

Annual Report

2014-15



ICAR–National Institute of Agricultural Economics and Policy Research
(Indian Council of Agricultural Research)
New Delhi - 110012

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NIAP Annual Report 2014-15

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PREFACE



Year 2014-15 has been a momentous year for the National Centre for Agricultural Economics and Policy Research (NCAP) as the ICAR has changed the status of NCAP from 'Centre' to 'Institute' and named it as National Institute of Agricultural Economics and Policy Research (NIAP). This could happen due to hard work and strong commitment of staff of the Centre. The Institute has completed 24 glorious years of its existence and the year 2015-16 will be Silver Jubilee year of the Institute. The Institute is committed to strengthen agricultural economics and policy research in the country and also take research on new issues and challenges facing Indian agriculture. The Institute has already started 3 network projects involving good number of ICAR institutes and state agricultural universities (SAUs). It will be our endeavour to further expand and strengthen this partnership. Along with this, NIAP would also strengthen international linkages to augment its research capacity and resources.

This report provides the glimpse of achievements of the Institute during the year 2014-15. It is pertinent to mention that 3 network projects undertaken in partnership with other institutes have received a lot of attention of stakeholders who have emphasized expansion of the network partners. The network projects include regional crop planning for improving resource use efficiency and sustainability, market intelligence and impact assessment of agricultural research and development. Besides, the Institute conducted 13 other studies during the year 2014-15 out of which 2 were funded by international organizations.

The network on regional crop planning is assessing performance of crop activities in terms of market prices, social costs and environmental accounting methods. It also proposes to develop optimum crop plans for the selected regions that are sustainable in terms of natural resources. The network project on market intelligence provides advance information about prices to guide farmers in acreage allocation and in marketing decisions. The institute also did valuable work in the area of climate change. The studies done by the Institute have enormously helped ICAR in addressing issues related to benefits of agricultural R&D. The Institute has been involved in agricultural policy debates and decisions and also contributed in preparing reports of important committees. Six scientists made 9 visits abroad for academic purposes. NIAP's scientists received 4 awards during the year. The Institute organized two training programmes for officers of Indian Economic Services and one training programme for capacity building in agricultural economics and policy research for the scientists of NARS of India. The Institute also published 1 research article and 3 policy briefs in Rajbhasha (Hindi).

The Institute's scientists have published 32 research papers during the period under report. The Institute received overwhelming support from the Indian Council of Agricultural Research

(ICAR) in accomplishing its targets. We are grateful to Dr. S. Ayyappan, Director-General, ICAR, and Secretary, Department of Agricultural Research and Education (DARE), Government of India, for his continuous guidance and encouragement to take this Institute to new heights. We would like to express our gratitude to Dr. Arvind Kumar, Deputy Director-General (Education), and staff of Education Division of ICAR for support and motivation in achieving mandate of the Institute.

My colleague Dr. Sant Kumar, Principal Scientist, rendered hard work and undertook the responsibility of compiling, editing and bringing out the report in the present form. Dr. T. Kingsly Immaneulraj and Shri Deepak Tanwar provided help in processing and formatting the manuscript. Mr. Ajay Tanwar has helped in preparation of Hindi computer-script. 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 in accomplishing our mission.



(Ramesh Chand)
Director

LIST OF ACRONYMS

AERR	Agricultural Economics Research Review
AI	Artificial Insemination
AICIL	Agricultural Insurance Company of India Limited
AKMU	Agricultural Knowledge Management Unit
ANGRAU	Acharya NG Ranga Agricultural University
BGREI	Bringing Green Revolution in Eastern India
BSI	British Standards Institute
BVICAM	Bharti Vidyapeeth's Institute of Computer Applications and Management
CACP	Commission for Agricultural Costs and Prices
CAS	Current Awareness Service
CeRA	Consortium for e-Resources in Agriculture
CGIAR	Consultative Group on International Agricultural Research
CGWB	Central Ground Water Board
CIMMYT	International Wheat and Maize Improvement Centre
CROPWAT	Crop Water Requirements
CSI	Computer Society of India
DDG	Deputy-Director General
DDS	Document Delivery Service
DRF	Dose Response Function
DST	Department of Science and Technology
EFC	Expenditure Finance Committee
EPW	Economic and Political Weekly
ERNET	Education and Research Network

FAO	Food and Agriculture Organization of the United Nations
GBPUAT	Govind Ballabh Pant University of Agriculture and Technology
GGSIIP	Guru Govind Singh Indraprastha University
GHG	Green House Gas
GoI	Government of India
GPI	Gender Parity Index
HVCs	High Value Crops
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
ICRIER	Indian Council for Research on International Economic Relations
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IEEE	Institute of Electrical and Electronics Engineers
IES	Indian Economic Service
IET	Institution of Engineering and Technology
IETE	Institution of Electronics and Telecommunication Engineers
IFPRI	International Food Policy Research Institute
ILL	Inter Library Loan
ILRI	International Livestock Research Institute
IMC	Institute Management Committee
INDOGFOE	Indo-German Frontiers of Engineering Symposium
IRC	Institute Research Council
IRRI	International Rice Research Institute
IWMI	International Water Management Institute
JSC	Joint Staff Council
LAN	Local Area Network

MANAGE	National Institute of Agricultural Extension Management
MNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
MVP	Marginal Value Product
NAAS	National Academy of Agricultural Sciences
NARS	National Agricultural Research System
NBPGR	National Bureau of Plant Genetic Resources
NBSS&LUP	National Bureau of Soil Survey and Land Use Planning
NDRI	National Dairy Research Institute
NIAP	National Institute of Agricultural Economics and Policy Research
NIANP	National Institute of Animal Nutrition and Physiology
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
NRV	Natural Resource Valuation
NRMP	Net Return at Market Price
NSA	Net Sown Area
NSSO	National Sample Survey Organization
PAU	Punjab Agricultural University
PDKV	Punjabrao Deshmukh Krishi Vidyapeeth
QRT	Quinquennial Review Team
R&M	Rapeseed and Mustard
RAC	Research Advisory Committee
RCP	Regional Crop Plan
RFD	Results-Framework Document
RSCs	Responsibility Sub-Centres
RTI	Right to Information Act
SAARC	South Asian Association for Regional Cooperation

SC/ST	Schedule Caste and Schedule Tribe
SSN	Social Science Network
TC	Technical Change
TE	Triennium Ending
TEC	Technical Efficiency Change
TERI	The Energy and Resources Institute
TFP	Total Factor Productivity
TNAU	Tamil Nadu Agricultural University
UAS-B	University of Agricultural Sciences-Bangalore
UN-ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
USAID	United States Agency for International Development
WEAI	Women Empowerment in Agriculture Index
WTO	World Trade Organization

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EXECUTIVE SUMMARY

The 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 the ICAR through credible evidence-based feedback to actively participate in agricultural policy debates and decisions and in monitoring and interpreting the research impacts systematically. The Institute sensitizes policy planners and research administrators 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 16 scientists, 17 other staff members and the research project staff. The total expenditure of the Institute, including that from external sources was ₹ 817.75 lakh during the year 2014-15.

A high-powered Research Advisory Committee led by Prof. S. Mahendra Dev, distinguished economist and Director (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, publication committee, budget committee, purchase committee, etc. facilitate decentralized management of the Institute.

Research studies of topical importance are conducted at the Institute under five broad themes, viz. technology policy, sustainable agricultural systems, markets and trade, institutional change, and agricultural growth and modelling. Each broad theme is supervised by a senior faculty. Research programmes within and across themes are so designed as to achieve the mandate of the Institute. During the year 2014-15, 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 a number of workshops, trainings and policy advocacy programmes. The main research achievements and a glimpse of other activities undertaken by the Institute during 2014-15 are given below:

- Agricultural diversification towards high-value crops (HVCs) is considered as one of the alternatives to increase income, generate employment and reduce poverty. Study on crop diversification revealed that the likelihood of a farmer being poor is 3-7 per cent less if he grows HVCs. The biggest impact of HVCs on poverty is assessed for smallholders having landholding less than or equal to 2 hectares. Estimates show that higher the degree of diversification, lower is the probability of a household being poor.
- Indian agriculture has become more knowledge intensive over past one decade.

The role of information in meeting knowledge intensive agriculture is more pertinent in view of increasing commercialization, changing demand pattern, climate change, stress on natural resources, etc. Farmers not only needed improving farm productivity and conserving natural resources but to comply with market preferences for safe and quality food also. The study has shown that about 28 per cent of farmers in India use information on modern crop technologies and practices. About information sources, analysis revealed that government sources are used by 14 per cent of the farm households, and they meet rest of their information needs from social networks (29%), mass media (33%) and private sources (23%).

Farmers who use information on modern farm practices realize 12 per cent or more net returns per hectare. The impact is significantly higher (17%) for farm households growing cash crops along with the food grains than for those who grow only food grains. These findings are crucial for policy decisions regarding information dissemination. The policy should aim at developing mechanism for information dissemination in such a way that there is a greater uptake of information by the farmers. Study also observed that the public investment in extension services has not kept pace with the rising demand for information in agriculture. About 12 per cent higher net income per hectare for users adds ₹ 1140 per hectare of cropped area (at 2002-03 prices). This suggests that underinvestment in public extension may limit realization of the potential increases in agricultural productivity from spending more on agricultural research.

- The quality of information is essential to improving productivity. The preliminary results of a study on livestock services in Haryana has revealed that public sector service providers are more qualified and experienced than the private service providers. Their impact on livestock productivity is yet to be assessed.
- A study on impacts of climate change on yields of major crops revealed that 1 °C rise in the maximum temperature in *kharif* season reduces the yield of rice, sorghum and pigeon pea by 11-12 per cent and of maize and groundnut by 9 per cent. However, the effect of a similar increase in the minimum temperature is opposite but is not sufficient enough to fully compensate the loss due to rise in maximum temperature. The yield loss due to maximum temperature has been found considerable in the case of wheat, but the net effect after accounting for the positive effect of rise in minimum temperature remains significant (5.9%). The marginal effect of 1 °C rise in minimum temperature on yield of rapeseed-mustard is positive and almost equivalent to the negative effect of a similar increase in the maximum temperature.

The marginal effect of rainfall on *kharif* crops, except maize, has been found positive and significant. However, in the *rabi* season its effect was not significant, except on rapeseed-mustard where it was negative and significant. The non-significant effect of rainfall in the *rabi* season is expected as the quantum of *rabi* rainfall is not only less but more variable also. In general, the marginal effect of rainfall is much smaller than of temperature. These results suggest

that the climate change impact on Indian agriculture will be largely driven by temperature change.

- Analysis of total factor productivity change, technical efficiency change and technical change in production of rapeseed and mustard in major growing states revealed that the mean (states) TFP increased at the rate of 3 per cent during 1994-95 to 2011-12. The technical efficiency has increased at the rate of 2.24 per cent and technical change at the rate of 1.9 per cent.
- A study on regional crop planning for Punjab state showed that sugarcane and paddy (basmati) are the most profitable crops to be grown considering market price situation. These two crops remain most profitable even when input subsidies are removed and environment effect of crop cultivation is monetised and included in cost and returns. It was found that rice in *kharif* and wheat in *rabi* enjoy strong technological advantage over other crops besides stable market and input subsidy benefits. The study observed that pricing of power and fertilizer at economic prices is not likely to shift area under wheat and paddy but it will reduce irrigation water use significantly.
- A study on performance of rainfed agriculture at national level revealed that yields of crops during 1990s improved but at a higher cost. The increase in cultivation cost was higher in traditional rainfed crops compared to water intensive crops like paddy and sugarcane. The study suggests for increased investment in rainfed areas for water conservation and improving water use efficiency for sustainable crop production.
- Continuance of rice-wheat cropping pattern in Punjab has led to severe decline in groundwater table in recent years and requires an optimum crop plan that could be sustainable and profitable for farmers. If use of groundwater is restricted to replenishable level then optimum cropping pattern dictate large area in *kharif* season to be kept fallow. Optimum crop plan for *rabi* crops suggested no change in existing cropping pattern and only minor reduction in area under maize crop. Following the optimum crop plan of sustainable groundwater use, net returns from crop sector reduces by about one-third. The optimum crop plans indicate that reduction in farmers' net income due to removal of subsidies will be much lower than the cost borne by society.
- The study on groundwater use in Punjab indicated drastic decline in water table especially during the recent years. Among different crops, paddy emerged as the most water-guzzling crop and farmers give more than 50 per cent higher groundwater than the optimum level for its cultivation. The average cost of groundwater extraction in Punjab was estimated as ₹ 0.46 per cubic meter (cum) and farmers pay almost half of the groundwater irrigation cost even in case of free electricity supply by the government. The groundwater extraction cost was found to be varying directly with the decline in water-table and inversely with the size of land holdings. The study further shows that removal of power and diesel subsidy would make crop production comparatively less profitable but may not alter the dominance of paddy-wheat system which enjoys high level of policy as well technological edge over other crops.

- In other study on Women Empowerment in Agriculture Index (WEAI) was done in Rupnagar district of Punjab state. Study revealed that 31 per cent of farm women are empowered having WEAI score of 0.815. Control over income, use of production resources and proper time management are the factors contributing towards their empowerment.
- The network project on market intelligence intended to provide price forecasts to farmers on selected agricultural commodities as to enable them take informed production and marketing decisions. Price forecasts for major agricultural commodities are disseminated to farmers before sowing and during harvest so that farmers can take benefits from possible price forecasts. So far 129 forecasts have been generated and provided to farmers. The predicted prices have been found close to the actual market prices in most cases.
- A comparison of value chains for milk between formal and informal sector was made considering aspects of efficiency, inclusiveness and financing mechanism. Study revealed that majority of smaller dairy farmers use informal channels (vendors and consumers) for selling milk, while large dairy farmers prefer selling milk to formal channels including cooperatives, multinational and domestic private processors. Study further revealed that small dairy farmers are also supplying to formal sector value chains as processors cannot heavily rely on few large farmers. Study showed that price difference was not significant indicating milk markets in Punjab are competitive, though the food safety standards are more associated with formal markets. Analysis showed that more than half of the dairy farmers borrow credit from formal and informal financial institutions. Chain-based financing is available to less than one-third of farmers.
- Establishing processing unit for mango pulp requires substantial investment and working capital. The study on financing of value chains for mango pulp industry in Andhra Pradesh revealed that about 55 per cent units require finance as working capital and 27 per cent require assistance for both working capital and term loan. Commercial banks and private sector banks are the main source of finance for establishing processing units. Study revealed that mango processors are facing challenges due to middlemen menace, post-harvest losses, poor profitability and seasonality of processing activity. Other challenges facing mango processors include high perishability, lack of post-harvest infrastructure and standardized supply-chain system.
- The trend in sectoral employment showed that the rural labour market is undergoing profound changes. Despite increase in the total rural workforce during 1993-94 to 2011-12, workforce in agriculture declined during 2004-05 to 2011-12. This decline in labour force was primarily due to withdrawal of female workers from agriculture. Moreover decline in female workforce was not accompanied by increase in female workers in non-farm sectors. Among the main factors, high wage rates and labour productivity in non-farm sectors were the drivers of labour shift from agriculture to non-agriculture. A changing work culture and the emerging

contractual arrangements between labour and its hiring households are also affecting the rural labour market. The improvement in education and skills of large uneducated and unskilled rural labour will further change occupation structure of rural labour force.

- Analysis showed that labour productivity in agriculture increased with increase in labour absorption in most crops during TE 1975-76 to 1995-96, while after mid-1990s, per hectare labour use has shown mixed trends. It declined in majority of the crops, but increased in paddy in West Bengal and cotton in Gujarat and Punjab. Study revealed that productivity of labour in agriculture has been higher than decline in labour use per unit of area during past 15 years.
- A study on agricultural diversification indicates that Indian agriculture is diversifying towards horticultural crops. The speed of diversification accelerated after 2005-06 as compared to period 1995-96 to 2005-06. The growth in horticulture output showed twice the growth rate of all crops and non-horticultural crops, except cotton. This could happen due to very high differential in productivity of horticultural crops relative to non-horticultural crops and high demand for horticultural crops. Price trend evinced that prospects for demand-led growth of horticultural crops are very high.
- Study on farm income and agrarian crisis showed that during two decades since 1983-84, the growth in income of farmers and farm labourers could not keep pace with growth in income earned by the non-farm workers. However, in recent years, the income gap has been narrowing. Growth rate in farm income is found to be closely associated with number of farmers' suicides. The study observed that after 2004, number of farmers suicides declined and growth rate in farmers' income accelerated.
- A study on employment diversification in rural India and the role of non-farm sector in altering the economic and social life of rural people revealed that between 1993-94 and 2011-12, employment share declined by 20 per cent for crop sector and by 48 per cent for livestock sector, while the share of non-farm sectors in rural employment increased substantially (83%). Analysis further revealed that non-farm employment was higher for marginal and small farmers compared to large farmers. Notably, construction activity was attracting more number of workers than other non-farm activities after 2004-05. Its share in non-farm sector is bulging at the cost of other sectors such as trade and hospitality, community, personal and social services. The main factors determining non-farm employment includes age and gender, education of household head and size of households.
- The study on consumption of livestock products (milk, eggs, meat) for improving food and nutritional security revealed that cereals consumption, a predominant contributor of total nutritional intake, is declining over the years. Any reduction in cereals consumption is bound to be reflected in nutritional impoverishment if it is not accompanied by sufficient large increase in non-cereals food, particularly livestock products which are high in calorie and protein. Temporally, the share of

livestock products in total calorie (protein) intake as well as their supply increased during the past 16 years (1993-94 to 2009-10). Further, livestock products are better source of nutrients supply during drought conditions and relatively stable prices than other products make them a preferred commodity.

- The Institute organised a number of training programmes to achieve the objective of capacity development of scientists in ICAR institutions and state agricultural universities (SAUs) and project staff. Besides, NIAP conducted two one-week training programmes on 'core issues in the agricultural sector' for the officers of Indian Economic Services. The several other short-term project-wise trainings, interaction meetings, workshops, etc. were also organized which helped in capacity building of the project partners.
- The website of NIAP available at <http://www.ncap.res.in> has been redesigned and regularly updated. The Institute

publications are now available in the PDF format and can be downloaded. Data revealed that policy briefs, working papers and policy papers were the most referred publications during the year. The faculty at NIAP published 32 research papers in leading journals of national and international repute and contributed 16 book chapters/ popular articles. More than 12 presentations were made in national and international conferences. The scientists of the Institute were involved in a number of professional and policy interactions and projects.

- Faculty of NIAP have played a major role in creating proper perception and awareness among public on various agricultural issues through public debates and newspaper reporting. In total 11 policy inputs were provided to various Ministries by the Institute. Director NIAP Chaired important high-level committees constituted by the Government of India on price policy, WTO and Trade during the reporting year.

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राष्ट्रीय कृषि आर्थिकी एवम् नीति अनुसंधान संस्थान (पूर्व में केन्द्र), कृषि अर्थशास्त्र तथा नीति अनुसंधान में उत्कृष्टता बनाये रखने के लिए सतत प्रयासरत है। संस्थान को नीतिगत शोध में विशेषज्ञता प्राप्त है तथा यह संस्थान 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 शोध प्रभावों के योजनावद्ध तरीके से मूल्यांकन एवं विवेचन में मदद करता है। यह संस्थान देश में किसानों की चिंताओं तथा खेती में आ रहे बदलाव से नीति-निर्माताओं तथा शोध 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 16 वैज्ञानिक तथा 17 अन्य कर्मचारी तथा शोध परियोजनाओं के अन्तर्गत कर्मचारी कार्यरत हैं वर्षावधि में वाह्य वित्तपोषित परियोजनाओं सहित संस्थान का कुल व्यय 817.75 लाख रुपये था। प्रोफेसर महेन्द्र देव, प्रख्यात अर्थशास्त्री की अध्यक्षता में अनुसंधान सलाहकार समिति इस संस्थान के शोध कार्यक्रमों का निर्धारण एवं मार्गदर्शन करती है, तथा प्रबंध समिति इसकी प्रशासनिक एवं आर्थिक गतिविधियों पर निगरानी रखती है। इसके अतिरिक्त केन्द्र के विकेन्द्रीकृत प्रबंधन एवं संचालन के लिए कई अन्य समितियाँ जैसेकि प्रकाशन समिति, बजट समिति, खरीद समिति, आदि गठित की गयी हैं।

इस संस्थान में सामयिक महत्व के विषयों पर अनुसंधान कार्य पाँच प्रमुख क्षेत्रों में किये जाते हैं। ये क्षेत्र हैं: प्रौद्योगिकी नीति, टिकाऊ कृषि प्रणाली, विपणन एवं व्यापार, संस्थागत बदलाव तथा कृषि वृद्धि एवं मॉडलीकरण। प्रत्येक क्षेत्र में शोध कार्य एक वरिष्ठ कृषि अर्थशास्त्री की देखरेख में किया जाता है। कृषि के विभिन्न अनुसंधान क्षेत्रों में शोध कार्यक्रमों का परस्पर समन्वय इस प्रकार किया जाता है

जिससेकि संस्थान के निर्धारित उद्देश्यों की प्राप्ति की जा सकें। वर्ष 2014-15 में केन्द्र में 16 शोध परियोजनाएं संचालित की गई, इसी अवधि में एक परामर्शी परियोजना को भी क्रियान्वित किया गया। इस वर्षावधि में संस्थान ने विभिन्न भारतीय एवं विदेशी संस्थाओं के साथ अपने शोध संबंधों एवं अनुबंधों को बनाये रखा तथा इसे और भी अधिक सुदृढ़ तथा व्यापक बनाया। इस वर्ष भी संस्थान ने अनेक कार्यशालाओं, संगोष्ठियों, प्रशिक्षण कार्यक्रमों तथा नीति-चर्चाओं का आयोजन किया। वर्ष 2014-15 की अवधि में संस्थान की मुख्य शोध उपलब्धियों तथा गतिविधियों की झलक का विवरण निम्नवत हैं:

- अधिक मूल्य वाली फसलों की तरफ कृषि में विविधीकरण, आय में वृद्धि, रोजगार पैदा करने तथा गरीबी कम करने के विकल्पों में से एक है। फसलोत्पादन में विविधीकरण पर अध्ययन दर्शाता है कि यदि किसान अधिक मूल्य वाली फसलें उगाते हैं तो उनके गरीब होने की संभावना 3-7 प्रतिशत कम होती है। अधिक मूल्यवाली फसलों का गरीबी निवारण में लाभ सबसे अधिक छोटे किसानों (2 हेक्टेयर से कम जोत वाले) को मिलता है। अध्ययन दर्शाता है कि यदि एक कृषक परिवार अधिक मूल्य वाली फसलों की तरफ कृषि में विविधीकरण करता है तो उसके गरीब होने की संभावना में कमी आती है।
- पिछले एक दशक में भारतीय कृषि काफी सूचनापरक हुई है। बढ़ता वाणिज्यीकरण, जीवन शैली एवं खानपान में बदलाव, जलवायु परिवर्तन तथा प्राकृतिक संसाधनों पर बढ़ता दबाव आदि चुनौतियों से निपटने में कृषि में सूचना का महत्व बढ़ता ही जा रहा है। अब किसान केवल कृषि उपज बढ़ाने एवं प्राकृतिक संसाधनों के संरक्षण की आवश्यकता महसूस नहीं करते हैं वरन् बाजार माँग के अनुरूप सुरक्षित एवं

गुणवत्ता युक्त भोजन उपलब्ध कराने की सोचते हैं। अध्ययन से पता चला है कि 28 प्रतिशत भारतीय किसान नवीन फसल प्रौद्योगिकियों एवं पद्धतियों की जानकारी के लिए सूचना स्रोतों का उपयोग करते हैं। सूचना स्रोतों का विश्लेषण दर्शाता है कि केवल 14 प्रतिशत किसान सरकारी स्रोतों से सूचना प्राप्त करते हैं। जबकि शेष किसान अन्य सूचना स्रोतों जैसे सामाजिक नेटवर्क (29 प्रतिशत) तथा संचार मीडिया (33 प्रतिशत) से खेती की जानकारी प्राप्त करते हैं।

जो किसान खेती की आधुनिक पद्धतियों का प्रयोग करते हैं वे प्रति हेक्टेर 12 प्रतिशत या इससे अधिक लाभ प्राप्त करते हैं। उन किसानों को अपेक्षाकृत अधिक लाभ मिलता है जोकि अनाज फसलों के साथ नगदी फसलों की खेती करते हैं, वनस्पति उनके जो केवल अनाज फसलों की खेती करते हैं। यह निष्कर्ष सूचना संप्रेषण संबंधी नीतिगत निर्णय लेने में महत्वपूर्ण है। सूचना संप्रेषण की ऐसी पद्धतियों का विकास किया जाना चाहिए जिससेकि किसान अधिक जानकारी एवं लाभ कमा सकें। अध्ययन से यह भी पता चला है कि कृषि में सूचना की बढ़ती माँग के अनुरूप कृषि प्रसार सेवाओं में सार्वजनिक निवेश नहीं हुआ है। खेती की आधुनिक पद्धतियों के प्रयोग से 12 प्रतिशत या अधिक लाभ खेती से प्राप्त कुल शुद्ध लाभ में 1140 रुपये प्रति हेक्टेर अतिरिक्त वृद्धि करता है (2002-03 के भाव पर)। अध्ययन दर्शाता है कि सार्वजनिक कृषि प्रसार सेवाओं में कम निवेश कृषि की संभावित उत्पादकता वृद्धि में गतिरोध पैदा कर सकता है जिससेकि कृषि शोध में निवेश का पूरा-पूरा लाभ नहीं मिल सकेगा।

