ANNUAL REPORT 2002-2003

National Centre for Agricultural Economics and Policy Research

राष्ट्रीय कृषि आर्थिकी एवं नीति अनुसंधान केन्द्र

ICAR

NCAP Annual Report 2002-2003

Published
July, 2003

Published by
Dr. Mruthyunjaya
Director, NCAP
New Delhi

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

NCAP

Annual Report 2002-2003

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

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Preface

It is yet another year of hard work, superior performance and fulfillment to the Centre. National Centre for Agricultural Economics and Policy Research (NCAP), a brand name in ICAR for performance, has always delivered on account of effective workplace, emotionally charged staff and above all continued feedback and loyalty from you all, our valued customers. Our strength is that we have tapped the resources and emotions of humans for making unlimited competitive advances. And we firmly trust and believe that this is the only front on which forward strides can occur.

The most outstanding contributions of NCAP during the reporting year relates to consolidating gains in institutionalizing PME mechanisms in NARS. Few studies completed by some SAUs on research prioritization and 25 PME Cells continuing efforts in the impact assessment of technologies under NATP give us immense satisfaction. Other significant achievements include: understanding the nature and dynamics of agricultural diversification; potential and problems (particularly feed) of livestock sector for growth and poverty alleviation; mapping sustainability status of agro-ecological sub regions using sustainable livelihood security indices; value of technological interventions towards food security of poor people in underprivileged regions of tribal, backward and hilly regions; extent of climate induced natural calamities and effectiveness of farmers adaptive mechanisms; nature and trend of total factor productivity in Indo-Gangetic Plains; constraints of rice economy in eastern India: economics of sub surface drainage and resource conservation technologies; impact of interventions of Government in food grain market in terms of long term food security; potential of forging regional trade agreements; trade prospects in fisheries sector; potential and problems of production and marketing of medicinal plants; technical efficiency in oilseed production; performance of the agricultural innovation system and specific lessons for research policy and practice; scientific manpower position and policy in ICAR with emphasis on improving research efficiency; developing a cafeteria for women in agriculture; agricultural interventions and linkages among different departments in addressing malnutrition; paradigm shifts in Indian seed system etc.

The Centre continued its outreach programme with an NGO in Western UP and helped to take up production of vegetables, which have enhanced profits of farmers.

The Centre did very well in several national and international collaborative projects, publications and policy dialogue with ICAR and others concerned. Infact, the Centre is flooded with offers for collaborative academic and policy analysis works, some of which could not be conceded on account of non-availability of staff.

Dr. Rasheed Sulaiman V has ably compiled this report. Mr. N. Suresh, provided help in preparation of this manuscript. I am highly thankful to them and all others who have helped in various ways.

July 2003

Mruthyunjaya
Director

EXECUTIVE SUMMARY

Annual Report, 2002-2003

The National Centre for Agricultural Economics and Policy Research (NCAP) expanded its research areas and linkages with other organisations in the current year. The Centre has at present 18 scientists (including one National Professor) and 14 other staff in position with a budgetary outlay of Rs. 331.5 lakhs for the period 2002-03. A high level Research Advisory Committee guides the centre. It also has a Management Committee to advise the Centre on research administration. A number of other internal committees facilitate decentralised management of the Centre's activities. The research at the centre is conducted under five broad themes, viz., Technology policy, Sustainable agricultural systems, Markets and trade, Institutional change and Agricultural growth and modeling. A senior professional heads each theme. Salient research achievements during the year are summarized below.

Agriculture in South Asian countries is diversifying towards high value crops. Bangladesh, Bhutan and Nepal show less diversity as compared to other countries. In most of the countries, crop diversification is taking place through area expansion. However it is through crop substitution in India and Srilanka. Agriculture in the semi-arid tropics of India is diversifying steadily in favour of fruits, vegetables, milk, meat and eggs. The incidence of diversification was lower in highly irrigated and high rainfall areas. The tendency to diversify was noticed to be higher on small farms. Infrastructure particularly roads was identified as a major determinant of diversification towards horticulture and livestock enterprises.

Over the last two decades, per capita consumption of various livestock products in India has increased considerably. Per capita consumption of milk and egg has almost doubled. Growth in per capita consumption of meat and fish was relatively slow. There exists a significant positive relationship between income and per capita consumption of livestock products. Increase in production might come from increase in number of animals and their productivity. The first option does not seem to be practical considering chronic scarcity of feed and fodder, and declining per capita land availability, besides its adverse effects on the environment. The second option emphasizes optimisation of livestock population commensurate with the feed resources, and generation and dissemination of yield-enhancing technologies. At present, productivity of different species of livestock is low compared to the world average. This indicates that there is a considerable scope to raise the production through yield improvement measures.

The demand and supply functions for major livestock products were estimated for making projections for the year 2020. In 2020, surplus production would occur to the order of 84.9 million litres of milk, 68.9 billion eggs, 7.9 million tonnes of beef and buffalo meat, 4.5 million tonnes of fish and 1.9 million tonnes of chicken. However, there would be shortage of 3.1 million tonnes of mutton and goat meat. Increasing fodder supply, remunerative prices to livestock products, and investments in technology improvements in livestock sector are critical to bridge the demand-supply gap in livestock products.

Growth in India's livestock sector is considered to be poverty reducing as livestock wealth is more equitably distributed than land. Marginal and small holders (<2ha) comprise 63 % of the total households and share 34 % of land. In contrast they share 67 % of bovine, 65 % of ovine, 70% of pigs and 75 % of poultry. Our analysis has confirmed that the growth in livestock sector is important in reducing poverty in comparison to growth in other sections of agricultural sector.

Climate induced natural disasters (CINDs) like drought, flood and cyclone have become serious problems to Orissa and households have adopted one or the other coping strategies. The common strategies (in order) are diversifying food and income sources; adjustment in crop practices; adjusting livestock keeping practices; risk minimisation through share-cropping and building up stocks and inventories; seeking institutional support like demanding relief; managing scarce water resources; etc. Besides these, government relief and rehabilitation programmes have also helped the poor to reduce the risk of CIND vulnerability. However, there is an urgent need for a shift in focus from food aid to long-term mitigation measures such as drought proofing, development of resistant cultivars (against drought, flood and salinity), infrastructural development in terms of road and irrigation, and generating off-farm employment opportunities, etc.

Sustainability status of 52 Agro-ecological sub-regions (AESRs) was mapped using the sustainable livelihood security indices. 16 AESRs covering 142 districts has a relatively low sustainability value and these regions should receive immediate priority attention and preference.

Water-food security scenario analysis was conducted for the AESRs 4.4 covering the state of Madhya Pradesh. Comparative analysis of value of water in Madhya Pradesh's major crops has revealed that among kharif crops, soybean followed by maize and groundnut has outdone the paddy by being more responsive with high marginal net benefits in the ratio of 2 to 3 times per cubic meter of water used as compared to that of paddy. Among rabi crops, mustard and gram are superior to wheat. Considering the competition for water between soybean and rabi crops, the value of marginal net benefits per cubic meter of water for soybean is almost as much as gram and mustard and much more attractive than wheat as well as paddy in kharif. Despite the increasing scarcity of water, the productivity of water is dismally low in the state. This is partly due to wastage caused by dilapidated infrastructure, but more importantly it is due to a lack of regulation, appropriate volumetric or quasi-volumetric pricing, incentives along with inadequate exploration of comparative advantage of growing alternative crops.

An assessment of sub surface drainage installation in Haryana revealed multiple benefits that includes substantial increase in crop yield ranging from 29 to 35%; crop intensification and diversification toward high value crops; decrease in salt content in the drained land by 35% as compared to 2.2% increase in un-drained lands; improvement in the water table; and increase in gainful employment by 85 mandays/ ha. Results of the decomposition analysis showed that absolute contribution of drainage in the yield increase is to the tune of 40 to 70 %. However, despite economic, social and environmental benefits, the adoption of this technology is still not very high. Appropriate institutional arrangements based on participatory approaches need to facilitate better adoption of this technology.

The study of impact of an integrated technology intervention approach for improving the food security status of poor people of under privileged regions of tribal, backward and hilly areas of India, revealed that, of the total sample households, about 71 % is food insecure. Intensity of food insecurity within the group depicts that on an average almost 33 % households were destitute (poorest of the poor), followed by 19 % each, very poor and poor. Among various technology interventions, the benefits-cost ratio is higher in case of minor millet followed by migratory sheep, pen culture and carp polyculture. Lack of irrigation facilities, low price of the produce and non-availability of quality seeds are the major constraints in the cultivation of minor millets. Lack of veterinary facilities has been the major constraining factor in the case of migratory sheep, whereas, non availability of the carp seed and fingerlings in the locality in time is the major limiting factor for technology adoption in fisheries.

A review study on socio-economic aspects of rice economy in eastern India revealed that more attention was given to studies on agricultural technology assessment during the 80's and 90's at the cost of other important areas such as sustainability, agricultural risk and gender issues. Rice is an important crop covering more than 50% of the total cropped area in Eastern India. But the productivity is low and there is a wide fluctuation in area, production and yield. Cultivation of boro rice, if backed by appropriate policy interventions can bring rice revolution in the region.

Demonstration of zero tillage technology in wheat during the last 5-6 years has facilitated the large-scale adoption of this technology among farmers in Haryana and Bihar. Apart from demonstrations, small modification in the zero-till drill frame, active participation of the manufacturers in producing the drill, training given by the government and researchers on its manufacture, and provision of subsidy by the government have all contributed to the adoption of this technology. This shows the importance of technology refinement and dissemination efforts and the need of public-private partnership in the development and adoption of technologies.

The share of the rice-wheat based system to the gross cropped area in the Indo-Gangetic plains increased during the period 1985-1995. Expansion in area under rice-wheat has generated enormous employment opportunities in this region. Though yield levels of rice and wheat were lower in Middle and Upper Gangetic Plains, these were produced more efficiently than the Trans-Gangetic Plain, where yields were considerably higher. High cost in the Trans-Gangetic Plain region was due to injudicious use of nutrients, irrigation water and energy. On the other hand, the Middle Gangetic Plain is using too little resources compared to Trans-Gangetic Plain.

The government's foodgrain procurement, distribution, and buffer stocking programmes during 1990s have had negative impact of repressing private foodgrain marketing, undercutting its potential contribution to long term food security. Mere announcement of higher support prices for commodities, which are not effectively backed up by procurement arrangement, does not serve the purpose of raising level of prices received by producers. Higher procurement prices caused adverse impact on the margin of private trade, which slowly started withdrawing from the market. Involvement of private sector in foodgrain marketing has to be given due attention. In the long run, country needs to develop new mechanisms to provide protection to farmer's income as price intervention alone results in several distortions. Development of a viable crop insurance mechanism and a system of "deficiency price payment" are necessary to protect the farmers' interests.

Under the current context of globalisation, it has become extremely important for Asian countries to forge regional trade agreements and identify potential sub-regional groupings for mutually beneficial trade. The Food and Agriculture Organisation (FAO) should sensitise the various governments in Asian countries about the benefits of forging mutually beneficial trade blocks and facilitate move towards regional integration of agricultural trade. This would require studies on mutually beneficial combinations of countries for free regional trade in various commodities, dissemination of findings to policy makers, technical exchanges to acquire knowledge and improve understanding of trade opportunities and trade environment in countries of the region, and capacity building for trade analysis and promotion.

The export basket of fisheries products is reasonably diversified. In value terms, the diversification index has showed an increasing trend; it increased from 0.40 in TE 1989 to 0.54 in TE 2000. Revealed Comparative Advantage analysis has indicated that the fisheries sector is quite competitive. For 1 % increase in the world fisheries trade, export demand for Indian fisheries would increase by about 0.42 %. With 1 % reduction in Indian export price, export demand for Indian fisheries sector would increase by 1.13 %.

After signing the World Trade Organization (WTO) agreement, a number of fisheries products were moved to the Special Import License (SIL) and freely importable lists since 1997 onwards. The tariff structure in the fisheries sector has also undergone a sea change. Although it is too early to predict the exact impact of removal of QRs on trade in fisheries sector, higher tariff rates combined with attaining competitiveness of Indian fish and fish products would only protect the surge of imports of fish and fish products.

Productivity with efficiency in input use is necessary for agricultural commodities to remain competitive in domestic and global markets. For instance, Madhya Pradesh with around 4.5 mha of area under soybean accounts for 70% of the area as well as production share in India. The productivity of soybean is currently 1.1 t/ha. But if the crop could be provided with one-supplemental irrigation of 10 cm with water stored in the large and small dams, it would result in an yield increase of 0.42-0.55 tons/ha. This yield increase would also make Indian soybean competitive in relation to US soybean, which is competitively priced currently.

Though several studies have established the high economic potential of medicinal plants, their cultivation has not picked up at the pace required for meeting the demands of the herbal industry. Absence of formal marketing linkages and effective buy-back arrangements are considered as the biggest hurdle in the development of medicinal plants sector. Lack of co-ordination among various stakeholders, viz., government departments, research organisations, traditional medicine sector and private industrial houses is yet another important constraint. Innovative institutional arrangements, effective legislative and policy instruments to deal with post-WTO scenario and a comprehensive technology portfolio are needed to fully harness the potential of medicinal plants sector in India.

A study on plant variety protection and food security in the developing countries revealed that the plant breeder's rights have differential impact across crops. Though plant breeders' rights have facilitated access to improved foreign varieties in certain cases, this has yet to contribute to food security. Developing countries should draw upon these experiences while framing and implementing their legislation for protection of plant genetic resources and their impact on food security.

Oilseeds production has more than doubled from 10 million tonnes in TE 1981 to 21.3 million tonnes in TE 2000. Increased production came from soybean (55 %), followed by rapeseed and mustard (28 %), groundnut (7.44 %) and sunflower (6.16 %). A clear shift in production has been noted regionally from the eastern and northern states to central and western states during the last two decades. Approximately, 56 % of the oilseed area is under improved seeds and of the total improved seeds, the share of certified seeds was about 35 %. High growth in input use is the major reason for increasing the production of rapeseed and mustard. Lower technical efficiency in augmenting output is a matter of serious concern and this needs to be addressed through better targeting of R & D efforts. Research issues for different agro-regions growing maize were prioritised. Lack of quality seeds and poor crop stand in eastern region; and drought and lack of poor quality seeds in high rainfall region of southern region were the most important researchable issues.

A number of technologies are being developed or refined under NATP. Impact assessment of some of these technologies indicates that farmers are realizing significant economic benefits while promoting sustainability of the production system. The study has clearly demonstrated that returns to investment in dissemination of available technologies are substantial and should receive due attention in future. Major initiative for dissemination of technologies has to be taken by public extension system though research system's role in facilitating this, is no less important.

Improving the performance of the agricultural innovation system, comprising actors involved in the generation, distribution and adaptation of new technical, managerial and institutional knowledge, continues to be an important challenge for agricultural R & D. Case studies on partnerships among actors in the innovation system have led to a synthesis of specific lessons for research policy and practice. The study found that successful projects have been those that have focussed specifically on establishing coalitions of local actors around a particular problem area or task. There is a need to address a broad range of institutional features of the current agricultural innovation system, which prevent these linkages developing. Static and compartmentalised roles, combined with poorly developed learning culture are issues that need specific attention. Organisations that are willing to experiment and learn are the ones that succeed and continuous institutional learning therefore needs to be encouraged. Research approaches that support institutional learning and change need to be recognised for their contributions to developing the capacity of innovation systems.

Census of Scientific Manpower in Agriculture-2001 of the Indian Council of Agricultural Research (ICAR), shows that the average age of ICAR scientists is now 45 years, with 43 % falling above the average age. The high average age, as well as high proportion of scientists in the declining productivity phase necessitates induction of young scientists in the research cadre. With regard to gender, barely 12 % of ICAR scientists were women. More than three-fourth of ICAR scientists belonged to crop sciences, natural resource management and animal sciences groups; horticulture, fisheries and social sciences account for the rest. Almost half of ICAR institutions have less than 30 scientists and these account for about one-sixth of the total scientists. These numbers suggest the need for some rationalisation in allocation of scientists to improve research efficiency.

Though several new extension approaches were adopted by various Indian states in the last one decade, the state Department of Agriculture (DoA) face several constraints in providing adequate extension support to farmers. Technology dissemination continues to be understood as the main extension role and other equally important support needs of farmers (access to markets, research, credit, infrastructure and business development services) remain unattended. Public sector extension agency should provide this wide range of services and for this it has to partner with different agencies in the public and private sector. District and block level staff have to play a larger role in planning and implementing innovative extension programmes and their capacity to do this needs strengthening.

The Centre developed a cafeteria for Women in Agriculture for the Ministry of Agriculture based on lessons from the implementation of past and on-going programmes for farmwomen. Implementation of women in agriculture programmes had improved farm women's access to information on agricultural technology, led to increased adoption of technology and realisation of economic benefits. The cafeteria contains several suggestions to improve the performance of on-going programmes and guidance note on development of various components namely, mobilisation of groups; group formation and capacity development; linkages and support; communication and media support; technology development and promotion; staffing; gender sensitisation; and sustainability.

Agricultural interventions are more sustainable in addressing malnutrition among the rural poor. However the poor linkages existing among various line departments and lack of joint activities for identifying "at risk households" and organising common programmes have adversely affected the performance of nutritional interventions. Several inter-departmental joint activities for improving the nutritional security have been identified by the study.

To provide a data-warehouse on soil, water, climate, animal, fish, crops and cropping system along with socio-economic and geographical features on a single platform, an Integrated National Agricultural Resource Information System (INARIS) is currently developed. The centre is developing this comprehensive database covering socioeconomic aspects of agriculture. This includes five databases viz., national accounts statistics, agriculture markets and trade, socio-economic variables, agriculture inputs & costs and infrastructure. This data warehouse would allow evolving methodologies to interpret the interlinked data through the Central Data- Warehouse for planning and development purposes as per the requirement of the user agencies.

To monitor changes in farming systems and implications for agricultural research and thereby to understand its implications for agricultural research and policy, a panel database for different NARP agro-ecological regions is being developed in collaboration with ICRISAT.

The Indian seed system has been undergoing several changes in the last one decade. The growth of the private sector seed industry has reduced the market share of public seed agencies. The structure of the industry is changing primarily because of availability of superior material developed through R&D efforts, foreign direct investment and collaboration with multinational seed companies. Another recent change witnessed has been the diversification of export-oriented or agro-processing companies into seed for supporting their main business. These changes are currently studied.

The centre is coordinating the activities of twenty-five multi-disciplinary PME cells created in different ICAR and SAUs to support PME. Several workshops were organized to prepare a concrete workplan and to review the progress of the PME activities. The website of agricultural economists (http:// www.agrieconet.nic.in) was developed and nested with 60 organizations, mainly SAUs and ICAR Institutes. The web site is regularly updated. As an outreach programme, the Centre has been collaborating with the Society for Education and Social Welfare (SESW), an NGO in Muzaffarnagar District of Uttar Pradesh.

The Centre published 4 Policy Papers, 2 working papers, 2 workshop proceedings and 4 PME Notes during the current year. Centre's staffs have been involved in a number of professional and policy interactions and consultancy projects and have also organised several workshops and meetings at NCAP and outside. It has also collaborated with a number of national and international organisations.

