricultural productivity were delineated using k-means cluster (multivariate) analysis. Based on the relative values of clustering variables, these clusters were termed as highly advantaged, moderately advantaged, less advantaged, and disadvantaged. The disadvantaged region was sub-divided into less disadvantaged and highly disadvantaged regions (Table 11; Figure 14).

Out of total 487 districts, 206 districts were found to be disadvantaged based on the relative values of clustering variables. Total disadvantaged area in the country has been estimated as 56.2 Mha, which is about 42 per cent of the net sown area. The low cropping intensity, poor irrigation coverage and groundwater use, low fertilizer use and large area under problematic soils across districts of this cluster resulted low agricultural productivity (Table 11). Better water resources endowment in several districts in this region, through high rainfall, was not productively utilized possibly lack of proper irrigation

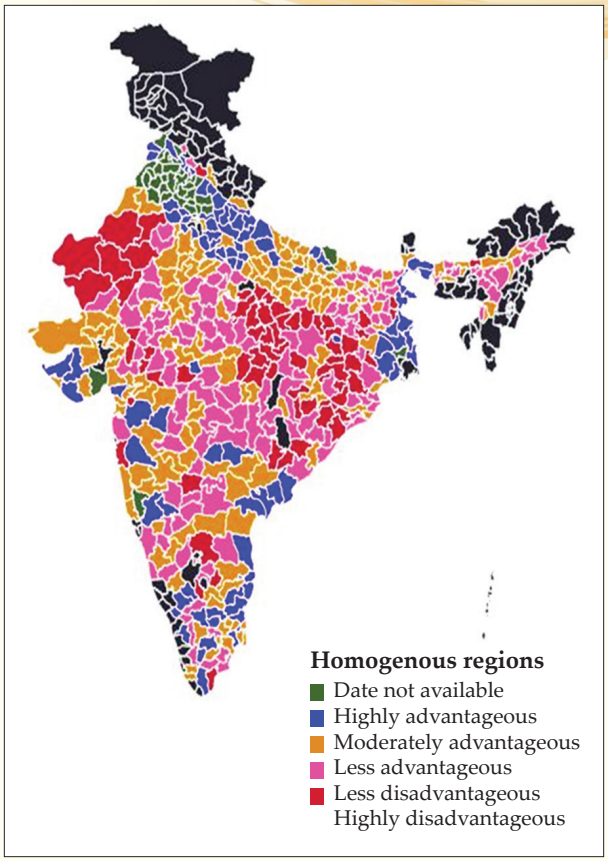



**Figure 14 : Delineation of homogenous regions based on determinants of agricultural productivity and rural poverty.**

**Table 11 : Homogenous regions and mean value of clustering variables**

(2011-12)

| Clustering variables | First stage clustering | | | | Second stage clustering | |
|---|---|---|---|---|---|---|
| | Highly advantaged | Moderately advantaged | Less advantaged | Disadvantaged | Less disadvantaged | Highly disadvantaged |
| Cropping intensity (%) | 188 | 156 | 144 | 135 | 137 | 132 |
| Irrigation coverage (%) | 74 | 65 | 49 | 29 | 33 | 21 |
| Fertilizer use (Kg/ha) | 236 | 209 | 148 | 107 | 130 | 60 |
| Rainfall (mm) | 632 | 918 | 1056 | 1148 | 1206 | 1032 |
| Problem soil (%) | 16 | 35 | 41 | 41 | 39 | 44 |
| Groundwater development (%) | 138 | 74 | 65 | 51 | 51 | 52 |
| Agricultural productivity (Rs/ha) | 119345 | 72570 | 45257 | 26477 | 30524 | 18443 |
| Agricultural worker per sq km | 156 | 222 | 240 | 304 | 312 | 288 |
| **No. of districts** | **35** | **88** | **158** | **206** | **137** | **69** |

infrastructure. The expansion of water storage capacity and expansion of irrigation network would go a long way in improving agricultural productivity in the region. The consequences of lowland productivity and high work-force pressure were reflected through lowest worker productivity (Rs/agril. worker) and highest rural poverty.

## Changes in nutritional insecurity and consumption patterns among Indian households: 1993-94 and 2011-12

*Jaya Jumrani and Ramesh Chand*

The study evaluates changes in the nutritional security between 1993-94 and 2011-12 by estimating undernutrition (calorie deficiency) and malnutrition (protein deficiency) of various income groups. It was noted that there was reduction in actual calorie intake across locale and expenditure classes. The calorie deficiency was starker for middle income population, residing in urban households than those in rural households. Prevalence of undernutrition was much higher based on the ICMR-NIN norm. Based on the norm, almost 60 per cent of the population in rural areas and 53.5 per cent in urban areas were under-nourished during 1993-94. This incidence increased by 5 and 1 percentage points, respectively in 2011-12 (Table 12).

As expected, the prevalence of hunger declined with rise in income. The rate of decline was, however, stronger in earlier years. It needs to be emphasized that undernourishment was significantly present even among richer households. This existence

**Table 12 : Prevalence of undernutrition and malnutrition based on FAO norm and ICMR - NIN norm across various income groups**

| Locale and Expenditure class | Undernourishment (%) | | | | Malnourishment (%) | |
|---|---|---|---|---|---|---|
| | FAO norm | | ICMR-NIN norm | | ICMR-NIN norm | |
| | (1993-94) | (2011-12) | (1993-94) | (2011-12) | (1993-94) | (2011-12) |
| ***Rural*** | | | | | | |
| Poor | 47.63 | 58.22 | 78.65 | 84.67 | 45.97 | 51.44 |
| Middle income | 9.63 | 18.78 | 38.41 | 60.5 | 18.36 | 27.99 |
| High income | 2.3 | 3.65 | 16.25 | 34.4 | 8.21 | 12.83 |
| All rural | 30.85 | 28.44 | 60.67 | 65.93 | 33.75 | 33.58 |
| ***Urban*** | | | | | | |
| Poor | 62.83 | 70.86 | 77.8 | 82.37 | 57.96 | 61.07 |
| Middle income | 21.72 | 32.61 | 42.13 | 55.71 | 32.38 | 41.15 |
| High income | 4.04 | 10.05 | 14.5 | 28.27 | 12.21 | 21.97 |
| All urban | 36.07 | 34.46 | 53.55 | 55 | 40.46 | 40.83 |
| ***Rural + Urban*** | 32.09 | 30.07 | 58.97 | 62.97 | 35.36 | 35.55 |

Note: ICMR-NIN norms are adjusted for age, sex and activity status.
Source: Authors' own estimation using unit-level NSSO 1993-94 and 2011-12 CES data.

of undernourishment among non-poor population can be termed as 'voluntary hunger'. Such a population has the necessary income resources but still are not consuming – may be out of choice or due to other non-income factors. For demographically and activity-adjusted ICMR-NIN norms, there was a consistent increase in prevalence of undernourishment throughout 18-year period across rural and urban India. At the all-India level, incidence of undernourishment according to the ICMR-NIN norm was twice that of FAO norm. Prevalence of malnourishment was less severe than undernourishment. It was more prevalent among urban households as compared to rural households across all income categories. Over years, this deficiency has increased by 5 and 3 percentage points, respectively, among the rural and urban households.

Further, the spatial analysis revealed that all the states were consuming more than widely-accepted FAO norm of 1800 Kcal in both the sectors. Almost all southern states, Kerala, Karnataka, Andhra Pradesh, Tamil Nadu, Gujarat, Maharashtra and Assam were much more calorie deprived than BIMORU (Bihar, Madhya Pradesh, Odisha and Rajasthan). This reiterates that calorie and income poverty are not moving in tandem in India. Majority of the states in both rural and urban areas indicated protein deficiency levels that were higher than national level. Interestingly, not-so-poor southern states of Karnataka, Kerala, Andhra Pradesh and Tamil Nadu showed such high rates of protein deficiency. Jammu and Kashmir emerged as the state that requires special policy focus. The results again hinted towards that income enhancement alone might not always be a good predictor of food and nutritional insecurity. There is a strong need to create awareness about adequate intake of energy and protein and bring in attitudinal change to raise energy and protein intake and adoption of lifestyle to digest higher energy and protein. The use of different measures may play a complementary role and guide policy-makers to design appropriate targeted interventions for various groups according to the needs.

## Livestock, women and child nutrition in rural India

*Jaya Jumrani and P. S. Birthal*

The study assesses the role of livestock in improving women's bargaining power in intra-household resource allocation and its effects on children's nutritional status using India Human Development Survey (IHDS) data of 26,734 rural households for 2004-05. The study indicates that males and females both participate in animal husbandry, but with an additional female- worker a household could realizes more than 7 per cent higher income from livestock activities.

The results indicated that nutritional outcomes might be affected by livestock ownership in rural India, though with varying patterns across age groups of children. A strong association is observed between ownership of large ruminants and child nutritional status; specifically on the probability of their being underweight (limited to children between 2 and 5 years of age). Further, these nutritional outcomes are affected by interplay of various factors such as child and parental characteristics, dwelling characteristics, etc. The study suggests that it is now critical to put on a gendered lens to all livestock related interventions and activities. Such interventions would help directly enhancing diet quality of the members of the household, besides enhancing livelihood opportunities and incomes.

# MARKETS, TRADE AND INSTITUTIONS

## Labour scarcity in agriculture

*S. K. Srivastava and P. S. Birthal*

Between 2004-05 and 2011-12, about 34 million workers left agriculture sector. While transfer of labour from farm to non-farm sector is desirable for economic development, farming community has started complaining about shortage of labour for agriculture. The problem is often attributed to implementation of the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS).

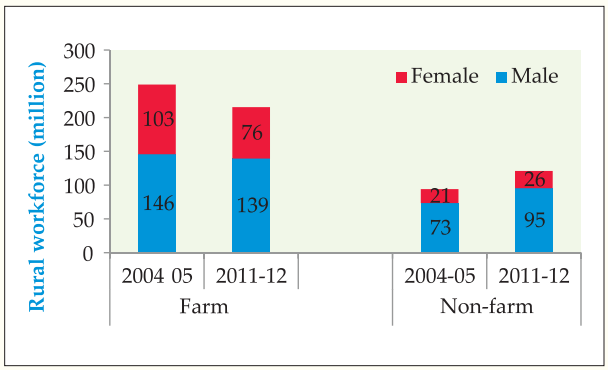



**Figure 15 : Employment trend in rural India**

The decline in work-force in agriculture is primarily contributed to withdrawal of female workers. Of the 34 million workers who have left agriculture, 79 per cent were females (Figure 15). Further, rural-labour market witnessed growing employment opportunities in the non-farm sector; since 2004-05 work-force in rural non-farm sector has increased by 27 million. The employment growth in non-farm sector was through construction sector; the value addition from which registered a robust 10.3 per cent annual growth between 2004-05 and 2011-12. The expanding opportunities in the non-farm sector is one of the major reasons for labour scarcity in farm sector.

Demography, socio-economic conditions and policies have also contributed to transformation of rural labour market. More than two-thirds of rural females in the working age group of 15-59 years did not enter labour force because they were primarily engaged in household activities. The decision to participate in labour market depends on the economic condition of the household and improvement there in overtime. The net domestic product from agriculture grew at an annual rate of 3.7 per cent between 2004-05 and 2011-12, as compared to 1.6 per cent between 1999-2000 and 2004-05. Increased literacy in both males and females is the other reason for workers leaving farming. During 2004-05 to 2011-12, the literacy rate for rural males increased by 8 percentage points and of females by 11 percentage points. Literate youth normally prefer moving to non-farm sector because of higher wages.

Notwithstanding that MGNREGS could generate 3 per cent of the total rural employment (2,090 million person-days) in 2011-12, but because of higher remuneration it seemed to have pushed up reservation wage levels for agricultural workers. With higher reservation wage level, agricultural labourers seemed operating on backward bending supply curve, leading to shortage of labour. Farmers responded to rising wages by reducing labour use in farm operations, yet their wage bills (rupees per hectare) have consistently increased, pushing up cost of cultivation (Figure 16). Farm wage bill increased at an annual rate of 4.7 per cent, and the share of the wage bill in cost of cultivation increased from 26 per cent in 2004-05 to 30 per cent in 2012-13.

Mechanization in farming is one of the plausible ways to mitigate labour crisis. While farmers will still require labourers for certain key processes, mechanization can substantially

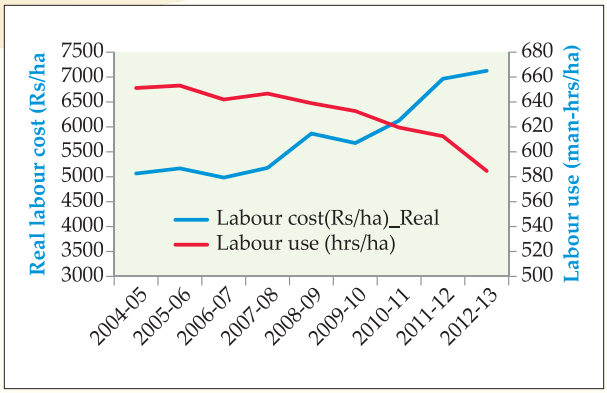



**Figure 16 : Trend in labour use and wage bill**

reduce labour demand. Another solution can be that the government compensates farmers for higher input cost by increasing minimum support prices of agricultural commodities. This may, however, lead to inflation, hence not so desirable. India must look at the technological breakthroughs that may lead to improvement in agricultural productivity to the extent that it potentially off- sets impact of higher wages on the cost of cultivation or farm profits.

## Women's role in agriculture and gender differential perception in trustworthiness

*Usha Ahuja, Rajni Jain and Sonia Chauhan*

The study analyses role of women in agriculture production and other socio-economic activities using primary data from 480 households of the 12 villages of six districts in three selected states in Eastern India (Bihar, Jharkhand and Odisha). It was observed that women participation was maximum in domestic activities, followed by livestock and non-farm activities outside the house to earn wages, while men devoted maximum time to earn income from non-farm activities in village, followed by livestock and farm activities at their own farm.