- गुणवत्ता परक सूचना उत्पादकता बढ़ाने में आवश्यक है। हरियाणा प्रान्त में पशुधन सेवाओं के एक प्रारम्भिक सर्वेक्षण से पता चलता है कि सार्वजनिक क्षेत्रों के सेवा प्रदाता निजी क्षेत्र के सेवा प्रदाताओं की अपेक्षा अधिक अर्हता प्राप्त एवं अनुभवी थे। इन सेवा प्रदाताओं के पशुधन उत्पादकता प्रभाव का विश्लेषण अभी किया जाना है।

- जलवायु परिवर्तन का फसलों पर प्रभाव का विश्लेषण दर्शाता है कि अधिकतम तापमान में एक डिग्री सेंटीग्रेड की वृद्धि होने पर खरीफ फसलों जैसे चावल, ज्वार तथा अरहर की उत्पादकता में 10-12 प्रतिशत, मक्का तथा मूँगफली की उत्पादकता में 9 प्रतिशत की कमी आती है। इसके विपरीत न्यूनतम तापमान में वृद्धि, अधिकतम तापमान बढ़ने से हुए नुकसान की भरपाई करने में पर्याप्त नहीं है। अधिकतम तापमान में वृद्धि से गेहूँ की उत्पादकता में काफी नुकसान होता है, जबकि न्यूनतम तापमान में वृद्धि के बावजूद गेहूँ की उपज में नुकसान सार्थक स्तर (6.5 प्रतिशत) तक होता है। न्यूनतम तापमान तथा अधिकतम तापमान के स्तर में 1 डिग्री सेंटीग्रेड की वृद्धि तोरिया-सरसों फसलों की उत्पादकता में हुए नुकसान की भरपाई करने के बराबर है।

खरीफ फसलों पर बारिश के सीमांत प्रभाव का आंकलन केवल मक्का फसल को छोड़कर, सकारात्मक एवं सार्थक पाया गया है। जबकि, रबी फसलों पर बारिश का प्रभाव, केवल तोरिया-सरसों को छोड़कर, सार्थक नहीं मिला। रबी मौसम में वर्षा के स्तर में कमी तथा अन्य कारणों से इसके सीमांत प्रभाव का स्तर सार्थक नहीं है। सामान्य रूप से वर्षा का सीमांत प्रभाव तापमान की अपेक्षा कम होता है। उपरोक्त परिणाम दर्शाते हैं कि भारतीय कृषि में जलवायु परिवर्तन, प्रमुख रूप से तापमान में परिवर्तन के कारण होगा।

- तोरिया-सरसों फसलों उत्पादन के संदर्भ में कुल कारक उत्पादकता, तकनीकी क्षमता एवं प्राद्योगिकी बदलाव का अध्ययन बताता है कि वर्ष 1994-95 से 2011-12 की अवधि में कुल कारक उत्पादकता में 3 प्रतिशत की वृद्धि हुई है जिसमें तकनीकी क्षमता की वृद्धि दर 2.24 प्रतिशत तथा प्रौद्योगिकी बदलाव की वृद्धि दर 1.9 प्रतिशत रही।
- पंजाब प्रान्त के लिए क्षेत्रीय फसल योजना का अध्ययन दर्शाता है कि बाजार मूल्य को ध्यान में रखते हुए गन्ना एवं बासमती चावल फसलों की खेती

- लाभप्रद हैं। आर्थिक एवं प्राकृतिक संसाधनों के मूल्य परिदृश्यों को ध्यान में रखने पर भी इन्हीं फसलों की खेती लाभदायक प्रतीत होती है। अध्ययन का निष्कर्ष है कि खरीफ मौसम में चावल तथा रबी मौसम में गेहूँ फसलें अन्य फसलों की अपेक्षा तकनीकी रूप में अधिक लाभदायी हैं तथा इनके लिए बाजार अधिक स्थिर एवं उत्पादन कारकों पर सरकारी सहायता लाभदायी है। अध्ययन में पाया गया है कि बिजली एवं उर्वरकों पर प्राप्त सरकारी सहायता से मुक्त करने पर भी चावल एवं गेहूँ फसलों के बुवाई क्षेत्रफल में सार्थक कमी नहीं होगी तथा सिंचाई जल की प्रयोग दक्षता में कमी आयेगी।
- राष्ट्रीय स्तर पर बारानी कृषि के प्रदर्शन पर एक अध्ययन में मिलता है कि नब्बे के दशक में फसलों की उत्पादकता बढ़ने के साथ-साथ इनकी खेती की लागत भी बढ़ी है। अध्ययन दर्शाता है कि बारानी क्षेत्रों में उगाई जाने वाली परम्परागत फसलों की खेती करने की लागत, अधिक पानी चाहने वाली फसलों यथा चावल और गन्ना से अधिक बढ़ी है। अध्ययन में सुझाव दिया गया है कि टिकाऊ फसलों/उत्पादन हेतु बारानी क्षेत्रों में जल संरक्षण और सिंचाई जल दक्षता में वृद्धि हेतु निवेश बढ़ाने की आवश्यकता है।
 - पंजाब प्रान्त में गेहूँ-चावल फसल चक्र के लगातार अपनाने से भूजल स्तर में हाल के वर्षों में अधिक गिरावट आयी है जोकि एक टिकाऊ एवं लाभदायी फसल योजना के विकास की आवश्यकता पर बल देता है। अध्ययन दर्शाता है कि भूजल के replenishable स्तर तक सिंचाई के लिए प्रयोग की स्थिति में खरीफ मौसम में अधिकतम क्षेत्रफल में बुवाई नहीं की जा सकती है। रबी मौसम की फसलों के लिए इष्टतम फसल योजना में केवल मक्का फसल के क्षेत्रफल में कमी आयेगी और मौजूदा फसलों के क्षेत्रफल में मामूली परिवर्तन सुझाया गया है। इष्टतम फसल योजना से संकेत मिलता है कि उत्पादन कारकों पर सरकारी सहायता हटाने पर किसानों की शुद्ध आय में कमी समाज द्वारा उठाये जाने वाली कीमत से कम होगी।
 - पंजाब प्रान्त में भू-जल सिंचाई अध्ययन से संकेत मिलता है विशेष रूप से हाल के वर्षों में भू-जल के स्तर में काफी कमी आयी है। विभिन्न खरीफ फसलों में धान की खेती में सबसे अधिक पानी की आवश्यकता पड़ती है तथा किसान इसकी खेती के लिए उपलब्ध भू-जल स्तर की तुलना में 50 प्रतिशत अधिक जलदोहन कर धान की खेती करते हैं। पंजाब में सरकार द्वारा खेती के लिए मुफ्त बिजली की आपूर्ति की दशा में भूजल निकासी हेतु किसान प्रति घन मीटर औसतन रूपये 0.46 खर्च करते हैं। भूजल निकासी की लागत में विभिन्नता गिरते भूजल स्तर तथा भूजल के समानुपाती है। अध्ययन दर्शाता है कि बिजली एवं डीजल पर अनुदान समाप्ति की स्थिति में भी किसान धान-गेहूँ फसल चक्र अपनाते रहेंगे यद्यपि कि वर्तमान की अपेक्षा बदलते परिवेश में यह प्रति इकाई क्षेत्रफल कम लाभदायी होगा। ऐसा अन्य फसलों की अपेक्षा धान-गेहूँ फसलों में तकनीकी प्रगति एवं राज्य सरकार की जारी नीतियों के कारण होगा।
 - पंजाब प्रान्त के रूपनगर जिले में महिला सशक्तिकरण कृषि सूचकांक का अध्ययन किया गया। अध्ययन दर्शाता है कि 31 प्रतिशत खेतिहर महिलायें जिनका कृषि में महिला सशक्तिकरण सूचकांक 0.815 था, निर्णय लेने में सशक्त थीं। खेतिहर महिलाओं के सशक्तिकरण में आय के ऊपर नियंत्रण, उत्पादन साधनों के प्रयोग एवं समय का उचित प्रबंधन आदि कारक महत्वपूर्ण हैं।
 - बाजार संबंधी खुफिया सूचना पर आधारित नेटवर्क परियोजना किसानों को कुछ चयनित कृषि वस्तुओं के लिए बाजार गतिविधियों की विश्वसनीय सूचना देने के इरादे से चलाई गयी है जिससेकि किसान इनके उत्पादन एवं विक्रय संबंधी उचित निर्णय ले सकें। मुख्य कृषि वस्तुओं के मूल्य पूर्वानुमान किसानों को फसल-बुवाई से पूर्व तथा फसल-कटाई के दौरान उपलब्ध कराये जाते हैं जिससेकि किसान संभावित मूल्य पूर्वानुमान से लाभ कमा सकें। पिछले दो वर्षों में 129 फसल पूर्वानुमान किये गये एवं किसानों

को उपलब्ध कराये गये। मूल्य पूर्वानुमान, वास्तविक बाजार कीमतों के करीब पाये गये हैं।

- दूध बिक्री में संलग्न औपचारिक तथा अनौपचारिक क्षेत्र में दक्षता, समग्रता तथा वित्तीय तंत्र पहलुओं का एक तुलनात्मक अध्ययन किया गया। अध्ययन से पता चलता है कि छोटे दुग्ध किसान बहुतायत रूप में असंगठित माध्यमों (दुधियों एवं उपभोक्ताओं) द्वारा दूध बेचते हैं, जबकि बड़े किसान औपचारिक माध्यमों जैसे सहकारी संघों, बहुराष्ट्रीय एवं निजी घरेलू प्रसंस्करण इकाईयों को दूध बेचना पसंद करते हैं। अध्ययन दर्शाता है कि औपचारिक इकाईयों भी छोटे किसानों से दूध खरीदती हैं क्योंकि वे बड़े किसानों पर अत्याधिक निर्भर नहीं रह सकती हैं। अध्ययन बताता है कि पंजाब प्रान्त में दुग्ध बाजार प्रतियोगी होने के कारण संगठित एवं असंगठित क्षेत्र में दूध के मूल्यों में कोई सार्थक अन्तर नहीं है और संगठित क्षेत्र के बाजारों में खाद्य सुरक्षा मानक ज्यादा प्रभावी हैं। अध्ययन दर्शाता है कि आधे से अधिक दुग्ध किसान संगठित एवं असंगठित वित्तीय संस्थाओं से ऋण लेते हैं। श्रृंखलावद्ध ऋण की सुविधा एक-तिहाई से कम किसान प्रयोग में लाते हैं।
- आम के प्रसंस्करण इकाई की स्थापना हेतु पर्याप्त निवेश एवं कार्यशील पूँजी की आवश्यकता होती है। अध्ययन दर्शाता है कि आंध्रप्रदेश में आम का गूदा प्रसंस्करण उद्योग स्थापित करने के लिए 55 प्रतिशत इकाईयों को केवल कार्यशील पूँजी, जबकि 27 प्रतिशत इकाईयों को कार्यशील पूँजी एवं दीर्घावधि ऋण दोनों की आवश्यकता पड़ती है। आम प्रसंस्करण उद्योग को ऋण उपलब्ध कराने में वाणिज्यिक बैंक एवं निजी क्षेत्र के बैंक प्रमुख स्रोत हैं। आम प्रसंस्करण उद्योग स्थापित करने वाली इकाईयों बिचौलियों के बीच उपद्रव, फसल-कटाई उपरान्त नुकसान, कम लाभप्रदता तथा संस्करण गतिविधि का मौसमी होना आदि चुनौतियों का सामना कर रही हैं। आम प्रसंस्करण उद्योग के सामने अन्य चुनौतियाँ—जैसे अत्यधिक नश्वरता, कटाई उपरान्त बुनयादी

सुविधाओं की कमी तथा मानवीकृत आपूर्ति श्रृंखला प्रणाली की कमी आदि शामिल हैं।

- रोजगार-परक क्षेत्र की प्रवृत्ति दर्शाती है कि ग्रामीण श्रम बाजार परिवर्तन के दौर से गुजर रहा है। वर्ष 1993-94 तथा 2011-12 के बीच कुल ग्रामीण श्रम शक्ति में वृद्धि के बावजूद वर्षावधि 2004-05 और 2011-12 के बीच कुल कृषि श्रम शक्ति में कमी आयी है। कुल श्रम शक्ति में कमी प्राथमिक रूप में महिलाओं की कृषि में हिस्सेदारी घटने के कारण आयी है। फिर भी कृषि क्षेत्र में महिलाओं की घटती प्रवृत्ति का गैर कृषि क्षेत्रों में इनकी बढ़ोत्तरी से कोई संबंध स्थापित नहीं होता है। गैर कृषि क्षेत्रों में श्रम शक्ति की बढ़ती प्रवृत्ति के प्रमुख कारकों में उच्च-मजदूरी दरें तथा अधिक श्रम उत्पादकता आदि प्रमुख हैं। श्रमिक बाजार में बदलती कार्य संस्कृति तथा श्रमिकों एवं इनके रोजगार प्रदाताओं के बीच नये प्रकार के संबंध स्थापित होने से भी ग्रामीण श्रम बाजार में परिवर्तन आ रहा है। भविष्य में बड़े पैमाने पर अशिक्षित एवं अकुशल ग्रामीण श्रमिकों की शिक्षा एवं कार्यकुशलता में सुधार आने पर ग्रामीण श्रम बाजार की संरचना में बदलाव होगा।
- भारतीय कृषि में श्रमिकों की उत्पादकता का अध्ययन दर्शाता है कि वर्षावधि 1975-76 से 1995-96 में कृषि में श्रमिकों के अधिक उपयोग से इनकी श्रम उत्पादकता बढ़ी है, जबकि 1990 के दशक के उत्तरार्ध में कृषि में प्रति हेक्टेयर श्रमिकों के उपयोग से मिश्रित परिणाम प्राप्त हुए हैं। अधिकतर फसलों में श्रमिकों की उत्पादकता घटी है जबकि प्रति हेक्टेयर श्रमिक उत्पादकता चावल उत्पादन में पश्चिम बंगाल में तथा कपास उत्पादन में गुजरात एवं पंजाब प्रान्तों में बढ़ी है। अध्ययन दर्शाता है कि पिछले 15 वर्षों में प्रति हेक्टेयर श्रमिकों के प्रयोग में कमी के बावजूद भी कृषि में श्रमिकों की उत्पादकता बढ़ी है।
- कृषि में विविधीकरण का अध्ययन बताता है कि भारतीय कृषि बागवानी फसलों की तरफ विविधीकृत हो रही है। विविधीकरण की गति में बढ़ोत्तरी वर्षावधि

- 2005-06 के बाद के वर्षों में 1995-96 से 2005-06 की तुलना में अधिक हुई है। केवल कपास को छोड़ कर, बागवानी फसलों के उत्पादन में वृद्धि सभी फसलों एवं गैर-बागवानी फसलों की तुलना में दोगुनी हुई है। बागवानी फसलों के उत्पादन में वृद्धि की प्रवृत्ति इनकी अधिक माँग तथा गैर बागवानी फसलों की अपेक्षा प्रति हेक्टेयर अधिक उपज के कारण हुई है। बागवानी फसलों की बढ़ती माँग वृद्धि तथा इनकी कीमत की प्रवृत्ति से प्रतीत होता है कि भविष्य में भी इनकी माँग में वृद्धि जारी रहेगी।
- कृषि से प्राप्त आय एवं कृषि में संकट पर एक अध्ययन में मिला है कि वर्ष 1983-84 के बाद के दो दशकों में किसानों एवं खेतिहर मजदूरों की आय में वृद्धि, गैर कृषि क्षेत्रों की तुलना में कम हुई है। हालांकि बाद के वर्षों में आय के अन्तर के बीच कमी हुई है। अध्ययन दर्शाता है कि वर्ष 2004 के बाद कृषि आय में वृद्धि से किसानों की आत्महत्या में कमी हुई है।
 - ग्रामीण भारत में रोजगार-विविधीकरण एवं गैर कृषि क्षेत्रों के बढ़ते महत्व के कारण लोगों के सामाजिक एवं आर्थिक जीवन में बदलाव आ रहा है। अध्ययन से पता चलता है कि 1993-94 से 2011-12 की वर्षावधि में फसल क्षेत्र में सृजित रोजगार में 20 प्रतिशत तथा पशुपालन क्षेत्र में 48 प्रतिशत की कमी आयी है। तथा गैर कृषि क्षेत्र में रोजगार में 83 प्रतिशत वृद्धि हुई है। अध्ययन बताता है कि गैर कृषि क्षेत्र में रोजगार सृजन से छोटे एवं सीमांत किसान अधिक लाभान्वित हुए हैं। विशेष रूप में 2004-05 के बाद श्रमिकों का झुकाव निर्माण गतिविधियों में गैर कृषि क्षेत्र की अपेक्षा अधिक हुआ है। गैर कृषि क्षेत्र में निर्माण गतिविधियों में श्रमिकों की संख्या अन्य गैर सेवा क्षेत्रों जैसे होटल उद्योग, व्यक्तिगत एवं सामाजिक सेवाएँ आदि की कीमत पर बढ़ रही हैं। गैर कृषि क्षेत्रों में रोजगार पाने के प्रमुख कारकों में उम्र तथा लिंग, परिवार के मुखिया की शिक्षा तथा परिवार का आकार आदि प्रमुख हैं।
 - एक अध्ययन में पशु उत्पादों (दूध, अण्डे तथा मांस) का उपभोग जो कि खाद्य एवं पोषण सुरक्षा में सहायक है, दर्शाता है कि पहले परिवार में ऊर्जा का मुख्य स्रोत अनाज की खपत रहा है, लेकिन पिछले कुछ वर्षों में इसकी खपत में कमी दिखाई पड़ती है। अनाजों की खपत में कमी की स्थिति में पोषण सुरक्षा हेतु गैर अनाज खाद्य पदार्थों में वृद्धि लाजिमी है, विशेष रूप से पशु उत्पादों (दूध, अण्डे तथा मांस) जोकि अधिक ऊर्जा एवं प्रोटीन से युक्त है। पिछले 16 वर्षों (1983-84 से 2009-10) में पशु उत्पादों से प्राप्त कैलोरी एवं प्राटीन में बढ़ोतरी पायी गयी है। इसके अलावा, सूखे की स्थिति में तथा पशु उत्पादों की कीमतें अपेक्षाकृत स्थिर रहने के कारण, पशु उत्पाद पोषक तत्वों की आपूर्ति के लिए बेहतर स्रोत हैं।
 - इस संस्थान ने परिषद् के संस्थानों तथा राज्य कृषि विश्वविद्यालयों के वैज्ञानिकों, तथा परियोजना में कार्यरत कर्मचारियों के क्षमता एवं कौशल विकास के उद्देश्य की पूर्ति हेतु अनेक प्रशिक्षण कार्यक्रम आयोजित किये। इसके अतिरिक्त दो एक साप्ताहिक प्रशिक्षण कार्यक्रम भारतीय आर्थिक सेवाओं में संलग्न अधिकारियों के लिए आयोजित किये। परियोजनाओं के अन्तर्गत कई अल्पकालिक प्रशिक्षण/कार्यशालाएं एवं बैठकें आयोजित की गईं। जोकि परियोजना भागीदारों की क्षमता बढ़ाने में सहायक हुई हैं।
 - इस संस्थान की वबेसाइट (<http://www.ncap.res.in>) को नया स्वरूप प्रदान किया गया तथा इसे अद्यतन भी किया गया। संस्थान के सभी प्रकाशन पी डी एफ प्रारूप में उपलब्ध हैं तथा इन्हें डाउनलोड किया जा सकता है। उपलब्ध आकड़ों के अनुसार इस वर्ष संस्थान द्वारा प्रकाशित नीति संक्षेप (Policy Brief) वर्किंग पेपर (Working Paper) तथा नीति पत्र (Policy Paper) सर्वाधिक अवलोकित किये गये। संस्थान के वैज्ञानिकों ने 32 शोध-पत्र (Research Papers) राष्ट्रीय एवं अन्तर्राष्ट्रीय पत्रिकाओं में, तथा पुस्तकों/समाचार पत्रों में 16 लेख (Book

Chapters/Articles) प्रकाशित किये। संस्थान के वैज्ञानिकों ने राष्ट्रीय एवं अन्तर्राष्ट्रीय सम्मेलनों में कई शोध पत्र भी पढ़े। संस्थान के वैज्ञानिकों ने कई व्यवसायी एवं नीति विचार-विमर्श तथा परियोजनाओं में सहभागिता की।

- इस संस्थान के वैज्ञानिकों ने विचार-विमर्श, समाचार पत्रों में लेख तथा टेलीविजन कार्यक्रमों

में भाग लेकर कृषि मुद्दों/विषयों पर उचित जानकारी एवं जागरूकता लाने में मुख्य भूमिका निभायी है। संस्थान ने विभिन्न मंत्रालयों को कुल मिलाकर 11 पालिसी इनपुट उपलब्ध कराये। संस्थान के निदेशक ने भारत सरकार द्वारा गठित कई उच्च-स्तरीय समितियों जैसे मूल्य नीति, डब्लू टी ओ तथा व्यापार आदि की अध्यक्षता की।

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 makings. It serves as the nodal agency of the ICAR in monitoring and interpreting the research implications of changes at grassroots level, and macroeconomic environments 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 Centre (NASC) Complex 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 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 five major theme areas:

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

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, 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 participations in policy making bodies are the usual modes of policy interface which help improve the outreach of the Institute. The Institute regularly brings out publications like Policy Papers, Policy Briefs, Conference Proceedings, and Working Papers, besides publishing research articles in journals. 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.

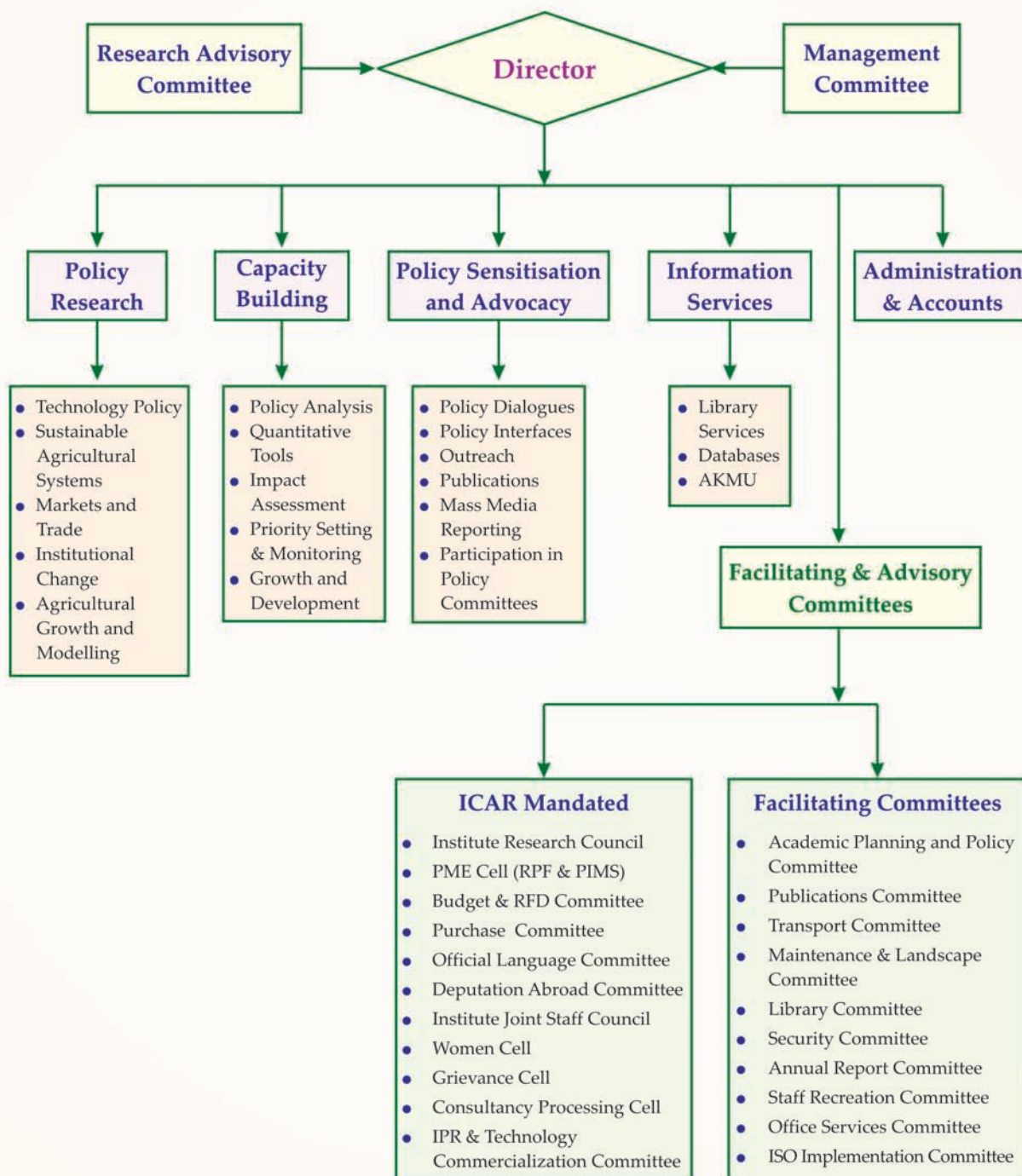
Management

A high-powered Research Advisory Committee (RAC) comprising eminent professionals, mostly from outside the ICAR system, guides the Institute on its research activities. Prof. V. S. Vyas, Member, Prime Minister's Economic Advisory Council, was the Chairperson of the previous RAC. Prof. S. Mahendra Dev, Director (Vice Chancellor), Indira Gandhi Institute of Development Research (IGIDR), Mumbai, is the Chairman of present 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, Hon. 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 a clear impression of the Institute with all the latest 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 bilingual and available in both English and Hindi.