I INTRODUCTION

The National Centre for Agricultural Economics and Policy Research (NCAP) was established by the Indian Council of Agricultural Research (ICAR), in March 1991, to strengthen agricultural economics research in the National Agricultural Research System comprising: Indian Council of Agricultural Research (ICAR), its affiliated institutions and the state agricultural universities (SAUs). The mandate of the Centre includes:

- Policy oriented research on: (i) technology generation, diffusion and impact; (ii) sustainable agricultural production systems; (iii) interaction between technology and other policy instruments like incentives, investments, institutions, trade, etc. and (iv) agricultural growth and modeling.
- To strengthen agricultural economics research and teaching capability in the state agricultural universities and ICAR institutes.
- To enhance ICAR participation in agricultural policy decisions through policy-oriented research and professional interactions.

Location

The Centre is located at the campus of the Indian Agricultural Statistical Research Institute (IASRI), which is a sister institute of Indian Council of Agricultural Research (ICAR). It is adjacent to the Indian Agricultural Research Institute (IARI), a premier agricultural research institute in the country. This location offers advantages to the Centre in terms of opportunities for inter-disciplinary professional interaction as well as an access to library, computational and other infrastructure available at these institutes.

Faculty

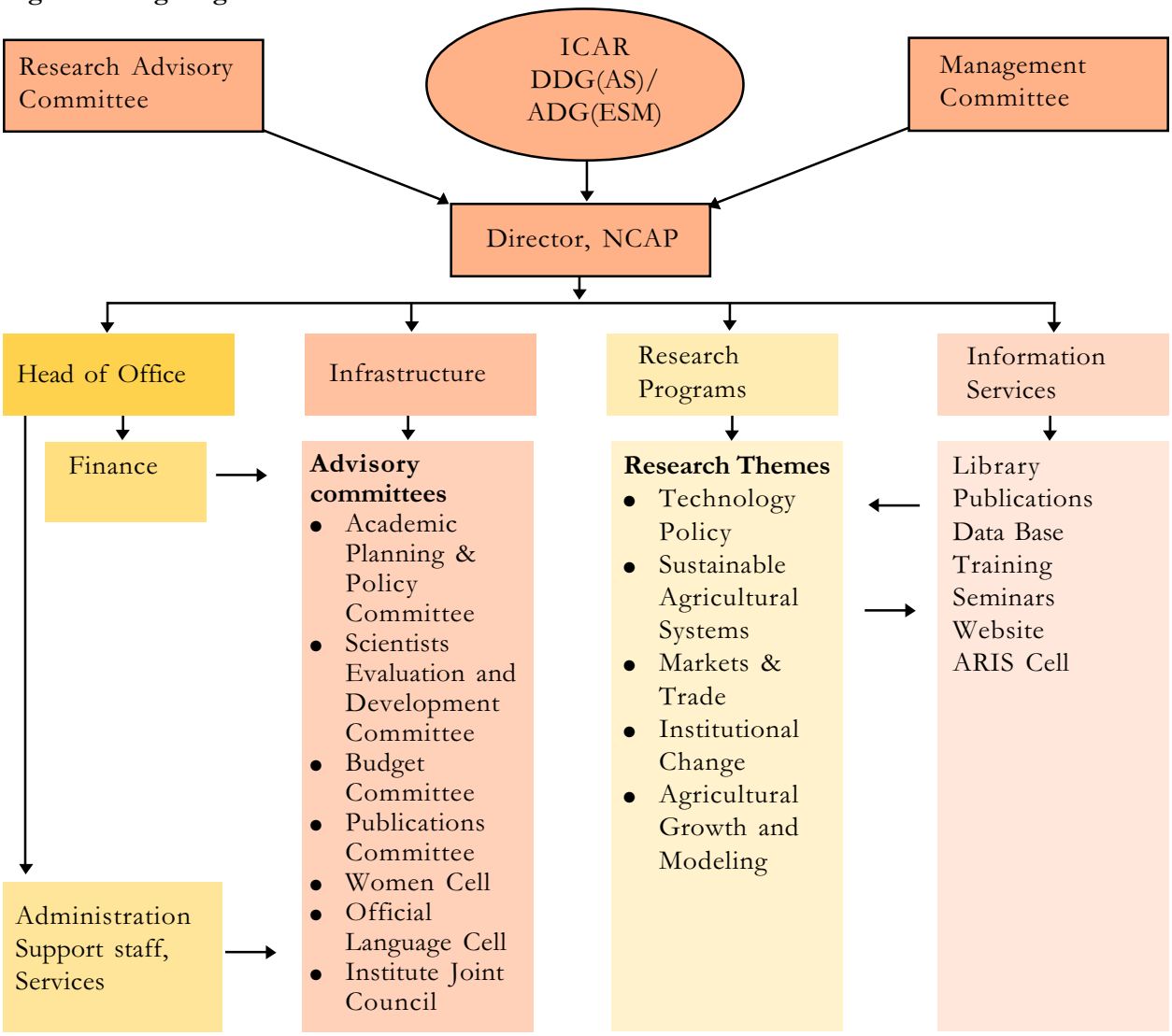
The Centre has at present eighteen scientists. This includes the Director, one National Professor, five Principal Scientists, two Senior Scientists and nine Scientists.

Management

A high powered Research Advisory Committee (RAC), comprising mostly eminent professionals outside the ICAR system guides the Centre in its research policies. Prof. Y.K. Alagh the former Minister of State for Power and Science and Technology, Government of India and presently a Member of Parliament (Rajya Sabha) was the first Chairman of the RAC. Currently, Prof. S. Rajagopalan an eminent Agricultural Economist is the Chairman. The RAC guides planning, research thrusts and strategies. Initiatives in human resources development, approaches to improve policy dialogues and evaluation are also being guided by the RAC.

The Centre is supervised by the Management Committee (MC), which is constituted and mandated by the Council. A number of internal committees, such as: Staff Research Council, Budget Committee, Academic Planning & Policy Committee, Scientists' Evaluation and Development Committee, Purchase Committee, PME/NATP Site Committee, Official Language Committee, Library Committee, Publications Committee, Consultancy Processing Cell, Grievance Cell and Women Cell have been constituted for decentralized management. The joint Staff Council of the institute promotes healthy interaction and proper work environment.

Figure 1: Organogram of NCAP



Budget

Expenditure patterns during the year 2002-2003.

Table 1: Expenditure during 2002-2003 (in Lakh Rs.)

Head of Account	Plan	Non-Plan	Total
Pay and Allowance	—	72.22	72.22
OTA	—	0.20	0.20
Travelling expenses	2.98	0.95	3.93
Works	—	—	—
Other charges including equipments	34.97	10.04	45.01
HRD	1.75	—	1.75
Total	**39.70**	**83.41**	**123.11**
NATP	—	—	58.48
Other projects	—	—	26.75
Resource generation	—	—	
Grant Total	**—**	**—**	**331.45**

Staff Position

Table 2: Staff Position (2002-03)

Designation	Numbers
Director	1
National Professor	1
Principal Scientist	5
Senior Scientist	2
Scientist (Sr. Scale)	7
Scientist	2
Assistant Administrative Officer	1
Assistant Accounts and Finance Officer	1
Assistant	1
Stenographer	1
Junior Stenographer	1
Upper Division Clerk	1
Lower Division Clerk	2
Technical Assistant (T-4)	3
Technical Assistant (T-5)	1
Driver (T-1)	1
Supporting Staff Gr. I	1

II RESEARCH ACHIEVEMENTS

Technology Policy

Impact of Resource-Conservation Technologies for the Rice-Wheat System

Suresh Pal, AK Jha, Rakhi Goel and PK Gulia

A number of resource-conservation technologies (RCTs), *viz.*, zero-tillage, raised-bed planting, leaf color chart, super urea granules for full fertilizer application, direct seeding of rice on puddled and unpuddled beds, system diversification, laser land leveling, and incorporation of crop residue in soil are at various stages of experimentation and adoption on farmers' fields. Among all the RCTs, zero-tillage for wheat sowing is being demonstrated on farmers' fields during the last 5-6 years and therefore, is adopted by a large number of farmers. Leaf color chart, raised-bed planting, direct seeding of rice and introduction of new crops like pulses are being demonstrated for a couple of seasons and therefore a very few farmers know about these technologies. A significant proportion of farmers in and around the study villages located in Haryana and Bihar are practicing zero-tillage since the last couple of years. A notable feature is that all the categories of farmers are adopting zero-tillage and its advantages are well understood. According to farmers, the advantages are: (a) cost saving and thus higher profit, (b) saving of irrigation water, especially in first irrigation, and (c) improvement in soil fertility due to decomposing of paddy stubbles in soil. The date of sowing is also advanced by a couple of days. Another significant advantage, is control of *Phalaris minor* weed population in wheat. This is because zero-tillage does not provide conditions conducive for germination of the weed seeds. As a result, weed infestation is very thin and plant population is good, increasing wheat yield significantly. Nevertheless, some of the farmers still are not sure about sustainability of wheat yield due to hardening of soil as a result of continuous use of zero-tillage.

Reasons for adoption of zero-tillage in wheat

Who are adopters:	All the categories of farmers
Drivers of adoption:	(a) Cost reduction (b) Help control *P. minor*
Other direct benefits:	
Crop yield:	A few farmers mention higher yield with zero tillage, but not sure about the long-term impact
Soil fertility:	Positive, because of incorporation of paddy stubbles, but it will take some more years to show visible impact on soil fertility
Irrigation water:	Saves water in first irrigation
Major adoption facilitating factors:	
	(a) Refinement of zero-till drill (b) Promotion of manufacturing of the drill and provision of subsidy (c) Integration of research efforts and large-scale demonstrations on farmer's fields in a persistent manner

There are some important lessons to be learnt from the experience of zero-tillage. First, small refinement of technology could lead to large-scale adoption. In this case small modification in tine and furrow opener blade of zero-till drill frame, made the use of the drill more convenient for the farmers. Second, active participation of the manufacturers has improved the availability of zero-till drill and thus, facilitating the adoption process. Training and encouragement provided to the drill manufactures by the government and researchers encouraged their participation. This means that input suppliers, whether in public and private sector, should be seen as partners in the technology dissemination process–an aspect which was not given due attention until now. Third, the provision of subsidy (Rs 3000) per machine with a unit gross price of Rs 13,000 has not only reduced the cost of the drill and hence improved the access of farmers, but also helped in convincing farmers that the concept of zero-tillage is beneficial and therefore government support is provided. Lastly, persistence in the efforts to disseminate a technology can even take farmers out of outdated beliefs and help them embrace modern agricultural technologies.

Farmers find it difficult to use other RCTs like leaf color chart because of their inability to compare chart and leaf color. Similarly, there is problem of weed in direct seeding of paddy on the unpuddled raised bed. Now the situation is that farmers need to understand more about these technologies and scientists should refine some of them like control of weed in paddy.

Analysis of Productivity Changes and Future Sources of Growth for Sustaining Rice-Wheat System

P.K. Joshi, R.K. Singh, Karam Singh, Jawahar Thakur, A.K. Giri and Laxmi Tewari

Information was collected from the Comprehensive scheme on "Cost of Cultivation–Principal Crops in India" to estimate the area under rice-wheat system and other systems in the Indo-Gangetic Plain (IGP) for 1985 and 1995. Approximately 35% of the gross cropped area in the IGP was a rice-wheat based system in 1995. It was about 24% in 1985. Area under rice-wheat system increased in all the regions in the IGP during 1985 and 1995 (Table 3). Lower Gangetic Plain was having very negligible area under rice-wheat system. Rice-fallow and rice-rice are more popular in the Lower Gangetic Plain region. Concentration of rice-wheat system was more in large farms as compared to small holders. It appears that small farm holders are gradually diversifying towards other crops.

Table 3: Share of rice-wheat system in gross cropped area in different regions of IGP (%)

Agro-Eco region	1985	1995
Trans-Gangetic Plain	32.3	40.5
Upper-Gangetic Plain	14.2	32.1
Middle-Gangetic Plain	36.9	49.7
Lower-Gangetic Plain	01.7	01.3
Average Indo-Gangetic Plain	24.3	34.6

Expansion in area under rice-wheat has generated enormous employment opportunities in the IGP. Approximately 5.8 million mandays were absorbed by rice-wheat system in 1995, which used to be about 3.58 million mandays in 1985.

Unit cost of production of rice and wheat was estimated for 1985 and 1995. It was noted that though the yield levels of rice and wheat were lower in Middle and Upper Gangetic Plains, these regions were producing them more efficiently than the Trans-Gangetic Plain where yields were considerably higher

(Table 4). High cost in the Trans-Gangetic Plain region was due to injudicious use of nutrients, irrigation water and energy. On the other hand, the Middle Gangetic Plain is using too little resources compared to Trans-Gangetic Plain. The feasibility of producing rice and wheat in the Trans-Gangetic Plain completely depends on higher output prices. During the 1990s, the increase in gross revenue from rice and wheat in Trans-Gangetic Plain largely came from higher prices rather than yield advantage or cost reduction.

Table 4 : Unit cost of production of rice and wheat in IGP, 1995

Region	Rice(Rs. per q)	Wheat (Rs. per q)
Trans-Gangetic Plain		
Foothills and Shivalik	325	337
Plains	336	341
Arid	349	376
Upper Gangetic Plain		
Central Plain	114	140
North-Western Plain	135	130
South-West Plain	110	151
Middle-Gangetic Plain		
North-Eastern Plain	164	147
Eastern Plains	182	161
Vindyan	221	179
North-Bihar Plains	171	192
North-East Bihar Plain	145	163
South Bihar Plains	162	201

Diversification and Disparities in the Semi-Arid Agriculture

P.S. Birthal, P. Parthasarathy Rao and P.K. Joshi

Agricultural diversification is reckoned as an important strategy to cope with the production and market risks, augmenting income, generating employment and arresting natural resource degradation in the semi-arid tropics. The semi-arid tropics (SAT) accounts for 54 per cent of the total net cropped area; houses 45 per cent of the population and contributes: 68 per cent to total coarse cereals production, 73 per cent to oilseeds production, 72 per cent to cotton production and 60 per cent to total pulses production in the country. Its contribution to rice and wheat is 30 and 23 per cent respectively. The corresponding figures for fruits, vegetables, milk, and meat and eggs are 41, 35, 41, and 43 per cent. The productivity of SAT agriculture, however, is low.

Agricultural sector of the SAT however is diversifying steadily in favour of high value commodities (fruits, vegetables, milk, meat and eggs). Between 1980/82 and 1996/98 the share of high value commodities, in the value of agricultural sector output increased from 27.9 to 32.7 per cent. Contribution of livestock to the agricultural sector increased from 16.3 to 19.1 per cent, and of fruits and vegetables from 11.6 to 13.6 per cent. Considerable changes were noticed in the crop sub-sector. Share of oilseeds in total value of output increased from 12.6 to 20.6 per cent, of commercial crops remained stagnant (around 14 per cent), and of pulses declined marginally. Share of cereals in total value of output declined drastically from 50.6 to 29.6 per cent mainly on account of decline in shares of sorghum and rice. Dairying dominated the livestock sub-sector with a share of about 80 per cent. Share of milk witnessed

marginal increase, while that of meat declined marginally. The decline in the share of meat was due to decline in contribution from small ruminants, but the increasing share of broilers offset this. There were some differences in the composition of agricultural sector of marginal and favourable SAT. Notwithstanding such differences, both the crop and livestock sub-sectors have been growing at the rates of 3.3 and 4.5 per cent a year.

There was a considerable spatial variation in the production of high value commodities (fruits, vegetables, milk, meat and eggs). This could be explained by the differences in both the demand and supply factors. Urbanization was identified as an important determinant of demand for these commodities, and consequently their pattern of production. Incidence of diversification was lower in highly irrigated and high rainfall areas. Technology of production had a mixed effect on the spatial distribution of high value commodities. Infrastructure, particularly roads was identified as a major determinant of the diversification towards high value commodities. Tendency to diversify was noticed to be higher on small farms. In general, rising per capita income, growing population and urbanization are driving rapid growth in demand for high value commodities. To meet this, their production need to be backed up by adequate infrastructure, technology and support services. Small landholders are expected to be benefited the most from such efforts.

The growth in semi-arid agriculture however has been accompanied by rising regional disparities (Table 5). The Gini coefficient representing income inequality has increased from 0.19 in 1980/82 to 0.28 in 1996/98. The productivity of agriculture in marginal areas has remained less, compared to favourable areas. But, owing to high population pressure per capita value of output in favourable regions is slightly less than that in marginal areas. In other words, agricultural sector in the favourable areas should also receive an equal attention in R&D efforts. Besides, this also implies higher focus on development of non-farm sector there. In the past considerable efforts have been made to promote cultivation of oilseeds, but these have remained concentrated in few pockets.

Table 5: Decomposition of regional income inequality, 1996/98

Commodity Group	Gini correlation (Rk)	Gini coefficient (Gk)	Income share (Sk)	RkGkSk	(RkGkSk) /G	Relative income inequality	Marginal effect of change in income source
Cereals	0.55	0.28	0.31	0.05	0.18	0.56	-0.14
Pulses	0.52	0.64	0.07	0.02	0.08	1.22	0.01
Oilseeds	0.84	0.88	0.16	0.12	0.44	2.68	0.27
Commercial crops	0.51	0.67	0.11	0.04	0.14	1.24	0.03
Fruits & Vegetables	0.32	0.50	0.13	0.02	0.08	0.58	-0.06
Agriculture	**0.99**	**0.32**	**0.79**	**0.25**	**0.91**	**1.16**	**0.12**
Cattle	0.30	0.29	0.07	0.01	0.02	0.31	-0.05
Buffalo	0.59	0.35	0.09	0.02	0.07	0.76	-0.02
Small ruminants	-0.12	0.31	0.02	0.00	0.00	-0.14	-0.02
Pig	-0.63	0.51	0.00	0.00	0.00	-1.16	0.00
Poultry	-0.04	0.57	0.02	0.00	0.00	-0.09	-0.03
Livestock	**0.52**	**0.22**	**0.21**	**0.02**	**0.09**	**0.42**	**-0.12**
Total	**1.00**	**0.28**	**1.00**	**0.28**	**1.00**	**1.00**	**0.00**

Agricultural Diversification in South Asian Countries

P.K. Joshi, Ashok Gulati, P.S. Birthal and Laxmi Tewari

A study was conducted to examine the nature, pattern and the speed of agricultural diversification in South Asian countries during the last two decades ending 1999-2000. All seven countries, namely, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka, were selected for the study. Extent of agricultural diversification was measured by computing Simpson Index, while nature of diversification was examined by tracking changes in cropping patterns and the speed by estimating annual compound growth rates. The salient findings are reported as below:

The Simpson Index of Diversity (SID) for South Asia was 0.64 in triennium ending (TE) 1999-2000, up from 0.59 in TE 1981-82. This shows that South Asia is gradually diversifying. (Table 6). Among countries, Bangladesh, Bhutan and Nepal show less diversity as compared to other countries. Bangladesh has specialized in rice. More than three-fourths of the area in the country is under rice. But the remaining one-fourth area is highly diversified.