Besides, gender-specificity in various economic activities has been seen by taking into consideration of gender deferential participation in different farm activities. It was found that in Bihar participation of women in farming activities was not much and most of the activities were performed by men, however their joint participation was observed with men in weeding, harvesting, storage of seeds, watching, threshing and selection of crops. In Jharkhand although joint participation was noticed but in transplanting, hand-weeding and interculture, women's participation was comparatively more than men; in about 79 per cent of households women alone did transplanting and in 33 percent households weeding was done by women only. In Odisha, situation was more or less like Bihar and participation was found joint, but male dominance was observed in all activities, barring a few, like seed storage, harvesting, threshing, transplanting land preparation, interculture and weeding.

Results of impact of migration on the work-load of farm women indicated that overall workload on women was higher in migrant households as compared to non-migrant households in Bihar; Jharkhand followed the similar trend. Interestingly, young and adult women contributed more than double the male contribution in both types of households. In Odisha, in migratory households young women were doing lesser work compared to non-migratory households. Overall the results indicated that male out-migration significantly impacted lives of farm women. However, the nature and extent of the impact depended on the pattern of out-migration and many other factors. Education and awareness leading to change in mind-set regarding ownership of assets and access to production resources, skill development and capacity-building are pre-requisites for empowering rural women.

## Identification of most vulnerable crops and farmers groups and special insurance products to meet their requirements in Madhya Pradesh

*Ramesh Chand and S. S. Raju*

Crop production in Madhya Pradesh is subject to high level of risk. In most of the crops, farmers suffer losses not only due to yield decline but also due to lesser area coverage under different crops in adverse years. It was observed that yield risk and area risk move in the same direction in 2/3rd of the crops, which amplified risk faced by farmers. Further, irrigation coverage was positively correlated with area instability; implying that crops with higher irrigation coverage were not less prone to risk (Table 13). The correlation between year on year growth in production and farm harvest prices revealed that market could set-off production risks of a few crops. Thus, there is an urgent need to develop effective crop insurance cover in the state.

**Table 13 : Correlations between instability and other variables**

| Particulars | Correlation coefficient |
|---|---|
| Area instability and irrigation (%) | 0.704*** |
| Production instability and irrigation (%) | -0.044 |
| Yield instability and irrigation (%) | -0.141 |

The most vulnerable crops in the state are *ragi*, mesta, rapeseed and mustard, tobacco, castor, rice and potato. Linseed, wheat, banana, groundnut, gram, *bajra, arhar*, sunflower and cotton are in medium risk category, and sugarcane, *jowar*, onion, sesamum, sweet-potato, sunnhemp, maize, soybean, barley and niger seed are placed in low risk category.

To establish association between area under crop and risk in yield move in opposite in same direction the correlation between year on year changes in area and yield were computed. Similarly, to find whether production risk is compensated by change in price, the correlation between year-on-year change in production and farm harvest prices were estimated. Out of 15 major crops, which covered 81 per cent gross cropped area in the state, four crops showed significant negative correlation between year to year fluctuations in yield and area. These crops were barley, *arhar*, niger seed and sugarcane. The correlation between change in area and change in yield was positive in most of the crops but was statistically significant at 10 per cent level in rice, wheat, gram, groundnut and rapeseed and mustard. This implies that rainfall and other natural and economic events affect area and yield in the same direction in these crops, which amplified the risk.

Correlation between production and per cent change in farm harvest prices was negative in all the crops, except wheat and soybean. This implies that change in prices received by farmers compensates the risk due to fall in production but the effect was significant only in cotton and *bajra*. Therefore, when there is a fall in production, there is no commensurate increase in the prices to compensate farmers for the production risk. The farm groups growing *ragi*, mesta, rapeseed and mustard, tobacco, castor, rice and potato are more vulnerable than others. For the state as a whole, farmers owning less than 1.6 acres of net sown area are highly vulnerable to risk in crop production, as they either live under poverty or would fall in poverty due to fall in crop production' resulting from any shock to crop production.

In spite of various schemes launched from time to time, crop insurance has served

a very limited purpose. The coverage in terms of area and number of farmers is very small, payment of indemnity based on area approach miss affected farmers outside the compensated area, and most of the schemes are not found viable. Expanding the coverage of crop insurance would, therefore, increase government costs considerably. Unless the programme is carefully restructured to make it viable, prospects of its future expansion to include and impact more farmers is very bleak. This requires renewed efforts by the 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 viability of the insurance schemes over time. With the improved integration of rural countryside and communication network, the unit area of insurance could be brought down to a village level. Insurance products for the rural areas should be simple in design and presentation so that they are easily understood. With increased commercialization of agriculture, price fluctuations have become highly significant in affecting farmer's income.

## Investment in public extension services *vis-a-vis* agricultural productivity

*Pratap S. Birthal, Shiv Kumar, Digvijay S. Negi and Devesh Roy*

The study analysis role of information on net farm income using data from a nationally representative survey conducted by the National Sample Survey Office of the Government of India. Those who use information realize 12 per cent more returns per hectare than those who do not. The impact of information is higher in the case of diversified systems (cash crops along with foodgrains) as compared to farms specialized in foodgrains. Further, the investment in public extension services has not kept pace with rising demand for information in agriculture. Investment on agricultural research and development has been shown to have considerable potential for enhancing farm productivity and in alleviating poverty. A 12 per cent higher net income per hectare for users translated into an additional Rs. 1,140 per hectare of cropped area (at 2002-03 prices). This was much higher than the expenditure on public extension services (Rs. 29 per hectare), and also on the research and education (Rs. 157/ha) in 2002-03. This implies that under-investment in public extension may limit realization of potential gains in agricultural productivity from spending more on agricultural research. Results suggest that returns on investments in extension services are quite attractive, and certainly there is a scope for increasing outreach of information for spread of agricultural technology in a fragmented society.

## Trends in agricultural wages in major states of India

*Sant Kumar, Md. Ejaz Anwer, H. P. Singh, Sarba N. Mishra, S. K. Sarkar, T. K. Immaneuraj and Sumant Kumar*

Rise in agricultural wages and labour scarcity are widely discussed issues, particularly, after the launch of the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) in 2007-08. This study analysed trends in agricultural wages in major states of India during 2003-04 and 2013-14. In most states, except Bihar, Karnataka and Madhya Pradesh, nominal wages paid to the agricultural labour were higher than minimum wages (fixed by the states) and wages paid under the MGNREGS. In fact, in the past one and half decades the nominal wages in agriculture have increased 4.5 times at all-India level; from Rs. 54.3/

person/day in 2000-01 to Rs 244.4/person/day in 2013-14 Also the non-farm wages have also increased by 3.6 times at all-India level; from Rs. 90.0/ person/day in 2000-01 to Rs. 329.0/ person/day in 2013-14; which is an important factor contributing to increased agricultural wages.

Moreover, the study also found rising trend in real wages (using CPIAL deflator) per person per day to undertake farm activities across states and at all-India level. Real wages for agricultural labourers rose by 19 per cent between 2003-04 and 2008-09, and nearly 37 per cent between 2008-09 and 2013-14 at all-India level. Among states, Tamil Nadu remained highest wage state during 2009-14, while Gujarat paid lowest wages to farm labourers. It was also noticed that real wages have shown sustained rising trend across states and it can be safely concluded that wages have played a major role in swelling the cost of cultivation of crops, in particular, and raising agricultural production cost, in general.

Further, real wages expressed in terms of paddy equivalents declined in Bihar, Haryana, Madhya Pradesh and Uttar Pradesh between 2003-04 and 2008-09. Data also imply that post-MGNREGS, wages in paddy equivalents rose across states, varying from about 25 per cent in Madhya Pradesh to 99 per cent in Tamil Nadu between 2008-09 and 2013-14. It was observed that agricultural labourers in southern and northern states could purchase relatively higher paddy than their counterparts of eastern and central states comprising Assam, Bihar, Madhya Pradesh, Odisha, Uttar Pradesh and West Bengal. Agricultural labourers in Kerala could purchase highest quantity of grain, while it was lowest in Madhya Pradesh and Gujarat, since real wages paid in Kerala were highest among major paddy-growing states.

## Institutional innovations for enhancing outreach and inclusiveness of livestock services

*Subhash Chand and Prem Narayan*

The study identified emerging institutional changes in livestock service delivery systems, their outreach, efficiency and inclusiveness. The status of the livestock infrastructure in different states and union territories was analysed. In all states, veterinary infrastructure development in terms of hospital and dispensaries was satisfactory except a few union territories and small states. Other facilities like, artificial insemination (AI) centres, mobile dispensaries, *Goshalas*, Veterinary Aid Centre and Stockmen Centres were more available/accessible in developed states like Gujarat, Tamil Nadu, Haryana, Rajasthan, Uttar Pradesh, West Bengal, Jammu and Kashmir, Karnataka, Andhra Pradesh , Madhya Pradesh, Bihar, etc. Rajasthan, Bihar Gujarat, Haryana, Karnataka, Madhya Pradesh, Tamil Nadu, and West Bengal recorded very high growth rate in terms of number of AIs performed, while small states like Meghalaya, Mizoram and Nagaland registered negative performance during 1996 to 2014.

Survey data of 500 livestock owners of Yamuna Nagar and Kaithal districts of Haryana and 413 farmers from Udaipur and Bikaner districts of Rajasthan indicated positive relationship between herd size and income level of respondents; larger herd size with higher income. Number of visits per year made by respondents for availing livestock services from different service providers such as government dispensary and Hospitals, Private practitioner and local healers was elicited during the survey. It was observed that most of the livestock services were performed at farm by farm owners. On an average 2 - 3 visits were made per year by each household. However, at the centre also more than one

time service was availed by majority of the respondents. Respondents availed services mainly from private service provider (70%), followed by the government Institutions and local practitioners/healers.

The average expenses for getting health services in chronic cases, surgical gynaecological treatment, etc. was about Rs . 536 per animal, including costs of medicines and fees in government dispensaries but local healers were less expensive. In nutshell, cost provisions at the centres were lesser than at farm gate. Thus, private practitioners and local healers were preferred in the study states due to their easy accessibility and comparatively economical charges. It was also observed that farmers mostly got treated their milch animals only. Therefore, there is need to create awareness among farmers towards health management of all animals, including male animals, which were generally ignored.

## Network Project on Market Intelligence

*Raka Saxena, Pavithra S., Ranjit Kumar Paul, Simmi Rana, Shikha Chaurasia, Deepika Joshi, Mohd. Zeeshan, Mohit Singh and Ashwini Kumar*

This Project was initiated to provide reliable and timely price forecasts to farmers and other stakeholders for selected agricultural commodities to enable them to make informed production and marketing decisions, which in turn could lead to higher profitability. The


### Collaborating Centers

1. Banaras Hindu University, Varanasi
2. Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Maharashtra
3. G.B. Pant University of Agriculture and Technology, Uttarakhand
4. Indian Institute or Horticulture Research, Karnataka
5. ICAR Research Complex for NEH Region, Meghalaya
6. Institute or Agri Business Management, Rajasthan
7. Jawaharial Nehru Krishi Vishwa Vidyaiaya, Madhya Pradesh
8. Junagarh Agricultural University, Gujarat
9. Kerala Agricultural University, Kerala
10. Orissa University or Agriculture and Technology, Orissa
11. Professor Jayashankar Telangana State Agricultural University
12. Sher-E-Kashmir University or Agricultural Sciences and Technology, Jammu & Kashmir
13. University or Agricultural Sciences (B), Karnataka

**New Centre: Visva-Bharti (Central University), West Bengal**

**Figure 17 : Geographical spread of project network on market intelligence**

price forecasts are developed based on the scientific modelling framework along with consideration of qualitative expectations of farmers and traders. Besides, climate changes, supply and market fronts are also considered. The forecasts are disseminated to farmers and other stakeholders before sowing and during harvest through newspapers, television, radio, information bulletins etc. Along with, price forecasts are e-published through websites

**Table 14 : Details of commodities and price forecasts disseminated to the farmers**

| Centre | Commodities | Pre-sowing forecasts | Pre-harvest forecasts | Dissemination modes |
|---|---|---|---|---|
| BHU | Tomato, Potato, Mango, Maize, Mustard, Bengal Gram | 8 | 13 | Farmers, Fair, University Website, Newspapers, Text SMS, Personal contacts |
| GBPUAT | Potato, Tomato, Cabbage, Green Peas, Fine Paddy | 9 | 8 | News Paper, Radio, University Website, Personal contacts |
| IABM | Cumin, Chickpea, Pearl Millet, Cluster bean, Coriander, Mustard | 10 | 11 | News Paper, Bulletin/Brochures, "ChokhiKheti", Newspaper of SKRAU, Bikaner IKSL, College website, Magazine, Personal contacts |
| ICAR NEH | Tomato, Ginger, Turmeric, Potato, Pine-Apple | 10 | 9 | Farmers' meeting, Website (KIRAN), SMS (Mobile) based agro-advisory service for registered farmers, Newspapers, Personal contacts |
| IIHR | Tomato, Onion, Mango, Pomegranate, Grapes | 7 | 12 | Newspaper, Mandi offices, Farmers' meeting, Krishipete (popular kannada Article) , Personal contacts |
| JAU | Cotton, Groundnut, Castor, Maize, Tur, Potato, Cumin | 13 | 17 | Newspaper, Television, Mandi offices KVK, Farmers' meeting, Voice mail SMS. E-mails copies, Personal contacts |
| JNKVV | Soybean, Chickpea, Pigeon Pea, Maize, Rapeseed & Mustered, Lentil | 15 | 16 | Newspaper, Kisan Call Centre, KrishiVigyan Kendra, Farmers' meeting, Personal contacts |
| KAU | Black Pepper, Tapioca, Coconut, Arecanut | 0 | 27 | KAU Website, KVKs, Farmer fair, Personal contacts |
| OUAT | Coconut, Cotton, Turmeric, Ginger, Groundnut, Maize, Green Gram | 20 | 31 | Doordarshan, Local Newspaper, Farmer fairs, Text SMS, Personal contacts |
| PDKV | Green Gram, Gram, Red Gram, Onion, Maize, Soybean | 9 | 16 | Newspaper, University website. Personal contacts |
| PJTSAU | Chickpea, Green Gram, Maize, Groundnut, Cotton, Chillies | 21 | 17 | Univ. Website, Pamphlets, Text SMS, Magazines (Vyavasaayam), DATT centres, Newspapers (Telugu & English), Youtube channel, Facebook, Personal contacts |
| SKAUST | Cherry, Apple, Pear, Walnut, Plum | 0 | 8 | T.V. Radio, Newspapers, KVKs, Directorate of Horticulture Planning & Marketing, Personal contacts |
| UASB | Maize, Ragi, Red Gram, Potato, Banana, Turmeric | 13 | 34 | University website, Agro-Pedia website, Krishisewa website, Personal contacts |
| VBU | Potato, Mustard, Onion, Jute, Pineapple | 1 | 1 | Newspaper, Farmers through m-kisan portal via RKVK, Magazines/pamphlets, : Institute Website (www.psbvb.in), Facebook Page (Network Project on Market Intelligence West Bengal Page (@NPMIWB) , Personal contacts |

of respective institutions, agropedia portal, YouTube, and Facebook. Stringent efforts are also being made to personally disseminate price forecasts to farmers of selected commodities. Currently the project is being implemented at 14 centres across the major states of India (Figure 17). Table 14 provides details of price forecasts disseminated to farmers till date.