During the year, access to NIAP website increased significantly. Data revealed that the



Figure 2: Home page of NIAP website



Figure 3: Distribution of visitors to NIAP website

visitors from India increased considerably during the 2014-15. Figure 3 presents that about 80 per cent of the visitors who accessed NIAP website were from India (39%), USA (25%) and

China (16%). Measurements of some important performance parameters of the NIAP website are given in Table 1.

Table 1: Performance parameters of NIAP website

Parameters	Unit	Mean Value
Sessions/Day	Number	620
Hits/Day	Number	3678
Pages/session	Number	249
Time/Session	Second	1.5

Agricultural Knowledge Management Unit

The Agricultural Knowledge Management Unit (AKMU) at this Institute is committed to promote ICT driven technology and information

dissemination system for quick and cost-effective delivery of messages to all the stakeholders in agriculture. Keeping pace with the current knowledge diffusion trends, the 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 put information close to 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.

To attain these objectives, the AKMU at NIAP is well equipped with latest computers, servers, firewall (Fort iGATE 80c), centralised antivirus server and analytical software like SPSS 20, STATA 12, LIMDEP 9.0, GIS, GAMS, Stella and SAS 9.3 (Figure 4). For data management and in-house software development, SQL server 2008 and Visual Studio facilities have been installed. NKN leased line of 100 mbps has been installed to



Figure 4: Agricultural Knowledge Management Unit

enhance the research work and fast internet access. 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. ERPMS-FMS has been installed during the year 2014-15. The AKMU has been instrumental in providing access to NIAP researchers to various publications throughout globe via e-mail system.

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 was awarded to NIAP by the British Standards Institute (BSI) w.e.f. 28 May 2014. Further, a continuing surveillance assessment was conducted on March 24, 2015 and the performance was found satisfactory with recommendations of continuation of ISO certificate.

Library

NIAP library is accomplishing its task by providing reading materials to social scientists and agricultural policy makers and other stakeholders in the NARS of the country. Its

library has a specialized collection of print, electronic, audio, audio-visual and digital resources. Presently, library web activity subscribes Economic and Political Weekly (EPW) print + digital archives, EPW Research Foundation and indiastat.com. Electronic databases being made available through Institute network to the library users. Library is conducting innovative information literacy programme for benefit of NIAP staff and use of Consortium for e-Resources in Agriculture (CeRA), J-Gate. The Institute at present houses a total of 6816 publications, comprised of 3434 reference books, 125 CD ROMs, 2321 database publications, 812 reports, 124 SAARC publications and other reference materials. The Institute's library has subscription of 15 international journals and 10 national journals. It also has a depository of SAARC, FAO and World Bank reports. Institute 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 form the CGIAR institutes like IFPRI, IWMI, CIMMYT, IRRI, ILRI, ICARDA, ICRISAT etc. Further three computers; one scanner and one printer are placed in library with internet connectivity for convenience of users. We endeavor to further improve all our efforts to facilitate right information to the right user at the right time.

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 for the year 2014-15 is presented in Table 2 and its staff position is depicted in Table 3.

Table 2: NIAP expenditure during 2014-15

(in lakh Rs)

Head of Account	Plan	Non-Plan	Total
Pay and allowances	-	330.10	330.10
Over time allowance (OTA)	-	0.07	0.07
Travelling allowances			
Domestic	6.66	0.06	6.72
Foreign	0.36	-	0.36
Office equipment	46.04	-	46.04
Library	11.97	-	11.97
Furniture	4.92	-	4.92
Human resource development (HRD)	1.36	-	1.36
Network Project	150.38	-	150.38
Research & Operational Expenses	149.86	1.14	151.00
Administrative Expenses	7.44	2.48	9.92
Misc. Expenses	9.97	0.46	10.43
Pension/Retirement benefits	-	-	-
P-Loans & Advances	-	1.02	1.02
Sub-Total	388.96	335.33	724.29
Other projects	4.27	89.19	93.46
Grand Total	393.23	424.52	817.75

Table 3: NIAP staff position during 2014-15

(Number)

S. No.	Name of Post	Sanctioned	Filled	Vacant
1.	R.M.P	1	1	-
2.	Principal Scientist	6	2	4
3.	Senior Scientist	6	3	3
4.	Scientist	13	11	2
5.	Technical Assistant	4	4	-
6.	Technician (T-1)	1	1	-
7.	Administrative Officer	1	1	-
8.	Assistant Administrative Officer	1	1	-
9.	Assistant Finance & Accounts Officer	1	1	-
10.	Private Secretary	1	1	-
11.	Assistant	4	4	-
12.	Stenographer	1	1	-
13.	Upper Division Clerk	1	1	-
14.	Lower Division Clerk	2	-	2
15.	Skilled Supporting Staff	2	2	-

II. RESEARCH ACHIEVEMENTS

TECHNOLOGY POLICY

Impact of Crop Diversification on Farm Poverty

Pratap S. Birthal, Devesh Roy and Digvijay S. Negi

It is well established in the literature that agricultural growth has a larger effect on poverty reduction than the growth in other sectors. However, with continuous fragmentation of landholdings, one question that arises is whether such small holdings can allow farm households to move out of poverty. Moreover, the ability of agriculture to contribute to poverty reduction is now challenged due to deceleration in productivity growth and declining labor absorption capacity.

While agriculture continues to have excessive employment pressure, past trends indicate limited opportunities for a rapid transfer of labour to non-farm sectors. With a tardy shift of labour towards non-farm sectors, within agricultural sector, crop diversification out of staples towards high-value crops (HVCs) is one of the alternatives that can augment incomes, generate employment and reduce poverty. HVCs such as vegetables, fruits,

condiments and spices, flowers, aromatic and medicinal plants, and plantation crops like tea and coffee generate higher net returns per unit of land compared to staples or other widely grown crops. These are appropriate when land is scarce and labor is abundant-endowments that are typical of the smallholder farmers. Small farmers may prefer HVCs since economies of scale are usually less important in these relative to staple crops.

We use data from a nationally representative survey conducted in 2002-03 by the National Sample Survey Organization (NSSO) on the state of farming in India. In terms of crop choices, we find that smaller farmers allocate larger shares of land to HVCs, and are also comparatively efficient in production. Estimates presented in Table 4 show that the likelihood of a farmer being poor is 3-7 per cent less if he grows HVCs. By farm size, the biggest impact of HVCs on poverty is assessed for marginal farmers (-7.49%) followed by smallholder farmers (-6.30%).

Further, we examine the relationship between the intensity of diversification and the likelihood of being poor by landholding size employing dose response functions (DRF) that

Table 4: Estimated effects of high-value agriculture on poverty

(Per cent)

Method	Marginal (≤1.0ha)	Small (1.0-2.0ha)	Medium (2.0-4.0ha)	Large >4.0ha)	All
Instrumental Variable approach	-7.49	-6.30	-0.18	-5.69	-6.68
Linear Probability Model	-2.53	-2.16	-1.77	-0.23	-2.78

establish the ranges in which crop diversification is effective in influencing poverty. Based on the estimated DRFs for different land size classes, the probability of a household being poor is generally lower, higher the degree of diversification. Growers of HVCs on average allocate close to one-fourth of their area to these crops. Results show that farmers would need to increase their area under cultivation of HVCs from 33 per cent to about 50 per cent to be able to escape poverty. Note that there is an inverse relationship between farm size and productivity of HVCs, and these categories of farmers could focus on enhancing farm productivity rather than bringing additional area under HVCs.

Impact of Information on Returns from Farming

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

Owing to increase in commercialization of agriculture and growing stresses on land, water and energy, and climate change, agriculture is becoming increasingly knowledge-intensive. Farmers need different types of information, ranging from weather forecasts and advisories,

inputs, agronomic practices, varieties, pest management, markets and prices. The demand for information has amplified as farmers are tasked with not only improving agricultural productivity and conserving natural resources but also with other requirements such as complying with market preferences for diverse, safe and quality food. To adjust to these changes, there is a need for a variety of information, the access to which can differentiate households, in terms of returns from farming. In this study using data from a nationally representative survey conducted in 2002-03 by the NSSO to assess the state of farming in India study examines use of information by farm households by farm size and social identity based on caste and its effects on net farm income.

Approximately 28 per cent farm households in India use information on modern crop technologies and practices (Table 5). The users of information are relatively better educated and more informed about government policies. The distribution of information users by information source indicate that the government information sources that include public extension workers, Krishi Vigyan Kendras, farm demonstrations, and trainings

Table 5: Sources of information by farm type

(Per cent)

Sources of information	Sub-marginal (<0.5 ha)	Marginal (0.5–1 ha)	Small (1–2 ha)	Medium (2–4 ha)	Large (>4 ha)	All
Mass media	30.2	33.0	36.4	35.9	37.4	33.8
Government	10.0	13.2	14.3	16.6	19.2	13.7
Private	26.6	23.9	22.0	21.3	19.3	23.4
Social networks	33.2	30.0	27.3	26.2	24.1	29.1
All	100.0	100.0	100.0	100.0	100.0	100.0
Any source	20.0	29.5	35.3	38.3	40.6	27.6

and study tours organized by the government agencies, are a source of information only for 14 per cent of the farm households. Farmers meet most of their information needs from other sources. Social networks (progressive farmers, primary cooperative societies and village fairs) are utilized by 29 per cent of the users with farmer-to-farmer exchange of information being more prominent. About 23 per cent of the users depend on private sources mainly on input dealers for their information needs. Mass media comprising radio, television and newspaper are utilized by one-third of the information users.

The smallholder farmers and those at the bottom of social hierarchy (based on caste identity) use fewer information sources and they largely depend on informal social networks and input dealers for their information needs. About 41 per cent of the large farmers use information as compared to 20 per cent of the sub-marginal farmers. By social hierarchy, about 35 per cent of the upper caste households use information as against 23 per cent and 20 per cent amongst the scheduled caste and scheduled tribe (SC/ST) households, respectively. Larger farmers and those from upper castes rely relatively more on public sources such as radio, television and newspaper, and also avail information from more than one source.

After controlling for the potential selection biases in access to and use of information, we find that farmers who use information on modern agricultural technologies and practices realize 12 per cent or more net returns per hectare. The impact is significantly higher (17%) for the farm households growing cash crops along with the food grains than for those who grow only food grains. Further examination on the impact of information by source, broadly

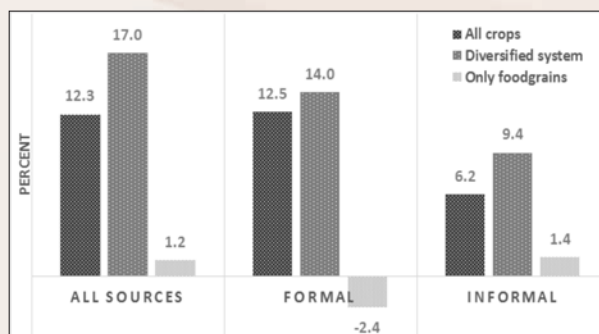


Figure 5: Impact of information on net returns from farming

categorized as formal and informal, shows that formal sources though have a smaller outreach, their impact on farm outcomes is almost twice as compared to that of the informal sources. The impact of formal sources on foodgrains is not encouraging possible because of their limited outreach to serve a huge number of farmers growing foodgrain crops.

The returns on investment in public extension systems are quite attractive. There is certainly scope for increasing the outreach of these channels that are more important for spread of agricultural technology in a fragmented society. Finally, a note on the public investment in extension services in India. The investment in public extension services has not kept pace with the rising demand for information in agriculture. Investment on agricultural research and development has been shown to have considerable potential for enhancing farm productivity and poverty reduction in. A 12 per cent higher net income per hectare for users adds ₹ 1140 per hectare of cropped area (at 2002-03 prices). This is much higher than the expenditure of ₹ 29 per hectare on public extension services, and also on the research and education (₹ 157/ha) in the same year. This suggests that underinvestment in public extension may limit realization of the potential increases

in agricultural productivity from spending more on agricultural research.

Impact of Climate Change on Yields of Major Food Crops in India

Pratap S. Birthal, Md. Tajuddin Khan, Digvijay S. Negi and Shaily Agarwal

The study has analyzed impact of climate change on yields of major *kharif* and *rabi* crops in India using data for the period 1969-2005 employing fixed effects panel model. The marginal effects of 1 °C rise in the maximum temperature in *kharif* season reduces the yield of rice, sorghum and pigeon pea by 11-12 per cent and of maize and groundnut by around 9 per cent (Table 6). However, the effect of a similar increase in the minimum temperature is opposite but is not sufficient enough to fully compensate the loss due

to rise in maximum temperature. The sorghum and maize crops benefit more from the rise in minimum temperature. The net effect of change in temperature is observed negligible in the case of maize. In the *rabi* season, barley is most affected by the rise in maximum temperature, but is benefited from the rise in minimum temperature. The yield loss due to maximum temperature has been found considerable in the case of wheat, but the net effect after accounting for the positive effect of rise in minimum temperature remains significant (5.9%). The marginal effect of 1 °C rise in minimum temperature on yield of rapeseed-mustard is positive and almost equivalent to the negative effect of a similar increase in the maximum temperature. For chickpea, the marginal effect of a 1 °C rise in minimum and maximum temperatures is negative but almost equal in magnitude.

Table 6: Marginal effect of climate change on *kharif* and *rabi* crops, 1969-2005

<i>Kharif crops</i>					
Variables	Rice	Maize	Sorghum	Peagon pea	Groundnut
Minimum temperature	0.0526*** (0.0164)	0.0864*** (0.0183)	0.0820*** (0.0220)	0.0309 (0.0195)	0.0385* (0.0213)
Maximum temperature	-0.1189*** (0.0130)	-0.0894*** (0.0166)	-0.1133*** (0.0208)	-0.121*** (0.0183)	-0.0938*** (0.0176)
Rainfall	0.0002*** (0.0000)	-0.0001*** (0.0000)	0.0001 (0.0001)	0.0002*** (0.0000)	0.0002*** (0.0000)
Irrigation	0.0053*** (0.0014)	0.0017 (0.0019)	-0.0008 (0.0020)	-0.0010 (0.0021)	0.0035* (0.0020)
<i>Rabi crops</i>					
Variables	Wheat	Barley	Chickpea	Rapeseed-mustard	
Minimum temperature	0.0337*** (0.0130)	0.0873*** (0.0179)	-0.0329* (0.0170)	0.0725*** (0.0175)	
Maximum temperature	-0.0927*** (0.0155)	-0.1050*** (0.0166)	-0.0392** (0.0175)	-0.0675*** (0.0161)	
Rainfall	-0.00003 (0.00008)	-0.00005 (0.0001)	0.00012 (0.0001)	-0.0003*** (0.00009)	
Irrigation	0.0084***	-0.0019	0.0023	0.0067***	

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

The marginal effect of rainfall on *kharif* crops, except maize, has been found positive and significant. However, in the *rabi* season its effect was not significant, except on rapeseed-mustard where it was negative and significant. The non-significant effect of rainfall in the *rabi* season is expected as the quantum of *rabi* rainfall is not only less but more variable also. In general, the marginal effect of rainfall is much smaller than of temperature. These results suggest that the climate change impact on Indian agriculture will be largely driven by temperature change.

The effects of climate change on crop yields have been projected for three time-slices viz. 2035, 2065 and 2100 at minimum and maximum changes in temperature and rainfall using the latest predictions for changes in temperature and rainfall (Table 7). Pulses will be affected by the climate change more than any other crop.

By the year 2100 with a significant change in climate, the yield of chickpea and pigeon pea will be lower by around 25 per cent than without climate change. The climate impacts on cereals will vary widely in *kharif* as well as *rabi* seasons. In the *rabi* season, wheat yield will be less by about 22 per cent less, almost three times that of barley. Likewise, among *kharif* cereals, rice will be affected more than maize and sorghum. The rice yield will decline by over 15 per cent with significant changes in climate as compared to loss of 7 per cent in sorghum and of 4 per cent in maize. Groundnut also stands to lose, but rapeseed-mustard is likely to gain at the margin. If the climate does not change significantly, yield losses will be much smaller. The climate impacts will not be so severe in the short run that is, towards 2035. It is also possible that in the long run too climate impacts may not be so severe because of continuous adaptation.

Table 7: Projected change in crop yields

(Per cent)

Time-period	2035		2065		2100	
	Minimum ΔT and ΔR	Maximum ΔT and ΔR	Minimum ΔT and ΔR	Maximum ΔT and ΔR	Minimum ΔT and ΔR	Maximum ΔT and ΔR
<i>Kharif</i> crops						
Rice	-2.5	-7.1	-6.5	-11.5	-5.9	-15.4
Maize	0.2	-1.2	0.0	-3.7	0.4	-4.2
Sorghum	-1.2	-3.3	-3.1	-5.3	-2.8	-7.1
Peagonpea	-3.2	-10.1	-8.6	-17.7	-7.5	-23.3
Groundnut	-2.2	-5.6	-5.5	-8.6	-5.1	-11.8
<i>Rabi</i> crops						
Wheat	-0.5	-8.3	-3.5	-15.4	-8.2	-22.0
Barley	0.0	-2.5	-0.9	-4.7	-2.4	-6.8
Chickpea	-1.1	-10.0	-4.6	-18.6	-10.4	-26.2
Rapeseed-mustard	0.9	0.3	1.1	0.7	1.4	0.5

Total Factor Productivity of Rapeseed and Mustard Production in India

Sant Kumar and Md. Ejaz Anwer

Estimate of total factor productivity (TFP) is commonly used to signify the role of research. This study examines TFP of rapeseed and mustard (R&M) production in major producing states of India. The Malmquist Productivity Index is used in estimating TFP and its elements – technical efficiency change (TEC) and technical change (TC) using the software DEAP 2.1. R&M is one of the major edible oilseeds in India and accounts for about 26 per cent of total oilseeds production in India. Country produced about 76 lakh tonnes (Mt) of R&M from an area of 63.8 lakh ha with average yield of 1190 kg/ha in 2012-13. Regionally, this crop is concentrated in six major states of Rajasthan (47%), Madhya Pradesh (11.8%), Uttar Pradesh (10.7%), Haryana (12.3%), and West Bengal (5.9%) and Gujarat (4.3%), and Assam (2.1%). These states together contribute about 94 per cent of production in the country. The average farm level data on output and

inputs was taken from the published reports of Commission for Agricultural Costs and Prices (CACP) for the period 1993-94 to 2011-12.

TFP growth in R&M production was minimal (0.02 per cent per year) at all India (mean of states) in past 18 year periods during 1994-95 to 2011-12 (Figure 6). The deterioration in TEC (-0.01) brought down the TFP growth, while TC was positive and grew by 0.20 per cent annually during above period. Like other oilseeds, production of R&M is risky and largely affected by low temperature and rainfall during winter season due to fungal infestation.

State-wise analysis has shown mean TFP change of states was 3.3 per cent which was contributed by both TEC (2.3%) and TC (1.9 %) during 1994-95 to 2011-12 (Table 8). Across states growth in TFP of R&M was positive and ranged between 1 and 6 per cent, while growth in TC was about 2 per cent. Technical efficiency change (TEC) which along with TC affect growth of TFP has shown mixed results. The more worrisome is the deteriorating TEC

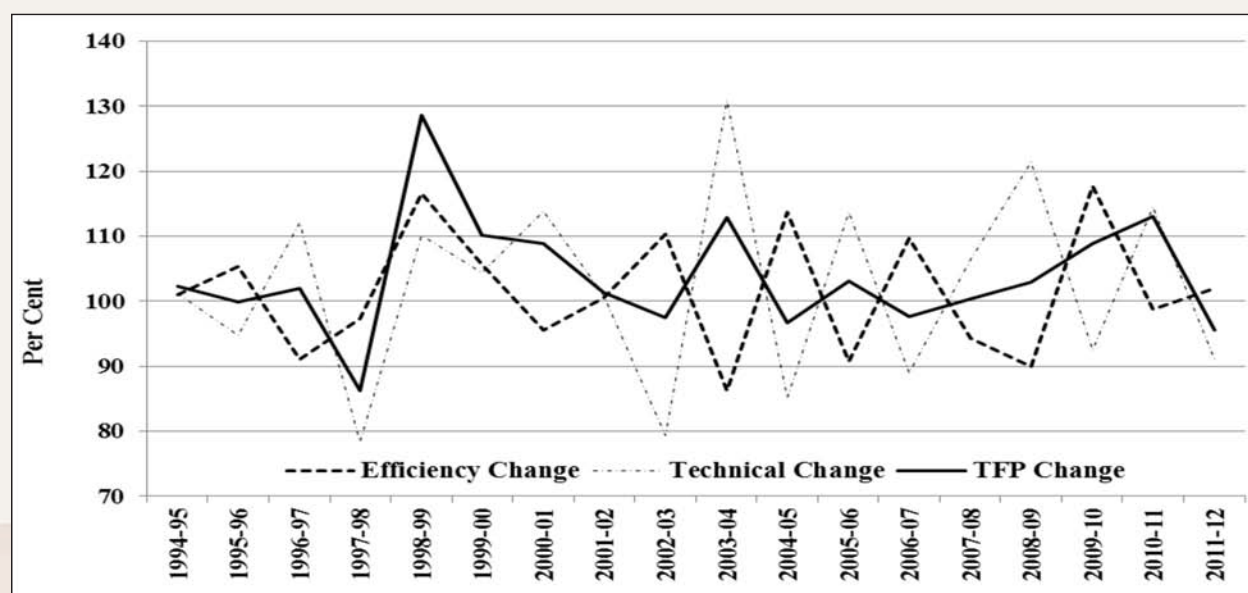


Figure 6: Movement in indices of efficiency change, technical change and TFP change of R&M production in India

Table 8: Trends in technical change, technical efficiency change and total factor productivity change of R&M production, 1994-95 to 2011-12

State	Efficiency change	Technical change	TFP change
Assam	104.3	101.7	102.6
Gujarat	100.3	101.5	101.3
Haryana	101.6	102.1	104.6
Madhya Pradesh	102.5	102.0	104.8
Rajasthan	99.7	101.9	101.3
Uttar Pradesh	101.6	102.1	103.0
West Bengal	106.2	102.1	105.7
Mean (states)	102.3	101.9	103.3

occurred in Rajasthan, a major R&M producing state, which contribute to about 50 per cent of total R&M production. The decline in technical efficiency is a matter of concern. Data shows that over years the less important states have improved the production performance with respect to major states, by employing better management practices and adoption of improved technology.

SUSTAINABLE AGRICULTURAL SYSTEMS

Regional Crop Planning for Improving Resource Use Efficiency and Sustainability

S. S. Raju, S. K. Srivastava, Rajni Jain and T. Kingsly Immanej

This study aims at developing regional crop plan which would optimize the level of different crop activities, their input use, and output/ returns generated in different resource endowments and price scenarios. Three approaches have been used in estimating net income from major crops viz. (i) net income at market prices, (ii) net income at social cost and prices (net of subsidies), and (iii) income based on natural resource valuation (NRV) and

environment cost. The study used plot level data available under cost of cultivation scheme of Directorate of Economics and Statistics, Ministry of Agriculture, GOI. Net income at market prices in this study is arrived as gross return (from main product and by-product) less variable Costs (Cost A_1 +Imputed value of family labour) at market prices actually paid and received by the farmer or imputed in some cases. Net income based on social cost and prices is to be taken as net income at market prices *minus* subsidies on inputs like fertilizers and irrigation used in crop production. The total irrigation subsidy is to be distributed over selected crops based on use of diesel/electric power for irrigation under each crop. Net income based on natural resource valuation is to be computed by adding value of nitrogen fixation by legume crops at economic price of nitrogen and deducting the imputed value of increase in Green House Gas (GHG) emission cost to the atmosphere.