Nepal and Bhutan are aiming to have higher degree of self-sufficiency in basic foodgrain than what it is today, and therefore, concentrating more towards cereals, particularly rice, wheat and maize. Table 6 shows that in most of the countries, crop diversification is coming from area expansion, with some exception of crop substitution in India and Sri Lanka. Incidentally, in Nepal, Pakistan and Sri Lanka, area expansion is also coming from deforestation, which is a cause of concern from environmental point of view.

Table 6: Extent of diversification and its sources in South Asian countries

Country	Simpson Index of Diversity in triennium ending			Sources of diversification (%)	
	1981-82	1991-92	1999-2000	Cropping intensity	Crop substitution
				1991-92 to 1999-01	
Bangladesh	0.39	0.36	0.35	64.67	35.33
Bhutan	0.37	0.48	0.44	97.82	2.18
India	0.61	0.65	0.66	36.63	63.37
Maldives	0.77	0.77	0.77	83.22	16.78
Nepal	0.39	0.40	0.41	84.79	15.21
Pakistan	0.54	0.56	0.57	76.56	23.44
Sri Lanka	0.76	0.77	0.75	78.90	21.10
South Asia	**0.59**	**0.63**	**0.64**	**42.98**	**57.02**

Annual compound growth rates in area, production and yield of major commodity groups in South Asia during the decades of 1980s and 1990s are given in Table 7. Production performance of non-food commodities was superior to the food commodities. Among food grain group, cereals performed better than pulses. Cereal sector was specializing in favour of rice and wheat. It was because of overriding concern for food self-sufficiency in all the South Asian countries. Availability of improved and high yielding rice and wheat varieties, induced specialization in favour of these crops. These replaced sorghum,

millets and barley. Performance of pulses was pathetic during 1990s. These were relegated to marginal environments. With the availability of irrigation and improved varieties of rice and wheat, a large share of pulses was shifting in favour of rice and wheat. There are some exceptions as well. For example, lentil and pigeonpea are coming-up in a big way in Nepal. Black gram and green gram and to some extent chickpea are emerging in Indian rainfed regions. In Pakistan, chickpea is gaining importance.

Table 7: Annual compound growth rates (%) of area, production and yield of major commodity groups in South Asian countries

Commodity group	1980-90			1991-2000		
	Area	Production	Yield	Area	Production	Yield
Cereals	-0.01	3.08	3.09	0.34	2.45	2.11
Pulses	0.04	2.37	2.33	-0.02	0.72	0.74
Oilseeds	1.72	5.46	3.68	0.95	2.05	1.09
Vegetables	1.41	3.33	1.89	2.44	2.59	0.14
Fruits	1.71	2.61	0.89	2.40	5.61	3.14
Dry fruits	1.98	3.56	1.55	3.62	4.30	0.66
Spices	1.46	4.27	2.77	0.68	2.47	1.78

Different countries grow a large number of vegetable and fruit crops. Fruits (both fresh and dry) and vegetables have shown good performance during 1980s and 1990s. Fruits and vegetables are highly diversified in all the countries. Livestock and fisheries sectors also flourished during the last two decades (Table 8).

Table 8: Growth performance of livestock activities and fish in South Asia

Commodity group	Annual compound growth rates (% per annum)					
	1981-90			1991-2000		
	Number	Production	Yield	Number	Production	Yield
Milk						
Cow	2.33	4.86	2.53	2.10	5.50	3.40
Buffalo	4.11	4.84	0.73	2.53	5.10	2.57
Total	—	4.93	—	—	5.17	—
Poultry						
Chickens	9.26	10.51	1.25	5.72	5.66	-0.06
Eggs	4.43	7.19	2.76	4.76	4.49	-0.27
Total Meat	**—**	**4.30**	**—**	**—**	**2.12**	**—**
Fish	**—**	**5.20**	**—**	**—**	**3.50**	**—**

The evidence shows that agriculture is gradually diversifying in the sub-continent with some inter-country variation. Diversification was observed in favour of high value commodities. Since their share in area and production was too low in comparison to foodgrain crops, the extent of diversification was unnoticed.

Land, Livestock, and Rural Poverty

P.S. Birthal and P. Parthasarathy Rao

Rising demand for livestock products is driving rapid growth in India's livestock sector. The share of livestock sector in agricultural GDP has grown from 14 per cent in 1980-81 to 23 per cent in 1998 (1980-81 prices), while the share of agricultural GDP in total GDP has declined from 35 per cent to 25 per cent. The growth is considered to be poverty alleviating, as livestock wealth is more equitably distributed than land. The marginal and small landholders (<2 ha) comprise 63 per cent of the total households and share 34 per cent of the land. In contrast they share 67 per cent of the bovine, 65 per cent of the ovine, 70 per cent of the pigs and 75 per cent of the poultry. The distribution of the value of the land and livestock resources clearly shows that livestock wealth is more equitably distributed than land.

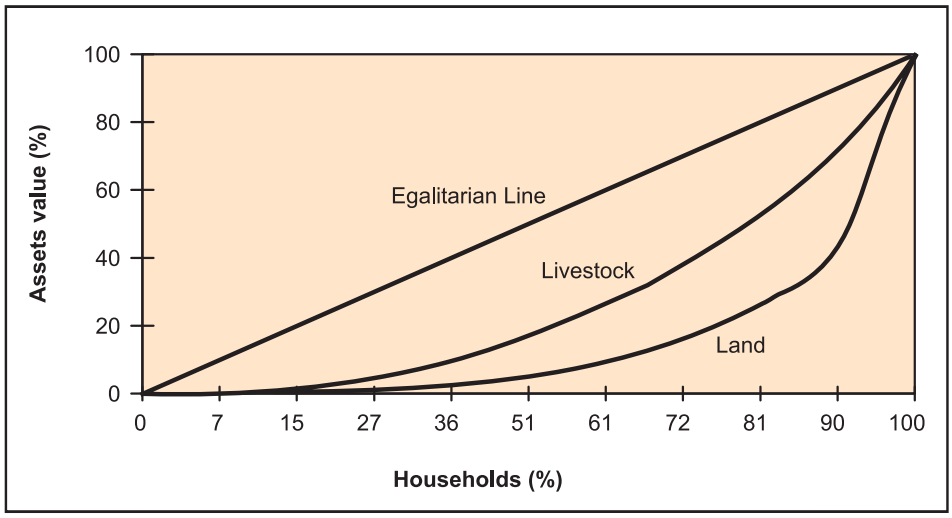
Unequal distribution of resources is a major cause of poverty particularly in the economies dominated by smallholdings. Size of land holding is too small to provide an adequate living to the poor. The poor households supplement their livelihood from a number of other farm and non-farm activities including livestock. Livestock has been viewed as an important activity in the poverty-alleviating programmes in India. But has it contributed to reducing poverty? Table 9 shows the econometric estimates of the relationship between livestock sector growth and poverty. The results confirm that livestock sector growth is more important than agricultural sector growth in reducing poverty.

Table 9: Log-linear estimates of relationship between poverty and livestock sector growth

Explanatory variables	Dependent variable: Log of poverty (%)	
	Regression coefficient	t-value
Constant	8.769	13.30*
Per capita agricultural GDP (Rs/annum)	-0.450	6.64*
Share of livestock output in agricultural GDP (per cent)	-0.532	3.48*
Log-likelihood function	-35.00	

** Significant at 1 per cent level.*

Figure 2: Lorenz curve for distribution of land and livestock assets



Emerging trends in the consumption of livestock products: Implications for Research

P.S. Birthal and Praduman Kumar

Over the last two decades, per capita consumption of various livestock products in India has increased considerably (Table 10). Per capita consumption of milk and egg almost doubled. Growth in per capita consumption of meat and fish was relatively slow. Consumption rates and consumption pattern vary widely across income classes. There is a wide gap in the consumption rates of different food items between the rich and poor. The gap is higher for milk, compared to meat and fish. This however has been narrowing down. There are also considerable differences in consumption rates of rural and urban consumers; per capita consumption is higher in urban areas. But, the disparities in consumption rates of the rural and urban population are weakening. On the other hand, substantial disparities exist in consumption pattern across regions. Milk is the most preferred livestock product in almost all the regions. It shares over 80 per cent of the expenditure on livestock products in northern, western and hill regions. In the eastern and southern regions, meat and fish are as important as milk. In all the regions, per capita consumption of different livestock products has increased, but the pattern of consumption has not changed much over time.

Table 10: Per capita consumption of livestock products in rural and urban areas (kg/annum)

Products	1983	1987-88	1993-94	1999-2000
Rural				
Milk	36.96	49.42	54.73	63.33
Meat	1.96	2.14	2.05	2.44
Eggs	5.91	8.26	9.32	15.10
Fish	2.39	2.73	2.77	3.38
Urban				
Milk	55.46	64.59	65.24	90.70
Meat	3.24	3.22	2.99	4.22
Eggs (Nos.)	15.99	19.89	19.34	26.85
Fish	2.58	2.90	3.21	3.63

The level and pattern of consumption of different livestock products are influenced by: income, price of the product and its substitutes, availability of the products and tastes and preferences. There exists a strong positive relationship between income and per capita consumption of livestock products. Poor households consume more of inferior types of meat. Differences in regional consumption patterns are mainly due to availability of the product. In India about 60 per cent of the population is of non-vegetarians, but the per capita consumption of meat has remained much below than in the developed countries. Vegetarianism, as is often claimed, does not seem to be responsible for low level of meat consumption. It is the availability and affordability that determine the level of meat consumption.

Demand plays an important role in the growth of livestock sector. In the past, growth in livestock sector was mainly demand driven, and is likely to remain so. Emerging trends in consumption of livestock products have some important implications for the growth of livestock sector. The production trends in the past have been quite robust, and if these trends were to continue, future demand for food of animal origin will be adequately met through domestic supplies. The production of food however,

is likely to come under heavy pressure. Increase in production might come from increase in number of animals and their productivity. The first option does not seem to be practical considering chronic scarcity of feed and fodder, and declining per capita land availability, besides its adverse effects on the environment. The second option emphasizes optimization of livestock population commensurate with the feed resources, and generation and dissemination of yield-enhancing technologies. At present, productivity of different species of livestock is low compared to the world average. For example average milk yield of Indian bovines is about 50 per cent of the world average, and mutton yield is about 70 per cent and pork yield is about 50 per cent. This indicates that there is a considerable scope to raise the production through yield improvement measures. The emerging trends in meat consumption imply that the structure of meat production will gradually shift towards monogastrics (poultry and pig) with the rising per capita incomes. There are significant inter-personal disparities in consumption of livestock products. The consumption levels of the poor are much below the consumption levels of the rich, though gap is narrowing down. Similarly, the gap in consumption levels of urban and rural population is also heading towards a convergence. With sustained growth in rural incomes and reduction in poverty, demand for livestock products is expected to increase faster, as there is little if any difference in the proportion of non-vegetarian populations across income classes and between rural and urban areas. This implies a need for faster growth in production of livestock products.

Contribution of Livestock to Food Security in Asia

V.K. Taneja, and P.S. Birthal

Asia houses about 61 per cent of the world-undernourished people. In terms of per centage of total population, 16 per cent of the Asian population is undernourished. The incidence however varies from 2 per cent in Malaysia to 33 per cent in Bangladesh and India. Increasing consumption of livestock products can help reduce problem of food insecurity. Figure 3 that plots cross-country incidence of undernourished population and per capita animal protein consumption confirms this. Further, income is an important determinant of consumption of livestock products (Figure 4). Per capita meat consumption is high in countries with high per capita income (Malaysia, Thailand, Philippines and China). Proportion of urban population is also higher in high-income countries. While per capita milk consumption is higher in low-income countries (Nepal, India, Pakistan).

Figure 3: Relationship between animal protein consumption and undernourished population

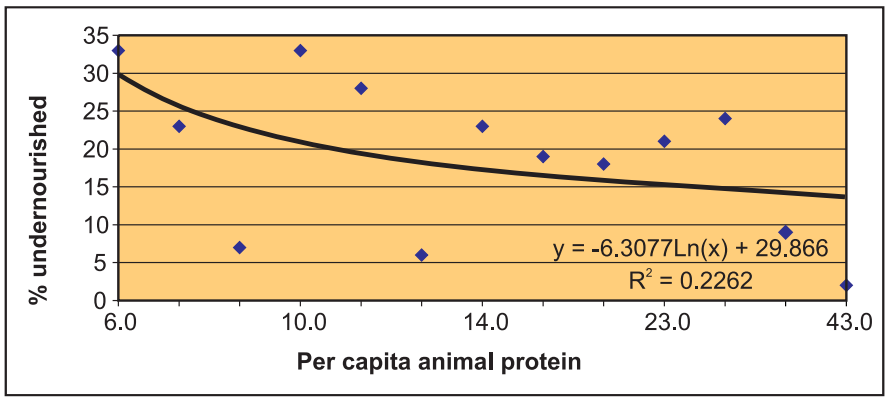
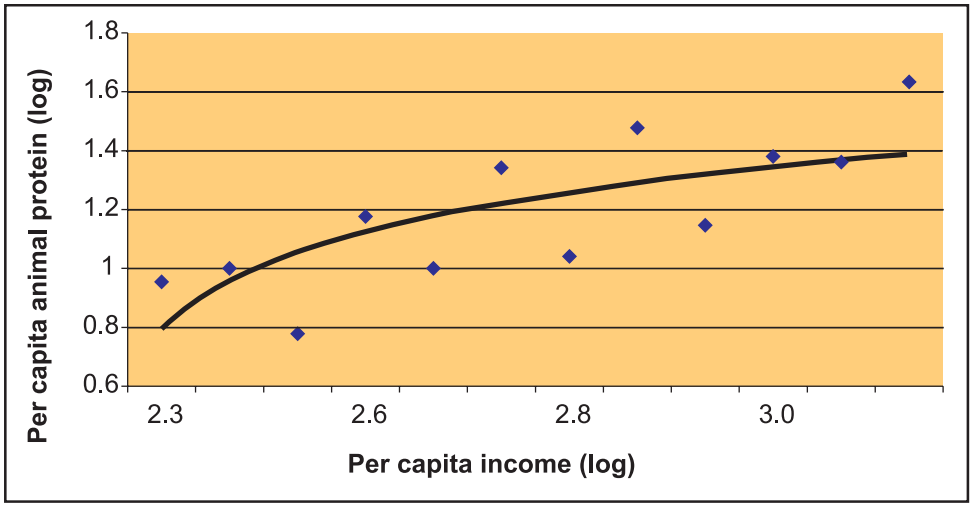


Figure 4: Relationship between animal protein consumption and income, 2000



Production Performance of Oilseeds in India

P.K. Joshi, S.K. Pandey, Prem Narayan and M.T. Rajashekharappa

The total oilseeds production has more than doubled from 10 million tonnes during TE 1981 to about 21 million tonnes during TE 2000-01, which came from nearly 24.55 million hectares. Groundnut, soybean, rapeseed and mustard and sunflower are the major oilseeds. Presently, these four crops occupy nearly 84 per cent of the total oilseeds area and contribute to about 91 per cent of the total oilseeds production in the country. Increased production came from soybean (55 per cent), followed by rapeseed and mustard (28 per cent), groundnut (7.44 per cent) and sunflower (6.16 per cent) (Table 11).

Table 11: Change in production of different oilseeds in India (Million tonnes)

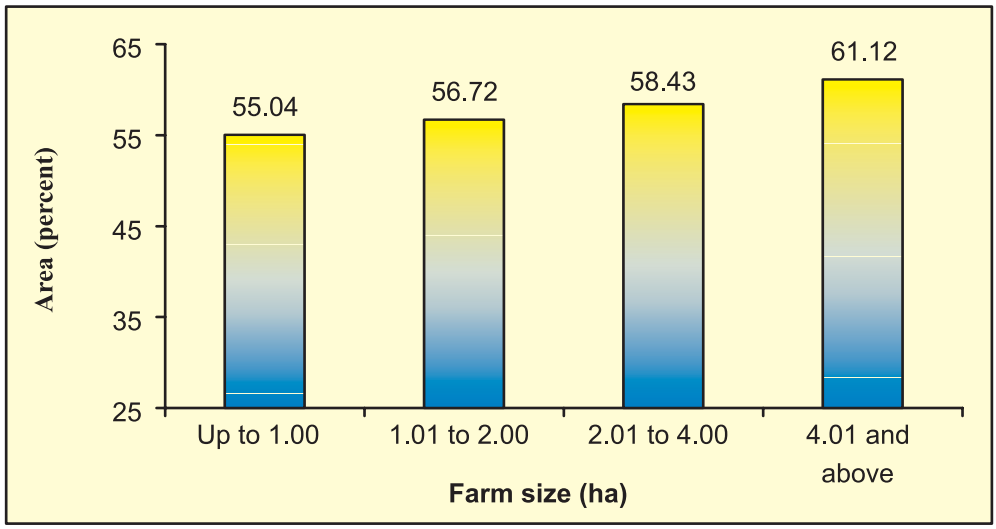
Oilseeds crop	TE 1981	TE 2000	Change in production	Per cent change
Groundnut	5.97	6.81	0.84	7.44
Rapeseed and mustard	2.04	5.20	3.17	28.02
Sunflower	0.098	0.79	0.69	6.16
Soybean	0.30	6.45	6.19	54.78
Others	1.57	1.97	0.40	3.54
Total	**10.00**	**21.31**	**11.31**	**100.00**

A clear shift in production has been noted from the eastern and northern states to central and western states during the last two decades. These shifts reveal that oilseeds were moving from irrigated to rainfed environments and from medium to low rainfall areas. This can be supported from the fact that the share of total kharif oilseeds production, which is mainly dependent on rainfall, has increased from about 59 per cent in TE 1981 to 64 per cent in TE 2000. The share of rabi oilseeds, which require at least one critical irrigation, has declined during the same period.

Adoption of technology

Approximately 56 per cent of the oilseeds area is under improved seeds and of the total improved oilseeds, the share of certified seeds was about 35 per cent. There is a positive relationship between farmsize and the adoption of the improved varieties (Figure 5)

Figure 5: Area under improved oilseeds by farm size in India, 1998



The data on front line demonstration of rapeseed and mustard obtained from National Research Centre for Rapeseed and Mustard, Bharatpur, Rajasthan was used to assess the benefits of adoption of improved varieties of oilseeds over local varieties was for different regions of India.

The total cost of cultivation was higher in irrigated regions than in rainfed regions. Unit cost of production was lower in case of improved varieties than for local cultivars. This is due to higher yields of improved varieties. However in Gujarat and Haryana, the difference in cost of production between improved and local cultivars was very marginal due to low yield gap. Further, the ratio of MSP to cost of production was found to be less than unity in the rainfed region of Uttar Pradesh (for both the cultivars) and in Bihar (in case of local cultivar) implying failure to recover the total cost even at the minimum support price level (Table 12).

Frequency distribution of farms in relation to the unit cost of production is presented in Table 13. In Rajasthan, for all the sample farmers (growing both improved and local varieties) who used improved varieties of rapeseed and mustard, the cost of production was below Rs.1000 per quintal. Gujarat and Haryana were found to be the next best efficient regions for cultivation of rapeseed and mustard cultivation after Rajasthan.