## Comparison of market infrastructure for selected markets of Uttarakhand: Whether market infrastructure contributes to enhanced commodity arrivals?

*Raka Saxena, Deepika Joshi, Ranjit K. Paul and Md. Ejaz Anwer*

The market infrastructure development index was computed for comparison of markets in terms of their standing in infrastructure status. For this, infrastructure variables were broadly categorized into three categories — trade infrastructure, storage infrastructure and support infrastructure. Infrastructure development index is computed as a weighted average of various components of marketing infrastructure services belonging to trade, storage and support infrastructure for fifteen markets of Uttarakhand, where weights vary inversely to variations in infrastructure components.

Haldwani and Dehradun markets emerged as the two most equipped marketing gateways of Kumaon and Garhwal regions of Uttarakhand. Haldwani was the best equipped market as per the combined index (score of 0.62) and also scored highest in all infrastructure categories. Kashipur stood next due to its better positioning in trade infrastructure. Dehradun scored low in combined index due to poor trade and storage infrastructure, despite being second in support infrastructure category. Sitarganj and Khatima scored quite low in combined index despite being relatively better in storage infrastructure.

Arrivals in various markets are assumed to be determined by crop production, prices, infrastructure, location etc. To establish this, the arrival of one of the most important horticultural commodity of Uttarakhand i.e., potato was regressed on prices and market dummies. The panel data of top five markets — Haldwani, Dehradun, Haridwar, Rishikesh and Vikasnagar, which covered more than 75 per cent of potato arrivals in the state—were developed for 10 years (2005-2014).

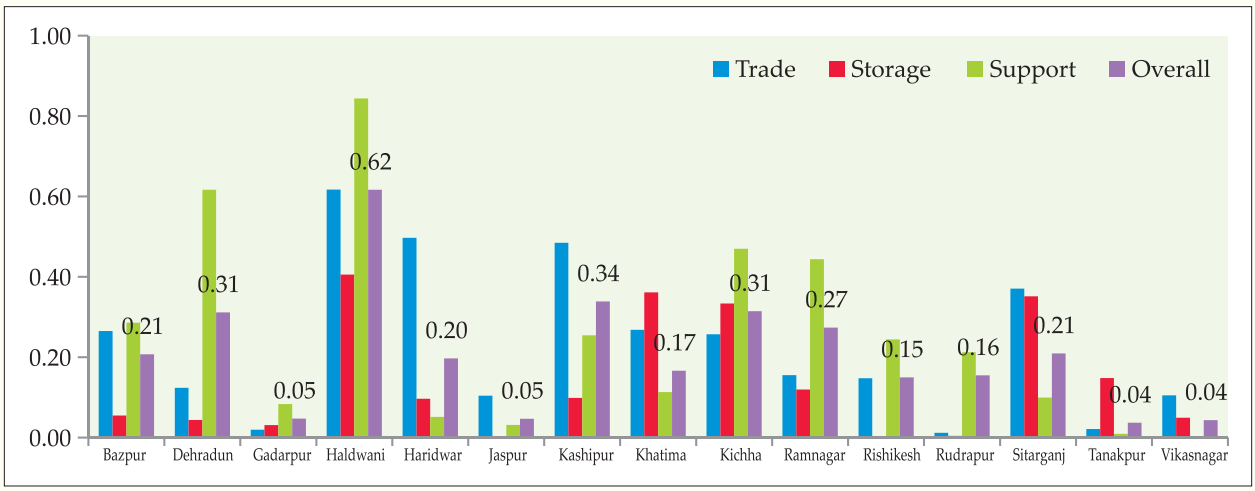



**Figure 18 : Ranking of markets: Overall infrastructure development index**

The results of panel regression revealed that price showed no-time varying effect on the arrival of potato (Table 15). However, significant and positive relationships among market attributes and potato arrival were observed, which reflected that the arrival of potato crop was driven by market attributes. Market attributes usually should capture broadly convenience associated with markets, and the convenience can specifically be described in terms of infrastructural facilities available in the markets, farm-market connectivity, distance of markets, networking among marketing chain participants specially farmers and traders, marketing practices existing in the markets, etc. As some of these are difficult to measure, the effect was estimated in the form of fixed effects for market attributes. As market infrastructure is one of the important constituents of market, thus, one may infer that arrivals in the selected markets may be driven by infrastructural facilities. Fixed effects for market attributes indicate that, except Dehradun market, rest of the markets (Vikasnagar, Rishikesh and Haridwar) received significantly less arrival as compared to Haldwani market. Dehradun received 13,753 quintals higher arrival of potato as compared to Haldwani market. This is also due to the reason that Dehradun, Uttarkashi and Chamoli contribute close to 50 per cent of total potato production in Uttarakhand. This is an interesting fact that Haridwar, Vikasnagar and Rishikesh, despite being the closer marketing destinations to the producing region, received less arrival as received in Haldwani market. Indirectly, this indicates importance of marketing infrastructure; as Haldwani is the best market in terms of various kinds of marketing infrastructure like trade, storage as well as support infrastructure.

## Agricultural trade structure and linkages in SAARC

*Raka Saxena, Ranjit Kumar Paul, Simmi Rana and Shikha Chaurasia*

The analysis of total and agricultural trade of the SAARC nations revealed that SAARC as a whole as well as all the SAARC countries were net importers as far as the total trade was concerned. However, SAARC was net exporter of agricultural trade (Table 16). The three major economies of the region - India, Pakistan and Sri Lanka contributed to this development, as these three accounted for more than 95 per cent share of agricultural exports from the SAARC. India is the largest economy contributing maximum to the total as well as agricultural trade. India alone has—82 per cent share in total exports and 74 per cent in agricultural exports from the region. At the same time, India has 81 per cent share in total imports and 55 per cent in agricultural imports of the region. Apart from formal trade, which is evident from the trade statistics, a lot

**Table 15 : Relationship between potato arrival, price and markets**

| Variable | Estimate | Standard Error | Pr > \|t\| | Label |
|---|---|---|---|---|
| Intercept | 214493.8 | 37558 | 0.6151 | Intercept |
| Price | 31.39 | 48.92 | 0.5244 | |
| Markets | | | | |
| Rishikesh | -125054 | 34258.3 | 0.0007 | Cross sectional effect 1 |
| Dehradun | 13753 | 34663.2 | 0.6935 | Cross sectional effect 2 |
| Vikasnagar | -195476 | 34516.6 | <.0001 | Cross sectional effect 3 |
| Haridwar | -69487 | 34322.7 | 0.0490 | Cross sectional effect 4 |

**Table 16 : SAARC countries percentage share in total world trade and total world agricultural trade, TE 2013**

**(in billion US $)**

| Country | Total exports | Total imports | Total trade | Ag exports | Ag imports | Total Ag trade | Share of agriculture in total trade (%) |
|---|---|---|---|---|---|---|---|
| **World(Billion Dollar)** | 18334 | 18500 | 36834 | 1839 | 1868 | 3707 | 10 |
| **SAARC** | 2.04 | 3.20 | 2.60 | 3.50 | 2.53 | 3.01 | 12 |
| **Afghanistan** | 0.00 | 0.04 | 0.02 | 0.01 | 0.05 | 0.03 | 15 |
| **Bangladesh** | 0.15 | 0.20 | 0.17 | 0.11 | 0.56 | 0.34 | 20 |
| **Bhutan** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 8 |
| **India** | 1.69 | 2.58 | 2.12 | 2.60 | 1.40 | 1.99 | 9 |
| **Maldives** | 0.00 | 0.01 | 0.00 | 0.00 | 0.02 | 0.01 | 28 |
| **Nepal** | 0.00 | 0.03 | 0.02 | 0.01 | 0.04 | 0.02 | 13 |
| **Pakistan** | 0.14 | 0.24 | 0.19 | 0.60 | 0.34 | 0.47 | 25 |
| **Sri Lanka** | 0.05 | 0.10 | 0.08 | 0.19 | 0.17 | 0.18 | 23 |

**Source**: Data compiled from International Trade Statistics (www.intracen.org)

of informal trade exists among SAARC nations due to factors like neighbourhood, similarity in demand, etc. Though India accounted for largest share in agricultural trade, it suffered from very high volatility.

The agricultural exports from the SAARC multiplied three times after the formation of SAFTA in the region; exports increased from 19.68 billion USD to 64.46 billion USD. The similar increase was witnessed in agricultural imports of the SAARC, which increased from 15.62 billion USD to 47.31 billion USD. Cotton, cereals, fish and crustaceans, tea and beverages were top four exported items in TE 2005 and TE 2013, which together accounted for more than 50 percent share of exports from the SAARC to the world. Animal or vegetable fat, cotton, and rubber and articles were the top three imported items of the SAARC from the world during both the time periods. Cotton was the most important exportable commodity group and second most importable commodity group of the SAARC. Though cotton exports and imports increased in absolute terms over the selected period, its composition in the export and import baskets of the SAARC showed change. The major import items of the SAARC were raw cotton and woven cotton fabrics. The overall share of intra-SAARC trade in the total trade was 4.29 per cent, which ranged from as low as 2.15 % in India to as high as 79.81 per cent in Bhutan. The study revealed a unidirectional causality between GDP and agricultural exports, where agricultural exports Granger cause GDP, but GDP does not Granger cause agricultural exports. Also, one-way causal relationship between GDPag and agricultural exports was observed, where causality was from agricultural exports towards GDPag, but not *vice-versa*. However, GDP and agricultural imports share bidirectional causality, as GDP does Granger cause agricultural imports and *vice-versa*.

## Price linkages between domestic and export prices of onion: Whether domestic price shocks are transmitted to export prices?

*Ranjit K Paul, Raka Saxena and Shikha Chaurasia*

The study examined price linkages among major domestic onion markets and onion export prices using co-integration and Granger causality framework. It also examined short-term and long-term price movements through error correction mechanism, based on the monthly onion price data of six major markets— Azadpur, Lasalgaon, Pune, Solapur, Bengaluru and Hubli from three major onion-marketing states on the basis of market arrivals from April 2005 to December 2014 along with the export prices of onion.

The price series for all markets were found non-stationary at level and became stationary at first difference. Except for Bengaluru and Hubli, there existed one co-integration vector between combinations of two markets each (Table 17). The results detected at least one co-integration relationship between prices of domestic markets. The speed of adjustment reflected efficiency of the markets in bringing prices to equilibrium. Delhi, Bengaluru, Pune and Lasalgaon marketrs showed higher speed of adjustment as compared to other markets. This might depend on the inter-linkages across the markets, backward linkages within the value chain, infrastructural conditions and also linkages with global markets.

A uni-directional causal relationship was observed between the domestic and the export prices. It revealed that prices in domestic markets caused changes in export prices, the reverse causality was not observed.

**Table 17 : Cointegration and speed of adjustment between major domestic onion markets and export prices of onion**

| H0: Rank=r | H1: Rank>r | Eigen value | Likeli hood ratio | Trace test | Speed of adjustment | |
|---|---|---|---|---|---|---|
| **Delhi market and Export price** | | | | | **Delhi market** | **Export price** |
| 0 | 0 | 0.181 | 27.004 | 31.956 | 4.6 | 41.21 |
| 1 | 1 | 0.041 | 4.702 | 6.002 | | |
| **Bangalore market and Export price** | | | | | **Bangalore market** | **Export price** |
| 0 | 0 | 0.217 | 33.254 | 30.040 | 5.67 | 40.06 |
| 1 | 1 | 0.050 | 5.795 | 6.030 | | |
| **Hubli market and Export price** | | | | | **Hubli market** | **Export price** |
| 0 | 0 | 0.217 | 32.483 | 25.873 | 5.81 | 46.70 |
| 1 | 1 | 0.044 | 5.091 | 5.234 | | |
| **Lasalgaon market and Export price** | | | | | **Lasalgaon market** | **Export price** |
| 0 | 0 | 0.268 | 40.806 | 29.966 | 03.70 | 40.65 |
| 1 | 1 | 0.051 | 5.840 | 5.982 | | |
| **Pune market and Export price** | | | | | **Pune market** | **Export price** |
| 0 | 0 | 0.245 | 36.552 | 31.443 | 07.02 | 47.32 |
| 1 | 1 | 0.044 | 5.021 | 5.660 | | |
| **Solapur market and Export price** | | | | | **Solapur market** | **Export price** |
| 0 | 0 | 0.260 | 43.489 | 26.272 | 3.06 | 43.27 |
| 1 | 1 | 0.074 | 8.832 | 4.332 | | |

*Note*: 5 per cent critical value of likelihood ratio at rank 1 is 9.24 and 5 per cent critical value of trace at rank 1 is 9.13.

## The recurring onion price crisis: Identifying the price triggers

*Raka Saxena and Ramesh Chand*

Among various crops, onion has emerged as the fastest growing crop in the recent years; onion production grew at the rate of 5.46 per cent per year during 1974-75 to 2014-15, and the growth rate accelerated to 12.65 per cent per year after 2000-01. Despite very impressive growth in output, onion has remained achilles heel for policy- planners due to frequent and often violent price spikes. Crisis in onion price have become a recurrent phenomenon, hitting almost every alternate year. Maharashtra is the highest onion producing state in India, contributing 30 per cent of the total production. Close to 50-60 per cent of the onions are produced in *rabi* season and remaining 40-50 per cent are produced in *kharif* and late *kharif*. A large proportion of *rabi* onion reaches from Maharashtra. The *rabi* onion arrival starts in April and has better shelf- life as compared to *kharif* onion. *Rabi* onion can be stored for 5-6 months, and consumed till September before *kharif* onions, its arrival is beyond October and majority of it comes from Andhra Pradesh and Karnataka.