The study compared performance of various crops by estimating their net income in the state of Punjab for the triennium ending (TE) 2010-11. Study has revealed that sugarcane and paddy (basmati) are the most rewarding crops under market price regime (Table 9).

Table 9: Net income from different crops in Punjab using various approaches of valuation, TE 2010-11

(₹/ha)

Crops	Based on Market Prices	Based on Economic Prices	Based on NRV
Paddy (Non-basmati)	46198	34250	32412
Paddy (Basmati)	53377	42372	40534
Wheat	36244	27086	26903
Maize	13792	5422	5263
Sugarcane (planted)	98384	85505	Na
Sugarcane (ratoon)	118676	108220	Na
Rapeseed and Mustard	14450	8738	8623
Cotton	42187	34935	Na
Potato	27138	8557	8322
Peas	44549	33354	34646
Vegetables - <i>Kharif</i>	26533	9918	9683
Vegetables - <i>Rabi</i>	45696	36107	35872
Fodder	5139	-3536	554

Note: Na= Not available

Even after adding amount of subsidies to cost and internalizing environmental costs and benefit in terms nitrogen fixation these noted crops remained most remunerative in the state.

The dominance of rice-wheat cropping system in Punjab is due to assured prices, yield advantage, technological superiority and farmers having very good knowledge of growing rice-wheat crops.

Rainfed Agriculture in India: Performance and Sustainability Implications

A. Suresh, S.S. Raju, Sonia Chauhan and Khyali Ram Chaudhary

The study examines performance of rainfed agriculture in India and ascertains the trend in terms of trade of crop groups of different water requirements in rainfed regions. The

major crop groups considered in the analysis are coarse cereals, oilseeds, pulses and cotton. The study period of 1980-2010 has been divided into pre-and post-liberalization period based on the period of structural adjustments in Indian economy. Studies have identified that the policies have resulted in encouragement of water intensive crops in rainfed regions, which could affect the sustainability of the very system. The growth in production of oilseeds and pulses during 1980s and early 1990s weaned out during the subsequent period, probably due to the dilution of some of the policy initiatives like mission mode operation for these crops and adverse terms of trade. However, the yield of most of the crops has increased during the post-liberalization period. This was also associated with a sharp increase in cost of cultivation. The rate of increase in cost of cultivation was severer for traditional rainfed crops compared to water intensive crops like

Table 10: Trend in net income and terms of trade of various cropping systems in rainfed agriculture since 1980-81

Period (TE)	Net income over variable cost (Rs/ha)			Net income over total cost (Rs/ha)			Net income parity		
	Irrigated system	Rainfed system (including cotton)	Rainfed system (excluding cotton)	Irrigated system	Rainfed system (including cotton)	Rainfed system (excluding cotton)	Irrigated system	Rainfed system (including cotton)	Rainfed system (excluding cotton)
1982-83	2373	838	834	492	105	109	2.85	1.00	1.00
1995-96	3175	1473	1220	784	426	226	2.60	1.21	1.00
2009-10	4966	1739	1647	1637	322	286	3.02	1.06	1.00

Note: Nominal price was deflated by consumer price index for agricultural labour (CPIAL) with base 1986-87.

sugarcane and paddy. Also, the growth in value of production has been lower than the growth in cost of cultivation for the rainfed crops during the post-liberalization period. The parity of the net income also favored cultivation of water intensive crops in rainfed lands (Table 10).

Rainfed regions need to focus on yield enhancement through natural resource conservation notably, water; and, incentivize rainfed agriculture through price policies and market opportunities. The study calls for increased investment for rainfed regions for creation of affordable technologies for water conservation and increasing water use efficiency; creation of institutions for better water management and spreading water literacy for sustainable crop production.

Regional Crop Planning for Punjab under Sustainable Ground Water Use

Rajni Jain, T. Kingsly Immanuelraj, S. S. Raju, S. K. Srivastava and Ramesh Chand

Green Revolution was initiated in mid-1960s to address the problem of food shortage in the country, with the use of modern technology

comprising intensive application of HYV seeds, chemical fertilizers, irrigation, farm implements and crop protection measures along with favourable price policies. It was a sheer success that shifted up the grain production particularly rice and wheat.

However, the continuance of intensive use of chemical inputs and cultivation practices has led to non-sustainability of agricultural production in terms of degrading of soil and water resources, excessive use of irrigation leading to falling ground water, depleting soil micro-nutrients, frequent occurrence of pest and diseases, emergence of new pests, and declining farm profitability, etc. This necessitates the revisiting of existing cropping patterns at regional level and developing optimum crop plans. For instance, in Punjab, water table is rapidly falling due to over exploitation for water intensive crops like paddy and inefficient irrigation practices.

Using cost of cultivation data for the TE 2010-11, optimal crop plan has been developed to maximise net returns under land and ground water constraints for Punjab (Table 11). When water drafting is limited to replenish-able water for irrigation, only 38 percent of net sown area is covered under

Table 11: RCP model for Punjab based on NRMP for sustainable use of land and water

(Area in '000 ha)

Kharif crops				Rabi crops			
Crop	Existing area	Optimum area	Change	Crop	Existing area	Optimum area	Change
Sugarcane	70	112	+	Sugarcane	70	112	+
Paddy	1900	0	-	Wheat	3519	3519	No change
Paddy (basmati)	860	669	-	Potato	69	80	+
Cotton	483	386	-	Vegetables (<i>rabi</i>)	65	92	+
Maize (<i>kharif</i>)	136	218	+	Maize (<i>rabi</i>)	150	65	-
Vegetables (<i>kharif</i>)	57	91	+	Others	70	75	+
Others	48	61	+				
Total	3554	1537		Total	3943	3943	0

cultivation during *kharif* season. Basmati paddy, sugarcane and cotton and maize (*kharif*) cover about 34 per cent of the existing area in *kharif* season. Remaining four per cent is covered under *kharif* vegetables and other minor crops. Paddy area is eliminated because of its intensive water consumption. However, some area under basmati paddy is still retained due to relatively high profitability. In *rabi* season sugarcane, wheat and potato are the major crops covering 91 per cent of the existing net sown area (NSA) followed by *rabi* vegetables and *rabi* maize with 2 per cent each of NSA. This scenario represents one extreme which does not seem to be feasible at present, and the study is building other scenarios which are feasible.

Based on plot level cropping pattern data for the TE average (2008-09 to 2010-11), net returns from the crop sector amounts to ₹ 304 billion, whereas under sustainable ground water use the net returns get reduced to ₹ 208 billion. Thus, given the water abundant condition, farmers may continue to over draft the groundwater for paddy cultivation as it is more profitable due to assured Minimum support Price and yield advantage. Otherwise, in the limiting ground

water regime major share of existing area *kharif* paddy crop will remain fallow.

Groundwater irrigation in Punjab: Sustainability and policy issues

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

The study addresses sustainability and policy issues related to groundwater use in Punjab. The groundwater use in the state has crossed the sustainability limits due to excessive reliance on groundwater resources, dominance of water intensive (paddy-wheat) cropping pattern, subsidized electricity, etc. The annual withdrawal of groundwater is 34.88 billion cubic metre (BCM) which is 72 per cent higher than the net replenishable groundwater availability of 20.32 BCM. The average groundwater level in the state has declined from 8.1 metre below ground level (mbgl) in the year 2000 to 15 mbgl in the year 2013 at the rate of 42 cm per annum. Consequently, about 80 per cent of the administrative blocks of the state have been categorized as 'dark blocks (over-exploited)' by Central Groundwater Board (CGWB). Further, groundwater depth

wise categorization of monitoring wells of the CGWB over the past 33 years revealed a structural shift in proportion of wells from shallow water level category (<10 mbgl) to deeper water level category (>10 mbgl). The declining groundwater level necessitates farmers to replace centrifugal pumps with the submersible pumps which puts financial burden on the farmers. It is worth noting that, there exists wide regional variation in groundwater development. Groundwater level in the state varies from near surface to 40 mbgl and groundwater development varies from 21 per cent in *Dharkalan* block of Gurdaspur district to 416 per cent in *Ahmadgarh* block of Sangrur district.

Agriculture sector, being the largest consumer of groundwater draft (97%), bears the prime responsibility in addressing the groundwater crisis in the state. Among the major crops, paddy was found to be the biggest consumer of groundwater resources (12151 cubic metre/ha) followed by sugarcane (6735 cum/ha), cotton (3920 cum/ha), wheat (2520 cum/ha) and maize (1485 cum/ha) during TE 2010-11 (Table 12). Interestingly, about 80 per cent of the total water use in paddy grown in monsoon season was supplied from groundwater resources. This indicates excessive reliance on groundwater for crop production in the state. Further, the estimated

marginal value product (MVP) of water for paddy was only 12 per cent of the MVP of water for wheat and optimality criterion ($MVP_{\text{groundwater}} = \text{Price}_{\text{groundwater}}$) indicated about 55 per cent over-use of groundwater resources in paddy cultivation in Punjab. Thus, there exists a great scope to reduce this unproductive use of groundwater resources through suitable technological and policy interventions.

The average per unit cost of groundwater extraction in Punjab was estimated as ₹ 0.46 per cum. The groundwater extraction cost depends on many factors such as type of pumps, energy source, groundwater level, extent of pump use, etc. The groundwater extraction cost was found to be varying directly with the decline in water-table and inversely with the size of land holdings of farmers (Table 13). This indicates that burden of declining water-table is borne heavily by the small and marginal farmers as compared to large farmers. The higher cost for marginal and small farmers might be due to under-utilization of irrigation pumps in smaller land holdings. Among different types of wells, cost was highest for diesel operated centrifugal pumps (₹ 1.04 per cum) followed by submersible pumps (₹ 0.55 per cum) and electric operated centrifugal pumps (₹ 0.23 per cum). Under the scenario of no energy subsidy, groundwater cost increases by more than 100

Table 12: Crop-wise groundwater use in Punjab during TE 2010-11

Crop	GW draft (Cum/ha)	Effective rainfall (Cum/ha)*	Crop yield (kg/ha)	GW use (Lit/kg)	Total water use (lit/kg)	Share of GW in total water use (%)
Paddy	12151	3076	5918	2053	2573	79.80
Wheat	2520	419	4224	597	696	85.75
Cotton	3920	1988	2112	1856	2797	66.35
Sugarcane	6735	3700	72906	92	143	64.45
Maize	1485	3608	3674	404	1386	29.15

* Effective rainfall was estimated using CROPWAT 8.0 model of FAO.

Table 13: Farm size wise effect of depth of water-table on extraction cost in Punjab, TE 2010-11

(₹/cum)

Groundwater Level (mbgl)	Marginal (0.01-0.99 ha)	Small (1-1.99 ha)	Semi-Medium (2-3.99 ha)	Medium (4-5.99 ha)	Large (>=6 ha)	Overall
<10	0.48	0.28	0.23	0.17	0.25	0.26
10-15	0.94	0.61	0.46	0.30	0.25	0.44
>15	1.21	0.86	0.47	0.49	0.35	0.57
Overall	0.94	0.65	0.41	0.36	0.30	0.46

per cent for electric operated pumps and by 23 per cent for diesel pumps. Further, energy subsidy constitutes about 50 per cent share of total groundwater extraction cost. Thus, farmers pay about half of the groundwater irrigation cost as fixed cost even in case of free electricity supply by the government.

The impact of subsidy removal on crop profitability and cropping pattern was examined by estimating net returns and return-cost ratio for major crops. The share of groundwater irrigation in total cost of cultivation varies from 3.56 per cent in sugarcane to 17.57 per cent in paddy with subsidy. Under no subsidy regime, the irrigation share increases to 8.14 per cent in sugarcane to 31.02 per cent in paddy. Thus, with the increase in irrigation cost, crop profitability will reduce depending upon the share of irrigation in cost of cultivation. However, the net returns were still found to be positive for all the crops even after removing the subsidy. Therefore, removal of energy subsidy shall not make agriculture unprofitable. It shall only reduce the crop profitability depending upon extent of groundwater use. The return-cost ratio further revealed that a rational farmer shall not alter the cropping pattern because return-cost ratio for water intensive paddy crop was still higher than low water requiring crops (eg. maize). It is expected that withdrawal of subsidy may

reduce the over-use of groundwater because farmers would try to economize the rising irrigation cost. This may exert a positive impact towards ensuring sustainability of groundwater resources in the state.

MARKETS AND TRADE

Network Project on Market Intelligence

Ramesh Chand, Raka Saxena, Pavithra S, Ranjit K Paul, Kavita Pal and Simmi Rana

The Network project on Market Intelligence was initiated to provide reliable and timely price forecasts to farmers on selected agricultural commodities in order to enable them to make informed production and marketing decisions. The price forecasts are disseminated to the farmers before sowing and during harvests so that farmers can take benefits from possible price forecasts. The project is being implemented at 16 centres across major states of India and disseminating price forecast information for major agricultural crops in these states of regional importance. Around 129 price forecasts were generated under the project in past two years. A random validation of forecast disseminated under the project was carried out for few centers and the results are presented in Table 14. The predicted prices are found to be quite close to the actual market

Table 14: Forecasts validation for various commodities

(₹ /qtl)

Pre-sowing forecast						
Centre	Crop Name	Forecast Price	Actual Price	Average forecast price	Average actual price	% deviation
GBPUAT	Cabbage	425-455	415-500	440	457.5	3.83
	Fine paddy	2100-2200	1900-2200	2150	2050	-4.88
PDKV	Maize	1250-1280	1040-1200	1265	1120	-12.95
	Soybean	3200-3400	2995-3050	3300	3023	-9.18
Pre-harvest forecast						
GBPUAT	Tomato	1000-1200	900-1150	1100	1025	-7.32
PDKV	Green gram	6100-6200	6157-6379	6150	6268	1.88
	Onion	1200-1300	1393-1633	1250	1513	17.38
	Maize	1100-1200	1040-1200	1150	1120	-2.68
	Soybean	3000-3100	2995-3050	3050	3023	-0.91
UASB	Maize	950-1000	965-1165	975	1065	8.45
	Potato	2000-2500	1500-2458	2250	1979	-13.69
	Banana (Ikkali)	28-30	27-38	29	33	10.77

prices. An impact assessment framework is also prepared and circulated to the centers for assessing the response of the farmers.

Export of Horticultural Commodities from India

M. B. Dastagiri

Horticulture is considered as one of the most significant sectors to promote food and nutrition security, increase net farm returns, generate greater employment and improve livelihood of people practicing it. India is the second largest producer of fruits and vegetables in the world next only to China. The large production base and variety offers India tremendous opportunities to export horti-commodities. During 2011-12, India exported vegetables and fruits worth ₹ 4801.29 crores. This study analyses growth in export of various fruits, vegetable and flower from India. Data employed in this study was collated from

National Horticulture Board, and the period of study is 1990-91 to 2011-12.

The growth in quantity of fruits, vegetables and flower exported from India to various destinations is shown in Table 15. Data shows mixed trend in export growth of fruits, and vegetables during study period. The export growth of fruits ranged between 6 and 20 per cent, and banana, and pomegranate recorded growth of about 20 per cent during 1991-2012. The range of export growth in vegetables varied widely, between 5 and 23 per cent during above period. Analysis has shown that export of onion and gherkin was relatively stable as compared to green chillies and potato.

INSTITUTIONAL CHANGE

Financing Dairy Value Chains

Pratap S. Birthal, Raka Saxena, Ramesh Chand, P. K. Joshi, Pallavi Rajkhowa, K. R. Chaudhary, Md. Arshad and Md. Tajuddin

Table 15: Performance of various horticultural commodities exported from India, 1991-2012

Commodities	Quantity (lakh tonnes)			Growth rates (%) per annum		
	1990-91	2000-01	2011-12	1990-91 to 2000-01	2000-01 to 2011-12	1990-91 to 2011-12
Mango	193.8	371.1	634.4	6.7	5.0	5.8
Grapes	64.1	206.5	1085.8	12.4	16.3	14.4
Banana	0.1	0.2	4.2	8.6	30.6	19.6
Pomegranate	7.8	44.6	301.6	19.0	19.0	19.0
Walnut	8.5	6.0	1.4	-3.5	-12.2	-8.1
Onion	2415.9	3428.6	13097.0	3.6	13.0	8.4
Potato	27.7	110.7	365.4	14.9	11.5	13.1
Green Chilly	0.5	32.1	1.4	51.3	-24.7	5.0
Gherkins	9.5	261.4	738.0	39.8	9.9	23.0
Rose	-	2.6	6.0	-	7.8	-

In this study we have compared value chains for milk driven by formal and informal sectors for their efficiency, inclusiveness and financing mechanisms. We find that for smaller dairy farmers, informal channels (vendors and consumers) are more important for selling milk, while larger dairy farmers prefer selling milk to formal channels including cooperatives, multinational and domestic private processors. Interestingly though small dairy farmers also outweigh large farmers in formal supply chains, their share in total milk sales to these is not as large as that of large dairy farmers. This implies that small dairy farmers though are not excluded from the formal sector value chains probably to spread supply risks of heavy reliance on a few large farmers.

After controlling for selection bias, we find a little if any difference in milk yields across different categories of farmers supplying milk to formal as well as informal value chains. The price difference is also not significant indicating that milk markets in Punjab are competitive. However, those with larger dairy herds realize

higher profits, indicating the bargaining power of larger dairy farmers in obtaining better price terms. We also looked into the importance of food safety in the choice of marketing channels, and interestingly those farmers who are aware of food safety standards are more associated with formal markets, and also realise better profits than who are not much aware of these.

More than half of the dairy farmers borrow credit from formal and informal financial institutions. The incidence of borrowing is higher among the households who sell milk to vendors and to private processors. Chain-based financing is available to less than one-third of the farmers. Smallholder farmers depend more on relatives and friends, and also moneylenders for their financial requirements. Financing by commercial banks is limited, and largely concentrated among large farmers in terms of herd as well as landholding size, implying that financing decisions of the commercial banks or other financing institutions are largely driven by creditworthiness, and smallholders are excluded from institutional value chain finance.

Value Chain Financing for Mango Pulp in Andhra Pradesh

Raka Saxena, Pratap S. Birthal, Ramesh Chand, P. K. Joshi, Pallavi Rajkhowa, K. R. Chaudhary, Mohd Arshad and Zeeshan

This study examines financing of value chain for mango pulp industry in Andhra Pradesh, one of the largest producers of mango and mango pulp in India. The domestic demand for mango pulp in India is low. Most mango pulp extracting units are export-oriented, targeting countries in Europe and Middle East. Processors purchase mangoes for pulp, concentrates and jelly from traders as well as growers. The processors supervise mango orchards as to ensure quality right at upstream of the chain. As pulp content depends on quality, processors insist on categorization and grading of mangoes; and prices are determined accordingly. Totapuri is the main variety for processing into pulp, followed by

Alphonso. Usually, a processing unit procures 12-14 thousand tonnes of Totapuri and around 3 thousand tonnes of Alphonso mangoes for the year-round utilization of its processing capacity. Totapuri is much cheaper as compared to Alphonso and its pulp yield is also higher.

Figures 7 and 8 illustrate the physical and financial arrangements along the value chain. Processing requires considerable investment, and working capital, these depend on commercial banks and other financial institutions for meeting their credit needs. About 55 per cent processing units require financial assistance as working capital and 27 per cent require working capital as well as term loan. Commercial banks including private sector banks are the main source of finance for them. To establish a processing unit and run its functional processes, the processor requires large amount of capital. About 50 per cent of processors have availed loans of more than ₹20 crores, while 36 per cent have availed in the

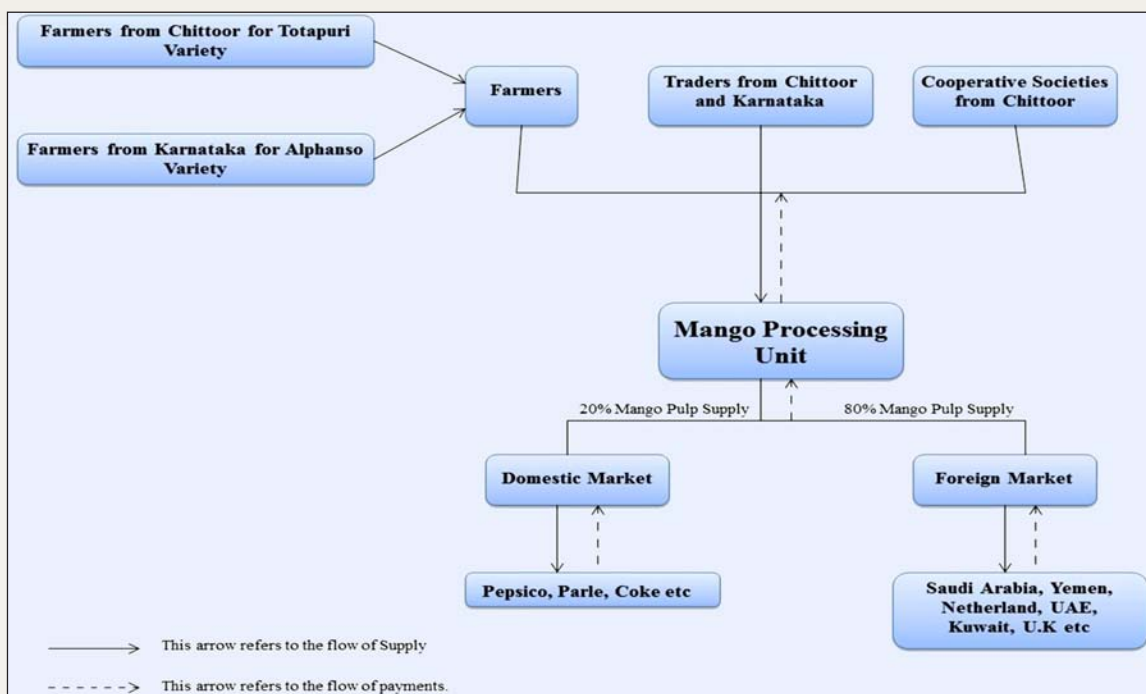


Fig 7: Physical and financial flows in mango pulp value chain

range of ₹ 5 to 20 crores. For farmers, traders are important source of finance, especially for the post-harvest operations.

Mango processors face various challenges like payments to middle men, huge post-harvest loss, lack of support by the concerned nodal bodies, poor profitability and seasonality of the processing activity, delayed payment from the buyers, financing documentation etc. Besides, high perishability, absence of post-harvest infrastructure, lack of standardized supply chain system, etc. resulted in substantial loss to mango production during post-harvest period. Most of the small units are operating on work order basis, where export houses provide some part of cost as advance and the remaining amount is paid after the consignment is lifted in phases, which may take several months. During this phase, processors' capital remains locked but they have to pay interest to banks from where they have borrowed the money. Thus, most of the small units are operating on very small margins.

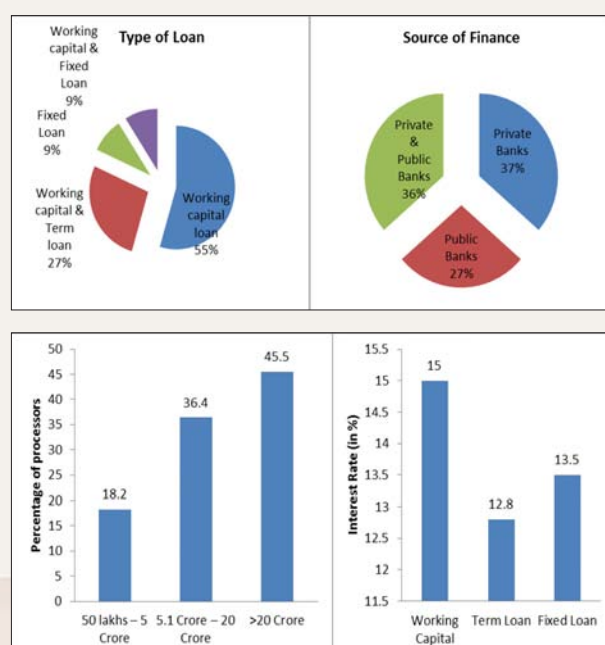


Fig 8: Financing arrangement of processors

Institutional Innovations for Enhancing Outreach and Inclusiveness of Livestock Services

Subhash Chand, Pratap S. Birthal and Prem Narayan

Until now growth in livestock production had largely been number-driven. This may not sustain in the long run and may also stress the resources. The future growth should come from improvements in productivity. This will require improvements in delivery of animal health and breeding services.