Sources of Output Growth

Sources of output growth in rapeseed and mustard was analysed using the data of the cost of cultivation published by Directorate of Economics and Statistics (Cost of Cultivation of Principal Crops in India) by estimating frontier function (Table 14). The analysis revealed that output growth came increasingly from input growth in all the five states. In Rajasthan the output growth during 1981 to 86 and 1987

Table 12: Average cost of production in rapeseed and mustard in different regions of India, 2001-02

Particulars	Uttar Pradesh		Rajasthan	Gujarat	Bihar	Haryana
	Irrigated	Rainfed	Rainfed	Irrigated	Irrigated	Irrigated
Total cost (Rs./ha)						
Improved	15124.43	8510.69	8012.35	13206.98	15430.05	18395.82
Local	12374.17	7838.34	5762.87	12622.29	15225.02	17151.91
Yield (Qtl/ha)						
Improved	19.11	13.05	14.90	17.72	16.99	22.37
Local	12.05	9.63	7.62	15.16	11.59	18.08
Net returns (Rs./ha)						
Improved	9488.03	6604.92	9878.04	7664.39	8677.15	10682.98
Local	3238.11	3237.9	3382.72	5231.17	1215.3	6352.55
Cost of production (Rs./Qtl)						
Improved	843.18	1695.04	540.28	757.64	966.33	832.01
Local	1139.91	2118.52	762.33	847.87	1417.51	971.02
MSP to cost of production						
Improved	1.54	0.76	2.40	1.71	1.34	1.56
Local	1.14	0.61	1.70	1.53	0.91	1.33

Note: MSP of rapeseed and mustard during 2000 was Rs.1300.

to 1992 was due to the changes in both technical efficiency change and the input growth, but during 1993 to 1998, the output increase obtained was mainly due to increase in input growth (by 167 per cent). In Haryana, technical efficiency improved in the later two periods, with a negative contribution during 1981 to 1986.

Table 13: Distribution of farms with respect to cost of production of rapeseed and mustard

Particulars	Uttar Pradesh		Rajasthan	Gujarat	Bihar	Haryana
	Irrigated	Rainfed	Rainfed	Irrigated	Irrigated	Irrigated
Cost range (Rs./ha)						
Upto 1000						
Improved	26	-	15	18	7	14
Local	18	-	15	14	3	10
1001 to 1300						
Improved	9	2	-	1	5	1
Local	7	-	-	4	5	5
1301 and above						
Improved	0	14	-	-	3	-
Local	10	16	-	-	7	-
Total farms (number)	**35**	**16**	**15**	**18**	**15**	**15**

Table 14: Sources of output growth of rapeseed and mustard in India (Per cent)

States	Periods 1981 to 86	1987 to 92	1993 to 98
Rajasthan			
TEC	42.83	41.22	-10.98
TC	-19.25	-34.95	-56.25
Input growth	76.42	93.73	167.22
Uttar Pradesh			
TEC	-23.71	-	52.80
TC	-64.77	-	-67.38
Input growth	188.48	-	114.57
Haryana			
TEC	-2.19	34.02	54.22
TC	-30.95	-5.21	-35.90
Input growth	133.15	71.19	81.67

Note: TEC- Technical Efficiency Change, TC- Technical Change

Since high input growth is the major reason for increasing the production of rapeseed and mustard, it has resulted in higher cost of production. Therefore, it is necessary to identify the causes for the poor contribution of technical efficiency in augmenting output. As technical efficiency change and technical change are the two key sources of long term productivity growth, attention should be paid to promote them through a better targeting R & D and access to improved seed.

Export Performance of Indian Fisheries Sector

Anjani Kumar

The Fish and fish products have emerged as the largest group in agricultural exports of India. The export of fish and fish products increased from 10 million US $ in 1960-61 to about 1300 million US $ in 2000-01. The export basket of fisheries sector has also diversified over time. Four decades ago, it began with the export of shrimp only and now fisheries export basket consists of more than 60 items.

Growth Trends in the Export of Fishery Products

The estimated annual compound growth rates for the export of fisheries products for the period 1987-2000 are given in Table 15. The growth rates registered by fisheries products were significant both in volume and value except for live fish. Exports of almost all fisheries products accentuated in recent years. Export policies for fisheries sector has been relatively liberal with few licensing restrictions since beginning. The trade reforms initiated in the 1990s seem to have further facilitated the export of fish and fish products from India. The values of export diversification indices showed that the export basket of fisheries products is reasonably diversified. The diversification in exports in physical terms was more pronounced and its values varied from 0.65 to 0.74 during 1987 to 2000 (Table 15). In value terms too, the diversification index has showed an increasing trend; it increased from 0.40 in TE 1989 to 0.54 in TE 2000.

Table 15: Growth Trends in the Export of Fisheries Products

(1987-88 to 2000-01) (CAGR in per cent)

Items/Commodities	Export	
	Qty	Value
Fish Fresh/Chilled	18.10 (2.10)	12.85 (9.02)
Live Fish	-0.23 (-0.03)	8.37 (2.16)
Fish Fresh/Chilled	18.10 (2.10)	12.85 (9.02)
Fish Frozen	28.08 (6.49)	27.58 (9.45)
Fish Dried Salted/Brine	17.77 (1.73)	9.12 (3.70)
Fish Fillets	9.29 (3.21)	9.17 (2.76)
Crustaceans W/N	7.04 (15.19)	9.09 (9.62)
Shrimp & Prawn	6.90 (13.4966)	9.23 (9.3752)
Lobster	2.63 (1.2058)	1.60 (0.6685)
Other Crustaceans	15.05 (8.3054)	21.47 (8.3054)
Molluscs W/N	9.92 (6.10)	8.72 (5.28)
Diversification index of export (1987)	**0.65**	**0.40**
Diversification index of export (2000)	**0.74**	**0.54**

Note: Figures in parentheses indicate t-values.

Source: Monthly Statistics of Foreign Trade of India; Volume Exports and Re-exports (various issues), Ministry of Commerce; and Economic Survey, Ministry of Finance, Government of India

International Competitiveness

The value of Revealed Comparative Advantage (RCAs) and Revealed Symmetric Comparative Advantage (RSCAs) for fisheries sector are presented in Table 16. The results indicate that fisheries sector has been quite competitive. RCAs till TE 1989 depicted a decreasing trend but it reversed afterwards and has been stable during last five years. However, the product group-wise results showed a mixed trend. India

Table 16: Revealed Comparative Advantage of India in Fisheries sector by product group, 1981-2000

	RCA				RSCA			
Year	Fish fresh, chilled frozen	Fish dried smoked etc.	Shrimps and Prawns	Total fish products	Fish fresh, chilled frozen	Fish dried smoked etc.	Shrimps and Prawns	Total fish products
1983	0.96	0.67	11.57	4.40	-0.02	-0.20	0.84	0.63
1986	0.64	1.28	11.42	3.84	-0.22	0.12	0.84	0.59
1989	0.24	0.47	11.90	2.54	-0.62	-0.36	0.84	0.43
1992	1.63	0.36	13.65	2.90	0.24	-0.47	0.86	0.49
1995	1.15	0.37	14.92	3.41	0.07	-0.46	0.87	0.55
1998	1.58	0.43	13.13	3.41	0.22	-0.40	0.86	0.55
2000	1.55	0.52	12.16	3.42	0.21	-0.31	0.85	0.55

Note: Data are for TE average;

Source: Based on data from Monthly Statistics of Foreign Trade of India; Volume Exports and Re-exports (various issues), Ministry of Commerce and FAO Trade Yearbook (various issues).

was not having comparative advantage in exporting fresh, chilled and frozen fish till TE 1989 as revealed by less than unity values for RCAs and negative values for RSCAs. However, it became reasonably competitive in subsequent years. Fish dried and smoked group had RCAs values less than unity and negative RSCAs in almost all years indicating a comparative disadvantage to India in exporting these items. It indicates inefficiency in the processing of fish and fish products in India.

India has been quite competitive in exporting shrimps and prawns and RCAs values hovered around 11 to 15 from TE 1983 to TE 2000. Similarly the RSCAs were very close to 1(0.85± 0.01). However, there has been slight erosion in the export competitiveness of shrimps and prawns in recent years.

Determinants of Fisheries Exports from India

The four basic determinants of export demand, *viz.,* export prices, international prices, market size and exchange rate together explain 95 per cent of the total variation in exports of fisheries products from India. The coefficients for all the variables, except non-Indian international prices, were statistically significant (Table 17).

Table 17: Estimation Results of Export Demand Functions for Fisheries Sector

Item	Value of the coefficients
Constant	13.3360**
Indian export prices (IEPx)	-1.1333*
The non-Indian international prices of fisheries products (WPx)	-0.1693
Volume of international trade in fisheries (ITF)	0.4274***
Exchange rate (ER)	0.7020*

*Note: *, ** and *** indicate level of significance at 1%, 5% and 10% respectively.*

The signs of the coefficients, except for non-Indian world price, are as per the economic logic. The domestic export price has negative effect on the demand for exports of Indian fisheries products. The results indicate that with 1 per cent reduction in Indian export price, export demand for Indian fisheries sector would increase by 1.13 per cent. The world export price does not theoretically have correct sign. However, it is not significant. Therefore, we can conclude that world prices do not play a very significant role in explaining export of fisheries products from India.

The estimate for world fisheries market shows that for one per cent increase in the world fisheries trade, export demand for Indian fisheries would increase by about 0.42 per cent. The estimate for exchange rate is positive and significant. A high exchange rate indicates lower purchasing power of domestic currencies in relation to other or standard currencies like US dollar. In other words, devaluation lowers the export price of the commodity for the foreign buyers and pushes up the domestic price of exportable and importable commodities and therefore encourages exports. The estimate for exchange rate indicates that its management seems to have played an important role in the export of fisheries commodities from India.

Attributes of Scientific Manpower in the Indian Council of Agricultural Research

Dayanatha Jha, Pandey S.K., Surabhi Mittal and Praveen Kumar

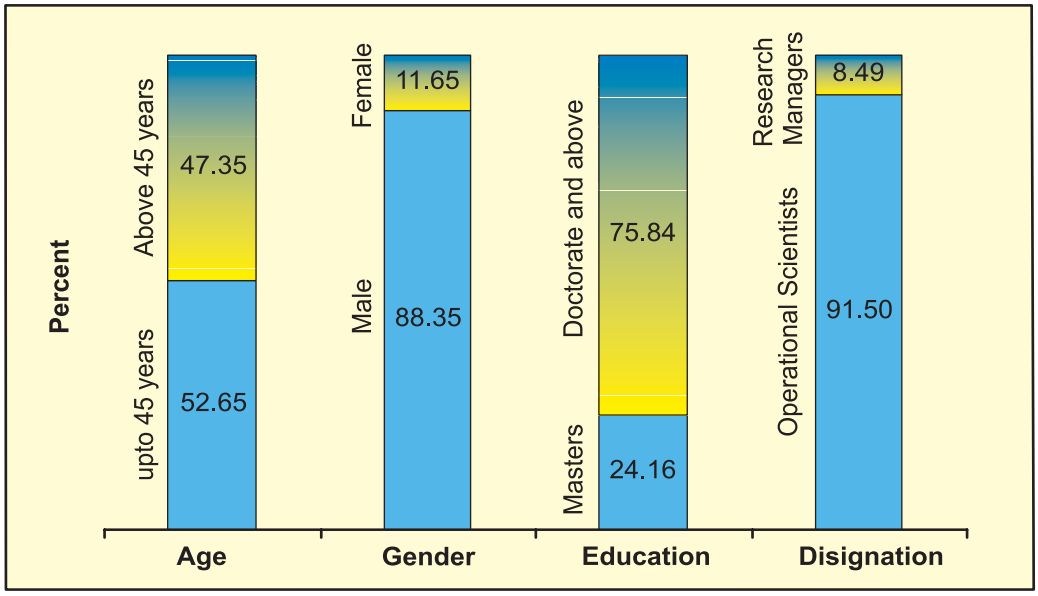
The 'Census of Scientific Manpower in Agriculture-2001' covered 4697 scientists of the Indian Council of Agricultural Research (ICAR), representing almost its entire scientific strength. Some findings on age distribution and time allocation of the scientists were reported earlier. Results of some further analysis of the census data are reported below.

Broad attributes of ICAR Scientists

Data on age, gender, education and levels of ICAR scientists are presented in Figure 6. The average age of ICAR scientists is now 45 years, with 43 per cent falling above the average age. The high average age, as well as high proportion of scientists in the declining productivity phase necessitates induction of young scientists in the research cadre. This is reinforced by the fact that the projected superannuation /retirement rate over the Tenth Five Year Plan is much higher than the historical recruitment rate.

With regard to gender, barely 12 per cent of ICAR scientists were women. This is not surprising since a historical gender bias existed in agricultural education, which has been redressed only recently. More in-depth scrutiny reveals that nearly two-third of the women scientists are below 40 years of age, and the proportion of women scientists declines in higher age groups. In the 50 to 60 years of age bracket, only 5 per cent are women and there are very few women scientists in management positions. These figures indicate that the Council has become more gender conscious over the last decade or so and the proportion of women scientists has improved in this period. Accordingly, the average age of women scientists is 37 years, which is 9 years lower than that for the male scientists. Figure 6 also shows that about one-fourth of the total scientific manpower have entry-level qualification (i.e. master's degree), more than two-third (i.e. about 71 per cent) at the entry level (scientist), followed by senior scientist (24 per cent). Attainment of a Ph. D. degree is an essential part of the carrier advancement policy of ICAR. Accordingly, in principal scientist and higher positions, only about 5 per cent are with only master's degrees.

Figure 6: Broad Attributes of ICAR Scientists, 2001

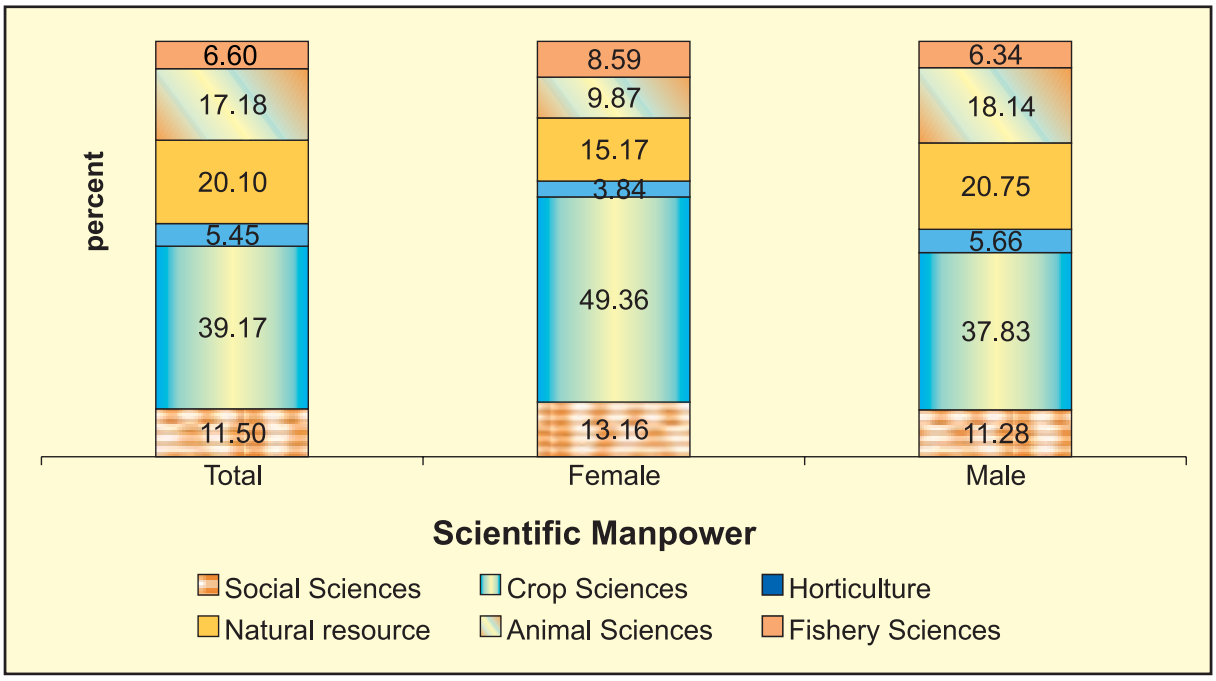


About 92 per cent of the total scientists are operational scientists pursuing research, education and extension whole time. Only 8 per cent hold research management positions. This implies that on an average one research manager is guiding about 14 operational scientists. This ratio is close to optimum for an efficient research programme.

Distribution of scientists by disciplines

Information on disciplinary orientation of ICAR scientists in relation to sex and education is provided in Figure 7. The disciplines have been grouped into 6 broad categories. It is seen that more than three-fourth of the scientists belonged to crop sciences, natural resource management and animal sciences groups; horticulture, fisheries and social sciences account for the rest. Crop sciences (including horticulture) alone accounted for about 45 per cent of total scientists. Since crops constitute the core of agriculture, this appears quite rational. The side panels of this figure show a bias in favour of crop sciences, fisheries and social sciences and against animal sciences and natural resource management on the part of women scientists. The analysis further reveals that the gender-preferred discipline groups have a strong component of basic (and social) sciences and most women scientists (more than three-fourth) come from this stream.

Figure 7: Distribution of ICAR scientists by disciplines and gender



Concentration of scientists

Table 18 shows the institute-wise concentration of scientists. On an average, there are 48 scientists per institute. However, almost half of ICAR institutions have less than 30 scientists and these account for about one-sixth of the total scientists. With an average size of 7 scientists in 27 institutions, one wonders whether the critical mass criterion is violated. On the other extremes, only 4 ICAR institutions share

about 22 per cent of the total scientific strength, with an average size of about 300 scientists. These numbers suggest the need for some rationalisation in allocation of scientists to improve research efficiency. In this climate of rightsizing, any across the board adjustment should be guarded.

Table 18: Concentration of scientific manpower in ICAR institutes

Scientists group (number)	Scientific Manpower		Institutions covered	Average number of scientist per institution
	Number	Per cent	Number	Number
16 - 30	562	11.97	25	22.48
Up to 15	194	4.13	27	7.19
16 - 30	562	11.97	25	22.48
31 - 50	680	14.48	18	37.78
51 - 100	1134	24.14	16	70.88
101 - 150	929	19.78	8	116.13
151 & above	1198	25.51	4	299.50
Total	**4697**	**100.00**	**98**	**47.93**

Prioritization of Maize R&D Plan in India

P.K. Joshi, N.P. Singh and N.N. Singh

Maize offers a promising substitute for diversifying agriculture in upland areas of India. The crop has high potential provided the available improved hybrids, composites and other technologies reach farming community. R&D portfolio was developed and prioritized for different regions of the country. Three indicators were used to prioritized R&D portfolio. These included efficiency, poverty and marginality of production environment. High priority was accorded to those research areas, which yield higher returns, confined in areas where more poor live and have marginal (low productivity) production environment. The R&D portfolio was developed in consultation with the maize scientists in a 3-days workshop after prioritizing production constraints obtained through RRA from the farmers in different agro-ecoregions.