A very strong and significant association has been noticed between production in Maharashtra and market arrivals in the state, i.e. lagged relationship; which indicates that market arrivals in the current year can be determined by the supply of onion during the previous year (Table 18). This is very logical as the state dominates in production of *rabi* onion, and that was accounted in the previous year, but marketing has been done in the next year. Onion production in Maharashtra was lower by 17.3 per cent in 2012-13, which reduced arrivals by 16 per cent in 2013-14; resulting in ever highest price increase in 2013-14. Similarly, production decline of 9 per cent in 2014-15 resulted in decline in market arrivals in 2015-16. The same was also witnessed through regression relationship, which revealed that 1 per cent increase in production would increase market arrivals by 0.38 per cent and *vice-versa*. The discussion with traders and farmers revealed that production decline resulted in decline in market arrivals and quality was also badly affected owing to

**Table 18 : Trends in production, arrival and prices of onion in Maharashtra**

| Year | Production (Th tons) | Arrival (Th tons) | Price (Rs/ton) | Change in production | Change in arrival | Change in price |
|---|---|---|---|---|---|---|
| **2005-06** | 2469 | 2321 | 396 | | | |
| **2006-07** | 2812 | 2417 | 537 | 13.9 | 4.1 | 35.6 |
| **2007-08** | 2713 | 2985 | 564 | -3.5 | 23.5 | 5.0 |
| **2008-09** | 3933 | 2719 | 734 | 44.9 | -8.9 | 30.1 |
| **2009-10** | 3146 | 4113 | 860 | -20.0 | 51.3 | 17.2 |
| **2010-11** | 4905 | 3405 | 1051 | 55.9 | -17.2 | 22.2 |
| **2011-12** | 5638 | 3308 | 594 | 14.9 | -2.8 | -43.5 |
| **2012-13** | 4660 | 3702 | 878 | -17.3 | 11.9 | 47.8 |
| **2013-14** | 5864 | 3108 | 1489 | 25.8 | -16.1 | 69.6 |
| **2014-15** | 5362 | 3548 | 1333 | -8.6 | 14.2 | -10.5 |
| **2015-16** | - | 3132 | 1382 | - | -11.7 | 3.7 |

untimely rains and thunderstorms. This further affected storability of *rabi* onion and reduced its shelf- life.

Nasik division is the major cluster producing *rabi* onion in Maharashtra, and Nasik, Ahmednagar, Dhulia, Jalgaon and Nandurgaon are major producing districts in the division. This cluster is the most important *rabi*-producing onion cluster in the country and the crisis is triggered from climate and production shocks in the region. Lasalgaon, Yeola and Pimpalgaon are most important primary onion markets, receiving arrivals only from onion producers. On the other hand, Solapur, Mumbai, Pune are major secondary onion markets in the state.

Lasalgaon is the biggest primary onion market in Maharashtra, and is supposed to govern entire trade and affect price situation across the country. It was revealed that the crisis generated from the primary onion markets and had spread throughout the markets in the country. To confirm this, the variance decomposition technique was applied for price change in the selected onion markets. As Delhi is a major consuming and distributing market, the time series onion wholesale price data were standardized by dividing with the Delhi wholesale price of onion. The results revealed that Lasalgaon was the major influencing market for all selected markets. As markets are co-integrated, the price signals are transmitted slowly to other markets as well. In case of Lasalgaon market, Lasalgaon prices are influenced by the changes in its own price. This seems to be very logical as Lasalgaon is the biggest primary market of onion and does not receive produce from any other markets. Thus, only changes on supply front in the surrounding producing clusters would bring change in Lasalgaon. In a long run, Pune may cause a little variation in Lasalgaon prices; the maximum contribution was close to 10 per cent. The long run impact of Lasalgaon in Indore was quite significant.

# III POLICY INTERACTIONS AND ADVOCACY

## Policy input to ICAR, various Ministries, NITI Aayog and Public Organizations, based on in-house research

- Provided measures to estimate farmers' income in the country
- Radio talk on "Agricultural Diversification" on DD Kisan on December 31, 2015
- Research inputs to ICAR units as members of RAC, IMC and board of studies
- Provided inputs on recommending maximum sale price of Bt Cotton for the year 2016-17
- Provided inputs on various aspects of India's agricultural policy in the context of the requirements under WTO rules including India's Notification Obligation
- Provided inputs on issues concerning revitalising rainfed agriculture network as core member of Governing Board
- Provided inputs as Member, Taskforce on agriculture, NITI Aayog, Government of India
- Contributed articles to newspapers on issues concerning agricultural sector and farmers

# IV AWARDS/ RECOGNITIONS

## Ramesh Chand

- Joined as Member NITI Aayog, Govt of India on 11 September, 2015
- Awarded Sir Chhoturam Agricultural Economics Prize 2015 in the function organized by Phoenix Foundation, Latur, Maharashtra, on May 3, 2015 at Mumbai
- Member of 39th Executive Committee of National Institute of Agricultural Marketing, Jaipur
- Chairman, Committee to look into various aspects of India's Agricultural Policy in the Context of the Requirements under WTO Rules including India's Notification Obligation, constituted by the Ministry of Commerce and Industry, Government of India, New Delhi
- Expert Member, Taskforce on Agriculture Development, constituted by NITI Aayog (earlier Planning Commission), Government of India, New Delhi
- Core Member of Governance Board (GB) of RRA Network
- Member, ICAR Governing Body
- Member, Research Advisory Committee of Central Institute of Sub-Tropical Horticulture, Lucknow (for 3 years period, w.e.f. 29.10.2013 to 28.10.2016)
- Member, Scientific Advisory Committee of National Horticultural Research and Development Foundation (NHRDF)
- Member, Board of Studies, South Asian University, Akbar Bhavan, New Delhi
- Chief Editor, Agricultural Economics Research Review (AERR), New Delhi
- Member, Editorial Board of Indian Journal of Animal Sciences, for 3 years since August 1, 2013,constituted by Director-General, Indian Council of Agricultural Research, New Delhi

## P. S. Birthal

- Joined as Director, Institute of Development Studies, Jaipur on 28 January 2016
- Member of the committee to examine the issue relating to unification of cadre and pay parity of ICAR employees of administrative category of ICAR institutes and ICAR headquarters
- Vice-President of Indian Society of Agricultural Economics
- D.K. Desai prize by the Indian Society of Agricultural Economics in 2015
- Chief Editor, Agricultural Economics Research Review (AERR), New Delhi
- Member, Planning Board of the Tamil Nadu Veterinary and Animal Science University, Chennai
- Member, Institute Management Committee, National Bureau of Plant Genetic Resources, since 2013
- Member, Research Advisory Committee of National Centre on Weed Control, Jabalpur

## S. S. Raju

- Member (Agricultural Economics), Editorial Board, SAARC Journal of Agriculture, Dhaka, Bangladesh.
- Reviewer of the Indian Journal of Agricultural Economics, Agricultural Economics Research Association, SAARC Journal of Agriculture, Journal of Environmental Planning and Management
- Expert/examiner for Ph.D thesis evaluation of ANGRAU

## Shiv Kumar

- External examiner at CAU, Imphal
- D.K. Desai prize by the Indian Society of Agricultural Economics in 2015

## Rajni Jain

- Session Chair and Convener, a special session on "Computer Applications in Agriculture and Social Sciences", 3rd 2016 International Conference on Computing for Sustainable Global Development during 16th – 18th March, 2016, 18 March, BVICAM, New Delhi
- Session Chair, a special session on "Data mining Modelling and Applications", 3rd 2016 International Conference on Computing for Sustainable Global Development during 16th – 18th March, 2016, 17 March, BVICAM, New Delhi
- Member, Technical Programme Committee, 2nd International Conference on Computing for Sustainable Global Development, New Delhi
- Faculty Member, 2015, PG School, IARI, New Delhi
- Member, Selection Committee for Ph.D. admission in Computer Applications, PG School, IARI, 2015

## Sant Kumar

- External Examiner at IVRI, Bareilly and conducted practical examination of post-graduate Students in Economics of Livestock Health on June 27, 2014
- Evaluated post-graduate Thesis on 'An Economic Study of Vegetables Production and its Varietal Impact in Haryana', Indian Agricultural Research Institute, New Delhi
- Expert Member for clearance of probation of ARS Scientist of NCAP on August 7, 2014

## Subhash Chand

- Best Paper Award for the year 2014 by the Indian Association of Soil and Water Conservationists in the International Conference on Natural Resource Management for Food Security and Rural Livelihood, held at New Delhi, February 10-13, 2015
- Evaluated post graduate Thesis on 'Regional Growth Analysis of Oilseed Crops in Uttar Pradesh', received from *Sardar Vallabhbhai Patel University of Agriculture and Technology*, Meerut, Uttar Pradesh

## Rajesh Kumar Rana

- Participated in 9th World Potato Congress at Yanqing, Beijing, China and delivered an invited lecture on "Future Challenges and Opportunities in Indian Potato Marketing"

## Naveen Prakash Singh

- Managing Editor, Agricultural Economics of Research Review (India), New Delhi
- Member Institute Management Committee (IMC) of ICAR-NIAP, New Delhi, ICAR-CCARI, Goa and ICAR-CAZRI, Jodhpur
- Mentor for ARS probationer for the professional attachment training of ARS Scientist Ms. Anjoo Yumnam, Scientist Agricultural Economics.
- Member of the Selection Committee for selection of Research Associates and Business Executives for ZTM & BPD, IARI, 12 February, 2016
- Appointed as a group member for the group, Improvement of spot selling price, Commodity Derivatives Advisory Committee, set up by Securities and Exchange Board of India March 04, 2016
- Member of Task Force for preparing the strategic paper on "Shifting measures to bringing pulses self sufficiency in India" by ICRISAT, Hyderabad, India

## Raka Saxena

- Joint secretary of Agricultural Economics of Research Association (India), New Delhi
- Member, Board of studies, Indian Institution of Agri-Business Management, Swami Keshwanand Rajasthan Agricultural University, Bikaner

## S. K. Srivastava

- Dr J. S. Pruthi award-2013 for the best research paper entitled "Inter-regional variations and future household demand and production of major spices in India" published in Journal of Spices and Aromatic Crops (Vol. 22, 2013, pp. 47-54)
- Member of Board of Studies for the Discipline of Agricultural Economics for academic session 2015-16

## Balaji S. J.

- Best paper presentation award 2015 by Indian Society of Agricultural Economics for the paper entitled *Structural Breaks, Yield Plateaus and Long-run Yield Trends in Indian Agriculture*

# V PUBLICATIONS

## A. Policy Paper

Birthal, P.S., Kumar S., D.S. Negi and Roy D. (2015) The impact of information on returns from farming. Policy Paper 29. National Institute of Agricultural Economics and Policy Research, New Delhi

## B. Policy Brief

Pal, Suresh, G. K. Jha and S. J. Balaji (2015). Accelerating Transformation of Indian Agriculture, Research Brief, Indian Agricultural Research Institute (IARI), New Delhi

## C. Research Papers

Ahuja, D. B., Ahuja, U., Singh, S. K. and Singh N. (2015) Comparison of integrated pest management approaches and conventional (non-IPM) practices in late-winter-season cauliflower in northern India. *Crop Protection*, 78C, pp. 232-238

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Birthal, P.S. (2015) Livestock marketing and supply chain management of livestock products- Summary of group discussion. *Indian Journal of Agricultural Economics*, 70(1): 106-108

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## D. Books/Manuals

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Jain, R., Raju, S.S, Kingsly, I., Srivastava, S.K, Kaur, A.P. and Singh, J. (2015) *Manual on methodological approach for developing regional crop plan*. ICAR-National Institute of Agricultural Economics and Policy Research, New Delhi, pages 1-52

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## E. Chapters in Books/Proceedings/ Popular Articles

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Arora, A. and Jain, R. (2016) Clustering: Case studies in agriculture. In: *Decision Support System in Agriculture: Quantitative Analysis*. Eds: Rajni Jain and S. S. Raju. Agrotech Publishing Academy, Udaipur ISBN 978-81-8321-395-0, pp 271-283

Chand S. (2016) Impact assessment of natural resources conservation programmes: A case study of watersheds. In: *Application of Analytical Techniques for Decision Making in Agriculture,* Eds: Raju, S.S., R. Jain, and U. Ahuja, Daya Publishing House, New Delhi

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## F. Book Reviews

Saxena Raka (2015) Book review of Food Security of India: An Overview, Suresh C. Modgal. *Agricultural Economics Research Review*, 28(1): 195-196

## G. Research Reports / Working Papers

Birthal P. S., Chand R., Joshi, P.K., Saxena, R., Rajkhowa, P., Khan, T., Khan, A., Chaudhary, K.R. (2016) *Formal versus informal: Efficiency, inclusiveness and financing of dairy value chains in India*, IFPRI Discussion Paper 01513, International Food Policy Research Institute, Washington DC

## H. TV Talks / Radio Talks

TV Show 'Agricultural diversification', DD Kisan, 6.00 to 7.00 P.M, December 31, 2015

## I. Presentations in Conferences / Workshops / Symposia

Ahuja, U. and Jain, R. (2016) Determinants of adoption of IPM in cauliflower cultivation in Haryana State, In: *3rd International Conference on Computing for Sustainable Global Development*, 10th INDIACom; INDIACom-2016

Ahuja, U., Ahuja, D.B., Jain, R., Negi, D.S, Narayan, P. (2016) Determinants of adoption of IPM in cauliflower cultivation in Haryana State. In: Proceedings of 3rd International Conference on Computing for Sustainable Global Development, 10th INDIACom; INDIACom-2016; IEEE Conference ID: 37465, Bharati Vidyapeeth's Institute of Computer Applications and Management (BVICAM), New Delhi (INDIA), 16th-18th March, pp 5615-5620

Arora, A., Chandra, S., Kumar, A., Jain, R, Marwaha, S (2016) Online software for forewarning of Onion thrips, In: *Proceedings of 3rd International Conference on Computing for Sustainable Global Development*, 10th INDIACom; IEEE Conference ID: 37465, Bharati Vidyapeeth's Institute of Computer Applications and Management (BVICAM), New Delhi (INDIA), 16th-18th March, pp 5559-5561