A total of 45 livestock service providers (11 public sectors and 34 private) from Haryana state were interviewed to collect data on various aspects of services provided to livestock farmers. Important socio economic features of service providers are presented in Table 16. Majority of the service providing personnel (about 51%) in public sector were in the age group 30-50 years, whereas this number was 73 per cent for private sector. All service providers in public sector had basic qualification as veterinarian whereas their counterparts in private sector have qualification in humanities and only 6 per cent were agricultural graduate. In the private sector livestock service providers called as Gopals were having matriculation qualification and remaining were below matric level. About 64 per cent personnel in public and 74 per cent in private sector were having 10 years of experience. The experience of private service providers was confined mainly to artificial insemination (A.I.) and minor clinical works. Public sector service providers were having vast experience in health and breeding services for livestock. The main reasons for not visiting public sector service providers by dairy farmers in the study districts were low income, orthodox belief, and less staff and lack of free services.

Table 16: Socio economic features of service providers

Particulars	Public (Number=11)	Private (Number =34)
Age (years)		
Upto 30	3 (27.3)	13 (38.2)
Between 30-40	6 (54.6)	11 (32.4)
Above 40	2 (18.1)	10 (29.4)
Educational qualification		
Professional veterinary	11 (100)	0.0
Agricultural graduate	0.0	2 (5.9)
Others (humanities)	0.0	32 (94.1)
Marital status and belong to area		
Rural areas	11 (100)	33 (97.1)
Urban areas	0.0	01 (3.0)
Marital status		
Married	10 (90.9)	30 (88.2)
Unmarried	1 (9.1)	4 (11.8)
Experience (years)		
Less than 10	7 (63.6)	25 (73.5)
Between 10-15	2 (18.2)	4 (11.8)
Between 15- 20	2 (18.2)	3 (8.82)
Above 20	-	2 (5.88)
Trainings attended (months)		
Less than 2.0	0.0	24 (70.6)
Between 2.0-6.0	0.0	7 (20.6)
Between 6.0-8.0	0.0	3 (8.8)
Above 8.0	11 (100)	-

Note: (i) Number of service providers contacted for study includes 11 from public sector and 34 from private sector, and (ii) Figures in parentheses are percent to total number of respondent in respective category.

Women Empowerment in Agriculture in Punjab

Usha Rani Ahuja

The women empowerment in agriculture index (WEAI) was constructed for Punjab state using the methodology developed by IFPRI in association with USAID and OPHI. The WEAI comprises of two sub-indices. The first assesses the degree to which women are empowered in five domains of empowerment

(5DE) in agriculture. These Domains are: (i) decisions about agricultural production, (ii) access to and decision making power about Productive resources, (iii) control over use of income, (iv) leadership in the community and (v) time Allocation. Women are considered to be empowered if they have adequate achievements in four of the five areas. The second sub-index is the Gender Parity Index [GPI] which measures gender parity. The GPI reflects the percentage of women who are

empowered or whose achievements are at least as high as the men in their households. For those households that have not achieved gender parity, the GPI shows the empowerment gap that needs to be closed for women to reach the same level of empowerment as men. The survey covers 80 women households of two villages in Rupnagar district of Punjab state for the reference year 2011-12. Results revealed that WEAI of Punjab is 0.815 which is a reflection of high level of empowerment of farm women. Overall 31 per cent farm women in Punjab are empowered having score of more than 0.80 in 5 domains under the study. Control over income, use of production resources and proper time management are the factors contributing towards their empowerment. In the study area 69 per cent women are disempowered (having score of less than 0.80 in five domains). Lack of leadership and less control over the use of income are the factors responsible for disempowerment. Surprisingly, it has also been observed that although WEAI is significantly high in Punjab but the gap between empowered and disempowered is also more in the state, which can be a matter of concern as it can be a reflection of income inequality within the state. On the basis of these results interventions to empower women can be prioritized regarding development of leadership qualities and control over income for farm women of the state.

Emerging Trends in Rural Employment and their Implications for Indian Agriculture

Ramesh Chand and S.K. Srivastava

The rural labour market is undergoing unprecedented changes. The NSS data reveals two distinct trends in rural employment during

the past 20 years. During 1993-94 and 2011-12, the total workforce in rural area increased by 50.3 million with a rate of 1.45 per cent annually (Table 17). But subsequently, rural workforce declined by 6.5 million during 2004-05 to 2011-12. Gender-wise disaggregation revealed that decline in total rural workforce is primarily led by the withdrawal of female workers. Among the sectors, decline took place only in agriculture sector by both male and female workers since 2004-05. The 6.5 million decline in male workforce from agriculture was negated by 21.8 million increase in male employment in non-farm sectors. However, for females, declining workforce from agriculture sector could not be accompanied by the similar increase in employment in non-farm sectors, resulting into a net decline in total rural female workforce. Between 2004-05 and 2011-12, 27.1 million female workers left agriculture at the rate of 4.2 per cent annually. The occupation-wise profiling of agricultural workforce further revealed that it is not only agricultural labours who are leaving agriculture but also cultivators. This is the first time in the history of agriculture in India that absolute number of cultivators has declined. Thus, empirical evidences clearly indicate de-peasantisation of agriculture after 2004-05 and emergence of employment diversification away from agriculture towards non-farm sectors. Another noticeable trend in rural employment is that demographic dividend is not visible in the workforce. It was found that although the proportion of population in the working age category (15-59 years) is increasing over the years, estimated workforce population ratio (an indicator of workforce participation) is declining for both male and female persons. Thus, we are not reaping the benefits of demographic dividends.

Table 17: Sector-wise trend in rural employment based on usual status

Sector	Workforce (million)			Compound Growth Rate (%)		
	1993-94	2004-05	2011-12	1993-94 to 2004-05	2004-05 to 2011-12	1993-94 to 2011-12
Male						
Agriculture	139.1	145.6	139.2	0.41	-0.63	0.00
Industry	13.1	17.3	19.1	2.53	1.41	2.09
Construction	6.0	14.9	30.5	8.60	10.80	9.45
Services	27.6	39.4	43.8	3.29	1.52	2.60
Total	187.8	218.9	234.6	1.40	0.99	1.24
Female						
Agriculture	90.3	103.3	76.2	1.23	-4.24	-0.93
Industry	7.3	10.4	10.0	3.24	-0.63	1.72
Construction	0.9	1.9	6.7	6.37	20.11	11.52
Services	5.9	8.2	8.5	3.07	0.49	2.06
Total	104.8	124.0	101.8	1.54	-2.78	-0.16
Person						
Agriculture	229.4	248.9	215.4	0.74	-2.04	-0.35
Industry	20.5	27.7	29.0	2.79	0.67	1.96
Construction	7.0	16.7	37.1	8.32	12.09	9.77
Services	33.4	47.6	52.1	3.25	1.35	2.51
Total	292.6	342.9	336.4	1.45	-0.28	0.78

The changing structure of employment is driven by a complex set of inter-related factors such as pattern of economic growth, inter-sectoral wage rate differentials and worker productivity differentials, large scale employment generating programme (e.g. MGNREGS), pursuit for education, availability of family labour, etc. The education improves the skills and capacity of the persons and broadens the employment choice of individuals. Although, about 52 per cent of cultivators and 71 per cent of agricultural labours are either illiterate or literate only upto primary level, a positive shift is taking place away from illiterate category to higher level of education.

From economic growth perspective, the output diversification from agriculture towards non-farm sectors is translating into employment shift but at a slow rate.

Agriculture sector contributed only 36 per cent of total rural output and employed 64 per cent of total rural workforce in 2011-12. This indicates heavy pressure of labour on agriculture and presence of excess labour which must come out of agriculture and seek employment in non-farm sectors. The inter-sectoral wage rates and productivity differential accelerated movement of labour from agriculture towards non-farm sectors.

The MGNREGS was found to provide supplementary employment to about 14 per cent of the cultivators and 31 per cent of the agricultural labours and the influence of this scheme on wages might be through the increase in reservation price of the labours.

Although the declining workforce from agriculture is desirable from economic growth and development point of view, it leads to labour shortage and increase in wage rate in agriculture sector. In the peak season shortage in labour supply hampers farm operation and consistent wage rise leads to inflationary pressure in the economy. Any significant rise in wages leads to increase in cost of production which in turn (if not compensated by productivity enhancement) transmits to food prices and puts inflationary pressure in the economy. Thus attempts need to be made to improve agricultural productivity to absorb the wage rise and prevent cost-push inflation. Any effect of labour scarcity needs to be addressed through the labour saving technological interventions for farm operations. But, the small size of land holding requires farm level innovations (e.g. custom hiring) in farm mechanization.

AGRICULTURAL GROWTH AND MODELLING

Trend in Labour Productivity in Agriculture: An Analysis of major Crops across States

S. S. Raju, A. Suresh, Ramesh Chand and Sonia Chauhan

Technological change in agriculture has made significant impacts on labour absorption, notably since green revolution. In this context the present study has analyzed the

productivity of labour across major states and crops during the period of mid-1970s to 2010. The study period has been into two sub-periods, up to mid-1990s as first period and post-mid 1990s till 2010 as the second period, broadly corresponding to the period of green revolution, and market reforms, respectively. The analysis was carried out for rice and wheat, two major food crops and cotton and sugarcane, two major commercial crops.

The share of human labour in total cost of cultivation followed a significant increase between TE 1975-76 and TE 1995-96 in most cases and a mixed picture emerged thereafter. Among the states, the highest share of human labour in total cost of cultivation of paddy was observed in Assam and West Bengal, above 40 per cent; whereas it was the lowest in Punjab at about 12 per cent during 2009/10 (Table 18). The penetration of mechanization in cultivation is the lowest in case of sugarcane and the highest for wheat. During the first phase, labour productivity increased along with increase in labour absorption in most cases. In the latter period, i.e. after mid-1990s, per hectare labour use declined in majority of the cases, while there was increase in per hectare labour use in a few cases like paddy in West Bengal, and cotton in Gujarat and Punjab. Increase in labour productivity during the last 15 years has been much higher than the decline in use of labour per unit of area. The net impact of this is increase in labour earning in crop production in all the crops and everywhere.

The analysis has shown wide variations in labour productivity among the four crops at the national level. The labour productivity has shown increasing trend across crops and regions under study.

Table 18: Crop wise labour productivity in different states of India

Crop	State	Labour Productivity (kg of output/hr)			Factor share of labour %		
		1975/76	1995/96	2009/10	1975/76	1995/96	2009/10
Paddy	Andhra Pradesh	2.5	4.0	6.7	17.9	30.9	27.2
	Assam	2.4	3.0	3.7	24.1	40.4	41.9
	Bihar	2.1	Na	3.2	16.8	Na	32.7
	Punjab	3.2	9.3	15.9	35.8	16.4	12.2
	West Bengal	2.2	2.8	3.1	22.5	32.5	40.8
	All India	2.3	3.8	5.1	20.9	29.6	30.2
Wheat	Madhya Pradesh	2.1	5.0	7.7	15.5	15.1	11.1
	Punjab	4.3	11.2	23.1	15.3	15.0	7.6
	Uttar Pradesh	2.5	5.6	7.1	13.6	16.2	13.3
	All India	2.8	6.8	9.8	14.9	16.2	12.6
Cotton	Gujarat	0.9	1.2	1.6	17.7	16.4	21.7
	Madhya Pradesh	Na	0.7	2.4	Na	24.1	19.0
	Maharashtra	0.5	0.8	1.5	21.1	19.6	23.2
	Punjab	1.2	1.6	3.0	27.2	20.4	20.5
	Rajasthan	Na	2.4	2.5	Na	14.1	22.2
	All India	0.8	1.4	2.3	18.3	18.8	24.1
Sugarcane	Maharashtra	26.9	39.8	45.7	12.0	23.7	17.8
	Tamil Nadu	Na	43.8	43.8	Na	22.6	33.5
	Uttar Pradesh	29.7	35.8	38.8	13.0	19.3	15.2
	All India	24.2	39.2	41.8	10.7	20.3	18.4

Agriculture Diversification towards Horticulture: Trends and Prospects

Ramesh Chand, S. S. Raju and Sonia Chauhan

Agriculture diversification in general parlance refers to the shift in allocation of land resources in a geographic location from one set of crops to another set of crops. It may involve redistribution of area over the existing crops and/ or replacement of some or all crops by another set of crops. Diversification is driven by demand side factors or supply side factors, or both. Sometimes supply side factors aid or enhance demand led diversification. Diversification towards horticultural crops

in India is a good example of demand led diversification supported by supply side factors. Due to changes in tastes, preferences and food habit, the consumption pattern in India has been shifting towards fruits and vegetables. Such changes are also happening globally. Thus both domestic demand as well as export demand is shifting in favor of horticultural crops. In supply side, production of horticultural crops shows much higher growth than other crops/groups like food grains, oilseeds, and sugar.

Technological developments in horticultural crops have facilitated this in several ways. Varieties of horticultural crops have been

developed for cultivation in off-season, under diverse climatic conditions and with various attributes to attract consumers. Despite favorable demand side and supply side factors, area under horticultural crops in the country has remained below 7 per cent and this area has expanded slowly. There are also concerns related to effect of area shift towards horticultural crops on basic food security and staple food production. In this background the present study examines production performance of horticultural crops and major crop groups like cereals, pulses, oilseeds, etc. at the country and discusses prospects of diversification towards horticulture.

Despite stagnation in area after 2005-06, growth rate in production of fruits and vegetables and condiment and spices witnessed sharp acceleration. Annual growth rate in horticulture output showed 60 per cent of the growth rate of non-horticultural crops (Table 19). This could happen due to very high differentials in productivity of horticulture crops relative to non-horticultural crops and strong demand for the former. It is evident from price trend that prospects of demand led growth of horticultural crops are very

high. Despite 60 per cent in the growth rate in output horticulture group witnessed much higher increase in prices compared to non-horticultural crops. Area under horticulture in some states is awfully low - less than 1.5 per cent. A small shift in crop pattern towards horticulture crops will bring large increase in production which will contribute to increase in agriculture productivity and higher growth in output.

Farm Income, Poverty and Agrarian Distress

Ramesh Chand, Raka Saxena and Simmi Rana

The present study examined the income status of farmers in relation to income of other sections of the society and also with respect to some threshold level like poverty line. It is often believed that disparity between farm income and non-farm income is rising and those who work outside agriculture are progressing faster than those who work within agriculture. It is alleged that labour in agriculture is getting costly and is eating the net income of farmer. These factors are considered as the reasons for rising farmers' distress in the country. This

Table 19: All India crop group wise annual growth in production

(Per cent)

Crop group	1985-86 to 1995-96	1995-96 to 2005-06	2005-06 to 2011-12
Cereals	3.00	0.46	2.70
Pulses	0.70	0.25	3.35
Oilseeds	6.97	0.53	1.96
Sugarcane	4.43	-1.30	2.02
Cotton	6.08	1.55	6.70
Horticulture	3.33	3.52	5.30
(a) Fruits & Vegetables	3.26	3.35	5.16
(b) Condiments & spices	3.89	4.84	6.32
All crops	2.98	1.92	3.25

study has looked above aspects and provides some empirical evidence on these aspects.

During 1983-84, a farmer cultivator or his/her family members whose primary source of income was agriculture earned three-times the earnings of a labourer while only one-third of income earned by a non-agriculture worker. In next five years, income of a cultivator increased at a lower rate as compared to income earned by an agricultural labourer and a non-agriculture worker. Accordingly, there was small decline in the disparity between farm income per cultivator and of a labourer. A cultivator continued to earn two and half times the income of a labour in agriculture during 1987-88 to 2004-05. The disparity further reduced by year 2011-12 when income of a cultivator reduced to 2.4 times the wage earnings of a labourer. Disparity in income of a cultivator and non-agricultural worker increased from 1:3 to 1:4 between 1983-84 and 2004-05. After this, the disparity in farm and non-farm income declined to 1:3.15; and a non-agricultural worker earned 3.15 times the income of a cultivator in year 2011-12. Acceleration in growth of agricultural output and decline in number of cultivators during 2004-5 to 2011-12 have arrested the rising disparity in income of farmers and non-farm

workers. This period also witnessed a decline, albeit small, in the very wide disparity between income of agricultural labourer and non-agricultural workers. Therefore, the accelerated agricultural growth during 2004-5 to 2011-12 can be termed as pro poor and inclusive.

The analysis presented in the Table 20 confirms that during two decades since 1983-84, the growth in income of farmers and agricultural labourer could not keep pace with the growth in income earned by non-agriculture workers. However, recent years have seen narrowing of gap in income earned by the households engaged in agricultural activities and those who are engaged in non-agricultural occupations. Between farmer and agricultural labourer, the development process has benefited the latter a little more, but there still remains a large gap between incomes of a cultivator and an agricultural labour.

To see the effect of growth in farmers' income on agrarian distress, the study examined the trend in farmers' suicide in the country. Data shows that the number of farmers' suicides in the country increased from 11 thousand to 18 thousand, an increase of 70 per cent, in 11 years during 1995 to 2005 (Figure 9). The growth rate in per cultivator income in this period was mere 1.96 per cent, which was lowest in the last

Table 20: Disparities in agriculture and non-agriculture income at current prices

Year	Farm income per cultivator (₹) F	Wage earning per agricultural labour (₹) L	Income per non agriculture worker (₹) N	Ratio L:F	Ratio N:F
1983-84	4286	1467	12786	0.34	2.98
1987-88	5653	2201	18036	0.39	3.19
1993-94	12365	4784	37763	0.39	3.05
1999-00	24188	8938	78565	0.37	3.25
2004-05	26146	10043	106688	0.38	4.08
2011-12	78264	32311	246514	0.41	3.15

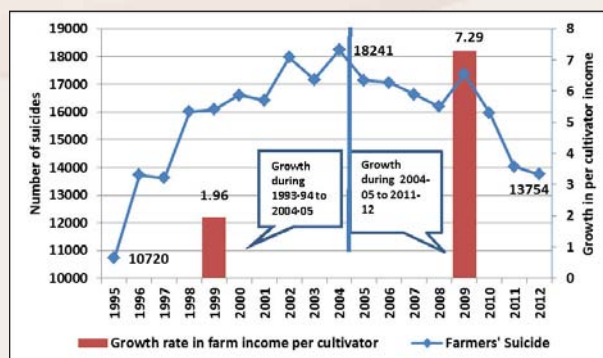


Figure 9: Trend in farmers' suicides and growth in farm income before and after 2004

three decades. After 2004, the growth rate in per cultivator income increased to 7.3 per cent and the number of farmers' suicides started falling and dropped to 13.7 thousand by the year 2012. This indicates that low growth rate in farm income was associated with increase in farmers' distress and vice-versa.

A comparison of income of a farmer cultivator with the poverty line for rural India shows that average income of a farmer household dependent on agriculture is only 58 per cent above the poverty line based on Tendulkar methodology. Average farm income per cultivator household is estimated ₹ 77230 while poverty line for a family of 5 members in rural area is ₹ 48960. This also implies that a farmer having land holding below 0.63 hectare will not earn enough income from agriculture even to keep his family out of poverty. In other words, about 53 per cent of farm households

in India will be living under poverty if they do not have earnings from non-farm sources.

It is pertinent to report that the tempo of growth in farm income could not be sustained after 2011-12 due to sharp decline in growth of GDP agriculture and faster increase in consumer prices in rural areas compared to wholesale prices for agricultural commodities.

Sectoral Linkages for Agricultural and Rural Transformation

Shinoj Parappurathu and Kingsly Immanuelraj T

This study attempted to closely examine the process of employment diversification happening in rural India and how the upcoming non-farm sector is altering the economic and social fabric of rural life. The study has used the household level data on 'Employment and Unemployment' collected by the NSSO pertaining to the years 1993-94, 2004-05 and 2011-12. The findings point to a shift of rural inhabitants from the farm sector to non-farm sector for employment thereby contributing to the emergence of the latter as an important source of livelihood in rural India. Both in terms of primary industry of activity of the households as well as usual status of employment of population, the farm sector has been gradually being replaced by the non-farm sector. Table 21 presents the changes in

Table 21: Changes in employment participation rate (usual status) by sectors in rural India, 1993-94 to 2011-12

Sector	Employment participation rate (%) - usual status			Change, % (1993-94 to 2011-12)
	1993-94	2004-05	2011-12	
Crops	71.5	65.9	56.5	-21.0
Livestock	6.4	7.5	3.3	-48.4
Other farm	1.5	1.4	2.5	66.7
Non-farm	20.6	25.2	37.7	83.0

employment participation rates (usual status) of people in farm and non-farm sectors in rural India during 1993-94 to 2011-12.

The results suggest that in 1993-94, the crops sector provided the highest employment to the rural inhabitants with 71.5 per cent of the sample population dependent on crop husbandry either as their primary activity or subsidiary activity. The share of people engaged in livestock rearing, other farm activities and non-farm activities were 6.4 per cent, 1.5 per cent and 20.6 per cent, respectively. By the year 2011-12 considerable changes happened in the employment profile with the crop sector losing its share from 71.5 per cent to 56.5 per cent. Similar decline in participation was observed in livestock. On the other hand, the participation of people in the non-farm sector gained considerably to reach 37.7 per cent by 2011-12. The unfolding process of diversification has been pervasive across various income and farm-size strata of the economy, but with differential impact at different levels. The share of non-farm employment was found to be higher for marginal and small holder households compared to larger farm-size

categories. Regional differences in evolution of the non-farm sector were also delved upon based on disparities in employment pattern across major states. Further, the study compared employment share in various sub-sectors. A notable finding from the analysis was that, among the various sub-sectors, the construction sector was found to attract more number of workers in relation to other sub-sectors particularly after 2004-05. Its share in total employment in the non-farm sector has been bulging mainly at the cost of employment in service sector particularly in trade and hospitality, community, personal and social services, etc. (Table 22).

The above findings have possible connotations in terms of casualization of workforce, marginalization of employment, and so on. Further, the study looked at various determinants that drive the upheaval of the non-farm sector. Several intra-household, socio-economic and demographic factors such as age, gender and education of the household head, size of the household, its affiliation to various farm size and expenditure classes etc. were found to drive the process, each of which was important from an

Table 22: Changes in employment participation rate (usual status) in rural non-farm sub-sectors in India, 1993-94 to 2011-12

Non-farm sub-sector	Employment as share of workforce in non-farm sector - usual status (%)			Change, % (1993-94 to 2011-12)
	1993-94	2004-05	2011-12	
Mining & quarrying	2.9	2.0	1.1	-61.7
Manufacturing	32.2	28.8	20.9	-35.1
Electricity, gas & water supply	0.9	0.5	0.5	-40.1
Construction	11.4	20.0	39.9	248.5
Trade and hospitality	20.2	22.5	15.8	-21.7
Transport, storage & communication	6.7	8.8	7.2	7.9
Financing, insurance & real estate	1.4	2.1	1.0	-25.3
Community, social & personal services	24.3	23.3	20.1	-44.4

overall perspective of structural transformation being unleashed in the economy.

Food and Nutritional Security through Livestock: Emerging Trend

Ramesh Chand and S.K. Srivastava

The study examines the prospects of livestock products to improve food and nutritional security in India. The NSS data reveals that the real per capita food expenditure in India has increased by 19.8 per cent in rural areas and 20.6 per cent in urban area between 1993-94 and 2009-10. But, the effect of this increase in food spending on nutritional intake is rather puzzling. The per capita calorie and protein intake witnessed a declining trend while the fat intake increased in both rural and urban areas during 1993-94 and 2009-10 (Table 23). The examination of food basket indicated the decline in cereals consumption is responsible for deteriorating state of nutritional security in the country. Cereals constituted about two

third of the total calorie and protein intake in rural areas and more than fifty per cent in the urban areas in 2009-10. Therefore, any reduction in cereals consumption is bound to be reflected in nutritional impoverishment if it is not accompanied by sufficient large increase in non-cereals food, particularly livestock products (milk, eggs, meat), which are high in calorie and protein. Though consumers' preference towards fruits and vegetables is rising but horticultural products do not contain much energy and protein. Thus, the only way to ensure adequate nutrition consistent with preference of Indian consumer is increase in the intake of livestock products. The livestock products supplied about 8 per cent of total calories, 13 per cent of total protein and 26 per cent of total fat intake by rural population in 2009-10. In urban areas, the share of livestock product was on higher side. Temporally, the share of livestock products in total calorie (protein) increased during the past 16 years. This shows increasing importance of livestock products in nutritional basket.

Table 23: Trend in food group wise nutrients intake in India

Food groups	Calories per unit (Kcal/capita/day)				Protein per unit (gm/capita/day)				Fat per unit (gm/capita/day)			
	1993-94		2009-10		1993-94		2009-10		1993-94		2009-10	
	R	U	R	U	R	U	R	U	R	U	R	U
Cereals	1528	1212	1301	1071	42	34	36	30	5	4	4	3
Pulses	89	107	75	91	6	7	5	6	0	1	0	1
Edible oil	111	168	191	245	0	0	0	0	12	19	21	27
vegetables	77	78	110	105	2	2	4	4	0	0	1	1
Fruits	6	11	9	16	0	0	0	0	0	0	0	0
Sugar	102	127	94	109	0	0	0	0	0	0	0	0
Livestock products#	145	192	154	214	6	8	7	10	10	14	10	15
Other food products	94	176	88	95	4	6	3	3	3	5	1	1
Total food products	2153	2071	2020	1946	60.2	57.2	55	53.5	31.4	42	38.3	47.9

Note: R = Rural; U =Urban; # includes milk, eggs and meat.