Based on all the three criteria, the maize production regions were prioritized for resource allocation as (i) eastern region (winter and irrigated maize), (ii) southern region (high and medium rainfall, (iii) central and western region (medium and high rainfall regions), and (iv) eastern region (high rainfall rainy season maize). Research areas for network mode under All-India Coordinated Improvement Project on Maize may be as follows: (i) policy research on seed sector, and imbalanced use of inputs, (ii) drought, moisture stress and water, (iii) poor crop establishment, (iv) turcicum leaf blight, (v) post-flowering stalk rot, (vi) stem borer, and (vii) post-harvest losses.

Top 10 research issues in different agro-regions are listed in Table 19. It may be noted that lack of quality seeds and poor crop stand in eastern region; whereas drought and lack of poor quality seeds in high rainfall region of southern region were the most important issues required to be researched. Under limited resource availability for maize research, the key constraints in potential areas need to be addressed to alleviate production constraint and to meet the national objective of increasing economic efficiency, alleviating poverty and reaching out to marginal and fragile areas.

Table 19: Top 10-research issues based on different criteria.

Region	Rainy season	Research issue	Criteria			Final rank
			Efficiency	Poverty	Marginality	
East	Winter	Lack of quality seeds	2	1	1	1
East	Winter	Poor crop stand	4	2	2	2
South	High	Drought	1	9	15	3
South	High	Lack of quality seeds	3	10	17	4
East	Winter	Imbalanced nutrient use	5	3	3	5
East	Winter	Post-harvest losses	7	4	4	6
East	Winter	Turcicum leaf blight	10	5	5	7
South	High	Post-flowering stalk rot	6	11	20	8
East	Winter	Post-flowering stalk rot	11	6	6	9
South	High	SDM	8	12	22	10

Indian Seed System Development

Suresh Pal, Harbir Singh, Rakhi Goel and M. Rajasekharan

This project aims to study the structure and effectiveness of the seed industry, so as to suggest appropriate policy measures to improve efficiency of the industry. The work will be completed in three phases, *viz.,* collection of secondary information and discussion with key informants, study of the seed agencies, and farm survey. During the year under report, the work on the first phase was undertaken. The structure of the industry is changing primarily because of availability of superior material developed through R&D efforts, foreign direct investment and collaboration with multinational seed companies. The most recent initiative is the diversification of export-oriented or agro-processing companies into seed for supporting their main business. The growth of private seed sector is taking away the share of public seed agencies. It would be interesting to analyse how the national companies are responding to these changes. The impression gathered so far is that the national companies look for support of the government and public research organisations.

Sustainable Agricultural System

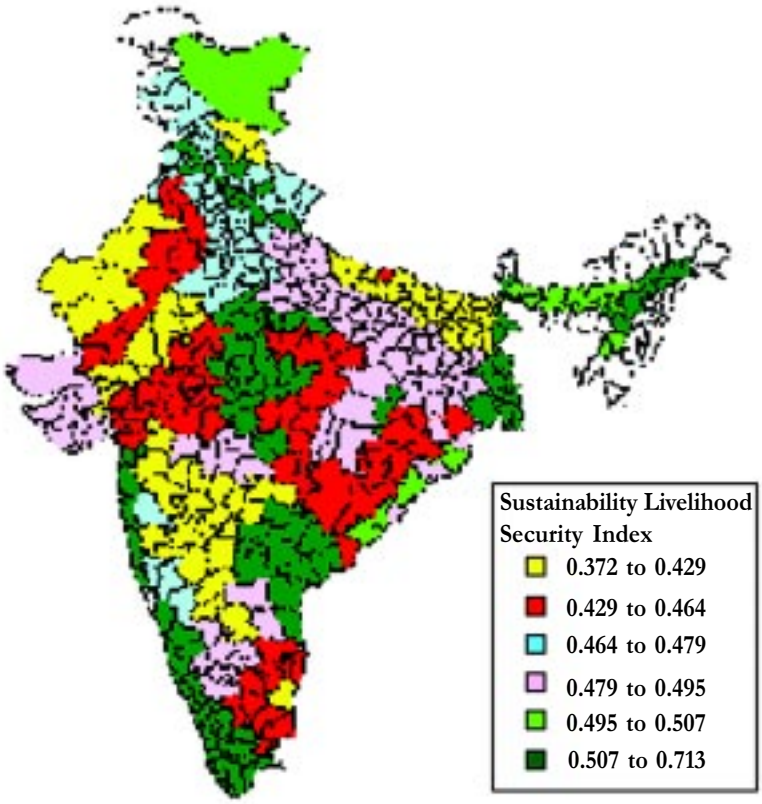
Sustainability mapping of Agroecological sub regions of India

S. Selvarajan, B. Natesh and B.C. Roy

Agroecological regional approach is adopted in the ongoing study on Water-food security scenario analysis for 2025 with a focus on sustainable development of agriculture. Sustainable agriculture, while keeping pace with the population and poverty alleviation goals, has to balance the future production growth among the diverse agro-ecological regions (AERs) without degrading the natural resource base. Sustainability has several dimensions, which are dynamic over space and time and more challenging to represent objectively. However, methodologies are evolving to measure sustainability over years, which is a continuous process for making it more transparent and understandable by the users. Indexing appropriately identified variables to represent various dimensions of sustainability is one of the commonly used approaches to measure sustainability status, which is used for classifying the 52 Agro-ecological sub regions (AESRs) of the country using 1995/96 data as the reference. Three dimensions

namely ecological, economic and equity dimensions of the sustainability are considered here to represent the agricultural system of AESRs. Ecological dimension is captured through land area under forest, utilizable ground water and population density. Economic dimension is represented by land productivity, labour productivity and cereal output. Equity dimension is captured through literacy and ground water use. In the first stage, the selected variables are integrated separately for ecological, economic and equity dimensions to construct respective indices. Three indices representing three dimensions of sustainable agriculture development are again integrated and indexed, by using the ratio of the inverse of the proportional contribution of ecological, economic and equity indices as a weighting scheme, while constructing sustainable livelihood security index for each of the AESRs. Using the sustainable livelihood security indices, the sustainability status of 52 AESRs is mapped (Figure 8).

Figure 8: Sustainability Status by AESRs



All AESRs are categorized into six groups based on the sustainable livelihood indices. 16 AESRs covering 142 districts have relatively low sustainability value of less than 0.464. These regions should receive immediate attention and preference in the sustainable development of agriculture over other regions. These districts are scattered across the country, covering part of states like Rajasthan, Maharashtra, Karnataka, Tamil Nadu, Bihar, Uttar Pradesh, Jharkhand, Andhra Pradesh, Himachal Pradesh, Jammu & Kashmir, Gujarat, Madhya Pradesh, Chattisgarh, Haryana, Punjab, Orissa and Uttaranchal. Spatial distribution of districts in 17 states and 16 AESRs with low sustainable livelihood security indices underline the need for regionally differentiated strategies for sustainable development of agriculture. 22 AESRs covering 129 districts, with a sustainability index value of over 0.5, are relatively better off for supporting agricultural growth in the short run without compromising on sustainability. These districts

are again distributed all over the country covering as many as 20 states. Intra-state variation in sustainability index varies widely. For instance, in Maharashtra, sustainability index across districts varied from a low of 0.373 to 0.718. This is observed in many other states like Karnataka, Tamil Nadu, Himachal Pradesh, Gujarat and Andhra Pradesh. Such variations in the sustainability status across districts within the state highlight the need for location specific resource use strategies for sustainable development of agriculture. For example, North Bihar and Avadh Plains zone (AESR 13.1) consisting of 28 districts in Bihar, 8 districts in Uttar Pradesh and 2 districts in Jharkhand have low ecological sustainability index as well as economic efficiency index ranking 50 and 41 out of 52 AESRs considered. Relatively lower ranking of AESR 13.1 in terms of ecological index as compared to economic efficiency index implies that afforestation and water conservation projects should be taken up on priority. However, detailed mapping of sustainability status of regions over time will be useful in aiding investment decisions targeting the prioritized programmes relevant to the sustainable development of agriculture in each region.

Status and determinants of land use dynamics

S. Selvarajan, S.D. Vaishnavi and Anjani Kumar

Shrinking resource base consisting of land and other resources both in terms of quantity and quality restricts India's future agriculture development options. Net and gross area sown available for an average farm holding to support eight persons has come down by more than half during the past five decades (1950-2000). Similarly, land available to meet fuel and fodder needs for each farm holding has come down by 80 per cent during the period. Despite the continuous decline in both land-man ratio and the carrying capacity of the land being witnessed over space and time, unutilized land resources represent one dimension of the existing idle capacity in agriculture sector. India's' Xth Plan emphasizes on utilizing the idle capacity in the economy for lowering the incremental capital output ratio and realizing the higher growth rates targeted for various sectors including agriculture.

Land-use dynamics

Land-utilization pattern of 13 states for the year 1995-96 was analyzed in terms of ecological and agriculture sectors. Ecological sector consists of forests, barren and unculturable lands, permanent pastures and land under miscellaneous crops. Agriculture sector consists of culturable waste, current fallow, fallow other than current fallow and net area sown. State-wise analysis reveals that Punjab and Haryana accounted for more than 4/5th of their reporting area allocated for agriculture sector while Orissa had nearly half of their reporting area under ecological sector. For the country, the share of non-agricultural uses in the reported area has gone up by two and half times during 1950-2000. Currently, states like West Bengal, Tamil Nadu and Bihar tops the list with 14 to 19% of their reported area going for non-agricultural uses.

Land-use in agriculture

Across states, wide diversity exists in agriculture land use dynamics. Net area sown has already accounted for 96 to 98% of the land use in agriculture with a very little area available as under utilized area.

Underutilized land consists of area under culturable waste, fallow other than current fallow and current fallow. States like Andhra Pradesh, Tamil Nadu and Bihar have more than 30% of area available for agriculture as under utilized.

Potential land utilization

As per the ICAR classification, potential land indicates the maximum area that can be brought under cultivation after suitable reclamation interventions. Arable land indicates the area that is under cultivation including the area that can certainly be brought under cultivation. Arable land includes net area sown, current fallows and fallows other than current fallows. Potential land includes arable land, culturable waste, permanent pastures and grazing land, land under miscellaneous tree crops and groves. Land utilization status as a per cent of potential and arable land exploited, varies widely (Table 20). More than 25% of the potential land area available for agriculture remains unutilized in Andhra Pradesh, Tamil Nadu, Bihar, Orissa, Gujarat and Karnataka. More than one-third of the land area remains underutilized under both arable and potential land categories in Andhra Pradesh.

Table 20: Land utilization status by states

State	Net area sown as a per cent of	
	Potential land	Arable land
Punjab	97.2	98.0
Haryana	95.0	96.3
West Bengal	93.5	95.8
Kerala	92.8	96.4
Uttar Pradesh	82.7	90.2
Maharashtra	78.6	88.0
Madhya Pradesh	77.9	93.0
Karnataka	76.2	87.4
Gujarat	72.7	92.5
Orissa	70.1	88.3
Bihar	66.8	72.0
Tamil Nadu	65.0	70.9
Andhra Pradesh	59.5	66.3

Determinants of underutilized land

Using climatic, economic, technological and institutional factors regression analysis was done with respect to the dependant variable namely per cent of potential land not exploited. The results revealed that rainfall, per cent of area under cereals, wage rate and farm size had significant inverse relationship with the unutilized potential land area. The inverse relationship between rainfall and per

Figure 9: Land-use dynamics in selected states (as % of reported area)

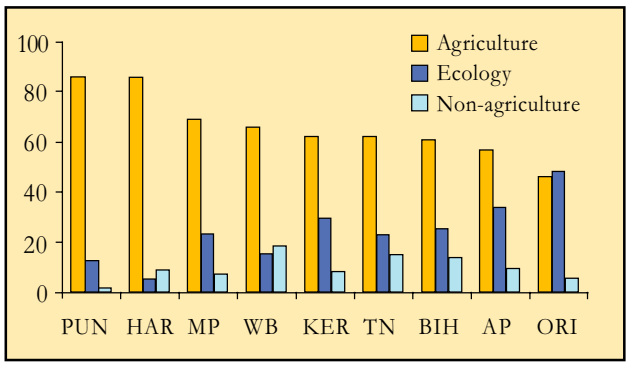
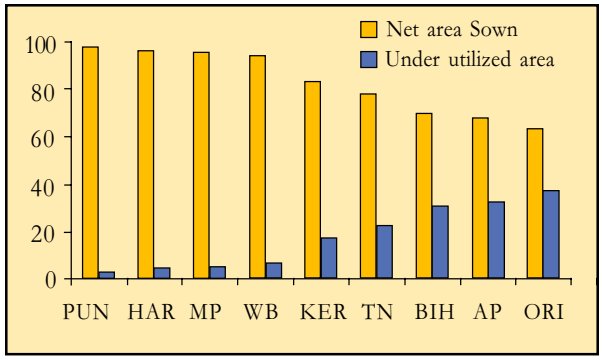


Figure 10: Land-use in agriculture (as % of land-use in agriculture)



cent of potential land not exploited highlights the need for resource conservation programmes. Major interventions are needed for conserving as much in situ soil moisture as possible to support viable agriculture in such under utilized lands. For getting more insights on the other determinants of underutilized land in agriculture, agro-ecological classification specific analysis will be useful.

Evaluating water productivity in irrigated agriculture

S. Selvarajan and B.C. Roy

Growing water scarcity led food security concerns necessitate that the inter and intra-sectoral water allocation decisions are guided by the economic value of water in its various uses. Assessing productivity of water by use is therefore necessary for sustainable integrated water resources management. Irrigated agriculture being the dominant water-using sector, water productivity based allocation decisions will ensure that scarce water is supplied for its most valuable uses while promoting water and food security.

Agro-ecological Sub-Region

Water -Food Security Scenario Analysis was conducted for the Agro-Ecological Sub Region (AESR) 4.4 covering Madhya Pradesh. In this state, in gross terms, 27,400 mcm of water (both surface and ground water) is currently used for irrigating an annual average area of 5.62 million-hectare (mha). As the major source of irrigation, 18,600 mcm of surface water accounts for 1.33 mha of irrigated area by canals, tanks and other sources while 8,800 mcm of ground water accounts for 4.29 mha of irrigated area by dug wells, tube wells and other sources during TE 2002. After allowing for overall irrigation efficiencies, 4200 m^3/ha (or 420mm) is available for the consumptive needs of crops irrigated from surface sources and 1540 m^3/ha (or 154mm) for crops irrigated from groundwater. However, if the same water were spread across the entire surface command area installed, the available surface water would reduce to 2390 m^3/ha (239mm).

Prevalant operating rules for storage dams prioritise the use of wet season inflows stored by the dams for irrigating dry season crops regardless of crops yields and their economic worth. For the state as a whole, wet seasons (during which paddy is the major preferred crop) account for less than 20% of the gross irrigated area. Dry seasons however, account for some 80% of the gross irrigated area, in which wheat is the major preferred crop. Yet productivity of both the crops predominantly grown with low inputs and technology, are much below the national average.

Productivity model

Using evapotranspiration as a measure to account for the quantity of water used by the crops, a production model of the relationship between crops' yields and water shortage is linked with a value-added approach for imputing economic value to the water evapotranspired by major crops in the state. Evapotranspiration of water can be estimated by using the relationship between yield response and water stress. Four cereal crops namely, paddy, wheat, maize and sorghum; three oilseed crops namely mustard, soybean and ground nut; one pulse crop namely chickpea (gram) and other crops like sugarcane and cotton are considered for estimating the value of water in M.P (Figure 11).

Physical productivity of water

Considering the physical productivity of water expressed as kg per m^3 of water, following inferences could be made:

- For all the crops, average productivity of water moved in a narrow range of 0.5 to 0.6 kg/m^3 except for wheat, maize, sorghum (all above 0.6 kg/m^3), cotton and sugarcane (all below 0.3kg/m^3).
- Wheat and maize recorded maximum marginal productivity of water (close to 1.0 kg/m^3), while groundnut (0.34kg/m^3) followed by cotton registered least marginal productivity (0.14 kg/m^3). For all the remaining crops, marginal productivity exhibited a narrow range of 0.4 to 0.5 kg/m^3.

Value productivity of water

Considering the productivity of water expressed in terms of net benefits (Rs per m^3), excluding all operational costs, it becomes clear that:

- Mustard, soybean and gram are the crops in the same sequence to record high average net benefits of above Rs 3 per m^3 of water utilized. Groundnut, maize and sugarcane are the other crops with the average net benefits of Rs 2 to 3 per m^3. Paddy, wheat and sorghum performed poorly with least average net benefits per unit of evaporation water consumed.
- In terms of marginal net benefits of evaporation water, again, paddy, sorghum and wheat gave low marginal net benefits of Rs 1 to 1.5 per m^3 of water used. Mustard registered the highest marginal net benefits above Rs 3 per m^3. Rest of the crops, namely sugarcane, gram, soybean and maize have also shown marginal net benefits above Rs 2.5 per m^3 of water utilised.

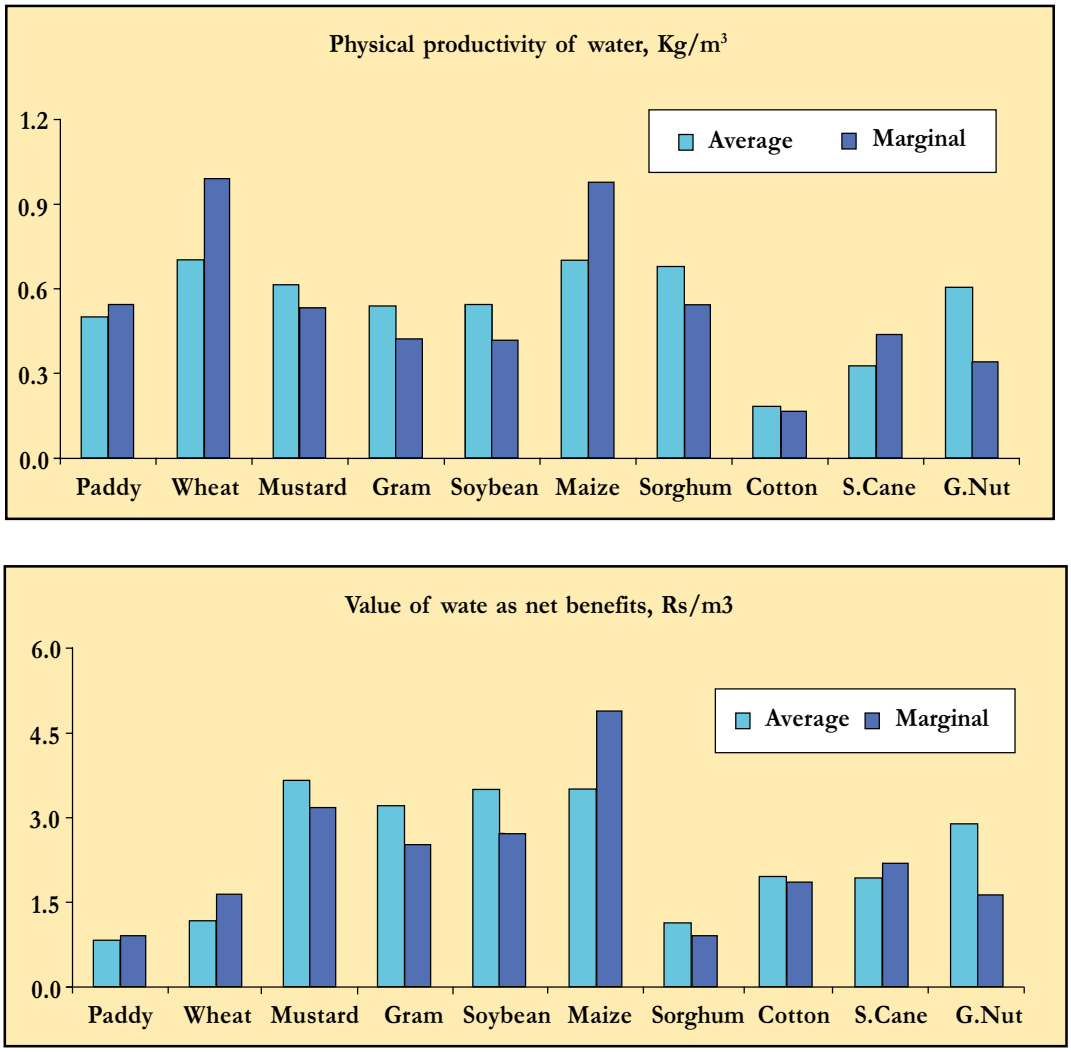
Value of water among crops

Comparative analysis of value of water in Madhya Pradesh's major crops has revealed the following;

- Among *kharif* crops considered, soybean followed by maize and groundnut has outdone the paddy by being more responsive with high marginal net benefits in the ratio of 2 to 3 times per cubic meter of water used as compared to that of paddy.
- Among *rabi* crops, mustard and gram are superior to wheat. Marginal net benefits in case of mustard and gram are 1/3rd to 3/4th higher than that of wheat.
- Considering the competition for water between soybean and *rabi* crops, the value of marginal net benefits per cubic meter of water for soybean is almost as good as gram and mustard and much more attractive than wheat as well as paddy in *kharif*.