Balaji S. J. (2015) The 75th Annual Conference or Platinum Jubilee Celebration of the Indian Society of Agricultural Economics held at PAU, Lubhiana (Punjab), 19-21 November, 2015. Presented a paper titled *Structural Breaks, Yield Plateaus and Long-run Yield Trends in Indian Agriculture*

Birthal P. S. (2015) Dairy for higher, sustainable and inclusive growth in the *workshop on Dairy Farming organized by NDDB* and Bharat Krishak Samaj on August 28, 2015 at India International Centre, New Delhi

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Birthal, P. S. (2015) workshop on *Improving food and livelihood security in Punjab through water-energy-agriculture management under climate change and variability.* The Centres for International Projects Trust and International Development Research Centre (IDRC), Canada New Delhi September 30, 2015

Birthal, P.S. (2015) Impact of drought on food production *in workshop on Mitigating Agrarian Distress in Indian Agriculture*, October 15, 2015, IFPRI and Centre for Good Governance, Hyderabad

Birthal, P. S. (2015) Can agricultural diversification be a pathway of improving food security and reducing poverty, in the workshop '*ANSISS-IFPRI consultation workshop on Food Security Portal Partnership in India: Emerging Food Security Issues in Bihar*, April 25, 2015, Patna, Bihar

Chand, S. and Singh, S (2015) Mangroves source of livelihood for the coastal people: A case study of Andaman and Nicobar Islands, India, Poster presented in *XII Agriculture Science Congress*, held at NDRI, Karnal, Haryana from 3rd to 6th February, 2015

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Jain, R., Singh, M. S., Arora, A., Marwaha, S. (2016) Software process model for agricultural productivity analysis, In: Proceedings of 3rd International Conference on *Computing for Sustainable Global Development*, 10th INDIACom; INDIACom-2016; IEEE Conference ID: 37465, Bharati Vidyapeeth's Institute of Computer Applications and Management (BVICAM), New Delhi (INDIA), 16th-18th March, pp 5550-5554

Raju, S.S. (2015) Agricultural Risk and Insurance to the participants of ICAR Summer School on *Analytical Techniques for Decision Making in Agriculture* on 16 July, 2015 at NIAP, New Delhi

Raju, S.S. (2015) Assessment of crops based on economic prices and natural resource valuation to the participants of ICAR Summer school on *Analytical Techniques for Decision Making in Agriculture* on 1 August, 2015 at NIAP, New Delhi

Raju, S.S. (2015) Estimation of animal feed resources availability and requirement ICAR Summer school on *Analytical Techniques for Decision Making in Agriculture* on 24 July, 2015 at NIAP, New Delhi

Raju, S.S. (2015) Horticulture trends and prospects in India. National Seminar on *Sustainable Agricultural Development Challenges and Issues* at Andhra University, Visakhapatnam on 22-23, November, 2015

Sharma S. and Jain, R. (2015) Outlier detection in agriculture domain: Application and techniques, 50 Golden Jubilee Annual Convention on Digital Life, CSI conference, 2-5 December 2015

Sharma S., Jain, R. and Mittal, P. (2016) AGRETL: Tool for ETL Activities for Agriculture Domain, In: Proceedings of 3rd International Conference on Computing for Sustainable Global Development, 10th INDIACom; INDIACom-2016; IEEE Conference ID: 37465, Bharati Vidyapeeth's Institute of Computer Applications and Management (BVICAM), New Delhi (INDIA), 16th-18th March, pp 5506-5512

## J. Abstracts

Ahuja U., Jain R. and Chauhan S. (2015) Impact of migration on the Roles and Responsibilities of Farm women and farm Productivity. *Indian Journal of Agricultural Economics* 70 (3) (Conference number), pp 437

Kumar S., Nikam, V. and Chaudhary, K.R. (2016) An econometric analysis of structural factors of pulse production in India: A case of gram in Maharashtra. Proceedings of National Symposium on Vegetable Legumes for Soil and Human Health (Feb 12-14, 2016). pp: 411-412

# VI ON-GOING RESEARCH PROJECTS

| Sl. No. | Title of Research Project | PI & Co-PI(s) |
|---|---|---|
| ***Institute Projects*** | | |
| **1.** | Total Factor Productivity and its Determinant in Indian Agriculture | Rajni Jain<br>Ramesh Chand |
| **2.** | Assessing Impact of Bringing Green Revolution in Eastern India (BGREI) - A Case Study of Stress Tolerant Rice Varieties | Sant Kumar<br>Pratap S. Birthal |
| **3.** | An Analysis of Crop Yield Gaps in India | Pavithra S.<br>S. K. Srivastava |
| **4.** | Women Role in Agriculture and Gender Differential Perception of Trustworthiness | Usha Rani Ahuja<br>Rajni Jain<br>Sonia Chauhan |
| **5.** | Institutional Innovations for Enhancing Outreach and Inclusiveness of Livestock Services | Subhash Chand<br>Pratap S. Birthal<br>Prem Narayan |
| **6.** | Changing Structure of Crop Production Cost and Technological Effects in India | S. K. Srivastava<br>Jaya Jumrani |
| **7.** | Changes in Nutritional Insecurity and Consumption Patterns Among Indian Households : 1993-94 and 2011-12 | Jaya Jumrani<br>Ramesh Chand |
| **8.** | Assessment of Technical Efficiency and Research Productivity of Wheat in India | T. K. Immanuelraj<br>Sant Kumar |
| ***Externally Funded Projects*** | | |
| **9.** | ICAR SSN Project on Market Intelligence | Raka Saxena<br>Pavithra S.<br>Ranjit Paul |
| **10.** | ICAR SSN Project on Regional Crop Planning for Improving Resource use Efficiency and Sustainability | S. S. Raju<br>S. K. Srivastava<br>Rajni Jain<br>T. K. Immanuelraj |
| **11.** | ICAR SSN Project on Impact Assessment of Agricultural Research and Development | Shiv Kumar<br>Pratap S. Birthal<br>Jaya Jumrani<br>S. K. Srivastava<br>T. K. Immanuelraj<br>Vinayak Nikam<br>Balaji S. J. |

| | | |
|---|---|---|
| **12.** | Institutional Innovations in Irrigation Water Management Systems for Enhancing Efficiency and Inclusiveness of Stakeholders in Northern India. | Subhash Chand, Shiv Kumar, N. Ravishankar and R. C. Srivastava |
| **13.** | Mainstreaming Adaptation Policies in Development Planning to Enhance Resilience of Indian Agriculture | N. P. Singh Jaya Jumrani Pavithra S. Balaji S. J. |
| **14.** | Impact of ICT on Agricultural Education in India | Rajni Jain Pavithra S. Anshu Bhardwaj Ranjit Paul |
| **15.** | Mapping Identifying Pathways of Socio-economic and Socio-personal Attributes and Study their Influence on Agricultural Performance Across Different Agro-ecosystems in India | N. P. Singh S. K. Srivastava Balaji S. J. |
| **16.** | Organize the Collection of Crop Germplam Improvement Research Related Direct Outcomes in South Southeast and East Asia, CIMMYT (Delhi) | Pavithra S. Pratap S. Birthal Ramesh Chand |

## VII CONSULTANCY/CONTRACT RESEARCH PROJECTS

| Name of scientist | Institution to which consultancy is provided | Area of consultancy / contract research |
|---|---|---|
| Ramesh Chand Raka Saxena | ICRIER, New Delhi | Bilateral India-Pakistan Agricultural Trade: Trends, Composition and Opportunities |

# VIII RESEARCH ADVISORY COMMITTEE (RAC)

The Research Advisory Committee (RAC) of NIAP was constituted by the ICAR for a period of three years w.e.f. February 3, 2014. The composition of RAC is as follows:

**Prof. S. Mahendra Dev (Chairman)**
Director (Vice Chancellor)
Indira Gandhi Institute of Development Research
Mumbai – 400065

**Dr. Rajinder S. Sidhu**
Dean
College of Basic Sciences
Punjab Agricultural University
Ludhiana, Punjab

**Dr. B. Gangiah**
Economic and Statistical Adviser
Directorate of Economics and Statistics
Ministry of Agriculture
Department of Agriculture and Cooperation
New Delhi

**Dr. Bharat Ramaswami**
Professor
Planning Unit, Indian Statistical Institute
New Delhi – 110016

**Dr. K. Palanisami**
Principal Researcher
International Water Management Institute
NASC Complex
New Delhi – 110012

**Sh. Viswhasrao Anandrao Patil**
P.O. Lohara, Taluq Pachora
Distt. Jalgaon
Maharashtra

**Dr. H. K. Srikanta**
59/1, 8th Cross, 5th Main
R.K. Layout, Padmanabhanagar
Bangalore, Karnataka

**Dr. Ramesh Chand (Ex-officio)**
Director
ICAR -National Institute of Agricultural Economics
and Policy Research
New Delhi – 110012

**Assistant Director General (EQR)**
Education Division
Indian Council of Agricultural Research
Krishi Anusandhan Bhawan-II
New Delhi-110 012

**Dr. Pratap S. Birthal (Member Secretary)**
Principal Scientist
ICAR -National Institute of Agricultural Economics
and Policy Research
New Delhi – 110 012

## Meetings of the Research Advisory Committee (RAC)

The second meeting of the 8th Research Advisory Committee of the National Institute of Agricultural Economics and Policy Research, New Delhi was held on August 03, 2015 under the chairmanship of Prof. S. Mahendra Dev, Director, Indira Gandhi Institute of Development Research, Mumbai. Prof Ramesh Chand apprised members of the salient accomplishments since the previous meeting mentioned below :

- The Centre has now been elevated to the status of an Institute, and now will be called as National Institute of Agricultural Economics and Policy Research.

- NIAP has also entered in its silver jubilee year, and as a part of celebrations will organize lectures and seminars.
- By virtue of its faculty being on the Editorial Board of Agricultural Economics Research Review the NIAP has contributed towards improving its quality and global ranking.
- NIAP has also improved its publication record in high impact international journals.

# IX INSTITUTE MANAGEMENT COMMITTEE

**Dr. Ramesh Chand**
Director & Chairman
ICAR-National Institute of Agricultural Economics and Policy Research (NIAP)
New Delhi – 110 012

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

**Economic Advisor**
Economic & Statistical Organization
Govt. of Punjab, Chandigarh- 160 017

**Dr. R.K. Khatkar**
Head
Department of Agricultural Economics
Haryana Agricultural University
Hisar, Haryana-125 004

**Sh. Vishwasrao Anandrao Patil**
P.O. Lohara, Taluq: Pachora
Distt. Jalgaon
Maharashtra

**Dr. Kalpana Shastri**
Joint Director
ICAR-National Academy of Agricultural Research Management (NAARM)
Rajendra Nagar
Hyderabad – 500 030, Andhra Pradesh

**Dr. Sunil Archak**
Principal Scientist
ICAR-National Bureau of Plant Genetic Resources (NBPGR), Pusa Campus
New Delhi – 110 012

**Dr. Naveen Prakash Singh**
Principal Scientist
ICAR-National Institute of Agricultural Economics and Policy Research (NIAP)
New Delhi – 110 012

**Dr. A.K. Vashist**
Assistant Director General, PIM
Indian Council of Agricultural Research
Krishi Bhawan
New Delhi – 110 001

**Assistant Director General (EQR)**
Indian Council of Agricultural Research
Krishi Anusandhan Bhawan-II
Pusa, New Delhi-110 012

**Sr. Finance and Accounts Officer**
ICAR-National Bureau of Plant Genetic Resources (NBPGR)
Pusa, New Delhi-110 012

**Administrative Officer (Member Secretary)**
ICAR-National Institute of Agricultural Economics and Policy Research (NIAP)
New Delhi – 110 012

## Meetings of the Institute Research Committee

Institute Research Committee (IRC) of NIAP is comprised of Director NIAP and scientific staff of the Institute. Director of NIAP is the Chairman of IRC. The Annual IRC meeting of NIAP was conducted on 7-8 April 2015 to review the annual progress of NIAP Scientists during 2014-15 and also to discuss the Annual Plan for 2015-16. Two external experts were invited from outside institutions to review the research progress. Besides, two regular IRC meetings were organized on 18th June, 2015 and 16th October, 2015 to discuss various research related agenda. During the IRC meetings, progress of the on-going research projects/ activities was discussed and other new research proposals were presented. Presentations were also made at the IRC meetings to share the experiences.