III. POLICY INTERACTIONS AND ADVOCACY

Policy input to ICAR, various Ministries, Planning Commission, Public Organizations, and State Governments, based on in-house research

1. Provided policy input as Member and Chairperson of several high level policy committees as under:

Suggested measures to improve methodology for fixing minimum support prices
Policy input on Requirements under WTO rules for India's agricultural Policy
Provided research inputs to ICAR units as expert member of RAC
Drafted report on Linking Farmers to Market, for <i>Haryana Kisan Aayog</i> as Chairman of the Working Group
Provided inputs to ICAR for Parliamentary Standing Committee on Agriculture on matters related to contributions of agricultural R&D and technology
Provided inputs to national dailies (newspaper) almost every fortnight on issues concerning agriculture sector and farmers.
Participated and provided input in Pre Budget Meeting with Finance Minister, Govt. of India.
Providing inputs as Member, Taskforce on Agriculture, NITI Aayog, Government of India
Participated in pre-budget discussion on agriculture, DD News, July 28, 2014
Radio Talk on Issues related to Agriculture Markets, All India Radio, August 8, 2014
Participated in Public debate on Agrarian Crisis in India, Lok Sabha TV, March 19, 2015

IV. AWARDS/ RECOGNITIONS

Ramesh Chand

- Chairman, Committee to examine Methodological Issues in Fixing Minimum Support Prices, constituted by Ministry of Agriculture, Department of Agriculture & Cooperation, Government of India, New Delhi.
- 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.
- 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.
- 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.



Dr. Pratap Singh Birthal receiving Recognition Award (Social Sciences) of the NAAS from Prof. K.S. Solanki, Hon'ble Governor of Haryana and Punjab in the inaugural session of XIIth Agricultural Science Congress of NAAS at NDRI Karnal, February 3-6, 2015

- Chief Editor, Agricultural Economics Research Review (AERR), New Delhi.

P. S. Birthal

- Recognition Award (Social Sciences), National Academy of Agricultural Sciences, New Delhi.
- Rapporteur, 74th Annual Conference of Indian Society of Agricultural Economics, Mumbai.
- Managing Editor, Agricultural Economics Research Review (AERR), New Delhi.
- Vice President, Indian Society of Agricultural Economics, Mumbai.
- Member, Planning Board of the Tamil Nadu Veterinary and Animal Sciences University, Chennai.
- Member, Institute Management Committee, National Bureau of Plant Genetic Resources, since 2013.

S. S. Raju

- Member, Research Advisory Committee, National Institute of Animal Nutrition and Physiology, Bengaluru.
- Member (Agricultural Economics), Editorial Board, SAARC Journal of Agriculture, Dhaka, Bangladesh.
- Member, Agricultural Expert Committee for Recruitment of 16 Officials of Agricultural Insurance Company of India Limited (AICIL), New Delhi.
- Reviewer of the Indian Journal of Agricultural Economics, SAARC Journal of Agriculture, International Association of Agricultural Economists.

- Expert /Examiner for M.Sc. and Ph.D. Theses evaluation of ANGRAU, TNAU, PAU, PJSTSAU.

- Chairperson, Co-chairperson and Rapporteur for various conferences.

a. Rapporteur for the session on 'Feed Informatics, Framework and Policies'. In: *Global Animal Nutrition Conference-2014*, at Hotel Vivanta, Bengaluru, organized by ICAR-NIANP, April 20-22, 2014.

b. Co-Chaired the sessions on (1) Research, Education, Extension and Infrastructure (2) Retailing, Processing and Exports. In: Inter Conference Symposium of International Association of Agricultural Economists on 'Revisiting Agriculture Policies in the light of Globalization Experience: The Indian Context' held at MANAGE, Hyderabad, October 12-13, 2014.

c. Chaired a session on "Biomass Feed Stocks and Biofuels", In: Symposium on Recent Advances in Biotechnology for Food and Fuel, at TERI, IHC, New Delhi, November 19-20, 2014.

M. B. Dastagiri

- Chairperson, Technical Session V, International Conference on 'Governance in Agriculture and Allied Sectors - Issues and Way Forward' December 18-19, 2014, organized by the Centre for Good Governance, Hyderabad.

Rajni Jain

- Guest Editor for special issue on 'Artificial Intelligence in Agriculture' *Journal of Indian*

Society of Agricultural Statistics, Volume 67 Issue 1 (2014).

- Received Best Paper Award for year 2014 from the Indian Society of Agricultural Statistics for paper on 'WBSTFP: Software for TFP Computation in Agriculture', published in *Journal of Indian Society of Agricultural Statistics*, 67(3): 381-391.
- Associate Editor, Journal of Indian Society of Agricultural Statistics (JISAS), 2014.
- Served as External examiner and conducted Viva-Voce Examination of Ph.D. (Computer Science) Student, Delhi University, June 18, 2014.
- Faculty Member, Post-Graduate School of Indian Agricultural Research Institute, New Delhi.
- Expert Member, Committee for promotion of Scientists in Computer Application Discipline under CAS at Directorate of Maize Research, New Delhi.
- Chaired a special session on 'Computer Applications in Agriculture and Social Sciences' in 2nd International Conference on *Computing for Sustainable Global Development* technically sponsored by IEEE Delhi Section; CSI, GGSIP University, New Delhi; ISTE Delhi Section; IETE Delhi Centre and IET (UK) Delhi Local Networks during March 11-13, 2015, held at BVICAM, New Delhi.

Sant Kumar

- Worked as External Examiner at IVRI, Bareilly and conducted practical examination of post-graduate Students in Economics of Livestock Health on June 27, 2014.

- Evaluated PG 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.

Raka Saxena

- Best Poster Award on 'Intensity of Market Infrastructure for Linking the Smallholder Farmers to Markets: Evidences from selected Markets of Uttarakhand, XIIth Agricultural Science Congress on 'Sustainable Livelihood Security of Smallholder Farmers' at NDRI, Karnal, jointly awarded to Raka Saxena, Anil Kumar, Pavithra, S., Ranjit Kumar Paul, Kavita Pal, Simmi Rana and Sonia Chauhan (February 3-6, 2015).
- Member, Board of Studies, Institute of Agribusiness Management, Bikaner.

Shinoj Parapurathu

- Member, Board of Studies, Division of Agricultural Economics, Indian Agricultural

Research Institute, New Delhi, w.e.f. August, 2014.

- Member, Board of Examiners, Department of Humanities, Indian Institute of Space Science and Technology, Valiamala, Thiruvanthapuram, w.e.f. March, 2015.

S. K. Srivastava

- 2015 Editor's Choice Article on 'Unravelling the spatio-temporal pattern of irrigation

development and its impact on Indian agriculture' published in journal *Irrigation and Drainage (Wiley Online Library)* 63(1): 1-11, Srivastava, Shivendra K., Souvik Ghosh, Ashwani Kumar and Pothula S. Brahmanand.

- Faculty Member, Division of Agricultural Economics, Indian Agricultural Research Institute, New Delhi, w.e.f. July 7, 2014.

V. PUBLICATIONS

A. Policy Paper

Shinoj Parappurathu, Anjani Kumar, Shiv Kumar and Rajni Jain (2014) Commodity outlook on major cereals in India, Policy Paper No. 28, NIAP, New Delhi.

B. Policy Brief

Chand, Ramesh and P. S. BIRTHAL (2014) Buffer stock norms for foodgrains during twelfth five year plan, Policy Brief No. 39, NIAP, New Delhi.

Chand, Ramesh and S. K. Srivastava (2014) Changing structure of rural labour market: Trends, drivers and implications for agriculture, Policy Brief No. 40, NIAP, New Delhi.

BIRTHAL, P. S., Digvijay S. Negi, Md. Tajuddin Khan and Shaily Agarwal (2015) Is Indian agriculture becoming resilient to droughts? Evidence from rice production, Policy Brief No. 41, NIAP, New Delhi.

C. Research Papers

Arora, A., M. Z. Zawanmard, Rajni Jain, S. Marwah and A. Bhardwaj (2014) Web based Fuzzy CMeans Clustering Software, *Journal of Indian Society of Agricultural Statistics*, **68** (1): 93-100.

BIRTHAL, P. S. (2014) Rapporteur's report on Livestock marketing and supply chain management of livestock products, *Indian Journal of Agricultural Economics*, **69**(3): 432-437.

BIRTHAL, P. S., Devesh Roy and Digvijay S. Negi (2015) Assessing the impact of crop diversification on farm poverty in India. *World Development*: doi:10.1016/j.worlddev.2015.02.015.

BIRTHAL, P. S., Digvijay S. Negi, Shiv Kumar, S. Agarwal, A. Suresh and Md. Tajuddin Khan (2014) How sensitive is Indian agriculture to climate change? *Indian Journal of Agricultural Economics*, **69**(4): 474-487.

BIRTHAL, P. S., Md. Tajuddin Khan, Digvijay S. Negi and S. Agarwal (2014) Impact of climate change on yields of major food crops in India: Implications for food security. *Agricultural Economics Research Review*, **27**(2): 145-155.

Chand, Ramesh and Raka Saxena (2014) Agriculture: Intentions and Actions, *Economic & Political Weekly*, **59**(31): 30-34.

Chand, Ramesh, S. S. Raju, and Sonia Chauhan (2014) Agriculture diversification towards horticulture: Trends and prospects. *Agricultural Situation in India*, **LXX** (9): 5-10.

Chand, Subhash, A. K. Sikka, D. V. Singh, R. Ragupathy and P. Sundrambal (2015) Comparison of acacia and eucalyptus agroforestry system for hills, Tamil Nadu, India, *International Journal in Management and Social Science (IJMSS)*, **3**(2): 990-1000.

Dastagiri, M. B. (2015) India's horticultural export markets in multispeed world economies: Trends of exports, prices,

- elasticity's and policies' *British Journal of Economics, Management and Trade*, **5**(4): 427-440.
- Dastagiri, M. B., MNV Prasad Gajula, and Ganeshagouda I. Patil (2014) World and Indian agriculture: Revolutions & multispeed strategies for future, *Science Discovery*. USA, **2**(1): 14-26. doi:10.11648/j.sd.20140201.12
- Gajula, M. N. V. Prasad, S. Vanisree, G. Soni and M. B. Dastagiri (2014) Outlook on application of bioinformatics in agriculture, *World Research Journal of Bioinformatics*, **2**(1): 33-40.
- Ghosh, Souvik, S. K. Srivastava, A. K. Nayak, D. K. Panda, P. Nanda and A. Kumar (2014) Why impacts of irrigation on agrarian dynamism and livelihoods are contrasting? Evidence from eastern India states, *Irrigation and Drainage*, **65**(3): 573-583 (Wiley online Library).
- Grace, K., T. K. Immanuelraj and M. B. Dastagiri (2014) Supply response with mix of stationary and nonstationary data: Case study in pulses, India, *Economic Affairs*, **59**(4): 591-596.
- Jain, Rajni, A. Arora and Usha Ahuja (2012) Knowledge acquisition using rough set based post-processing of clusters: Characterizing ICT access to women farmers. *Statistics and Applications*, **10** (1&2, New Series): 27-43.
- Johnson, B., K. Vijayaragavan and T. K. Immanuelraj (2015) Economic impacts of system of rice intensification, *Green Farming*, **6**(1): 168-171.
- Kumar, Anjani, P. K. Joshi, Praduman Kumar and Shinoj Parappurathu (2014) Trends in the consumption of milk and milk products in India: Implications for self-sufficiency in milk production, *Food Security*, **6**(5): 719-726.
- Kumar, N., K. S. Suhag, P. Bisnoi, S. Kumar and K. R. Chaudhary (2014) Economic analysis of cross-bred cow milk production vis-a-vis economic traits in Haryana, *Indian Journal of Animal Research*, **48**(3): 270-275.
- Kumar, S., L. K. Ankush and K. R. Chaudhary (2014) Agricultural growth and economic convergence in Indian agriculture, *Indian Journal of Agricultural Economics*, **69**(2): 211-228.
- Massoumeh N. Zadeh, Bitan Mondal, Raka Saxena and Smita Sirohi (2015) Compositional changes in Iranian trade basket of livestock sector, *International Journal of Research in Commerce, Economics and Management*, **5**(01): 37-42.
- Narayan, Prem and Sandeep Kumar (2015) Constraints of growth in area, production and productivity of pulses in India: An analytical approach to major pulses, *Indian Journal of Agricultural Research*, **49**(2): 114-124.
- Paul, R. K., P. S. Birthal and A. Khokhar (2014) Structural breaks in mean temperature over agroclimatic-zones in India. *The Scientific World Journal*, Vol 2014, pp. 1-9. doi:10.1155/2014/434325.
- Pavithra, S., P. S. Ananthan, and M. Krishnan (2014) Market shares, instability and revealed comparative advantage of seafood exports from India, *Indian Journal of Fisheries*, **61**(4): 90-97.
- Praveen, K. V., S. Kumar, D. R. Singh, A. Kumar, P. Arya, K. R. Chaudhary (2014) An analysis of price levels of selected food

- commodities under modern and traditional retailing formats in Kochi, *Global Journal of Finance and Management*, **5**(4): 96-101.
- Raju, S. S., A. Suresh, Ramesh Chand and Sonia Chauhan (2015) Pattern and trend in labour use in Indian agriculture: An analysis across major crops and states, *Economic Affairs*, **60**(1): 99-108.
- Raju, S. S., Ramesh Chand and Sonia Chauhan (2014) Instability in Indian agriculture: An inter-state analysis, *Economic Affairs*. **59** (July Special Issue): 36-45.
- Sethi, R. R., M. J. Kaledhonkar, M. Das, S. K. Srivastava, A. K. Nayak and A. Kumar (2014) Groundwater pumping options in coastal areas of Odisha, *Journal of the Indian Society of Coastal Agricultural Research*, **32** (1): 49-53.
- Shinoj, P., A. Kumar, S. Kumar and Rajni Jain (2014) A Partial equilibrium model for future outlooks on major cereals in India, *Margin-The Journal of Applied Economic Research*, **8**(2): 155-192.
- Sikka, A. K., M. Madhu, Subhash Chand, D. V. Singh, V. Selvi, P. Sundarambal, K. Jeevarathnam and M. Murgaiyah (2014) Impact analysis of participatory integrated watershed management programme in semi- arid region of Tamil Nadu, *Indian Journal of Soil Conservation*, **42**(2): 98-106.
- Singh, Shrawan, D. R. Singh, Subhash Chand, Ajanta Birah and S. Dam Roy (2015) Analysis of perspectives of self-sufficiency in vegetable production under tropical conditions, *International Journal of Vegetable Science*, **21**(1): 53-68.
- Srivastava, S. K., R. C. Srivastava, R. R. Sethi, A. Kumar and A. K. Nayak (2014) Accelerating groundwater and energy use for agricultural growth in Odisha: Technological and policy issues, *Agricultural Economics Research Review*, **27**(2): 259-270.
- Suresh, A. and S. S. Raju (2014) Poverty and sustainability implications of groundwater based irrigation: Insights from Indian experience. *Economic Affairs*, **59**(2): 311-320.
- Suresh, A., S. S. Raju, Sonia Chauhan and K. R. Chaudhary (2014) Rainfed agriculture in India: An analysis of performance and Implications. *Indian Journal of Agricultural Sciences*, **84**(11): 1415-1421.

D. Chapters in Books / Proceedings/ Popular Articles

- Ahuja, Usha Rani, Rajni Jain, Sonia Chauhan, Amarjit, Prem Narayan and K. R. Chaudhary (2015) Socio-economic impact of mobile phone in agriculture: A case study of Karnal District. In: *Proceedings of 9th IndiaCom; 2015, 2nd International Conference on Computing for Sustainable Development*, 5.135-5.138 pp.
- Arora, A., S. Marwah, L. K. Saha, Rajni Jain, and A. K. Jha (2015) Online system for integrated pest management on tomato in Agridaksh, In: *Proceedings of the 2nd International Conference on Computing for Sustainable Global Development*, 5.84-5.88 pp.
- Chand, Ramesh (2015) Government must take tough steps to persuade states to create common agri-markets, *Financial Express*, March 4.
- Chand, Ramesh and Raka Saxena (2014) Maize Marketing in Asia: Innovations and Reforms for Improving Efficiency, In: *Extended Summaries of 12th Asian Maize Conference and Expert Consultation on Maize for Food, Feed,*

- Nutrition and Environmental Security*, Eds. BM Prasanna, BS Vivek, AR Sadananda, Daniel Jeffers, PH Zaidi, Christian Boeber, Olaf Erenstein, Raman Babu, Sudha K Nair, Bruno Gerard, ML Jat, Natalia Palacios and Kevin Pixley, published by CIMMYT, APAARI, FAO and Thailand's Department of Agriculture (DoA), 27-36 pp.
- Chand, Ramesh and S. K. Srivastava (2014) Food and nutritional security through livestock: emerging trend and pattern, In: *Climate Resilient Livestock Feeding System for Global Food Security*, Eds. A K. Samanta, R. Bhatta, V. Sejjan, A. P. Kolte, P. K. Malik, S. K. Sirohi and C. S. Prasad, ICAR-National Institute of Animal Nutrition and Physiology, Bengaluru, 287-292 pp.
- Chand, Ramesh, S. S Raju and Sonia Chauhan (2014) Agriculture diversification towards horticulture: Trends and prospects. In: *Horticulture for Inclusive Growth*. Eds. K. L. Chadha, Pritam Kalia and S. K. Singh, The Horticultural Society of India and Westville Publishing House, New Delhi, 1-8 pp.
- Chand, Subhash, A. K. Sikka, D. V. Singh and M. Madhu (2014) Impact evaluation of village ponds rehabilitation programme in Ramnathpuram district of Tamil Nadu: A Case study. In: *Climate Resilient Dryland Farming and Watershed Management*, Eds. Anchal Das, K. S. Rana, Anil K. Choudhary and R. S. Bana, ICAR- Indian Agricultural Research Institute, New Delhi, 194-199 pp.
- Chand, Subhash, A. K. Sikka, M. Madhu, D. V. Singh, V. Selvi, R. Ragupathy and P. Sundrambal (2014) Watershed programme implementation and impact evaluation procedure: A case study, Coimbatore, Tamil Nadu, South India. In: *Climate Resilient Dryland Farming and Watershed Management*, Eds. Anchal Das, K. S. Rana, Anil K. Choudhary and R. S. Bana, ICAR- Indian Agricultural Research Institute, New Delhi, 187-193 pp.
- Chand, Subhash, A. K. Sikka, V. N. Sharda, M. Madhu, D. V. Singh, R. Ragupathy and M. S. Meena (2015) Sustainable agriculture development in rainfed areas through watershed programme: A case study, Coimbatore, Tamil Nadu. In: *Water Management in Agriculture*, Eds. M. S. Meena, K. M. Singh and B. P. Bhatt, Jaya Publishing House, Delhi, 75-94 pp.
- Jain, Rajni, Usha Ahuja, Ramesh Chand, R. Bala, and A. Kumar (2014) ICT and agricultural knowledge dissemination at farm level in Eastern India, In: *Proceedings of the 9th Conference of the Asian Federation for Information Technology in Agriculture on 'ICT's for Future Economic and Sustainable Agricultural Systems'*, ECU, Perth, Australia, 236-245 pp.
- Raina, Rajeswari S., Viswanatha Reddy K., T. K. Immanuelraj and Ramesh Kumar (2014) Increased funding for decentralized agricultural research, *Yojana*, Vol.58, December, 54-63 pp.
- Raju, S. S. and Ramesh Chand (2015) Risk and insurance in Andhra Pradesh agriculture-A disaggregate analysis. In: *Agricultural Risk Management*, Eds. J. Devi Prasad, B. Gangaiah and K. Suman Chandra, B. S. Publications, Hyderabad, 221-246 pp.
- Raychaidhuri, Mausumi, D. K. Panda, Ashwani Kumar, S. K. Srivastava, P. S. B. Anand, S. Raychaudhuri and G. Kar (2015) Impact of climatic variability on crop production in Mahanadi Delta region of Odisha, In: *Climate Change Modelling, Planning and*

Policy for Agriculture, Eds. Singh, A. K., J. C. Dagar, R Gopichandran, A. Arunachalam and K. N. Shelat, Springer India Publication, 99-107 pp.

Reddy, Viswanatha K. (2015) A regional profile: Research and education services for agriculture, *India-Science and Technology vol.3*. CSIR-National Institute of Science Technology and Development Studies, Cambridge University Press, New Delhi, India.

Srivastava, S. K. and Ramesh Chand (2014) Food inflation in India: Trends and causal factors. In: *Indian Economy since Independence: A Comprehensive and Critical analysis of India's Economy*, Uma Kapila (Ed), Academic Foundation, New Delhi, 333-344 pp.

Srivastava, S. K. and Ranjit Kumar (2015) Groundwater extraction for use efficiency in crop production under different water market regimes: A case study of Uttar Pradesh state (India), In: *Water Management in Agriculture*, Eds. M. S. Meena, K. M. Singh and B. P. Bhatt, Jaya Publishing House, Delhi, 125-130 pp.

E. Book Reviews

Saxena Raka (2014) Book review of Innovations in Rice Production, P. K. Shetty, M. R. Hegde and M. Mahadevappa (Eds), *Agricultural Economics Research Review*, 27(1): 141-142.

F. Research Reports/ Working Papers

Chand, Ramesh and Raka Saxena (2014) *Bilateral India-Pakistan Agricultural Trade: Trends, Composition and Opportunities*, Working Paper 287, Indian Council for Research on zBirthal, P. S., Ramesh Chand, Raka Saxena, P. K. Joshi, Pallavi Rajkhowa, K. R. Chaudhary, Md. Arshad and Zeeshan

(2014) Financing food value chains in India: Case studies of dairy and mango value chains and financing mechanisms, Project Report submitted to International Food Policy Research Institute, New Delhi.

Sirohi, Smita, Raka Saxena, A. K. Chauhan, J. P. Dhaka, S. K. Sirohi, Nishant Kumar, Deepak Sharma, Kavita Pal, Punit Kumar Agrawal (2014) Costs and returns in milk production: Developing standardized methodology and estimates for various production systems, Project Report submitted to Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture, Government of India, New Delhi.

G. TV Talks/Radio Talks

Participated in TV Show 'pre-budget discussion on agriculture', DD News, 5.00 to 5.30 P.M, July 28, 2014.

Participated in a discussion on Agriculture telecast by Lok Sabha T.V., Insight at 10:00 pm, March 11, 2015, and March 12, 2015 at 8:00 am.

Participated in T.V debate on Agrarian crisis in India, Public Forum, Loksabha T.V, March 19, 2015.

H. Presentations in Conferences/ Workshops/Symposia

Birthal, Pratap S. (2014) Promoting livestock for accelerated and inclusive growth. Workshop on Harnessing Opportunities to Improve Agri-Food Systems' organized jointly by IGIDR, Mumbai and IFPRI, New Delhi, July 24-25.

Birthal, Pratap S. (2014) Different models of integration of farmers with markets: implications on smallholder farmers Bbrainstorming session on *Linking Farmers*

- with Markets* organized by NAAS at New Delhi, July 26.
- Birthal, Pratap S. (2014) Maximising incentives and opportunities for the rural poor. Workshop for chairpersons of parliamentary agriculture committees for the India, Asia and Southeast Asia regions, organized by Government of Punjab at Chandigarh, October 29-31.
- Birthal, Pratap S. (2015) Models for linking farmers to markets in India: Implications for smallholders. Workshop on 'Best Practices in Contract Farming: Challenges and Opportunities in Nepal, organized by IFPRI, the Ministry of Agricultural Development, Government of Nepal, and Institute for Integrated Development Studies (IIDS), and Federation of the Nepal Chambers of Commerce and Industries (FNCCI) at Kathmandu, Nepal. February 10-11.
- Birthal, Pratap S. (2015) Impact of information on farm income in the workshop on Agricultural Extension Reforms in South Asia – Status, Challenges, and Policy Options, Organized by IFPRI, New Delhi, February 17-18.
- Chand, Subhash and Shrawan Singh (2015) Mangroves source of livelihood for the coastal people: A case study of Andaman and Nicobar Islands, India. Poster presented at the XIIth Agricultural Science Congress held at NDRI, Karnal, February 3-6.
- Chand, Subhash, Shrawan Singh, Vivekanand Singh, Sanjay Kumar Pandey and Chandrika Ram (2014) Culture and agriculture of tribal in Nicobar Islands: Conflicts and issues. Paper presented in 7th National Extension Education Congress (NEEC 2014), organized by Society of Extension Education, Agra and ICAR Research Complex for NEH Region, Meghalaya; Central Agricultural University, Imphal and Assam Agricultural University, Jorhat, November 8-11.
- Immanuelraj, T. Kingsly and Shinoj Parappurathu (2015) Employment diversification in India: Emerging opportunities for small holders in India. Poster presented at the XIIth Agricultural Science Congress held at NDRI, Karnal, February 3-6.
- Jain, Rajni (2014) ICT and agricultural knowledge dissemination at farm level in Eastern India, paper presented in 9th Conference of the Asian Federation for Information Technology in Agriculture on 'ICT's for future Economic and Sustainable Agricultural Systems', ECU, Perth, Australia, 29 September to 2 October.
- Jain, Rajni (2015) Socio-economic impact of mobile phone in agriculture: A case study of Karnal District. Paper presented in 2nd International Conference on Computing for Sustainable Global Development, at New Delhi, March 11-13.
- Kumar, Anjani and Shinoj Parappurathu (2015) Public distribution system in India: Implications for poverty and food security. Paper presented at the Annual Conference of Indian Society of Agricultural Statistics, held at IASRI, New Delhi, January 29-31.
- Raju, S. S. (2014) Key policy issues for bio-fuels in India, Paper presented in Symposium on Recent Advances in Biotechnology for Food and Fuel in the technical session on Biofuels: Their Sustainability and Impact on Environment and Economy, TERI, November 20.