Despite the increasing scarcity of water, the productivity of water is dismally low in the state. This is partly due to wastage caused by dilapidated infrastructure, but more importantly due to: lack of regulation, appropriate volumetric or quasi-volumetric pricing, and incentives along with inadequate exploration of comparative advantage of growing alternative crops.

Figure 11: Estimated Value of Water in Major Crops in Madhya Pradesh



Water allocation policy for enhancing soybean trade competitiveness

S. Selvarajan

Allocation of water, based on its economic value, enhances the productivity and efficiency of resource use while making the commodity highly competitive in the international market. Efficiency is needed for not only exploiting global market opportunities but also to protect the domestic market from import competition and soybean in Madhya Pradesh provides the classic example.

Soyabean status in M.P

M.P with around 4.5 mha of area under soybean accounts for 70% of the area as well as production share in India. The average productivity of soybean in the state has stagnated at around 1.1 t/ha during 1990s. The crop is grown for four months in kharif during June-October, under rainfed conditions. At the current productivity level of 1.1 t/ha, marginal productivity of water in soybean in Madhya Pradesh is estimated at 0.42 tonnes per ha while research studies reveal a yield increase of 0.55 t/ha if the crop could be provided with one supplemental irrigation (10 cm) during the all important reproductive stage which coincides with

the end of the monsoon (September). At this time the crop invariably suffers moisture stress leading to reduced yield. Eventhough the state's reservoirs will be full to capacity,the water is saved at this time under current reservoir operation policies for dry season cropping which is overwhelmingly dominated by wheat, a low yielding, low value commodity with few value added opportunities. This stored water in large seasonal dams used for irrigating soybean at the stage would help to optimise yields of soyabean, which is a potential high value crop with several value added opportunities.

Rational water policy for efficient soybean production

Per hectare cost of cultivation for soybean is less in Madhya Pradesh as compared to the USA (Table 21). For example in TE 2000, operating costs per hectare for soybean in USA remained more than twice that in M.P. However, soybean yield in USA was more than two and a half times than the average yield of 1.1 t/ha realized in M.P. Consequently, cost of production is significantly lower in USA as compared to M.P., thereby making Indian Soybean more competitive in the world market. The state should try to increase the yield of soybean per hectare along with efficient use of resources including water to achieve lower costs of production and get price advantage in the international markets.

For instance, if supplementary irrigation is provided to the soybean, yield could go up by 0.42 to 0.55 t/ha. Assuming an average increase in productivity of about 0.5 t/ha, it is clear that soybean yields could be increased from 1.1 to 1.6 t/ha thereby reversing the economics of competitiveness in soybean production between India and USA as highlighted in the Table 21.

Table 21: Impact of water allocation policy on competitiveness of soybean

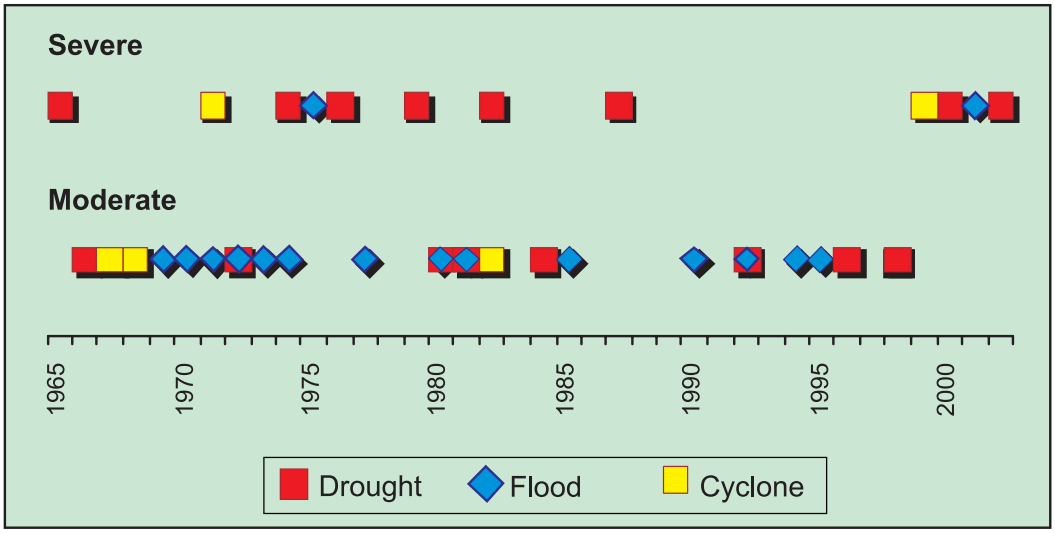
Country	TE 2000	New Water Allocation Policy
India (Madhya Pradesh)		
Operating costs (Rs per ha)	3870	4045
Yield (t/ha)	1.1	1.6
Cost of production (Rs/t)	3518	2528
Gross value of production including the value of secondary product (Rs/ha)	10659	14830
USA		
Operating costs (Rs per ha)	7900	
Yield (t/ha)	2.8	
Cost of production (Rs/t)	2795	
Gross value of production including the value of Secondary product (Rs/ha.)	22686	

Vulnerability to climate change and coping strategies: Experiences of rural poor from coastal Orissa

B.C. Roy, S. Selvarajan, Mruthyunjaya and Tom Downing

Climate induced natural disasters (CINDs) like drought; flood and cyclone have become serious problems to Orissa with regular occurrence particularly in coastal Orissa (Figure 12). The common perception of rural households in coastal Orissa is that climate has changed for the worse and CINDs occur more frequently and with more intensity. (Table 22).

Figure 12: Climate induced natural disasters (CINDs) in Coastal Orissa



The farmers and fishermen who are the traditional food producers living in such a fragile environments, have been ecologically, geographically and economically marginalized and among them, the poor are the worst affected. In most years, adjustment in household activities combined with relief works provides the minimal succour. Hence, certain coping mechanisms have been evolved by the rural households to reduce the impact of such CINDs.

Table 22: Peoples' perception about recent trends in CINDs (% of respondents)

Frequency/Events	Increased	No Change	Decrease
Drought			
Frequency	92	6	2
Intensity	90	7	3
Flood			
Frequency	57	23	20
Intensity	17	48	35
Cyclone			
Frequency	26	56	18
Intensity	54	39	7

Households seek access to a secure source of income that provides basic food and income when agricultural production fails. Therefore, a classical pattern of sequential and/or simultaneous quick responses was seen, building up from minor adjustments, such as diet changes or increased reliance on off-farm income sources, to the disposal of assets, notably land and cattle to a major shift such as out-migration (Table 23). The favoured strategy is mainly seeking wage earning locally. Only a small per centage of households have an access to such favoured activities and many households, therefore, resort to out-migration for daily wages.

Those, who cannot migrate and do not find adequate employment locally, attempt for a multitude of activities that complement each other in securing food or income for the household. It was also found that as high as 94% of the selected sample households have adopted one or the other strategies to adapt drought, flood, and cyclone vulnerability. The common strategies (in order) are diversifying

food and income sources; adjustment in crop practices; adjusting livestock keeping practices; risk minimization through share-cropping and building up stocks and inventories; seeking institutional support like demanding relief; managing scarce water resources; etc. All such strategies have reduced the adverse impacts but the poor continued to be the worst affected. CIND events trapped them in a situation compel them to sell off productive assets that become difficult to retrieve and therefore reinforcing the permanent nature of poverty. Besides these coping strategies, government relief and rehabilitation programmes have also helped the poor to reduce the risk of CIND vulnerability. However, there is an urgent need for a shift in focus from food aid to long-term mitigation measures such as, drought proofing, development of resistant cultivars (against drought, flood and salinity), infrastructural development in terms of road and irrigation, and generating off-farm employment opportunities, etc.

Table 23: Impact of calamity events on rural livelihood

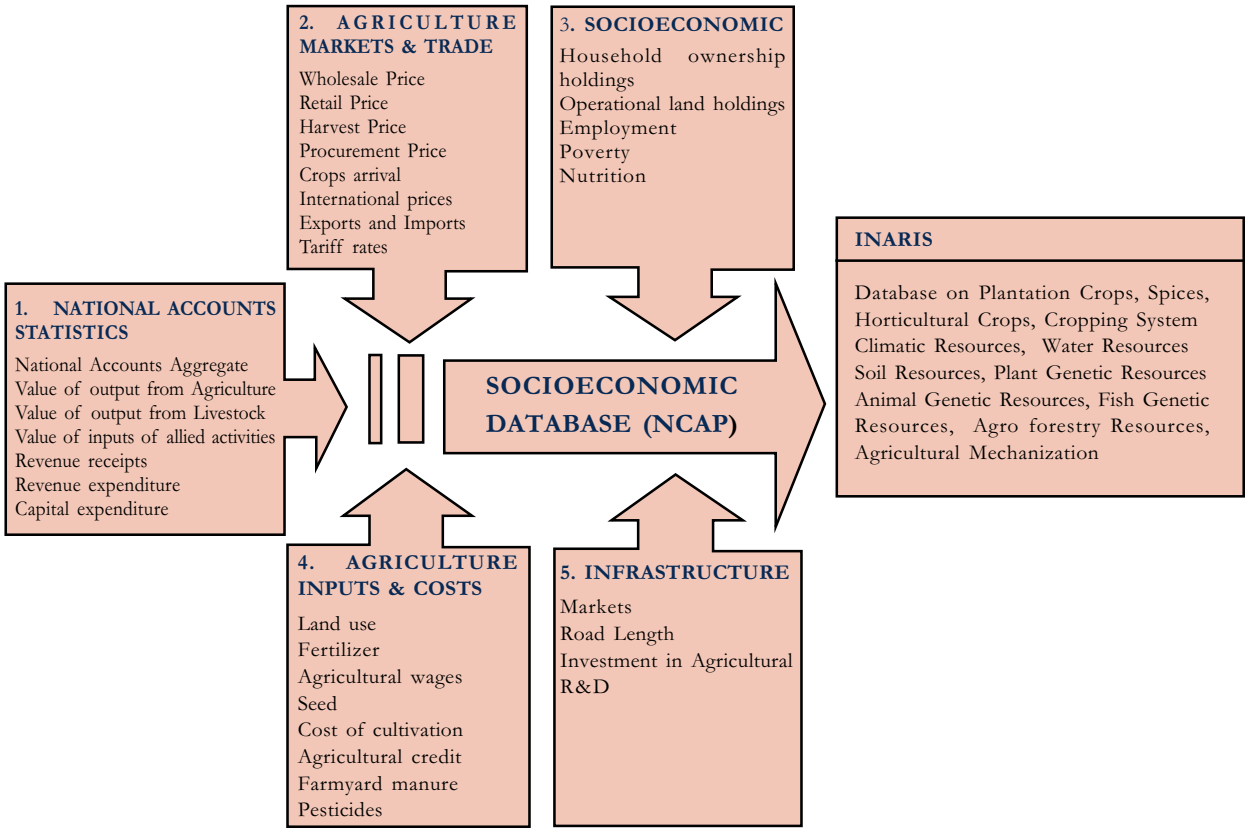
Particulars	Unit	Normal Year	Calamity year	% Reduction
1. Performance of crop farming				
Average Paddy Yield	Kg/ha	1188	702	-41
Area sown as per cent of operational holding	%	100	73	-27
2. Expenditures per household				
Food items	Rs/year	12324	10194	-17
Medical	Rs/year	1179	1126	-05
Education etc	Rs/year	1497	1161	-22
Clothes & festivals	Rs/year	1435	883	-38
3. Average price received for distress selling				
Land	%			-16
Cattle	%			-27
Jewellery etc	%			- 14
4. Income per household				
Wage earning	Rs/year	13990	11920	- 15
Crop production	Rs/year	4030	1854	- 54
Others	Rs/year	2764	1728	- 37

Database development for efficient agricultural technology management

S. Selvarajan, Prashant Kumar, Anjani Kumar and P.A. Lakshmi Prasanna

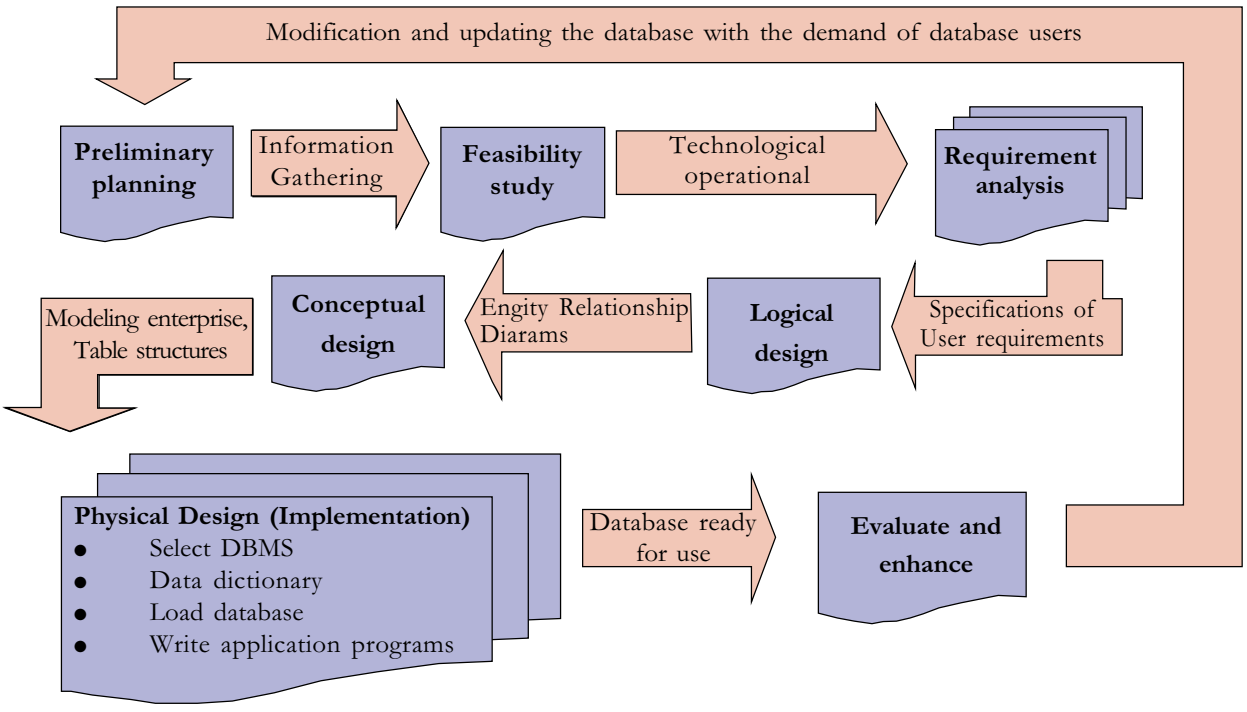
The purpose of the Integrated National Agricultural Resource Information System (INARIS) is to provide a data-warehouse on: soil, water, climate, animal, fish, crops and cropping system along with socio-economic and geographical features on a single platform, and allow to evolve methodologies to interpret the interlinked data through the Central Data Warehouse for planning and development purposes, as per the requirements of the user agencies. The Centre is developing a comprehensive database on socioeconomic aspects of agriculture covering National Accounts Statistics, Agriculture Markets and Trade, Socioeconomic variables, Agriculture Inputs & Costs and Infrastructure. The broad contents of these databases are shown in Figure 13.

Figure 13: Elements of Socioeconomic Database from NCAP



To be an integrated part of INARIS, Socio-economic database followed standard database development cycle (Figure 14). As mapped in the socio-economic database development life cycle each and every activity in this cycle produces an output that becomes the input for next activity in the cycle and after

Figure 14: Socio-economic database development cycle



making the database ready for use, the cycle starts again depending upon the demand of the user. For instance if a user wants to add more variables in the Agriculture Markets and Trade database then the same cycle will be repeated as it has been done earlier for the all five databases. As mentioned in the physical design (implementation) about the application programmes, these programmes consist the "Graphic User Interface" (GUI) for the users. These GUI consist user-friendly screens for updating the database and standard queries are generated by these databases in these front-ends. These front-ends can be updated as per the demand of users. The database as is being created will help the researchers, the policy makers and planners towards improving the efficiency of the agricultural technology management.