# X PARTICIPATION IN SCIENTIFIC ACTIVITIES

## Ramesh Chand

- One day Leadership Workshop Enhancing Organizational Productivity through Management of People at Work on April 19, 2015 at New Delhi
- Participated in the Review Workshop of Project Partners in Network Project on Market Intelligence at Banaras Hindu University, Varanasi on 7 - 8 May, 2015
- Attended Annual Vice-Chancellors' Conference of the State Agricultural University (SAUs) and Interface Meeting with ICAR Directors during May 14-16, 2015 at New Delhi
- Attended workshop on "Up-Scaling Quality Protein Maize for Nutritional Security" on May 20-21, 2015. (TAAS), New Delhi
- Attended consultation workshop and introduced the Theme on Policies and Strategies for Transformation at the National Level organized by IFPRI on May 22, 2015 at New Delhi
- Attended North Block Policy Charcha, Chaired by the Hon'ble Finance Minister on the topic "Crop Insurance in Indian Agriculture" on June 5, 2015 at North Block, New Delhi
- National Conference on Crop Insurance, spoke on the topic Identification of the most vulnerable crops, farmers groups and special insurance products to meet their requirements on June 15-16, 2015 at Bhopal
- Attended the RAC meeting of ICAR-Central Institute for Subtropical Horticulture, Lucknow on July 9, 2015
- 87th ICAR Foundation Day and Award Ceremony and National Conference of KVKs on July 25, 2015 at Patna
- Guest Speaker at Agriculture and Food Counsellors Meeting (Embassy of Japan) on July 22, 2015 , New Delhi
- Attended 1st Meeting of Standing committee on Academics of National Institute of Agricultural Marketing, Jaipur on 28 August, 2015

## Pratap S. Birthal

- Attended Workshop in Agro-Climatic Zone No. VI (Trans-Ganga Plains Regions) at ICAR-Central Soil Salinity Research Institute (CSSRI), Karnal on 5th October, 2015
- Attended a workshop on Mitigating Agrarian Distress in Indian Agriculture organized by International Food Policy Research Institute (IFPRI) and Centre for Good Governance (CGG), on October 15, 2015 in CGG, Gachibowli Campus, Hyderabad
- Attended a Platinum Jubilee Conference of the Indian Society of Agricultural Economics (ISAE), on 19 – 21 November, 2015, at PAU, Ludhiana
- Attended National Seminar on Enhancing of Agri-commodity Value Chain : Challenges and Opportunities at Bankers Institute of Rural Development, Lucknow on 29 November, 2015

- Attended 23rd AERA Annual Conference during 1-3 December 2015, at ICAR-Central Institute of Fisheries Education, Mumbai
- Consultation meeting at Parliament on e-marketing of December 16, 2015
- Attended Agricultural Technology Foresight Centres (ATFC) workshop on December 30, 2015 at New Delhi
- Participated in Hello Kisan Program at DD Kisan on December 31, 2015
- Attended meeting with the consultative Group on International Agricultural Research Centres, BISA and CABI to discuss their ongoing activities with India focus as well as their plans during the 12th Five Plan Period in January 2016 on January 19, 2016 at New Delhi

## Usha Rani Ahuja

- 10th INDIACom; 3rd 2016 International Conference on Computing for Sustainable Global Development at Bharati Vidyapeetha, New Delhi on March 16 - 18, 2016

## S. S. Raju

- National Conference on Crop Insurance at Hotel Jhuma Palace, Bhopal, 15-16 June, 2015
- Review meeting of Vigilance Officers of North Zone, ICAR at NASC, New Delhi, 6 July, 2015
- Workshop on Preventive Vigilance at NASC, New Delhi, 28 October, 2015

## Shiv Kumar

- Reviewed the *Rabi* Crops-Outlook Report of NCAER as directed by DAC, MOA&FW, New Delhi
- Participated as Resource person for Seminar during National Agriculture fair & Krishi Unnati -2016 on 19/03/2016 on the topic- Market led Production and Processing for Direct Income Enhancement in Field Crops & Horticulture
- Participated in workshop on "Technology Foresight: Theory and Practice", to be held on November 27, 2015 in Vigyan Bhawan, New Delhi
- Participated in Annual Conference of Agricultural Economics Research Review (AERA) to be held from 2-4 December, 2015 at Central Institute of Fisheries Education (CIFE), Mumbai
- Participated in National consultation to discuss the third National Report on the Implementation of the Cartagena Protocol on Biosafety on 28th October, 2015 in the MoEF & CC, New Delhi
- Participated in National Seminar – 'Microfinance: Issues and Challenges' at BIRD, Lucknow (16.10.2015 to 17.10.2015)
- Participated in National Seminar – 'Financing Value Chains in Agriculture' at BIRD, Lucknow (29.11.2015 to 30.11.2015)

## Rajni Jain

- Research Guide, 2015, Ph.D. thesis on Modeling of ETL Process to improve data quality in data warehouse for agriculture domain, Uttarakhand Technical University, The Faculty of Computer Science and Engineering, Dehradun
- Research Guide, 2015, M.SC. Thesis on Software for Agriculture Productivity Analysis, PG School, IARI, New Delhi
- Research Guide, 2015, M.SC. Thesis on Web based Application for Apportioning Temporal Data at District Level, PG School, IARI, New Delhi

- Course Co-Director, ICAR-Summer School "Analytical Techniques for Decision Making in Agriculture" 16 July-5 August, 2015

## Sant Kumar

- Attended 75th Platinum Jubilee Annual Conference of the Indian Society of Agricultural Economics, 19-21 November 2015 at PAU, Ludhiana

## Subhash Chand

- Evaluated the thesis of Ph. D student of ICAR- NDRI, SRS, Bangalore, Karnataka. Thesis entitle "Consumption pattern of milk and milk products in Kerala: An Economic Analysis", By Kirshnadas, M.
- Evaluated the thesis of MSc Ag. Economics student of Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu on Economic evaluation of different cropping pattern in Reasi District of Jammu region submitted by Kamal Barati
- Examination conducted (Viva-Voice): One MSc student final exam was conducted on 14/03/2016 at Agri. Business and agricultural Economics Division of Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu

## Naveen Prakash Singh

- Worked as an external member of the Moderation Board for the question papers of courses: a) Indian Agricultural Development and b) Cooperative and farmers' organization for the course of the PG Certificate in Agriculture Policy (PGCAP) of IGNOU University, October 30, 2015
- Worked as an external member of the Moderation Board Meeting for question papers of courses: a) Introduction to Plantation Management and b) Agriculture Policy for the course of PG Diploma in Plantation Management (PGDPM) of IGNOU University, February 26, 2016
- Nominated as rapporteur for the theme "Farm income, Productivity and Methodology of Farm Income Level" for the 76th Conference of Indian Society Agricultural Economics (ISAE), Mumbai
- Appointed as a member of the committee constituted for the selection of Best Teacher Award at NDRI (National Dairy Research Institute) Karnal, Haryana, February 23, 2016
- Appointed as the chairman of the committee "Achievements Highlights and Other Development" constituted for the events related with Annual Day of the National Institute of Agricultural Economics and Policy Research (NIAP), New Delhi, on May 2, 2016
- Evaluated the thesis of Ph.D. student of Department of Agricultural Economics of Banaras Hindu University, Varanasi, India, entitled "Analysis of Maize Value Chain under Climate Change in Bihar, India" submitted by Mr. Udhav Prasad Singh with Ref No. New/VI/40 (Ag)
- Evaluated the thesis of Ph. D student of Department of Agricultural Economics of Mahatma Phule Krishi Vidyapeeth (MPKV) Agricultural University, Rahuri, Ahmednagar, Maharashtra, India, entitled "Economic Analysis of Production, Marketing and Export of Grapes from Maharashtra" by Mr. Deshmukh Balkrishna Jagannath with ref. No AD/PGI/1918/2015
- Evaluated the thesis of Ph. D student of Department of Agricultural Economics & Statistics, Chandra Shekhar Azad University of Agriculture & Technology,

Kanpur, India, entitled "An economic Analysis of Production and marketing of Pulses in Bundelkhand region of Uttar Pradesh" by Mr. Prabhakar Kumar with ref.CSAU/R-Ph.D.4004

- Evaluated the thesis of Ph. D student at Centre of Studies in Resources Engineering, IIT, Mumbai, entitled "Geospatial Drought Vulnerability Assessment using Exposure, Sensitivity and Adaptive Capacity" by Mr. Ganapuram Sreedhar
- Conducted (Viva-Voice): Ph. D student Mr. Ganapuram Sreedhar Viva Voice was conducted at Centre of Studies in Resources Engineering, IIT, Mumbai, for the thesis entitled "Geospatial Drought Vulnerability Assessment using Exposure, Sensitivity and Adaptive Capacity"

## Raka Saxena

- Participated in the 23rd Conference of Agricultural Economics Research Association (India) held at Central Institute of Fisheries Education, Mumbai on 2-4 December 2015

## Jaya Jumrani

- Short course on "Transforming Nutrition in India: Ideas, Policies and Outcomes" organized by the Centre for Chronic Disease Control and Public Health Foundation of India in partnership with the Transform Nutrition Consortium held at The Pllazio Hotel, Sector 29, Gurgaon, Haryana during December 7-11, 2015
- Technical workshop on "Measurement of undernourishment and severity of food insecurity" organized by FAO India and Society for Social and Economic Research held at the India Habitat Centre, Lodhi Road, New Delhi on March 15, 2016
- Organized the review and training workshop on matching methods and Difference-in-Difference techniques under the SSN project on Impact Assessment of Agricultural Research and Development in India held during March 7-9, 2016 at ICAR-NIAP, New Delhi

## S. K. Srivastava

- Imparted 3 months professional attachment training to Miss. Prerna Kapur, Gokhle Institute of Politics and Economics, Pune, Maharashtra

## T. Kingsly Immanuelraj

- Participated in the XIIth Agricultural Science Congress, held at NDRI, Karnal, Haryana, February 3-6, 2015

# XI VISITS ABROAD

| Name of Scientist | Name of Training | Place | Duration |
|---|---|---|---|
| Rajesh Kumar Rana | Participated in 9th World Potato Congress at Yanqing, Beijing, China and delivered an invited lecture on "Future Challenges and Opportunities in Indian Potato Marketing" | Yanqing, Beijing China | July 28-30, 2015 |
| Raka Saxena | Participated in three day training programme on Communication for Policy Research and Impact organized by the International Food Policy Research Institute | Dhaka, Bangladesh | March 29 – 31, 2016 |
| Vinayak Nikam | Participated in three day training programme on Communication for Policy Research and Impact organized by the International Food Policy Research Institute | Dhaka, Bangladesh | March 29 – 31, 2016 |

# XII TRAINING AND CAPACITY BUILDING

Capacity building has always been an important activity of Indian National Agricultural Research System. After the Skill India initiative of Indian Government it has acquired greater importance. As per the guidelines issued by Indian Council of Agricultural Research (ICAR), the HRD unit of ICAR-National Institute of Agricultural Economics and Policy Research thoroughly carried out training needs assessment of its entire staff. Record of trainings undertaken by each and every employee of the institute during last 3 years was prepared and the employee wise skill deficiency analysis was carried out. Subsequently, the annual training plan was prepared and implemented for mitigating the skill deficiency of our employees.

## Participation in trainings

Category wise details of trainings attended by the institute staff during 2015-16 has been presented in the Table 19.

**Table 19 : Details of trainings undertaken by the ICAR-NIAP staff during 2015-16**

| Category | No. of trainings | Organizations providing trainings | Topics covered |
|---|---|---|---|
| Scientific staff | 23 | ICAR-NIAP, IFPRI, NAARM Hyderabad, NIAS Bangalore, CCDCPHF, IARI New Delhi, IIPA New Delhi | Impact assessment, Quantitative techniques for agricultural policy research, Training on DID and PSM, Analytical techniques for decision making in agriculture, Science and technology and emerging trends in governance etc. |
| Technical staff | 8 | ICAR-NIAP, NAARM Hyderabad, DKMA New Delhi, IIPA New Delhi | Competency enhancement programme, DELNET, Capacity building, Knowledge management and sharing, Basic computer application, MIS-FMS etc. |
| Administrative staff | 4 | ISTM, NIFM New Delhi | Financial statements, public procurement, Pension and retirement benefits etc. |
| Supporting staff | 4 | ICAR-NIAP, New Delhi | Basic computer applications, MIS-FMS etc. |

## Trainings organized for different staff categories

ICAR-NIAP organized training programs for different categories of its staff during 2015-16 and the details are presented in the Table 20.

**Table 20 : Details of trainings conducted by the ICAR-NIAP during 2015-16**

| Title of the training | Duration and venue | Category | Organizer(s) |
|---|---|---|---|
| Impact Assessment of Agricultural Research and Technologies | 24-29 May 2015 at ICAR-NIAP, New Delhi | Scientific staff | Collaborative training organized by IFPRI New Delhi and ICAR-NIAP, New Delhi |
| Basic Computer applications | 15-17 October 2015 at ICAR-NIAP, New Delhi | Supporting and technical staff | ICAR-NIAP, New Delhi |
| Basic MIS-FMS procedures and applications | 19-20 October 2015 at ICAR-NIAP, New Delhi | Supporting and technical staff | ICAR-NIAP, New Delhi |
| Training on DID and PSM techniques of impact assessment | 7-9 March 2016 at ICAR-NIAP, New Delhi | Scientific staff | Collaborative training organized by IFPRI New Delhi and ICAR-NIAP, New Delhi |

## HRD fund allocation and utilization

Account of funds allocation for HRD activities and their utilization during 2015-16 has been presented in the Table 21.

**Table 21 : Funds allocation and utilization for HRD activities during 2015-16**

| Allocation (Rs. Lakh) | Utilization (Rs. Lakh) | Comments |
|---|---|---|
| 2.00 | 1.23 | The funds utilization under HRD during 2015-16 was less due to non-booking of TA/DA of employees undergoing trainings under HRD head. |

## Trainings Organized/Other Meetings

| | |
|---|---|
| Organized a one-week training program 'Impact Assessment of Agricultural R&D'<br>March 7-9, 2016 | NIAP, New Delhi |
| Conducted final stakeholder Consultation Workshop on GOI – FAO Country Programming Framework' Food and Agriculture Organization of the United Nations and ICAR-National Institute of Agricultural Economics and Policy Research (NIAP)<br>February 3, 2016. | NIAP, New Delhi |

| | |
|---|---|
| Dr. Kirit S. Parikh, Honorary Professor, delivered the 8th Prof. Dayanatha Jha Memorial Lecture on "Development, Inclusion and Climate Change: India's Multiple Imperatives"<br>May 2, 2015 | NIAP, New Delhi |
| First Silver Jubilee Lecture by Dr Partap Chauhan, Founder Director, Jiva Ayurveda<br>September 26, 2015 | NIAP, New Delhi |
| NIAP Silver Jubilee Lecture on "Policies for Next Stage of Agricultural Development" by Prof. Ramesh Chand<br>October 31, 2015 | NIAP, New Delhi |
| ICAR Summer School on "Analytical Techniques for Decision Making in Agriculture"<br>July16 – August 5, 2015 | NIAP, New Delhi |
| Third Review Workshop of Network Project on Market Intelligence<br>May 7-8, 2015 | BHU, Varanasi |
| Fourth Review Workshop of Network Project on Market Intelligence<br>October 30-31, 2015 | NIAP, New Delhi |
| Capacity building program for Vishwa Bharti University in the network project of market Intelligence<br>January 15-16, 2016 | NIAP, New Delhi |
| Organized a review and training workshop of Network project on 'Impact Assessment of Agricultural R&D'<br>May 25-29, 2015 | NIAP, New Delhi |
| Review workshop on Network project on Regional Crop Planning<br>December 15-17, 2015 | NIAP, New Delhi |

## ICAR Summer School on "Analytical Techniques for Decision Making in Agriculture"

### 16 July to 5 August, 2015

A Summer School on "Analytical Techniques for Decision Making in Agriculture" was organized at NIAP during 16 July-5 August, 2015. Summer school was inaugurated by DDG education, Dr Arvind Kumar. It was coordinated by Dr S. S. Raju, Dr Rajni Jain and Dr Usha Ahuja under the guidance of Dr Ramesh Chand, Director. Twenty-four trainees, hailing from 20 states of India, participated in the Summer School which includes 41% from north, 21% from south, 25% from east and 13% from west. Twenty-Seven faculties delivered the lectures in the summer school. Usefulness and coverage of the content in lectures as responded by the trainees was 99%. The summer school consisted of four major topics as Data and Information management, Economics tools and Techniques, Applications, Software and Social Sciences. All the trainees were provided with lecture notes in the form of a CD based manual containing lectures delivered by the faculty members. The technical sessions were well appreciated by the trainees.