Saxena, Raka, Anil Kumar, Pavithra S., Ranjit Kumar Paul, Kavita Pal, Simmi Rana and Sonia Chauhan (2015) Intensity of market infrastructure for linking the smallholder farmers to markets: Evidences from selected markets of Uttarakhand, XIIth Agricultural Science Congress on Sustainable Livelihood Security of Smallholder Farmers, NDRI Karnal, February 3-6.

Shinoj, Parappurathu, Anjani Kumar, Cynthia Bantilan and P. K. Joshi (2014) Food and nutrition insecurity in eastern India: Evidences from VDSA households. Paper presented in Pre-Conference Mini-Symposium, organized by ICRISAT as part of the 8th International Conference of the Asian Society of Agricultural Economists at Dhaka, Bangladesh, October 13-15.

Shinoj, Parappurathu, P. K. Joshi and Anjani Kumar (2014) Convergence of policies and programmes for sustainable and climate resilient agriculture in India, lecture delivered in the 22nd Annual Conference of Agricultural Economics Research Association (AERA) special session on '*Converging Policies and Programmes for Sustainable and Climate Resilient Agriculture in India*', held at UAS, Raichur, Karnataka, November 18-20.

Shinoj, Parappurathu, P. S. Birthal and T. Kingsly Immanuelraj (2014) Employment and income diversification in rural India. Paper presented at the National Seminar on Agrarian Distress in India, Council for Social Development, New Delhi, November 11-12.

Usha, Ahuja (2014) Key policy issues for Biofuels in India, Paper presented in Symposium on Recent Advances in Biotechnology for Food and Fuel in the technical session on Biofuels: Their Sustainability and Impact

on Environment and Economy, TERI, November 20.

I. Abstracts

Ahuja, Usha Rani, Rajni Jain, Anjani Kumar, Dharminder Choudhary and Amarjit Singh (2015) Measurement of women empowerment in agriculture in Eastern India- Computation of Women Empowerment in Agriculture Index (WEAI), XIIth Agricultural Science Congress, NDRI, Karnal, Haryana, 274 p.

Chand, Subhash, Shrawan Singh, Vivekanand Singh, Sanjay Kumar Pandey and Chandrika Ram (2014) Tribal's credence on conservation of natural resources: A case study of Nicbary Tribe of Andaman & Nicobar Islands, India, In: Proceedings of conference on farmers first for conserving soil and water resources for Northern Region of India, organised by Central Soil and Water Conservation Research Training Institute, Dehradun, 54-55 pp.

Kumar, Nishant, Smita Sirohi, Raka Saxena, Rakesh Kumar, Deepak Sharma & Punit Kumar Agarwal (2015) Analysis of cost of milk production in eastern region of India, XIIth Agricultural Science Congress on Sustainable Livelihood Security of Smallholder Farmers, NDRI Karnal, 254 p.

Saxena, Raka, Anil Kumar, S Pavithra, Ranjit Kumar Paul, Kavita Pal, Simmi Rana and Sonia Chauhan (2015) Intensity of market infrastructure for linking the smallholder farmers to markets: Evidences from selected markets of Uttarakhand, XIIth Agricultural Science Congress on Sustainable Livelihood Security of Smallholder Farmers, NDRI Karnal, 252 p.

VI. ON-GOING RESEARCH PROJECTS

Sl. No.	Title of Research Project	PI & Co-PI(s)
<i>Institute Projects</i>		
1.	Total Factor Productivity and its Determinant in Indian Agriculture	Rajni Jain Ramesh Chand
2.	India's Export Horticulture Markets in Multispeed World: Effects on Production, Prices, Poverty and Trade	M. B. Dastagiri
3.	Assessing Impact of Bringing Green Revolution in Eastern India (BGREI) - A Case Study of Stress Tolerant Rice Varieties	Sant Kumar Pratap S. Birthal
4.	An Analysis of Crop Yield Gaps in India	Pavithra S. S. K. Srivastava
5.	Women Role in Agriculture and Gender Differential Perception of Trustworthiness	Usha Rani Ahuja Rajni Jain
6.	Institutional Innovations for Enhancing Outreach and Inclusiveness of Livestock Services	Subhash Chand Pratap S. Birthal Prem Narayan
7.	Changing Structure of Crop Production Cost and Technological Effects in India	S. K. Srivastava Jaya Jumrani
8.	Changes in Nutritional Insecurity and Consumption Patterns Among Indian Households : 1993-94 and 2011-12	Jaya Jumrani Ramesh Chand
9.	Sectoral Linkages for Agricultural and Rural Transformation	P. Shinoj T. K. Immanuelraj
10.	Sources of Growth in Rainfed Agriculture	Viswanatha Reddy K. Rajni Jain
<i>Other Projects</i>		
11.	Enhancing Resilience of Agriculture to Climate Change through Technologies, Institutions and Policies	Pratap S. Birthal Suresh A. Kurup Shiv Kumar G. P. Reddy Ranjit Paul

Sl. No.	Title of Research Project	PI & Co-PI(s)
12.	ICAR SSN Project on Regional Crop Planning for Improving Resource use Efficiency and Sustainability	S. S. Raju S. K. Srivastava Rajni Jain T. K. Immanuelraj
13.	ICAR SSN Project on Market Intelligence	Raka Saxena Pavithra S. Ranjit Paul
14.	ICAR SSN Project on Impact Assessment of Agricultural Research and Development	Pratap S. Birthal Jaya Jumrani S. K. Srivastava T. K. Immanuelraj
15.	Intellectual Property Management and Transfer/ Commercialization of Agriculture Technology Scheme (Upcoming of Existing Components i.e. Intellectual Property Right under ICAR Headquarter Scheme on Management of Information Services	Sant Kumar
<i>Externally Funded Projects</i>		
16.	Organize the Collection of Crop Germplasm 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 NAIP was constituted by the ICAR for a period of three years w.e.f. February 3, 2014. The composition of RAC is as follows:

<p>Prof. S. Mahendra Dev (Chairman) Director (Vice Chancellor) Indira Gandhi Institute of Development Research, Mumbai – 400 065</p>	<p>Sh. Viswasrao Anandrao Patil P.O. Lohara, Taluq Pachora Distt. Jalgaon Maharashtra</p>
<p>Dr. Rajinder S. Sidhu Dean College of Basic Sciences Punjab Agricultural University Ludhiana, Punjab</p>	<p>Dr. H. K. Srikanta 59/1, 8th Cross, 5th Main R.K. Layout, Padmanabhanagar Bangalore, Karnataka</p>
<p>Dr. B. Gangiah Economic and Statistical Adviser Directorate of Economics and Statistics Ministry of Agriculture, Department of Agriculture and Cooperation, New Delhi</p>	<p>Dr. Ramesh Chand (Ex-officio) Director ICAR -National Institute of Agricultural Economics and Policy Research New Delhi – 110 012</p>
<p>Dr. Bharat Ramaswami Professor Planning Unit, Indian Statistical Institute New Delhi – 110 016</p>	<p>Assistant Director General (EQR) Education Division Indian Council of Agricultural Research Krishi Anusandhan Bhawan-II New Delhi-110 012</p>
<p>Dr. K. Palanisami Principal Researcher International Water Management Institute NASC Complex, New Delhi – 110 012</p>	<p>Dr. Pratap S. Birthal (Member Secretary) Principal Scientist ICAR -National Institute of Agricultural Economics and Policy Research New Delhi – 110 012</p>

Meetings of the Research Advisory Committee (RAC)

The first meeting of the 8th Research Advisory Committee (RAC) of NIAP was held on August 11, 2014. Prof Ramesh Chand, Director NIAP welcomed the RAC members and apprised them the notable accomplishments of the Centre: one, Centre will be elevated to the status of Institute with additional faculty; two, Centre developed performance indicators for ICAR institutions to assess their overall contributions; and three, Centre extended its policy and capacity outreach programme

to central ministries of Commerce and Finance besides Agriculture. Chairman and members of RAC expressed satisfaction on compliance of recommendations. Chairman and Members of RAC stressed to have strong linkages with CGIAR institutions and expand collaboration with globally recognized institutions for short-term training need of its faculty for policy analysis. Memmbers of RAC suggested continue undertaking research in high-payoff areas and teaching and research guidance for post-graduate students of IARI. The other specific recommndations include undertaking research in areas like agricultural insurance and credit, sources of growth in rainfed agriculture and implications for research and policy, climate change, food value chain and developing model for improving viability of smallholders.

IX. INSTITUTE MANAGEMENT COMMITTEE

<p>Dr. Ramesh Chand Director & Chairman ICAR-National Institute of Agricultural Economics and Policy Research (NIAP) New Delhi – 110 012</p> <p>Director Directorate of Economics and Statistics Delhi State, Old Secretariat Delhi-110 054</p> <p>Economic Advisor Economic & Statistical Organization Govt. of Punjab, Chandigarh- 160 017</p> <p>Dr. R.K. Khatkar Head Department of Agricultural Economics Harayana Agricultural University Hisar, Haryana-125 004</p> <p>Sh. Vishwasrao Anandrao Patil P.O. Lohara, Taluq: Pachora Distt. Jalgaon Maharashtra</p> <p>Dr. Kalpana Shastri Joint Director ICAR-National Academy of Agricultural Research Management Rajendra Nagar Hyderabad – 500 030, Andhra Pradesh</p>	<p>Dr. Sunil Archak Principal Scientist ICAR-National Bureau of Plant Genetic Resources (NBPGR), Pusa Campus New Delhi – 110 012</p> <p>Dr. Naveen Prakash Singh Principal Scientist ICAR-National Institute of Abiotic Stress Management Malegaon, Baramati – 413 115</p> <p>Dr. A. K. Vashist Assistant Director General, PIM Indian Council of Agricultural Research Krishi Bhawan New Delhi – 110 001</p> <p>Assistant Director General (EQR) Indian Council of Agricultural Research Krishi Anusandhan Bhawan-II Pusa, New Delhi-110 012</p> <p>Sr. Finance and Accounts Officer ICAR-National Bureau of Plant Genetic Resources Pusa, New Delhi-110 012</p> <p>Administrative Officer (Member Secretary) ICAR-National Institute of Agricultural Economics and Policy Research (NIAP) New Delhi – 110 012</p>
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Meeting of the Institute Management Committee

The 25th meeting of the Institute Management Committee (IMC) of NIAP was held on 12 August 2014. Prof. Ramesh Chand, Director NIAP & Chairman of IMC welcomed the members and apprised them about activities of NIAP. The Committee appreciated the achievements made by

the Institute at the research and development front. It approved the list of all equipments (new and replacements), furniture and fixtures, and construction of training hostel as included in the EFC Memo.

Meetings of the Institute Research Council

Institute Research Council (IRC) of NIAP is comprised of Director NIAP and scientific staff of the Institute. Director of NIAP is the Chairman of IRC. Four meetings of the IRC (excluding annual IRC) were held during 2014-15 (April-March). A total of 13 number of presentations (including 5 presentations on deputations to foreign visits), almost 3 presentations at each meeting were made. 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 and outcome the foreign deputations of NIAP scientists and other staff.

X. PARTICIPATION IN SCIENTIFIC ACTIVITIES

Ramesh Chand

- Presented paper on Ensuring Food and Nutritional Security through Livestock in Global Animal Nutrition Conference at NIANP, Bengaluru on April 22, 2014.
- Participated in the meeting to carry forward the collaborative research work between IFPRI and NIAP on Energy and Agriculture in India, Washington, D.C., USA, May 19-23, USA.
- Participated in 'Priority Setting, Monitoring and Evaluation in National Agricultural Research System–Status, Experience and Way Forward' and delivered lecture on M&E performance indicators, at NASC Complex, New Delhi, May 27, 2014.
- Attended meeting as a Member of Selection Committee for the Recruitment of NIRD Faculty held at NIRD, Hyderabad, May 30-31, 2014.
- Attended and contributed to the deliberations in the meeting held by Hon'ble Finance Minister on pre-budget consultations with different stakeholder groups in connection with the forthcoming Union Budget 2014-15, Ministry of Finance, Govt. of India, New Delhi, June 5, 2014.
- Participated in the meeting of project on 'Tackling Agriculture-Nutrition Disconnect in India' at Indira Gandhi Institute of Development Research, Mumbai, June 13, 2014.
- Attended 19th Meeting of the Research Advisory Committee of Central Institute of Subtropical Horticulture, Lucknow, June 26-27, 2014.
- Delivered lecture on Remedial Measures to Control Food Inflation, at IGIDR-IFPRI Conference on Harnessing Opportunities to Improve Agri-Food Systems, NASC Complex, New Delhi, July 24, 2014.
- Made a presentation on Outlook for Wheat: Global and India, All India Wheat Researchers Workshop, JNKVV, Jabalpur, August 25, 2015.
- Chaired a session on Resolving Farmer and Consumer Challenges – Role of Biotechnology and also delivered a lecture on Public-Private Partnership in Agri-Biotechnology in 4th CII National Conference on Agri-Biotechnology Smart Agriculture: Transformation through Biotechnology, at New Delhi, November 25, 2014.
- Delivered lecture on Economics of Soybean Production in India, Opportunities and Challenges, In: Brainstorming Workshop on 'Sustaining Soybean Production and Productivity in India: A Resource Domains Initiative', at NAAS, New Delhi, November 28, 2014.
- UN-ESCAP first meeting of the Working Group on Increasing Economic and Technical Cooperation to Address shared Vulnerabilities and Risks, at United Nations Conference Centre in Bangkok, Thailand, December 10-11, 2014.
- Policy Dialogue on the Role of Technology Transfer in Agriculture for Sustainable Development Outcomes, February 10-11, 2015.

- Eleventh Session of Governing Council of U.N Centre for Alleviation of Poverty and Sustainable Agriculture, Bogor Indonesia, February 12-13, 2015.
- Participated as Expert in Consultation on Sources of Data on Land Holdings in Rural India at Indian Statistical Institute (ISI), Bangalore, March 6, 2015.

Pratap S. Birthal

- Harnessing Opportunities to Improve Agri-Food Systems' organized jointly by IGIDR, Mumbai and IFPRI, New Delhi, July 24-25, 2014.
- Brainstorming session on *Linking Farmers with Markets* organized by NAAS, New Delhi, July 26, 2014.
- Workshop for chairpersons of parliamentary agriculture committees for the India, Asia and South East Asia Regions, organized by Government of Punjab, Chandigarh, October 29-31, 2014.
- Attended 22nd Annual Conference of the Agricultural Economics Research Association (India) at UAS, Raichur, Karnataka, November 18-20, 2014.
- Attended 74th Annual Conference of the Indian Society of Agricultural Economics at Dr Bhimrao Ambedkar Marathwada University, Aurangabad, December 18-20, 2014.
- Attended XIIth Agricultural Science Congress of NAAS on Sustainable Livelihood of Smallholder Farmers, NDRI Karnal, February 3-6, 2015.
- Participated in the workshop on "Best Practices in Contract Farming: Challenges

and Opportunities in Nepal' organized by IFPRI, the Ministry of Agricultural Development, Government of Nepal, Institute for Integrated Development Studies (IIDS), and Federation of the Nepal Chambers of Commerce and Industries (FNCCI) in Kathmandu, Nepal, February 10-11, 2015.

- Attended workshop on Agricultural Extension Reforms in South Asia – Status, Challenges, and Policy Options, organized by IFPRI (India office) New Delhi, February 17-18, 2015.

Usha Rani Ahuja

- Workshop in Hindi at NASC Complex, New Delhi, September 26, 2014.
- National workshop on Gender Budgeting at NIRD&PR, Hyderabad, November 10-12, 2014.
- Workshop in Hindi at NCAAP, New Delhi, December 2, 2014.
- XII Agricultural Science Congress on Sustainable Livelihood Security for Smallholder Farmers at NDRI, Karnal, February 3-6, 2015.

S. S. Raju

- Global Animal Nutrition Conference at Hotel Vivanta, Bangalore, April 20-22, 2014.
- Meeting on Energy and Agriculture in India at IFPRI, Washington D. C., May 19-23, 2014.
- Inter Conference Symposium of IAAE and ISAE at MANAGE, Hyderabad, October 12-13, 2014.

- XXIII Meeting of the ICAR Regional Committee No.V at PAU, Ludhiana, November 14-15, 2014.
- Fourth International Symposium on Biofuels and Bioenergy: Enablers for Sustainable and Scalable Solutions at Hotel Le Meridien, New Delhi, November 17-18, 2014.
- Symposium on Recent Advances in Biotechnology for food and fuel at TERI, New Delhi, November 19-20, 2014.
- Participated in 3rd Annual Workshop on National Knowledge Network, IIT Guwahati, December 15 -17, 2014.
- Participated in 68th Annual Conference on Statistics and Informatics in Agricultural Research at IASRI, New Delhi, January 29-31, 2015.

Sant Kumar

- Attended Research Advisory Committee meeting at NIAP, August 11, 2014.
- Attended NAAS-IFPRI Brainstorming Meeting on Developing PME indicators and mechanisms in NARS, NASC Complex, New Delhi, August 12, 2014.
- Attended 74th Annual Conference of the Indian Society of Agricultural Economics at Dr Bhimarao Ambedkar Marathwada University, Aurangabad, December 18-20, 2014.
- Attended meeting of Committee of Parliament on Official Language at Hotel Samrat, New Delhi, January 19, 2015.

M. B. Dastagiri

- The Bharat Ram Memorial Seminar on 'India's Growth Trajectory in a Fractured World Economy: Opportunities and Challenges' organized by FICCI and Shri Ram Centre for Industrial Relations, New Delhi, December 12, 2014.
- International Conference on 'Governance in Agriculture and Allied Sectors - Issues and Way Forward' organized by Centre for Good Governance, Hyderabad, December 18-19, 2014.

Rajni Jain

- Attended Research Advisory Committee Meeting, NIAP, August 11, 2014.
- Attended NAAS-IFPRI Brainstorming Meeting on Developing PME Indicators and Mechanisms in NARS, NASC Complex, New Delhi, August 12, 2014.
- E-participation in 9th International Conference of the Asian Federation for Information Technology in Agriculture on "ICT's for Future Economic and Sustainable Agricultural Systems" held at Perth, Western Australia during 29 September to 1 October, 2014.

Subhash Chand

- Attended Workshop on Liaison Officers for SC/ST Rules and Guidelines at ISTM, New Delhi during 20-21 October 2014.
- Participated in 7th National Extension Education Congress 2014 (NEEC 2014) on 'Translational Research-Extension for Sustainable Small Farm Development' organized jointly by Society of Extension Education, Agra; ICAR Research Complex for NEH Region, Meghalaya with Central Agricultural University, Imphal and Assam Agricultural University, Jorhat, at ICAR-RC NEH, Meghalaya, November 8-11, 2014.

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

Raka Saxena

- Participated in IGIDR-IFPRI Conference on Harnessing Opportunities to Improve Agri-Food Systems, at NASC, New Delhi, July 24-25, 2014.
- Poster presentation in XIIth Agricultural Science Congress on Sustainable Livelihood Security of Smallholder Farmers, NDRI Karnal, February 3-6, 2015.

Jaya Jumrani

- International conference on 'Innovation in Indian Agriculture: Ways Forward' organized by Institute of Economic Growth - International Food Policy Research Institute (IEG-IFPRI) held at India International Centre, New Delhi, December 4-5, 2014.

S. K. Srivastava

- Participated in National Symposium on 'Dynamics of Rural Labour Markets:

Implications for Agricultural Growth and Rural Transformation', at NASC Complex, New Delhi, September 15-16, 2014.

Pavithra S.

- Training Workshop on Expert Elicitation at Kathmandu, Nepal, August 11-13, 2014.
- Review Workshop of project partners of Network Project on Market Intelligence, at National Institute of Agricultural Economics and Policy Research, New Delhi, November 10-11, 2014.
- International conference on 'Innovation in Indian Agriculture: Ways Forward' organized by Institute of Economic Growth - International Food Policy Research Institute (IEG-IFPRI) held at India International Centre, New Delhi, December 4-5, 2014.

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	Purpose	Place	Duration
Ramesh Chand	Participate in the meeting to carry forward the collaborative research work between IFPRI and NIAP on Energy and Agriculture in India and presented a seminar on Agriculture Growth, Farm Income and Nutrition in India	IFPRI, Washington, USA	May 19-23, 2014
	UN-ESCAP first meeting of the Working Group on Increasing Economic and Technical Cooperation to Address shared Vulnerabilities and Risks	Bangkok, Thailand	December 10-11, 2014
	Policy dialogue on the Role of Technology Transfer in Agriculture for Sustainable Development Outcomes	Bogor, Indonesia	February 10-11, 2015
	Eleventh Session of Governing Council of U.N. Centre for Alleviation of Poverty and Sustainable Agriculture	Bogor, Indonesia	February 12-13, 2015
Pratap S. Birthal	Attend workshop on Best Practices in Contract Farming: Challenges and Opportunities in Nepa, organized by IFPRI, Ministry of Agricultural Development, Government of Nepal, Institute for Integrated Development Studies (IIDS), and Federation of the Nepal Chambers of Commerce and Industries (FNCCI)	Kathmandu, Nepal	February 10-11, 2015

Name of Scientist	Purpose	Place	Duration
S. S. Raju	Participate in the meeting to carry forward the collaborative research work between IFPRI and NIAP on 'Energy and Agriculture in India'	IFPRI, Washington, USA	May 19-23, 2014
Shinoj Parappurathu	Attend 8 th International Conference of the Asian Society of Agricultural Economists	Dhaka, Bangladesh	October 13-16, 2014
S. K. Srivastava	Visited Potsdam, Germany to participate in Sixth Indo-German Frontiers of Engineering Symposium (INDOGFOE, 2014) organized by Department of Science and Technology (DST) and Alexander Humboldt Foundation	Potsdam, Germany	May 22-25, 2014
Pavithra S.	Attend Training Workshop on Expert Elicitation	Kathmandu, Nepal	August 11-13, 2014

XII. CAPACITY BUILDING ACTIVITIES

Trainings Organized/ Other Meetings

Training Programme on Optimization Techniques for NIAP project Scientists and Research Staff June 10-13, 2014	NIAP, New Delhi
Training Programme on Core Issues in the Agricultural Sector for IES officers October 27-31, 2014	NIAP, New Delhi
Annual Review Workshop of ICAR-Social Science Network Project on 'Market Intelligence' November 10-11, 2014	NIAP, New Delhi
Training Programme on Core Issues in the Agricultural Sector for IES officers December 22-26, 2014	NIAP, New Delhi
Annual Meeting of ICAR- Social Science Network project on 'Regional Crop Planning for Improving Resource use Efficiency and Sustainability' February 20, 2015	NIAP, New Delhi
Training Programme on Emerging Issues in Agricultural Policy Research March 19-25, 2015	NIAP, New Delhi

Induction level training programme for IES officers on Core Issues in the Agricultural Sector

October 27-31, 2014

The induction level training programme for the Indian Economic Service (IES) Officers was organized on "Core Issues in Agricultural Sector" at NIAP, New Delhi during October 27-31, 2014. Dr Raka Saxena, Senior Scientist, NIAP coordinated this training programme. A total of eighteen IES Officers attended the training programme. Since the Officers belonged to diverse background, the training programme was designed such that provided an overview of agricultural sector to the participants. The training programme was held in 22 sessions during five-day (27-31 October), which included three field visits to Agricultural Museum, Indo-Israel Project and Gene Bank. The topics covered during the sessions included technological innovations and options, food security, sustainable dimension, marketing and trade, climate change, dynamics of agricultural employment, etc. Besides faculty from NIAP, the distinguished experts from various national and international organizations were invited to share their views and experiences with the participants.