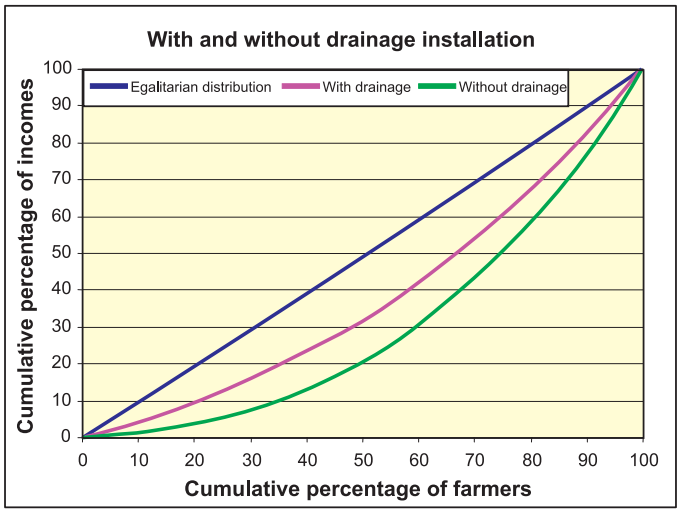
Socio-economic Impacts of Agricultural Land Drainage – A Study from North West India

K.K. Datta, B.C. Roy, C. de Jong and S.B. Singh

Soil salinity due to water logging is threatening agricultural production in roughly one million hectare area in North West India. To combat this problem, subsurface drainage (SSD) has been recommended and accordingly, huge investment is made. An assessment of SSD installation in the Gohana Sub-Division of the Sonepat district of Haryana reveals multiple benefits (within four year interval) that includes substantial increase in crop yield ranging from 29 to 35%; increase in cropping intensity from 117% to 175%, diversification towards high value crops; decrease in salt content in the drained land by 10 to 66% as compared to 2.2% increase in undrained lands; improvement in the water table by 0.2 to 0.7 meter; and increase in gainful employment by 85 mandays/ha. All these tangible benefits, coupled with some associated intangible benefits like improved sanitation and health, resulted in better quality of life.

The study is based on an area of about 4600 hectare with 2150 farm households. All information was collected at an interval of four years i.e., before (1995-96) and after (1999-2000) installation of SSD. The program also reduced the income inequalities across farmers (Figure 15). This technology maximizes the distribution of welfare gains to the weaker sections of society while conserving the land and water resources by reducing the income inequality by about 20 per cent as is evident from the Gini concentration ratio. Results of the decomposition analysis showed that absolute contribution of drainage to the yield increase alone is to the tune of 40 to 70 per cent. Despite these economic, social and environmental benefits, the adoption of this technology is still not very high. The specific constraints identified are the indivisible nature of the technology and lack of group action by the beneficiaries. These happen due to absence of appropriate institutional arrangements which are never considered as a part of the technology development process.

Figure 15: Lorenz curve for income distribution among farmers in the study area



Markets and Trade

Demand and Supply Analysis of Livestock Food Products in India during 2020

Dastagiri M.B.

This study estimated supply and demand functions for the major livestock products, for making the projections for the year 2020. For demand analysis, the study uses consumer expenditure data from 50th round of National Sample Survey Organisation pertaining to the year 1993-94 while supply analysis is based on time series data on quantity and prices of livestock products for the period 1970 to 1998. It is generally believed that in the agricultural sector, in response to a given change in the price level, the production first increases over time and then declines. The polynomial distributed lag model captures this type of phenomenon. Linear model also was used to estimate supply response. Seemingly Unrelated Regression Equations (SURE) model was used to estimate the complete systems of demand equations. The commodity groups for which the demand estimated include: milk, mutton and goat meat, beef and buffalo meat, chicken, egg, fish, other-foods and non-foods. The commodity groups for which the supply was studied included milk, mutton, beef, chicken, egg and pork.

Demand

The income elasticity of demand for milk was estimated to be 1.36 for rural households and 1.07 for urban households. The demand for beef and buffalo meat, chicken and egg was more elastic in rural households (ranges from 0.74 to 2.35) than in the urban households (ranges from 0.57 to 1.24). Interestingly, the income elasticity for mutton and goat meat was found to be more elastic (3.19) in urban households compared to rural households (0.52). This implies mutton and goat meat has tremendous demand in urban areas.

Supply

The production of livestock products are demand driven rather than supply driven as in case of cereals. The results of supply analysis indicated that the technological progress will be crucial to usher in livestock revolution. However it was observed that the rise in feed prices would affect the production of these commodities adversely. Thus, favourable price policy to help farmers to increase investments in the livestock sector is suggested. On the other hand, feed supply has to be increased.

The base line scenario revealed that the actual production trends for all the commodities closely follow the actual for consumption (Table 24). However, in 2020, there would be a surplus production is likely to emerge in milk, eggs, beef & buffalo meat, and fish of the order of 84.88 million liters, 1.89 billion eggs, 7.96 million tons beef and buffalo meat, 4.48 million tons of fish and 1.89 million tonnes of chicken. These results indicates that in 2020, India would not only be self sufficient in these products but would

Table 24: Demand and Supply gap of Livestock Food products (million tones)

Year/Livestock Products	Surplus/deficit	2000	2020
Milk	Surplus	17.79	84.88
Mutton &Goat meat	Deficit	-1.31	-3.13
Beef & Buffalo meat	Surplus	2.68	7.96
Chicken	Surplus	0.32	1.89
Egg*	Surplus	0.32	1.89
Fish	Surplus	1.21	4.48

**Note: Egg in billion numbers.*

be surplus, as all the projected production figures are more than consumption figures, except for mutton and goat meat, where there would be shortage of 3.12 million tonnes. Policies towards increasing fodder supply, remunerative prices to livestock products, and above all investments in technology improvements in livestock sector are important and are to be given attention.

Supply Elasticities for Livestock Products

The polynomial price lag model estimates are presented in Table 25. Time variable, which represents technological and other structural changes in the livestock sub-sector, is highly significant (1 per cent level) in six equations out of seven equations. Non-significant coefficient was obtained in case of fish. Feed price coefficients in four equations (mutton, beef, chicken, egg) are negatives indicating rise in prices of feed prices would lead to decline in production of these products. Fish seed coefficient is positive and significant indicating that the availability of fish seed would increase fish production.

Table 25: Estimates of the Supply Response Model (Polynomial price lag model)

Equations/ Variables	Mutton	Beef	Chicken	Fish	Pork	Egg	Milk
Constant	-6489.92	-101232	-57093.5	574.23	-42537.5	-2310593	-4514.92
	(-4.522)	(-2.808)	(-4.652)	(1.117)	(-9.45)	(-11.542)	(-17.64)
Price W_0	1.2119*	3.668	1.7509	0.8467*	1.3657	2.3557*	0.4323
	(2.419)	(1.29)	(1.131)	(2.396)	(0.406)	(2.995)	(0.649)
Price W_1	-0.948	-1.209	-2.5018	-1.1673	-7.9153	-3.3059***	0.3474
	(-0.656)	(-0.131)	(-0.613)	(-1.004)	(-0.508)	(-1.397)	(0.196)
Price W_2	-0.2357	-0.694	1.7284	0.4978	0.4935	1.5409	-0.480
	(-0.21)	(-0.099)	(0.561)	(0.56)	(0.644)	(0.852)	(-0.361)
Feed price	-0.0728	-1.48	-0.5076	0.3968*	N.A	-0.5328*	0.0409
	(-0.609)	(0.18)	(-0.54)	(5.933)		(-2.299)	(1.284)
Time	3.347 *	50.929*	28.817*	-0.282	0.1106*	1172.19*	2.287*
	(4.599)	(2.836)	(4.718)	(-1.085)	(9.462)	(11.76)	(18.344)
R^2	0.971	0.863	0.896	0.975	0.848	0.984	0.998
R^{-2}	0.963	0.829	0.87	0.968	0.819	0.98	0.997

Figures in parentheses represent t values
**1 per cent level of significance*
*** 5 per cent level of significance*
**** 10 per cent level of significance*
N.E — Not estimated due to non-availability of the data.

The estimates of price coefficients generally assume expected positive signs and exhibit a high degree of precision. In conformity with theory, all the seven price coefficients are positive. Mutton, fish and eggs price coefficients are significant at 1 per cent level, implying that higher prices stimulate the production of foods from livestock sector. It needs reorientation of price policy to create the environment in which farmers will increase investments to improve productivity in the livestock sector.

The estimated supply response functions are robust in terms of explaining variability in livestock food production. The price impact in the first period is positive and significant indicating the influence of immediate previous lag price on production of these products. It is interesting to note that the dynamic price impacts (as depicted by the delayed price coefficients) increases first with lag, then decreases and

finally increases indicating rise and fall of production every alternate year response to price changes. This finding is consistent with the hypothesis that livestock production, in response to a given change in the price level, first increases through time and then starts declining.

Government Intervention in Foodgrain Markets in the New Context

Ramesh Chand

In India about 26 per cent population is reported to be below poverty line and is undernourished. Cereals are the main source of calorie and food security for such population. Due to slowdown in output of cereals and accumulation of production in the government stock, availability of cereals for consumption has been adversely affected. There are two reasons for production going to stock rather than being consumed. One, PDS prices during 1990s have increased at a faster rate compared to open market prices and prices of other food and other commodities which caused a decline in per capita PDS demand in the recent years. Similarly, retail prices of rice and wheat in open market have also risen at a much faster rate during 1990s compared to 1980s causing an adverse impact on cereal demand during 1990s.

Government Procurement and Private Trade

The government's procurement, distribution, and buffer stocking programmes during 1990s have had negative impact of repressing private foodgrain marketing, undercutting its potential contribution to long term food security. Experience shows that mere announcement of higher support prices for commodities, which are not effectively backed up by procurement arrangement, does not serve the purpose of raising level of prices received by producers. Therefore, attempts by CACP to raise support prices of crops like edible oils and pulses, in which India is deficit, relative to support prices for rice and wheat which are in excess supply, cannot be expected to result in shift of resources from rice and wheat to the deficit crops. Another serious problem in government intervention in grain markets is that the regional concentration in government procurement of grain has remained quite strong. Proportion of marketed surplus procured by official agencies across states varies from below 2 per cent to more than 85 per cent. During recent years there have been frequent reports from states of Orissa, Madhya Pradesh and Bihar about distress sale of rice and maize below MSP. These states have been late adopter of new technology. Though they are food deficit at aggregate state level, several growth pockets have emerged in these states having surplus foodgrains. These pockets are in the first stage of green revolution and agricultural development, when private trade and market institutions are not in place to provide incentive to encourage adoption of new technology and hence output growth. Agriculture growth would get a serious setback in such areas if institutional support in the form of guaranteed price is not provided.

Several reasons are responsible for accumulation of grain stock much above the genuinely required level. First, during the decade of 1990s, procurement prices of rice and wheat were given a comfortable increase, which was quite higher than the increase in general prices. As demand side factors did not support this increase in price, growth in retail prices started trailing behind the growth rate in largely government influenced wholesale prices. This caused adverse impact on the margin of private trade, which slowly started withdrawing from the market. Accumulation of cereal stock with government agencies created a feeling that release of excess stock can anytime depress open market prices. These two factors led to withdrawal of private trade from grain markets in surplus states causing increase in procurement by government agencies, even when there was no shortfall in production. Another reason for the reduced role of private trade in direct purchases from then producers is the release of stock for open market

sale and export at a much lower price than what would be the unit cost of rice/wheat to private trade from direct purchases from producers. This created perverse incentive to private trade - not to participate in primary market and buy from government rather than buying the produce from producers.

Protection of Farmers Interests

In the long run, country needs to develop new mechanism to provide protection to farmers income. Achieving this objective through price intervention alone results in several distortions. Government should provide support to develop viable crop insurance for protecting crop income. When the emphasis of production is shifting from food security to market led production, it is not justified to base MSP on cost of production. Similarly, there are concerns relating to definition of cost of production on which MSP should be based. There could be cases where private trade turns out to be exploitative and farmers are paid price below MSP. One way to address this kind of situation is to compensate farmers through "deficiency price payment" a part of the difference between actual price received by farmers and MSP. Similarly, it is not possible to carry out procurement in all the markets in the country to ensure MSP, and, stock position may not justify procurement in some years. The system of deficiency price payment can work as an alternative to procurement operations in such situations. This would help in preventing unwanted stocks and help in providing price incentive to producers in all the regions considered relevant for the purpose. Thus, the system of "deficiency price payment" can help in achieving economy in procurement and regional equity in implementing the guaranteed price.

Regional Strategic Framework for Liberalisation of Agricultural Trade Policies in Asia

Ramesh Chand

The challenge thrown by low level of international prices in the recent years to domestic production is being used to oppose the process of further integration and liberalisation. Available evidence shows that reversing the process of liberalisation and raising protection would be a big setback to Asian economies. Asian countries should face the challenge thrown by low international prices by improving efficiency and competitiveness of their produce. This requires strong commitments to undertake further reforms in trade and domestic policy. There is a need to identify domestic regulations that restrict markets and access to the improved technologies and foreign capital and replace these with innovative and more open regulations. Similarly, system of incentives to encourage efficiency and quality has to be put in place. Trade liberalisation and globalisation can produce winners and losers. Therefore, appropriate strategies need to be worked out to counter adverse impact of opening up. Those who are adversely affected must be identified and alternative choices and suitable safety nets should be provided to them.

Asia as a region is showing economic dynamism and intra Asia agricultural trade is growing faster than world trade. However, fast growth of intra regional trade in Asia has not been followed by any regional integration in the form of trade blocks. This is depriving Asia of vast potential benefits and opportunity for trade creation and improvement in welfare of Asian countries. Besides, regional trade agreements are also very effective mechanisms to take benefits and also to safeguard from much of the WTO commitments. It has thus, become extremely important for Asia, in the globalising context, to forge regional trade agreements, and identify potential sub-regional groupings for mutually beneficial trade. FAO has to play a critical role in this direction. It should sensitize various governments in Asian countries about the benefits of forging mutually beneficial trade blocks and facilitate move towards regional integration of agricultural trade. This would require studies on mutually beneficial combinations

of countries for free regional trade in various commodities, dissemination of findings to policy makers, technical exchanges to acquire knowledge and improve understanding of trade opportunities and trade environment in countries of the region, and capacity building for trade analysis and promotion. Till that happens, FAO should encourage Asian countries to remove physical and political obstacles to trade with neighbouring countries, lower restrictions on trade in the region, and follow common external trade policy. FAO should evolve common product standards, and make efforts to bring harmonization in trade policy in the region.

Reforms in Trade Policies of Fisheries Sector in India

Anjani Kumar and P.K. Joshi

In the case of agriculture, including fisheries, India had followed protective trade policies in the past. Except for a few traditional commercial commodities, trade was being regulated through quantitative restrictions (QRs), canalization, licenses, quotas and high tariff rates. All marine and inland fish were on the negative list of imports. However in order to make trade policies consistent with the new economic policies and the provisions of WTO, a number of fisheries products were moved to the Special Import License (SIL) and freely importable lists since 1997 onwards. In the Exim policy announced in 1992, import of most of the fisheries items were either restricted or prohibited (Table 26). But, in the next Exim policy (1997-2002), the list of freely importable and importable items under SIL was expanded considerably. In the recently announced Exim policy (2002) the import of fisheries commodities was further liberalized and almost all commodities were moved to the list of freely importable commodities, except for five groups of live and Whale Shark (*Rhinocodon*).

Table 26: Status of Import policy of fishery products

Period	Total no. of fishery Restricted/Prohibited	Commodities	SIL	Free
1992-1997	121	-	7	114
1997-2002	121	62	21	38
2002-2007	127	-	122	5

Source: Exim Policy, Ministry of Commerce, GOI (Various issues).

The tariff structure in the fisheries sector has also undergone a sea change. The tariff rate applicable for import of fish products was 60 per cent till 1993-94. To meet the obligations of WTO after its establishment in 1995, the tariff rate for import of fish products was reduced to 24 per cent in 1998-99 and further to 21 per cent in 1999-00. In April 2000, India removed QRs on 715 items, which included commodity groups like fish and fish products, meat and other agricultural products. Further, QRs on agricultural and allied sector trade were completely removed for the last 714 items w.e.f. April 2001. More than 120 items of fish and fish products have been affected by these regulations. After complete dismantling of QRs, tariff rates were perceived as the only instrument for restricting imports. In 2000-01, the tariff on imports of fish and fish products was raised to 44 per cent and, after observing for a year, it was again moderated to the level of 35 per cent. Although it is too early to predict the exact impact of removal of QRs on fisheries sector trade, higher tariff rates accompanied with competitiveness of Indian fish and fish products would be able to protect the surge of imports of fish and fish products.

Institutional Change

Partnerships, Innovation, and Institutional Change

Andy Hall, Rasheed Sulaiman V., Norman Clark and B. Yoganand

The need for closer interaction between the national and international public-sector R and D organisations with the private sector has been widely recognised at present. Case studies to explore the relationship between these two sectors and to document alternative patterns and principles of innovation were undertaken adopting the principles of the Innovation System Framework. This framework contends that innovations (both technological and institutional) emerge from the interaction of actors involved in the production, diffusion and use of new knowledge: that these actors sit in political, institutional and cultural environment, which shapes the nature of relationship/partnership between the actors. Innovation was explored in these studies in its broad sense of activities and processes associated with the generation, distribution and adaptation of new technical, institutional and managerial knowledge and not in its narrow sense of the invention of a new technology in R and D laboratories, though it is clearly important.

The study found increasing evidence on the growing realisation that innovations happen when arrangements are in place that support learning and institutional change among groups of partners and stakeholders. This means that the arrangements whereby those involved in research and rural development reflect with their partners on their successes and failures and adapt approaches and procedures in order to achieve success. This process is referred to as Institutional Change, that means changing the norms, routines and conventions associated with the way innovation is approached. This might means reconsidering who is involved in research or implementation activities, who decides priorities and approaches, how successes are judged and by whom. The study found that without institutional change, the relevance of formal research organisations reduces over time as they have no way to adapt their focus and activities to match the constraints and opportunities faced by the technology users and society as a whole. It is for this reason that institutional learning (the process through which new ways of working emerges) assumes such importance in strengthening innovation system performance. There are a number of specific lessons for research policy and practice that emerge from these case studies which are as follows:

Nature of innovation

- Innovation involves dealing with issues in complex systems that have both the technical and Socio-economic parts and often involves producers, market chain actors and consumers.
- Both technical and institutional innovations are important.
- Formal R & D is only a series of related tasks required to bring about post-harvest innovation. It requires collaboration between different scientific disciplines, between researchers and technology users and between public and private sectors. It is sometimes useful to involve an organisation to act as a catalyst facilitating this pattern of broad-based collaboration.
- The institutional context of these collaborations or partnerships is a key determinant of their direction and outcome.

Institutional Change

- There is a generic concern relating to the need to build stronger and more consultative linkages between public-sector science and other actors in the innovation system. There is a need to address a broad range of institutional features of the current agricultural innovation systems, that prevent these linkages developing. Static and compartmentalised roles, combined with poorly developed learning culture are institutional issues that need specific attention
- Supporting institutional change requires long term commitment on the part of donors and policy agencies. This is particularly so because successful institutional change is observed to emerge indigenously, through trial and error in response to local circumstances
- Transferred institutional models or blueprints rarely succeed

Partnerships

- Successful projects have been those that have focussed specifically on establishing coalitions of local actors around a particular problem areas or task. These actors include scientific ones, but not exclusively so, and not necessarily as the leading actors. Similarly, roles may evolve over a time.
- The selection of the most appropriate grouping of partners is very often an empirical question that cannot be realistically answered at the outset of the project. Project should allow for this with inception phases and mechanisms that allow the introduction of new partners or replacement of old ones.