Participants, Chief Guest and staff of NIAP,ICAR Summer School on "Analytical Techniques for Decision Making in Agriculture" 16 July to 5 August, 2015


Summer school (16 July-5 August, 2015) inauguration by DDG Education, ICAR

Group photo of Summer school participants and faculty members with Director NIAP and DDG, Education on Inauguration day

## Third Review Workshop of Network Project on Market Intelligence

The third Review Workshop of the Network Project on Market Intelligence was held at the Banaras Hindu University, Varanasi to review the project progress. The workshop was attended

by 31 participants from 14 collaborating centres including the lead centre. The workshop started with the Inaugural session, wherein Dr. H P Singh, Head, Department of Agricultural Economics, Banaras Hindu University (BHU), welcomed the dignitaries and delegates and briefed about the purpose of the workshop. This was followed by a brief introduction about the relevance of the project by Dr. Raka Saxena, Senior Scientist and PI of the Network Project on Market Intelligence, NIAP, New Delhi. Dr. Vishampayam, Dean, Institute of Agricultural Sciences highlighted the scientific contributions of BHU along with the importance of market intelligence efforts. Prof Ramesh Chand, Director NIAP, New Delhi and Chief Guest of the function, inaugurated the workshop and emphasized the importance of the project.

He discussed about the "power of price" and informed that the gains from prior information about prices can be much more than the technological gains many a times. He also highlighted that the contribution of reliable forecasts is very important for farmers' welfare and can be very helpful in reducing their distress. Prof Ramesh Chand's remarks were followed by the felicitation ceremony of all the dignitaries. Dr. Ravi Pratap Singh, Director, BHU, provided the chairman's remarks. Dr Singh also highlighted the importance of prices in the economy and said that this project can bring much awaited change in the society. Inaugural Session was followed by technical sessions where all the centres presented their performance for the year 2014-2015 and also the action plan for the upcoming year.

## Fourth Review Workshop of Network Project on Market Intelligence

The fourth Review Workshop of the Network Project on Market Intelligence was held at the ICAR-National Institute of Agricultural Economics and Policy Research (NIAP), New Delhi to review the project progress during the period April–October 2015. The workshop was attended by 31 participants from 13 collaborative centres including the lead centre. The workshop started with inaugural session, presided over by Dr. Pratap Singh Birthal, Acting Director NIAP. The session

began with the welcome address by Dr. Raka Saxena, Senior Scientist, NIAP and PI of the project. Dr. Birthal, in his opening remarks, highlighted the need and importance of market intelligence in India and shared the concern of top authorities including the Ministry of Agriculture and Farmers Welfare on the price fluctuations in agricultural commodities. Inaugural program was followed by technical sessions, wherein, the respective collaborative centres presented the detailed project progress for the year 2015-2016 (April-October) and also proposed the action plan for the upcoming year.

## Capacity building for the new Centre of Network Project on Market Intelligence

A separate capacity building programme was organized for the team of Viswabharati Centre, Sriniketan, West Bengal on 15-16 January 2016 at NIAP, New Delhi

## Training Cum Annual Review Workshop of Network Project on "Regional Crop Planning for Improving Resource Use Efficiency and Sustainability"

The Training-cum-Annual review workshop of ICAR Social Science Network Project "Regional Crop Planning for Improving Resource Use Efficiency and Sustainability" was held on 18-19 December, 2015 at ICAR-NIAP, New Delhi. The meeting was attended by 22 participants from seven collaborators including the lead centre. At the outset Dr S S Raju, Principal Scientist and PI of the project extended a warm welcome to all the network project collaborators. The agenda of this meeting was to impart training on development of regional crop model using Linear Programming and GAMS, estimation of resource use efficiency by DEA approach. On the first day of the workshop, training for developing regional crop plan was conducted by Dr Rajni Jain, Dr S. K. Srivastava, Dr Kingsley and the research team followed by hands on experience by the collaborators. The training was well appreciated by the collaborators. On the second day all the collaborative centres presented the progress of the project followed by discussion, recommendations and action plan for the remaining period.

## First Silver Jubilee Lecture by Dr Partap Chauhan, Founder Director, Jiva Ayurveda

Dr Partap Chauhan, founder Director, Jiva Ayurveda delivered first lecture as part of Silver Jubilee celebrations of NIAP on Management of lifestyle diseases and stress for improving workplace

efficiency on 26th September 2015 at NIAP, New Delhi. Dr Chauhan founded Jiva Ayurveda in 1992 with the mission of taking ayurveda to every home with the objective of making people happy and healthy. He shared the useful tips for stress management and improvement in efficiency of employees at workplace. He also informed about the Jiva Telemedicine Center, which is one of its kind concept in the world and was established in 1998 as an integrated center for telephonic health consultation. He also shared that Jiva has been organizing ayurvedic educational and training programs for over a decade now. The occasion was also graced by the presence of Prof Ramesh Chand, Member, NITI Aayog, Government of India.

## Second Silver Jubilee Lecture by Prof. Ramesh Chand, Member, NITI Aayog, Government of India

Under the Silver Jubilee celebrations, Prof. Ramesh Chand, Member, NITI Aayog delivered a talk on 'Policies for the Next Stage of Agricultural Development' on October 31, 2015 at C. C. Maji Auditorium of the Institute. Prof. Chand provided useful insights on recent resurgence in agriculture which can help the country to raise sagging growth rate of the overall economy. He emphasized challenges to maintain the growth tempo achieved in agriculture sector during 2004-05 to 2013-14. He elaborated various policy options towards attainment of sustainable agricultural growth in the country. He also shared role and various initiatives of NITI Aayog aimed towards bringing stability and sustainability in agriculture production and improving farmers' welfare.



## Celebration of National Science Day

The National Science Day was celebrated at NIAP, New Delhi as per the directives from Govt of India to observe it. On this occasion, a quiz competition was organized for the staff of NIAP and consisted of the questions related to general and agricultural sciences. The winning teams were awarded on the occasion.

# XIII LECTURES DELIVERED BY NIAP SCIENTISTS

| Name of Scientist | Topic and Date | Venue |
|---|---|---|
| **Ramesh Chand** | Delivered Lecture in Constitution Club, New Delhi to Members of Parliament organized by TRS Legislative Research on State of Indian Agriculture and its Prospects<br>July 29, 2015 | Constitution Club, New Delhi |
| | Presented paper on Ensuring Food and Nutritional Security through Livestock in Glance 2014 Global Animal Nutrition Conference<br>April 22, 2015 | NIANP, Bengaluru |
| **Rajesh Kumar Rana** | Future Challenges and Opportunities in Indian Potato Marketing" an invited lecture delivered in 9th World Potato Congress<br>July 28-30, 2015 | Yanqing, Beijing, China |
| | Decision making pattern of potato farmers in India lecture delivered in ICAR Summer School<br>August 4, 2015 | NIAP, New Delhi |
| **Rajni Jain** | Annual Targets and achievements<br>April 8, 2015 | NIAP, New Delhi |
| | Regional Crop Planning for Improving Resource Use Efficiency and Sustainability, SOC, ICAR<br>April 30, 2015 | ICAR, New Delhi |
| | Total Factor Productivity using Tornquist Index, ICAR-Summer School<br>July 16, 2015 | NIAP, New Delhi |
| | NSSO Data Extraction using SPSS, ICAR-Summer School<br>July 27, 2015 | NIAP, New Delhi |
| | Regional Crop Planning using Optimization, ICAR-Summer School<br>August 1, 2015 | NIAP, New Delhi |
| | Linear Programming based Optimization using gams, ICAR-Summer School<br>August 1, 2015 | NIAP, New Delhi |
| | Project Completion Report for Total Factor Productivity and its Determinants in Indian Agriculture<br>October 16, 2015 | NIAP, New Delhi |

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|---|---|---|
| | Developing Optimal Regional Crop Planning Model, Annual Review workshop of Network project<br>December 18, 2015 | NIAP, New Delhi |
| **Sant Kumar** | Lecture on 'Priority Setting in Indian Agriculture: Concept and Methods' delivered in 21 days summer school (16 July to 5 August 2015)<br>July 21, 2015 | NIAP, New Delhi |
| **Subhash Chand** | Delivered a Lecture in training programme "Marketing Research for Value Chain in Fruits"<br>February 21- 22, 2016 | SKUAST, Kashmir |
| **Naveen Prakash Singh** | Delivered a lecture on "Vulnerability of SAT Agriculture to Climate Change and Adaptation Strategies" in the Quantitative techniques for Agricultural Policy Research held in IARI<br>March 2, 2016 | Division of Agricultural Economics, IARI |
| | Delivered a lecture on the topic "Analytical techniques for Decision making in Agriculture" during summer School organized by ICAR-NIAP<br>July 17, 2015 | NIAP, New Delhi |
| **Raka Saxena** | Delivered a lecture on "Estimates and Analysis of Farm Income in India, 1983–84 to 2011–12" in the ICAR Summer School on "Analytical Techniques for Decision Making in Agriculture"<br>July 16 to August 5, 2015 | NIAP, New Delhi |
| | Delivered a lecture on "Agricultural Market Intelligence in India" in the ICAR Summer School on "Analytical Techniques for Decision Making in Agriculture"<br>July 16 to August 5, 2015 | NIAP, New Delhi |
| | Raka Saxena, Ranjit Kumar Paul, Simmi Rana, Kavita Pal, Shikha Chaurasia and Zeeshan, (2015), Agricultural Trade in SAARC Countries: Structure and trade linkages, Paper presented during 23rd Conference of Agricultural Economics Research Association (India)<br>December 2-4, 2015. | CIFE, Mumbai |
| | Ranjit Kumar Paul, Raka Saxena, Shikha Chaurasia, Zeeshan and Simmi Rana, (2015), Examining export volatility, structural breaks in price volatility and linkages between domestic & export prices of onion in India, Paper presented during 23rd Conference of Agricultural Economics Research Association (India)<br>December 2-4, 2015 | CIFE, Mumbai |

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|---|---|---|
| **S. K. Srivastava** | Lecture on *"Extraction of cost of cultivation data and volumetric estimation of groundwater draft"* in a training programme on "Quantitative techniques for Agricultural Policy Research<br>February 20, 2016 | Division of Agricultural Economics, IARI |
| | Lecture on "Food Inflation: Trends and Forecasting" in Summer School on "Analytical Techniques for Decision Making in Agriculture<br>July 22, 2015 | NIAP, New Delhi |
| | Lecture on "Groundwater use in Agriculture" in Summer School on "Analytical Techniques for Decision Making in Agriculture<br>July 27, 2015 | NIAP, New Delhi |
| | Lecture on "Extraction of cost of cultivation data using SAS" in Summer School on "Analytical Techniques for Decision Making in Agriculture<br>August 1, 2015 | NIAP, New Delhi |
| **Jaya Jumrani** | Food and Nutrition Security in the Summer School on "Analytical Techniques for Decision Making in Agriculture" organized by ICAR-NIAP<br>July 31, 2015. | NIAP, New Delhi |
| **Pavithra S.** | Lecture on Fertilizer Use in the Context of NBS, in the NIAP organized Summer School on Analytical Techniques for Decision Making in Agriculture<br>August 4, 2015 | NIAP, New Delhi |
| **T. Kingsly Immanuelraj** | Introduction to Gams and Regional Crop Planning: Case Study of Punjab, presented in Summer School on Analytical Techniques for Decision Making in Agriculture held in NIAP<br>August 1, 2015 | NIAP, New Delhi |
| | Linear Programming- An introduction to Optimization and Gams, presented in winter school Training on Quantitative techniques for Agricultural Policy Research held in IARI<br>March 7, 2016 | IARI, New Delhi |
| | An introduction to Data Envelop Analysis and Stochastic Frontier Production Function delivered in Workshop under the Network project of Regional Crop Planning held in NIAP<br>December 17, 2015 | NIAP, New Delhi |
| | Linear Programming: An Introduction to GAMS delivered in Workshop under the Network project of Regional Crop Planning held in NIAP<br>December 16, 2015 | NIAP, New Delhi |

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|---|---|---|
| **Vinayak Nikam** | Women Farmers Producers Organization: Challenges and Opportunities. At training programme on Gender analysis and mainstreaming in agriculture<br>February 7, 2016 | Division of Agricultural Extension, IARI, New Delhi |
| **Balaji S. J.** | Lecture on Tracing Structural Breaks in Time-series Data at the CAFT training organized under the title Quantitative Techniques for Agricultural Policy Research<br>February 27, 2016 | Division of Agricultural Economics, IARI, New Delhi |

# XIV TRAININGS/SEMINAR/CONFERENCE ATTENDED

| Name of Scientist | Name of Training | Place | Duration |
|---|---|---|---|
| **Usha Ahuja** | One week Training Workshop in collaboration with IFPRI for Capacity Development of NARS Scientists on "Impact Assessment" | NIAP, New Delhi | May 25 - 29, 2015 |
| | 23rd Annual Conference, 2015 of Agricultural Economics Research Association (India) | CIFE, Mumbai | December 2-4, 2015 |
| **Subhash Chand** | Training attended on – DST Training Programme on Multidisciplinary Perspectives on Science, Technology and Society Core Theme: Energy Security and Management. | National Institute of Advance Studies (NIAS), Bangalore | August 10-21, 2015 |
| | Workshop/training on impact assessment methodology | NIAP, New Delhi | September 25-29, 2015 |
| | Attended conference/seminar of AERA | CIFE, Mumbai | December 2-4, 2015 |
| | Attended a expert consultation to develop cumulative index for assessment of extent of dependence in the CVCAs workshop/meeting | National Centre for Sustainable Coastal Management (NCSCM), Chennai | February 16-18, 2016 |
| **Jaya Jumrani** | CAFT training programme on "Quantitative Techniques for Agricultural Policy Research" | IARI, New Delhi | February 8 - March 9, 2016 |
| **Pavithra S.** | CAFT training programme on "Quantitative Techniques for Agricultural Policy Research" | IARI, New Delhi | February 8 - March 9, 2016 |
| **Kingsly I. T.** | Review workshop of the network project on Impact Assessment of Agricultural Research and Development | NIAP, New Delhi | March 7- 9, 2016 |
| | Adoption and economic surplus studies under the network project on Impact Assessment of Agricultural Research and Development | NIAP, New Delhi | May 25-29, 2015 |
| | Workshop on Regional Crop Planning | NIAP, New Delhi | December 15-17, 2015 |