The training programme was evaluated by trainee officers and revealed that nearly 90 per cent of them were very satisfied with training module. Majority of the participants were highly



IES Trainee Officers with Prof Ramesh Chand, the then DDG (Agricultural Education) ICAR and Dr Pratap S. Birthal, the then Acting Director during the inaugural function



IES Trainee Officer receiving certificate from Dr Mruthynjaya, Former Director, NIAP and Dr Pratap S. Birthal, the then Acting Director during the Valedictory Function

satisfied with the contents of the lectures delivered and opined that the programme helped in broadening their understanding about core issues in agriculture. The participants suggested increase in duration of programme. The participants also suggested to increase the number of field visits in order to give them field exposure and real technology demonstration.

Annual Review Workshop of ICAR Social Science Network Project on Market Intelligence

November 10-11, 2014

The second annual review workshop of social science network project on Market Intelligence was organized at the National Institute of Agricultural Economics and Policy Research, New Delhi, during November 10-11, 2014. The meeting intended to take stock of progress of project activities made at collaborating centres. The programme was attended by 38 participants



Participants and staff of NIAP, training programme on 'Emerging Issues in Agricultural Policy Research' March 19-25, 2015

from the lead centre as well as collaborating centres. In the programme, while inaugurating the workshop, Prof. Ramesh Chand, the then DDG (Agricultural Education) Indian Council of Agricultural Research (ICAR) highlighted the importance of social science research and to make the presence felt and contribution made by the social scientists to the NARS. Dr. P. S. Birthal, Acting Director, NIAP, shared a brief background of the relevance of project and also NIAP's expectations from project and collaborating partners. Dr. Birthal cautioned the collaborating centres while disseminating the timely information to stakeholders and suggested to follow cost effective delivery mechanism. The inaugural session followed other technical sessions where the collaborating centres presented their performance during 2014-15 and also the action plan for the remaining period.

Induction level training programme for IES officers on Core Issues in the Agricultural Sector December 22-26, 2014

The other induction level training programme for the Indian Economic Service (IES) officers second in series in the year 2014 on '*Core Issues in the Agricultural Sector*' was organized at NIAP during December 22-26, 2014. The programme was coordinated by Dr S. S. Raju, Principal Scientist, NIAP. A total of 32 Trainee Officers participated in the programme. The training programme provided an overview of important issues related to agriculture. All the trainees were provided lecture materials given by faculty members in a pen drive to economize the use of papers. The lecture sessions were appreciated by the trainees. A total of 21 lecture sessions were organized in five-day



Participants and staff of NIAP, training programme on "Core Issues in the Agricultural Sector" during December 22-26, 2014

training program, which included one field visit to ICAR- National Agricultural Science Museum. The themes of the sessions included wide variety of topics like technological innovations and options, food security, sustainable dimension, marketing and trade, climate change, dynamics of rural employment, etc.

Keeping in mind the usefulness of the course to IES officials and shortage of faculty for teaching in this area, efforts were made to provide lectures from the experts outside the NIAP also. Besides NIAP faculty, lectures from IARI, IASRI, DDG (Horticulture), DDG (NRM) were also invited to interact with participants.

Most of the participants were very well satisfied with the lectures delivered and opined that the training helped in shaping their skills. In general, the training schedule was found to be comfortable. However, the participants suggested increasing the duration of the training (at least for 2 weeks). The participants also suggested increase the number of field visits in order to give them field exposure. Though the training schedule was found to be quite comprehensive, the participants suggested some more dimensions for coverage in the future training programs like issues of agriculture in WTO, seed marketing, contract farming, future's trading. It was also suggested that modeling used in agricultural research and policy may also be covered in the future training programs.

Annual Review Meeting of Network Project on Regional Crop Planning for Improving Resource Use Efficiency and Sustainability

February 20, 2015

The annual review meeting of ICAR Social Science Network Project 'Regional Crop Planning for Improving Resource Use Efficiency and Sustainability' was held at NIAP, New Delhi, on February 20, 2015. The main objective of the meeting was to review the progress of project activities being undertaken in collaboration with partners and decide future plans. Dr. Ramesh Chand, Director and Chairman of the meeting in his inaugural address briefly outlined the importance and relevance of the project. He stated that it was the need of the hour to use natural resources efficiently as the natural resources are limited. He emphasized that discussion on agricultural growth and food security without the regional crop planning which lead to resource use efficiency is difficult and non-sustainable. He mentioned that as future plans are decided, partners should develop draft project report and upload on NIAP website for comments and suggestions.

During the technical sessions, the collaborating partners presented the progress made and future plans. After presentation, Chairman suggested that objectives 2 and 5 are core to this project, therefore each centre need to take two activities sincerely: (i) estimate cost and returns of selected crops under different regions of the country based on market and economic prices and natural resource valuation method, and (ii) develop optimum crop plan at regional levels for better resource use efficiency, sustainability and optimizing farm net income. Chairman emphasised that for calculating economic contribution from pulses through nitrogen fixation, centre need to utilize only published information from reliable sources. Several other recommendations were made in the meeting for bringing accuracy in the estimates.



Emerging Issues in Agricultural Policy Research **March 19-25, 2015**

Agriculture is now facing multiple complex challenges- declining productivity growth, degrading soils and water resources, depleting soil micro-nutrients, rising cost of production, and climate change, besides structural problems of declining landholding size and excessive employment pressure. If these trends were to continue, they would severely undermine the viability of agriculture and food security. Ensuring adequate food and nutrition to such a large population, without much food imports, there is a major challenge before researchers and development policy planners. On supply side, land and water have been and will remain the most limiting constraints. Thus, there is a need to discuss and share insight of experts on these emerging issues with multi-disciplinary scientists working in NARS. To fill this gap, a training programme on 'Emerging Issues in Agricultural Policy Research' was organised at NIAP during March 19-25, 2015, with following objectives:

1. To sensitize and expose participants to emerging issues in agriculture, and
2. To improve understanding of emerging issues in agricultural policy research.

The programme was coordinated by Dr Rajni Jain and Dr S. S Raju under the overall guidance of Prof. Ramesh Chand, Director of NIAP. A total of twenty-four participants attended the programme. The multidisciplinary team of participants comprising agricultural economics (14), followed by veterinary sciences (3), and 1 each from livestock economics, fishery science, plant genetics, animal genetics, microbiology, food and nutrition. Usefulness and coverage of the content through lecture delivered was close to 98 per cent as opined by the trainee participants themselves. All the trainees were provided with sufficient lecture notes in the form of a Pen drive containing lectures delivered by the faculty members.

XIII. LECTURES DELIVERED BY NIAP SCIENTISTS

Name of Scientist	Topic and Date	Venue
Ramesh Chand	Performance of agriculture and food security in India in training programme for IES probationers December 22, 2014	NIAP, New Delhi
	Indian agriculture towards 2050 in training programme for IES probationers December 23, 2014	NIAP, New Delhi
	Agricultural marketing and price policy in training programme for IES probationers December 26, 2014	NIAP, New Delhi
	Performance of agriculture and food security in India in ICAR-NIAP training programme on Emerging Issues in the Agricultural Policy Research March 19, 2015	NIAP, New Delhi
	Fertilizer use in the context of NBS in ICAR-NIAP training programme on Emerging Issues in the Agricultural Policy Research March 21, 2015	NIAP, New Delhi
	Agricultural marketing and price policy in ICAR-NIAP training programme on Emerging Issues in the Agricultural Policy Research March 21, 2015	NIAP, New Delhi
	Indian agriculture towards 2050 in ICAR-NIAP training programme on Emerging Issues in the Agricultural Policy Research March 23, 2015	NIAP, New Delhi
	Data sources and methods in ICAR-NIAP training programme on Emerging Issues in the Agricultural Policy Research March 25, 2015	NIAP, New Delhi
Pratap S. Birthal	Resilience of Indian agriculture to climate change, in the training programme for IES probationers October 28, 2014	NIAP, New Delhi
	Agriculture diversification for sustainable and inclusive growth, in the training programme for IES probationers October 28, 2014	NIAP, New Delhi

	Livestock, agricultural growth and rural poverty, in the training programme for IES probationers October 29, 2014	NIAP, New Delhi
	Developing modern value chains to connect smallholder to markets, in the training programme for IES probationers December 22, 2014	NIAP, New Delhi
	Resilience of Indian agriculture to climate change, in the training programme for IES probationers December 22, 2014	NIAP, New Delhi
	Agricultural diversification, small holders and markets in the training programme for IES probationers December 23, 2014	NIAP, New Delhi
	Livestock, agricultural growth and rural poverty, in the training programme for IES probationers December 23, 2014	NIAP, New Delhi
	Agricultural diversification and value chain development, in ICAR-NIAP training programme on Emerging Issues in the Agricultural Policy Research March 19, 2015	NIAP, New Delhi
	Impact assessment of frontier agricultural technologies in ICAR-NIAP training programme on Emerging Issues in the Agricultural Policy Research March 23, 2015	NIAP, New Delhi
Usha Rani Ahuja	Gender issues in agriculture in training programme for IES probationers December 22-26, 2014	NIAP, New Delhi
S. S. Raju	Risks and risk management in agriculture in training programme for IES probationers October 28, 2014	NIAP, New Delhi
	Risks and risk management in agriculture in training programme for IES probationers December 24, 2014	NIAP, New Delhi
	Risks and risk management in agriculture in the training programme on Emerging Issues in Agricultural Policy Research March 20, 2015	NIAP, New Delhi

	Regional crop planning for improving resource use efficiency and sustainability in training programme on Emerging Issues in Agricultural Policy Research March 21, 2015	NIAP, New Delhi
Rajni Jain	PME, PIMS, ISO 9001:2008 Certification, IRC May 6, 2014	NIAP, New Delhi
	Weblog analysis for monitoring website performance October 21, 2014	IASRI, New Delhi
	Total factor productivity trends in Indian agriculture, in training programme for IES probationers December 22, 2014	NIAP, New Delhi
	Total factor productivity trends in Indian agriculture, in training programme on Emerging Issues in Agricultural Policy Research March 20, 2015	NIAP, New Delhi
Sant Kumar	Agricultural R&D policy in an era of IPR, in training programme for IES probationers December 22, 2014	NIAP, New Delhi
Raka Saxena	Role of market intelligence in agriculture, in training programme for IES probationers October 27-31, 2014	NIAP, New Delhi
	Market intelligence efforts in India, in training programme for IES probationers December 22-26, 2014	NIAP, New Delhi
	Role of market intelligence in agriculture in training programme on Emerging issue in Agricultural Policy Research March 19-25, 2015	NIAP, New Delhi
Shinoj Parappurathu	Agricultural outlook models for medium- and long-term projections, in 21-day training programme September 24, 2014	IARI, New Delhi
	Managing food price volatility and inflation in India, in 21-day training programme September 26, 2014	IARI, New Delhi
	Agricultural outlook models for medium-and long-term projections, in training programme for IES probationers December 22-26, 2014	NIAP, New Delhi

S. K. Srivastava	Food and nutritional security in India: Availability and accessibility aspects in Global Food and Nutrition Session at the Indo-German Frontiers of Engineering (INDOGFOE, 2014) May 22-25, 2014	Potsdam, Germany
	Dynamics of rural labour market in India, in training programme for IES probationers October 27-31, 2014	NIAP, New Delhi
	Changes in employment and its implications for agriculture in rural India, in training programme for IES probationers December 22-26, 2014	NIAP, New Delhi
	Changes in employment and its implications for agriculture in rural India, in training programme on Emerging Issues in Agricultural Policy Research March 19-25, 2015	NIAP, New Delhi
	Regional crop planning for improving resource use efficiency and sustainability: A case study on groundwater irrigation in Punjab, in training programme on Emerging Issues in Agricultural Policy Research March 19-25, 2015	NIAP, New Delhi
Jaya Jumrani	Food and nutrition security in training programme for IES probationers October 30, 2014	NIAP, New Delhi
Pavithra S.	Fertilizer use in the context of NBS in training programme for IES probationers October 28, 2014	NIAP, New Delhi
	Fertilizer use in the context of NBS in training programme for IES probationers December 24, 2014	NIAP, New Delhi
T. Kingsly Immanuelraj	Statistical methods for research: Introduction and hands on session September 12, 2014	IARI, New Delhi

XIV. PERSONNEL

Scientific

Name	Designation	Area(s) of research
Ramesh Chand (till 17-9-2014) & from 21-11-2014 onward	Director	Agricultural Growth and Modelling Markets and Trade
Pratap S. Birthal (21-9-2014 to 20-11-2014)	Principal Scientist Director (Acting)	Institutional Change Technology Policy Sustainable Agricultural Systems Markets and Trade
Usha Rani Ahuja	Principal Scientist	Technology Policy Institutional Change
S. S. Raju	Principal Scientist	Sustainable Agricultural Systems Institutional Change
Anjani Kumar*	Principal Scientist	Markets and Trade Agricultural Growth and Modelling Institutional Change
M. B. Dastagiri	Principal Scientist	Markets and Trade
Rajni Jain	Principal Scientist	Agricultural Growth and Modelling Technology Policy
Sant Kumar	Principal Scientist	Technology Policy Agricultural Growth and Modelling
Subhash Chand	Principal Scientist	Institutional Change Sustainable Agricultural Systems
P. A. Lakshmi Prasanna (till 31-5-2014)	Senior Scientist	Institutional Change
Raka Saxena	Senior Scientist	Markets and Trade
Shinoj Parappurathu	Scientist	Markets and Trade
Sajesh V. K.**	Scientist	Institutional Change
T. Kingsly Immanuelraj	Scientist	Agriculture Growth and Modelling
S. K. Srivastava	Scientist	Agriculture Growth and Modelling
Jaya Jumrani	Scientist	Institutional Change Agriculture Growth and Modelling
Pavithra S.	Scientist	Technology Policy Markets and Trade
Viswanatha Reddy K.	Scientist	Technology Policy

* On deputation, ** On study leave

Technical

Name	Designation
Prem Narayan (since 12.09.2013)	Chief Technical Officer (T-9)
Prem Narayan (till 11.9.2013)	Assistant Chief Technical Officer (T 7-8)
Khyali Ram Chaudhary	Senior Technical Officer (T-6)
Mangal Singh Chauhan	Senior Technical Officer (T-6)
Sonia Chauhan	Senior Technical Officer (T-6)
Satinder Singh	Senior Technical Assistant (Driver)

Administrative

Name	Designation
A. K. Manchanda (till 24-4-2014)	Administrative Officer
Jagan Swaroop (since 22-5-2014)	Administrative Officer
Sushil Kumar Yadav	Assistant Administrative Officer
Rishi Kant Singh (since 30-7-2014)	Assistant Finance & Accounts Officer
Umeeta Ahuja	Private Secretary
Inderjeet Sachdeva	Assistant
Yatin Kohli	Assistant
Lalit Sharma	Assistant
Sandeep Mathur	Assistant
Deepak Tanwar	Junior Stenographer
Ajay Tanwar (since 25-8-2014)	Upper Division Clerk
Ajay Tanwar (till 24-8-2014)	Lower Division Clerk
Mahesh Kumar	S. S. Gr II
Mahesh Pal	S. S. Gr I

XV. TEACHINGS

Name	Course name (credit hrs)	Course Leader/ Associate	Institution
Rajni Jain	Artificial Intelligence (2+1)	Course Leader	IARI, New Delhi
Shinoj P.	Agricultural Price Analysis (2+1)	Course Leader	IARI, New Delhi
	Marketing Management (2+1)	Course Associate	IARI, New Delhi
S. K. Srivastava	Agricultural Marketing (2+1)	Course Leader	IARI, New Delhi
T. Kingsly Immanuelraj	Quantitative Analysis for Marketing and Business Analysis (2+1)	Course Associate	IARI, New Delhi
	Agricultural Production and Resource Economics II (Production Function Analyss) (2+1)	Course Associate	IARI, New Delhi

XVI. OTHER INFORMATION

NIAP Annual Day

The NIAP Annual Day was celebrated on 1 May, 2014 in the premises of the Institute. The programme was organized in two sessions of morning and evening. In the morning session, Prof. T. S. Papola, Honorary Professor, Institute for Studies in Industrial Development (ISID) delivered the 7th Professor Dayanatha Jha Memorial lecture on “*India’s Economic Growth During the Last Two Decades: Issues of Inclusiveness and Sustainability*”. The speaker highlighted the new growth story of India which has taken India closer to becoming a major economic power in near future. The per capita income in India during 2005-2011 increased by 6% per annum, which is unprecedented. The speaker

demonstrated that the growth has been inclusive as the rate of decline in poverty has shown progressive increase. He also shared that poverty reduction elasticity with respect to growth in per capita income has more than doubled during 2004-05 to 2011-12 as compared to 1993-94 to 2004-05. However, disparities in per worker income in agriculture and non-agriculture have risen due to non-realization of structural change in work force. The speaker termed it as a major failure of the growth pattern. The lecture expressed serious concern about slow employment growth and rising income inequalities in the country.

Promotion of Official Language

A Committee on Official Language is in place at the Institute to promote the use of official language (Hindi) among staff of the Institute. The Committee monitors progress of various actions being undertaken and suggests measures for improvement. It coordinates and helps in executing the Council’s orders and reports from time to time. Notings and drafting at the Institute were above 75 per cent in administrative files and correspondence in



official language Hindi. The Institute published one popular articles and three policy brief (i.e. *Niti Sankshep*) and executive summary of annual report 2013-14 in Hindi language.

The Committee on Official Language organized a series of events during 'Hindi Week' (15-22 September 2014) to generate awareness among staff about the use of Hindi. The activities which were organized during the 'Hindi Week' included debate on the topic "आनुवंशिक रूप से संशोधित फसलें : मानव जीवन के लिये वरदान या अभिशाप" and essay writing on topics 1. जलवायु परिवर्तन का कृषि पर प्रभाव एवं अनुकूलन 2. भारत में कुपोषण की समस्या – कारण एवं निवारण। The programme on *Shidhi Bat* was conducted on issues related to women rights and empowerments in society. Knowledge of administrative words were tested through dictation in both Hindi and English languages. The programme on poem recitation by staff of Institute was appreciated by the invited judges consisting Dr. Y. R. Meena, Deputy Commissioner (Agriculture), Govt. of India, and Dr. Puran Chand (formerly) Principal

Scientist at IARI, New Delhi. The other programmes like extempore speeches, anakshari, quiz, etc. were also organized. The participation of staff in these events was overwhelming. In addition, a workshop on 'Awareness of Constitutional Articles on Official Language' was organized on December 2, 2014 to promote the use of Hindi in day to day official notings.

In the valedictory function of 'Hindi Week' Dr. Rameshwar Singh, Project Director, Directorate of Knowledge Management in Agriculture, ICAR, New Delhi, was the Chief Guest and distributed the prizes to participants. Faculty from the Institute and other neighbouring institutions served as judges during different events to select the winners.

जलवायु परिवर्तन का कृषि पर प्रभाव एवं अनुकूलन
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- ऊषा अहूजा, प्रेम नारायण एवं अमरजीत सिंह, (2014) बाजरे की फसल में लेजर लेवलिंग का प्रभाव : हरियाणा के मेवात जिले का एक अध्ययन, भारतीय कृषि अनुसंधान पत्रिका, 29, अंक 2, पेज सं. 65-69।

The details of events and prize winners are as follows:

S. No.	Events	Prize winners	S. No.	Events	Prize winners
1	Debate	Sonia Chauhan Khyali Ram Chaudhary Sanjay Chayal	5.	Extempore	Sushil Kumar Yadav Khyali Ram Chaudhary Dr. Pavithra S.
2.	Essay Writing	Kavita Pal Sushil Kumar Yadav Sonam	6.	General Knowledge	Team B Ist prize Team D IInd prize
3.	Dictation	Sushil Kumar Yadav Lalit Sharma Sonam	7.	Poem Recitation	Dr. Md. Ejaz Anwer Khyali Ram Chaudhary Sonia Chauhan
4.	Translation	Khyali Ram Chaudhary Sonia Chauhan Yatin Kohli	8.	Special Prize	Prem Narayan Ajay Tanwar

- रमेश चन्द एवं जया जुमरानी (2014) भारत में खाद्य सुरक्षा एवं अल्पपोषण : वैकल्पिक मानकों तथा आय के प्रभाव का मूल्यांकन, नीति संक्षेप संख्या 38, राष्ट्रीय कृषि आर्थिकी एवं नीति अनुसंधान संस्थान, नई दिल्ली।
- रमेश चन्द एवं प्रताप सिंह बिरथल (2014) बारहवीं पंचवर्षीय योजना में खाद्यन्नों के लिये बफर स्टॉक मानदंड, नीति संक्षेप संख्या 39, राष्ट्रीय कृषि आर्थिकी एवं नीति अनुसंधान संस्थान, नई दिल्ली।
- रमेश चन्द एवं एस. के. श्रीवास्तव (2014) ग्रामीण श्रमिक बाजार की बदलती संरचना : रूझान, चालक एवं कृषि के लिये निहितार्थ, नीति संक्षेप संख्या 40, राष्ट्रीय कृषि आर्थिकी एवं नीति अनुसंधान संस्थान, नई दिल्ली।
- विशिष्ट सारांश, वार्षिक प्रतिवेदन, (2013–2014) राष्ट्रीय कृषि अर्थिक एवं नीति अनुसंधान संस्थान, नई दिल्ली।
- पंचवर्षीय प्रतिवेदन संसदीय राजभाषा समिति निरीक्षण प्रश्नावली, राष्ट्रीय कृषि अर्थिक एवं नीति अनुसंधान संस्थान, नई दिल्ली।

Participation in ICAR Sports Meet

The NIAP Sports Team comprising Subhash Chand, Ajay Tanwar, Satinder Singh and Mahesh Kumar participated in the ICAR Zonal Tournament at National Bureau of Soil Survey and Land Use Planning (NBSS&LUP) during September 16-20, 2014. The small team participated enthusiastically in various events.

Promotions

- Sh. Prem Narayan, Assistant Chief Technical Officer promoted to the post of Chief Technical Officer w.e.f. 12-9-2013.
- Sh. Ajay Tanwar, Lower Division Clerk promoted to the post of Upper Division Clerk w.e.f. 25-8-2014.

New Joining

- Sh. Jagan Swaroop joined as Administrative Officer on 22-5-2014.
- Sh. Rishi Kant Singh, joined as Assistant Finance and Accounts Officer on 30-7-2014.

Transfers

- Sh. A. K. Manchanda, Administrative Officer transferred to ICAR-Indian Agricultural Statistics Research Institute, New Delhi on 24-4-2014.
- Dr. (Ms) P.A. Lakshmi Prasanna, Senior Scientist (Agricultural Economics) transferred to ICAR-Directorate of Rice Research, Hyderabad on 31-5-2014.



March fast performed by participating teams



NIAP Badminton Team in action

Annual (April 1, 2013 to March 31, 2014) Performance Evaluation Report in respect of RFD 2013-14 of RSCs i.e. Institutes

Name of the Division: Agricultural Education
Name of the Institution: National Institute of Agricultural Economics and Policy Research (NIAP), New Delhi.
RFD Nodal Officer of the RSC: Dr. S.S. Raju, Principal Scientist

S.N.O.	Objective(s)	Weight	Action(s)	Success Indicator(s)	Unit	Weight	Target / Criteria Value				Achievements	Performance		Percent Achievements against Target values of 90% Col.	Reasons for shortfalls or excessive achievements, if applicable	
							Excellent 100%	Very Good 90%	Good 80%	Fair 70%		Poor 60%	Raw Score			Weighted Score
1.	Conduct research on economic and policy aspects of agriculture and provide policy inputs to stakeholders	69	Conduct in-house and collaborative research studies	Research reports prepared, research papers, policy papers, and policy briefs published	Number	45	30	27	25	23	21	30	100	45	111.11	Some publications are demand driven
2.	Capacity development in agricultural economics and policy research	20	Organizing training in economic and policy analysis	Person days of training	Number	20	550	500	480	450	420	600	100	20	120	Normally we organize ICAR Summer School once in two years
3	Efficient Functioning of the RFD System	3	Timely submission of Draft RFD (2013-14) for approval	On-time submission	Date	2	15/05/2013	16/05/2013	17/05/2013	20/05/2013	21/05/2013	0	0	0		
4	Administrative Reforms	4	Implement ISO 9001 as per the approved action plan	% Implementation	%	2	100	95	90	85	80	0	0	0		Administrative Officer and Member Secretary ISO resigned. Now, the work is under progress.
			Prepare an action plan for Innovation	On time submission	Date	2	30/07/2013	10/08/2013	20/08/2013	30/08/2013	10/09/2013	0	0	0		

5	Improving Internal Efficiency/ responsiveness/ service delivery of Ministry/ Department	4	Implementation of Sevottam	Independent Audit of Implementation of Citizen's Charter	%	2	100	95	90	85	80	100	100	2		
				Independent Audit of implementation of Public Grievance Redressal System	%	2	100	95	90	85	90	100	100	2		

Total Composite Score: 93.0
Rating: Very Good

Procedure for computing the Weighted and Composite Score

1. **Weighted Score of a Success Indicator = Weight of the corresponding Success Indicator x Raw Score / 100**
2. **Total Composite Score = Sum of Weighted Scores of all the Success Indicators**



हर कदम, हर डगर
किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद

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