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|---|---|---|---|
| **S. K. Srivastava** | Review workshop of the network project on Impact Assessment of Agricultural Research and Development | NIAP, New Delhi | March 7- 9, 2016 |
| | Adoption and economic surplus studies under the network project on Impact Assessment of Agricultural Research and Development | NIAP, New Delhi | May 25-29, 2015 |
| | Workshop on Regional Crop Planning | NIAP, New Delhi | December 15-17, 2015 |
| **Vinayak Nikam** | National dialogue on innovative extension systems for welfare of farmers | NASC Complex, New Delhi | December 17-19, 2015 |

# XV PERSONNEL

## Scientific

| Name | Designation | Area(s) of research | Date of Joining / Transfer |
|---|---|---|---|
| Dr. Usha Rani Ahuja | Principal Scientist | Technology Policy and Sustainable Development<br>Markets, Trade and Institutions | |
| | Acting Director | | Since 28.01.2016 |
| Dr. Ramesh Chand* | Principal Scientist | Technology Policy and Sustainable Development<br>Markets, Trade and Institutions<br>Agricultural Growth and Development | |
| | Director | | Till 11.09.2015 Joined as Member NITI Ayog |
| Dr. Pratap Singh Birthal* | Principal Scientist | Technology Policy and Sustainable Development<br>Markets, Trade and Institutions<br>Agricultural Growth and Development | |
| | Acting Director | | From 12.09.2015 to 27.01.2016 Joined as Director, IDS |
| Dr. Anjani Kumar* | Principal Scientist | Markets, Trade and Institutions<br>Agricultural Growth and Development | |
| Dr. S. S. Raju | Principal Scientist | Technology Policy and Sustainable Development | Transferred from NIAP on 19.12.2015 |
| Dr. Rajesh Kumar Rana | Principal Scientist | Technology Policy and Sustainable Development | Joined NIAP on 05.06.2015 |

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|---|---|---|---|
| Dr M.B. Dastagiri | Principal Scientist | Markets, Trade and Institutions | Transferred from NIAP on 31.08.2015 |
| Dr. Rajni Jain | Principal Scientist | Technology Policy and Sustainable Development<br>Agricultural Growth and Development | |
| Dr. Subhash Chand | Principal Scientist | Technology Policy and Sustainable Development | |
| Dr. Naveen Prakash Singh | Principal Scientist | Technology Policy and Sustainable Development<br>Markets, Trade and Institutions | Joined NIAP on 15.06.2015 |
| Dr. Sant Kumar Pandey | Principal Scientist | Technology Policy and Sustainable Development<br>Agricultural Growth and Development | |
| Dr. Shiv Kumar | Principal Scientist | Technology Policy and Sustainable Development<br>Markets, Trade and Institutions | Joined NIAP on 20.05.2015 |
| Dr. Raka Saxena | Senior Scientist | Markets, Trade and Institutions | |
| Dr. P. Shinoj | Scientist | Markets, Trade and Institutions | Transferred from NIAP on 25.04.2015 |
| Dr. Shivendra Kumar Srivastava | Scientist | Technology Policy and Sustainable Development | |
| Mr. Sajesh V.K.** | Scientist | Markets, Trade and Institutions | |
| Dr. Kingsly Immanuelraj T | Scientist | Technology Policy and Sustainable Development<br>Agricultural Growth and Development | |
| Ms. Jaya Jumrani | Scientist | Markets, Trade and Institutions | |
| Ms. Pavithra S. | Scientist | Technology Policy and Sustainable Development<br>Markets, Trade and Institutions | |

| | | | |
|---|---|---|---|
| Dr. Vinayak Ramesh Nikam | Scientist | Technology Policy and Sustainable Development<br>Markets, Trade and Institutions | Joined NIAP on 18.11.2015 |
| Mr. Balaji S. J. | Scientist | Agricultural Growth and Development | Joined NIAP on 12.10.2015 |

* On deputation, ** On study leave

## Technical

| Name | Designation |
|---|---|
| Mr. Prem Narayan | Chief Technical Officer |
| Mr. Khyali Ram Chaudhary | Assistant Chief Technical Officer |
| Mrs. Sonia Chauhan | Assistant Chief Technical Officer |
| Mr. Mangal Singh Chauhan | Senior Technical Officer |
| Mr. Satender Singh | Senior Technical Assistant (Driver) |

## Administrative

| Name | Designation | Date of Joining / Transfer |
|---|---|---|
| Mr. Jagan Swaroop | Administrative Officer | |
| Mr. Vinod Kumar Rai | Assistant Finance & Accounts Officer | Joined NIAP on 01.09.2015 |
| Mr. Sushil Kumar Yadav | Assistant Administrative Officer | |
| Mr. Rishi Kant Singh | Assistant Finance & Accounts Officer | Transferred from NIAP on 18.08.2015 |
| Mrs. Umeeta Ahuja | Private Secretary | |
| Mr. Inderjeet Sachdeva | Assistant | |
| Mr. Sandeep Mathur | Assistant | |
| Mr. Yatin Kohli | Assistant | |
| Mr. Lalit Sharma | Assistant | Resigned on 13.08.2015 |
| Mr. Harish Vats | Assistant | Joined NIAP on 19.10.2015 |
| Mr. Deepak Tanwar | Junior Stenographer | |
| Mr. Ajay Tanwar | Upper Divisional Clerk | |

## Skilled Supporting Staff

| Name | Present Designation |
|---|---|
| Mr. Mahesh Kumar | Skilled Supporting Staff |
| Mr. Mahesh Pal | Skilled Supporting Staff |

# XVI TEACHING

| Name | Course name (credit hrs) | Course Leader / Associate | Institution |
|---|---|---|---|
| **Rajni Jain** | Artificial Intelligence (2+1) | Course Leader | IARI, New Delhi |
| **Shiv Kumar** | International Trade (2+1) | Course Leader | IARI, New Delhi |
| **Naveen Prakash Singh** | Macro Economics - I (2+1) | Course Associate | IARI, New Delhi |
| **S.K. Srivastava** | Agricultural Marketing (2+1) | Course Leader | IARI, New Delhi |
| **T. Kingsly Immaneuelraj** | Quantitative Analysis for Marketing and Business Analysis (2+1) | Course Leader | IARI, New Delhi |
| | Agricultural Production and Resource Economics - II (Production Function Analysis) (2+1) | Course Associate | IARI, New Delhi |
| **Vinayak Nikam** | Course on Fundamentals of Management in Extension (AG EXT 555) | Course Associate | IARI, New Delhi |

# XVII OTHER INFORMATION

## NIAP Annual Day

The Centre celebrated its 23rdAnnual Day on 2 May, 2015. Dr. Kirit S. Parikh, Honorary Professor, delivered the 8th Prof. Dayanatha Jha Memorial Lecture on "Development, Inclusion and Climate Change: India's Multiple Imperatives.


## Promotion of Official Language

For the implementation and extensive use of Rajbhasha among the staff of the Centre, a committee on Hindi official language (Hindi) was established by Central Rajbhasha Department. The committee monitors the progress of various actions being taken and suggests measures for implementation of official language. It coordinates and helps in executing the council orders and circulars Central Rajbhasha Department Annual program guidelines and submitted the progress reports timely. This Centre has organized the monthly meeting of all staff and quarterly meeting of Rajbhasha and Hindi workshop regularly.

The Centre Rajbhasha Samiti implemented all the guidelines, circulars and instructions issued by ICAR and Central Rajbhasha Department, Government of India. Noting and drafting were made more than 62 percent in all administrative files and correspondence in official language 80 to 85 percent were made to outside all the regions. The Centre published 2 popular research articles and annual report 2014-15 in Hindi which are useful to farmers and researchers. We organized Hindi workshops for better awareness of Constitutional responsibility of official language, computerization, translation and typing in Unicode font during the year.

The Official language committee of NCAP organized a series of events to celebrate "Hindi Pakhawada" during 15 September, 2015 to generate more awareness among the staff about the use of Hindi. The activities which were organized during the 'Hindi Pakhawada' the event debate in Hindi on live discussion on burning topics "सरकारी नौकरियों में आरक्षण नीति आर्थिक या जातिगत आधार पर" and essay competition to develop creative writing skill on topics i.e. ''भूमि अधिग्रहण अधिनियम की वास्तविकता एवं भ्रांतियाँ 2. कृषि में जोखिम की समस्या – कारण एवं निवारण, भूमि अधिग्रहण अधिनियम की वास्तविकता एवं भ्रांतिया''. The poster presentation was conducted first time in the Institute to present their views in Hindi their on

Agricultural scenario and social issues. Dictations of administrative word in Hindi, translation from English to Hindi and extempore activities were also organized to improve the vocabulary in Hindi and English. The quiz competition and Antakachhari were arranged for general awareness in Rajbhasha. The participation and competitions in these events was overwhelmingly more than ninety per cent. Hindi Saptah ended with poem recitation completion on 28.09.2015.


Dr. Pratap Singh Birthal, Director Acting, NIAP, chaired the session, Dr Y. R. Meena, Deputy Commissioner, Department of Agriculture Extension, Krishi Bhawan, New Delhi was chief guest. All the participants recited their poem very nicely. The chief guest was appreciated all the poets and he told the level of poems is very good in small group of staff and asked to do more work in Hindi without hesitation. Shri Kishor shrivatava, Assistant Director (Rajbhasha) Agriculture Extension, Ministry of Agriculture, New Delhi and Dr. Raka Saxena, Senior Scientist, NIAP Pusa New Delhi served as crucial role of Judges to decide the winners in poem recitation. In last Dr. Pratap Singh Birthal, Director Acting, and Chief guest distributed the prize to winners. All the program of Rajbhasha arranged by Mr. Prem Narayan, Sachiv Rajbhasha and 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 |
|---|---|---|
| 1 | Debate | Sonia Chauhan<br>Khyali Ram<br>Sushil Kumar Yadav |
| 2. | Essay writing | Khyali Ram<br>Sonia Chauhan<br>Sushil Kumar Yadav |
| 3. | Extempore | Sushil Kumar Yadav<br>Khyali Ram<br>Sonia Chauhan |
| 4. | Translation | Yatin Kohli<br>Ajay Tanwar<br>Khyali Ram |
| 5. | Dictation | Sushil Kumar Yadav<br>Deepak Tanwar<br>Sonam Khaneja |
| 6. | General Knowledge | Team G<br>Team B<br>Team E |
| 7. | Poster Presentation | Sonia Chauhan<br>Yatin Kohli<br>Simmi Rana |
| 8. | Poem Recitation | Md. Ejaz Anwer<br>Khyali Ram<br>Jyoti Verma |
| 9. | Special Prize | Prem Narayan<br>Ajay Tanwar |

## राजभाषा में प्रकाशित अनुसंधान पत्रों एवं प्रतिवेदनों की सूची

1. मु. एजाज अनवर, राजेश राणा एवं प्रेम नारायण, 2015 भारतीय खाद्य सुरक्षा की वर्तमान स्थिति, खेती पत्रिका, अक्टूबर 2015 पृष्ट सं. 3–7।
2. प्रेम नारायण एवं सुभाष चन्द, 2015 वर्तमान में दलहनों के आपूर्ति एवं माँग असंतुलन के नीतिगत एवं तकनीकी सामाधान खेती पत्रिका, मार्च 2015 पृष्ट सं. 7–12।
3. वार्षिक प्रतिवेदन, 2014–15 राष्ट्रीय कृषि अर्थिक एंव नीति अनुसंधान केन्द्र, नई दिल्ली।
4. पंचवर्षीय प्रतिवेदन माननीय संसदीय राजभाषा समिति निरीक्षण प्रश्नावली 19 जनवरी 2015।

## Participation in ICAR Sports Meet

ICAR Zonal Sports Tournament for the year 2015 (relevant for ICAR-NIAP) was organized by the Directorate of Weed Research, Jabalpur during 7-11 December 2015. Fourteen sports persons from ICAR-NIAP participated in this competition. Fourth position in 800 m race by Dr. Kingsley Immanuelraj, fourth position in 200m (Final) by Sh. Yatin Kohli, second round qualification in Badminton (Single) for Men by Dr. Subhash Chand and third round qualification in Table Tennis (Single) for Men by Dr. Rajesh Kumar Rana were the noticeable performances from ICAR-NIAP in this tournament.


## New Joining

- Dr. Shiv Kumar joined as a Principal Scientist on 20-05-2015
- Dr. Rajesh Kumar Rana joined as a Principal Scientist 05-06-2015

- Dr. Naveen Prakash Singh joined as a Principal Scientist on 15-06-2015
- Sh. Balaji S. J. joined as a Scientist on 12-10-2015
- Dr. Vinayak Ramesh Nikam joined as a Scientist on 18-11-2015
- Sh. Vinod Kumar Rai joined as a AF&AO on 1-09-2015
- Sh. Harish Vats joined as a Assistant on 19-10-2015

## Transfers/Deputation

- Dr. Ramesh Chand, Director joined on deputation to NITI Aayog, New Delhi on 11-09-2015
- Dr. P. S. Birthal, Principal Scientist joined on deputation to IDS, Jaipur on 27-01-2016
- Dr. S. S. Raju, Principal Scientist transferred to CIFE, visakhapatnam on 19-12-2015
- Dr. M. B. Dastagiri, Principal Scientist transferred to NAARM, Hyderabad on 31-08-2015
- Sh. Rishi Kant Singh, AF&AO transferred to IABM, Ranchi on 18-08-2015

## Resignation

- Sh. Lalit Sharma resigned from the post of Assistant on 13-08-2015


**ICAR – NATIONAL INSTITUTE OF AGRICULTURAL ECONOMICS AND POLICY RESEARCH (NIAP)**
**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**