Institutional Learning

- There is a tendency, reinforced by the output-oriented problem-solving framework of the conventional project cycle, to under report process or institutional innovations and lessons associated with technological success (or failure). These lessons are often complementary innovations to the new technical knowledge and its application. This institutional learning should be part and parcel of technical projects and their outputs.
- If institutional or process lessons and innovations are to be fostered as a research output, an action research approach should be used. To implement this approach, self reflection and process monitoring and documentation skills will need to be developed in project teams. This is particularly so where team members comes from formal scientific research organisations where the learning culture is poorly developed.
- Institutional learning and change rarely succeed if it is driven by only one or two individuals particularly if they are relatively junior in an organisation. Institutional change can be prevented or legitimised depending on the support or otherwise of key senior figures, particularly directors of organisations or senior bureaucrats in donor and policy bodies.
- Organisations, that are willing to experiment and learn, are the ones that succeed. Often successful approaches develop and evolve along the way. Projects and organisations that encourage continuous institutional learning seem more likely to succeed.

Research approaches that support institutional learning and change, need to be recognised for their contributions to developing the capacity of innovation systems. This needs to be considered when planning, monitoring and evaluation procedures, as it is behavioural changes within the innovation system that will indicate progress towards longer term goals such as poverty reduction.

Post T & V innovations in extension delivery in India

Rasheed Sulaiman V

Several states in India experimented with different approaches to extension-delivery in the last one decade, especially after the external funding for Training and Visit (T&V) system came to an end. These includes: broadbasing (to include messages related to horticultural and livestock sectors), decentralisation (extension planning and control under elected bodies at the district level), contracting NGOs for some extension activities; promotion of private extension initiatives; adoption of group approaches (instead of the earlier individual approach); use of para extension workers (as substitutes for DoA field extension workers and also to increase the reach of the public sector extension system); and establishment of new organisations to implement special programmes. An analysis of these innovations in extension-delivery has revealed the following lessons.

Performance of Department of Agriculture

State Department of Agriculture (DoA) and other line departments still face several constraints in providing adequate extension support to farmers. Implementation of a large number of central and state sector schemes with specific targets to achieve, consume a major share of block and village level officials' time. Very little attention could therefore be paid for diagnostic field visits, advice on technological options, mobilising farmers and supporting farmer groups. Technology dissemination continues to be understood as the main extension role and the other support needs of farmers remain unattended. To provide a wide range of support, DoA need to partner with other organisations in the public and private sector having these expertise. But line departments such as DoA generally work in isolation and partnerships are rare. The DoA poorly serves tribal and remote areas and special efforts are needed to fill-up the vacancies in these areas. The centralised planning and implementation of extension programmes and the associated bureaucratic procedures leave practically very little flexibility to the block and village level functionaries to modify programmes based on farmers' needs.

New Approaches

Agricultural Technology Management Agencies (ATMA), established in 28 Districts (in 7states) under NATP, could successfully solve some of the operational constraints faced by extension, as it is relatively free from many bureaucratic and time consuming procedures and this provided the much-needed flexibility to respond quickly to demands from the field. Mechanisms such as SREP, FAC and block action plans supported with adequate funds contributed to making ATMA demand driven. But performance of ATMA varies widely across states and districts and the reasons behind this differential impact need to be understood.

Group approach has a number of advantages. But FIGs/SHGs of farmers need institutional support (from NGOs, financial institutions, agri-busineess firms, market committees, or government technical agencies) and they also need to be provided with the opportunities to enhance their capacity to address management, legal and social issues. How the DoA would support SHGs/FIGs in these aspects is not yet clear. There is an increasing attention to the potential role of para extension workers (PEWs). How successfully these PEWs transfer skills to other farmers is not clear. PEWs representing a SHGs/FIGs of farmers are more accountable to fellow farmers than those selected by a few farmers in a village or nominated by the government. Decentralisation has provided greater role for people's representatives

to influence development of need based and location specific programmes, but there is a wide variation in their capacity to influence planning and implementation of extension programmes positively. Though Information Communication Technologies offer many options for improving extension efficiency, organisations in the public sector are yet to exploit its potential. With infrastructural and hardware deficiencies getting sorted out, the challenge seems to be in producing content relevant to specific locations in the regional language, value addition to raw information and in developing systems at local level that ensure access to all farmers.

Several studies have shown that farmers are generally willing to pay for quality extension services provided they are convinced of their benefits. Private extension delivered as a part of a wide range of services is attracting more farmers at the moment. Keeping in view, the wide diversity in terms of agro-climatic conditions, socio-economic conditions of rural producers and infrastructure for agricultural development, a country-wide model for agricultural extension would be counter productive. Reform process in agricultural extension should consider the following key lessons learnt from the review.

- The main public sector extension agency, the DoA need to partner with a number of different organisations in the public and private sector to access the wide range of skills (related to business and market analysis, market development, value addition, community mobilisations and group formation) required for implementing the above broad agenda. DoA and other line department need to hire the necessary expertise on areas such as programme design and development, monitoring and evaluation, market analysis, market development, value addition opportunities and market promotion.
- Districts need to be supported with skills and resources to develop extension plans. Planning and implementation of extension programmes should keep in view the diversity of extension service providers and should indicate strategies to exploit this diversity. Capacity development of block, district and state level officials should concentrate on designing innovative extension programmes at the district and block levels and skills related to implementing, monitoring and evaluation of extension programmes.
- Organisational and Management reforms are essential in public sector extension organisations to provide a greater degree of flexibility to field level officers at the block and circle levels. Extension organisations should strive for developing a culture of learning, reflection and experimentation. This may necessitate drastic organisational restructuring and in certain cases developing the new forms of organisation.
- Group approach has a number of advantages, but farmer SHGs need to be supported technically and managerially to make them sustainable and economically viable organisations.
- Extension clearly needs more funding support. Funds to be linked to location specific (district level) and appropriate organisational changes informed by a detailed institutional analysis.

Medicinal Plants Sector in India: Review of Current Status, Opportunities and Constraints

Harbir Singh, Dastagiri M.B., Lakshmi Prasanna P.A. and Adhiguru P.

Indian medicinal plants sector has established that there are several strengths: enormous inherent biodiversity, large variations in temperature, soil and climatic conditions, standardizing of cultivation practices for a few medicinal plants, a rich heritage of Indian System of Medicine (ISM), a strong base of research and development laboratories and skilled manpower and lower production and manpower

costs in India. Though several studies have established the high economic potential of medicinal plants, their cultivation has not picked up at the pace required for meeting the demands of herbal industry. According to one estimate, of more than 500 plant species used for production of medicines by Indian industry, less than 20 are currently under cultivation in the country. Absence of formal marketing linkages and effective buy-back arrangements are considered as the biggest hurdle in the development of medicinal plants sector. As a result, India's export to the world-market in natural health products is just 0.57 per cent as compared to 3.6 per cent for Chinese exports.

The total domestic market potential for plant-based crude drugs as well as extracts is estimated to be around Rs. 3 billion. Eighty per cent of sales of crude drug and extract categories come only from 20 per cent of medicinal plants. Therefore, there is an immense scope for medicinal plants/ extracts by way of taking up their cultivation and processing as a priority. International market for medicinal plant based products is estimated at US$ 60 billion and is growing at the rate of 7 per cent per annum. The growth in this sector during 2001 and 2002 is estimated to be approximately 8 to 10 per cent a year with recent estimates putting these figures as 10 to 15 per cent. Lack of reliable database is one of the major constraints in planning and monitoring the developments in this sector. Most of the data are disjointed, scattered, grossly inadequate and incomparable. Moreover, no scientific method of cleaning, grading, transport, storage, labeling or marketing has evolved over time and no regulated market has been established to control the various marketing practices involved in the entire commercial chain. Lack of co-ordination among various stakeholders, such as: Ministry of Agriculture, Ministry of Environment and Forests, Ministry of Commerce, Department of Indian System of Medicine & Homeopathy (ISM&H), Department of Science & Technology, State Governments, private traditional medicine sector, research institutes, NGOs and international network is identified as yet another major constraint.

For utilizing the inherent strengths of medicinal plants in a sustainable way, the existing bottlenecks faced by growers as well as companies should be identified. Organic cultivation and farming system research for promoting medicinal plants cultivation need to be strengthened. With the given capacity, the medicinal plant sector in the country should emerge as the most sustainable growth sector in the years to come. Innovative institutional arrangements, for credit and marketing, effective legislative and policy instruments to deal with post-WTO scenario and a comprehensive technology portfolio for farmers are the need of the hour to harness the potential of medicinal plants sector in India. If these are not done, we will be missing a great opportunity.

Strengthening Inter-Institutional Linkages for Sustainable Nutritional Security

Adhiguru P.

There has been a realisation that the agricultural interventions are more sustainable in addressing the malnutrition among the rural poor in the long run. In this study, programmes of various development departments have been examined to assess the linkages in promoting nutritional security. Possible inter-institutional joint activities have been depicted in Table 27. There is some co-operation between Health Department and Integrated Child Development Service (ICDS) in identifying the 'at-risk' households. Their linkage with agriculture and allied departments has been found to be negligible. Data sharing on nutritional status and the list of 'at-risk' households amongst these departments is desirable.

Table 27. Interdepartmental joint activities for improving nutritional security

Primary role	Secondary role	Activity	Benefit
Health, Social welfare, Nutrition	Agriculture, Horticulture, Animal Husbandry	Identification of "at-risk" households Decentralized analysis of nutritional status data of ICDS	Integrated targeting of developmental schemes to 'at-risk' households Development of region-specific policy alternatives
	Horticulture	Estimation of nutritional requirements of average poor household in the region	Effective planning of nutritional gardening for poor households
	Agriculture and allied	Sensitizing extension personnel	Extension system incorporates nutritional objective in its technology transfer
Horticulture, KVKs	Social welfare, Nutrition	Processing and value addition of mushroom, vegetables	Increased shelf life, enhanced nutrient intake, access to nutritive foods in off-season.
Horticulture	Social welfare, Schools	Tree planting, nutrition gardening	Utilization of common land for increased supply of fruits and vegetables
Agriculture	Horticulture	Farming system diversification-intercropping, mixed cropping and border cropping	Enhanced nutrient supply from food systems
	Nutrition	Joint campaign on benefits of millets consumption	Sustaining millets cultivation and consumption
	Animal Husbandry	Developing integrated farming system model for promotion of dairy and poultry	Low cost feed, cost-effective maintenance of livestock and poultry, increased production
Panchayat union, Village *Panchayat*	Development departments	Coordinated proactive role in implementing development programs	Integrated targeting, enhanced nutritional security through poverty alleviation
Horticulture, SAUs University, KVKs, NGOs,	Social welfare, Nutrition	Identification of Micronutrient-rich indigenous crops	Crop introduction and or area expansion
State Agricultural University, ICAR , KVKs, Agriculture	Health, Social welfare, Nutrition	Development of nutrient rich transgenic varieties	Field fortification
Horticulture, KVKs	Social welfare, Nutrition	Technical know-how on nutrition gardening	Effective management of nutrition gardening by Anganwadis
Horticulture, NGOs	Social welfare, Nutrition	Social marketing- co-operative units	Awareness about nutritive value of foods and increased food and vegetable intake
Social welfare, Nutrition	Agriculture, Horticulture	Self-help Groups (SHGs) from 'at-risk' households	Empowering 'at-risk' households to solve malnutrition problems
Agriculture, Horticulture, KVKs, NGOs,	Social welfare, Nutrition, NGOs	Large-scale co-operative operations	Agro processing and sale of dehydrated and fortified greens/ vegetables

Animal Husbandry Department needs to strengthen the co-ordination with other line departments in implementing schemes that promote integrated farming systems. *Panchayati* Unions and Village *Panchayats*, which are implementing top-to-down schemes, should be innovative in coordinating with other development agencies. The agricultural regional research stations of State Agricultural Universities, Indian Council of Agricultural Research, *Krishi Vigyan Kendras* (KVKs) etc., can play a greater role in the area of nutrition gardening, identification of indigenous micronutrient-rich fruits and vegetables, developing varieties high in micronutrients, especially iron and vitamin A, and designing innovative cropping patterns etc. The role of extension functionaries needs to be reoriented because, at present, it is mostly concerned with the distribution of subsidised inputs. Therefore, training programs could be organised to sensitise them regarding nutritional issues of vulnerable sections of the society and the nutritive value of crops.

At present people are passive beneficiaries of governmental nutritional programs. Self-Help Groups can be formed and training programs can be organised in the areas of financial management, knowledge sharing, establishing grain bank, etc. The discussions with the nutrition department reveal that the quality and the quantity of supplementary feeding is one of the main concerns in implementing the schemes like ICDS. The development departments and Food Science and Nutrition Departments of State Agricultural Universities can jointly assist in the formation of community level agro-based small scale processing units which can produce dehydrated leaf powder of nutrient rich spinach, drumstick, agathi, spirulina, etc. Interdepartmental co-ordination committees may be constituted at various levels for periodic monitoring and evaluation and to evolve dynamic policy alternatives from time to time. A strong political will and blessings of the top management is essential to implement these policies and strategies to ultimately reach the goal of sustainable nutritional security.

Plant Variety Protection and Food Security: Review of Experiences and Lessons for Developing Countries

Harbir Singh

The purpose of this review is to contribute towards informed policy decisions to deal effectively with the possible implications of plant variety protection (PVP) legislation on agriculture sector in general and food security in particular. Based on earlier findings, an attempt has been made to synthesize the emerging viewpoints on plant variety protection and their implications with particular reference to developing countries. IPR laws in developing countries were relatively under-developed compared to developed countries whose laws were already mostly in conformity with the TRIPS Agreement. Legislative attempts in India and Africa for complying with TRIPS Article 27.3(b) is unique as both the countries simultaneously recognize rights of the farmers and plant breeders. Since Article 27.3(b) has a direct bearing on the developing countries agriculture in general and food security in particular, the moot question is how plant variety protection would help ensure food security in developing countries?

The results of various studies from developed countries indicate that plant breeders' rights have differential impact across crops. Increasing role of private sector in plant breeding is accompanied by appropriate strategies with serious implications. For example, increase in the varietal release rate is accompanied by a shortening life span of varieties and high level of market consolidation in the seed industry, which has been used to jack up seed prices. Studies from developing countries indicate that while, in certain cases, plant breeders' rights have facilitated access to improved foreign variety but this contributed little to food security. Developing countries should draw upon these experiences while

framing and implementing their legislations for protection of plant genetic resources and their impact on food security. Since there is no mention of UPOV convention in TRIPS Agreement, developing countries must take full advantage of the flexible provisions provided under TRIPS for enacting their own (*sui generis*) legislations on plant genetic resources keeping in view their local, regional and national goals. At the same time, developing countries should work collectively with a focus on maintaining their crop genetic diversity, developing localised seed delivery and production systems with the help of efficient institutional mechanisms. One implication of this is that, developing countries need the capacity and full preparedness to participate much more effectively in international IP negotiations on a regular basis than on exceptional basis. This would help in conservation and proper utilisation of plant genetic resources in such a way that food demands of the population are fulfilled locally and on sustainable basis.

Agricultural Growth and Modelling

Socio economic dynamics of rice production systems in eastern India

B C Barah

An annotated Rice Bibliography in Eastern India

An annotate bibliography on socio-economic aspects of rice economy in eastern India was developed. This compilation has revealed that the studies on agricultural technology assessment got more importance during the period 1980-2001 than the other major themes (Table 28). Issues, such as sustainability, agricultural risk and gender got only a very limited attention.

Table 28: Trends in research priority on Socio economic aspects of Rice production system (% of total)

Major theme	1980-85	1986-90	1990-95	1995-2000	Grand Total
Agricultural Production Technology	46.0	54.5	44.9	34.4	42.1
Trends, Growth and Stability	14.0	2.3	13.5	17.2	13.5
Agrarian Institutions	8.0	6.8	10.1	14.8	11.3
Constraints Analysis	4.0	4.5	11.2	5.5	6.8
Risks in Agriculture	8.0	4.5	2.2	7.8	5.8
Sustainable Agriculture System	6.0	2.3	5.6	4.7	4.8
Agricultural Trade and Market	4.0	15.9	1.1	2.3	4.2
General Issues	4.0	2.3	3.4	3.9	3.5
Poverty	2.0	0.0	0.0	4.7	2.3
Agriculture R and D	0.0	0.0	4.5	1.6	1.9
WTO and Agricultural Policy	0.0	0.0	3.4	2.3	1.9
Gender Issues	4.0	4.5	0.0	0.8	1.6
Grand Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

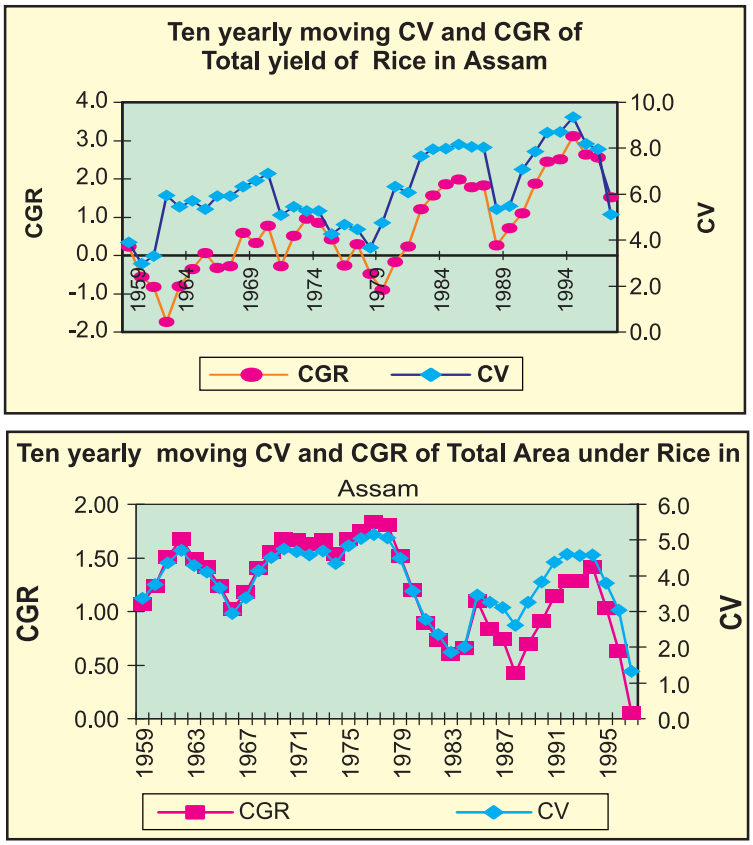
Data base of Rainfed Rice Economy:

A unique data base of rainfed rice economy containing statistical derivatives such as district level compound growth rate, triennium averages, variability and growth rate and CV based on moving averages was developed. It also contains valuable information on the primary survey of 1800 farmers

from 18 selected rainfed districts in eastern India. Some of the salient features of this data base are:

- The growth of population in the region is higher than that of national average rate indicating increasing pressure on land and other natural resources. 37 per cent of the population in this region live below the poverty line.

Figure 16: Trends in Moving Growth and Coefficient of Variation of rice in Assam



- More than 50 per cent of the total cropped area is under rice. But the productivity is low and pattern of growth in area, production, and yield is highly fluctuating. Figure 16 shows the 10 yearly compound growth (CGR) and variability (CV) based on moving average in area and the yield of rice in Assam. The fluctuations are more severe at district level.
- A number of districts in eastern India (particularly in West Bengal and Eastern Uttar Pradesh) show high growth of productivity and low variability. Development of ground water resources in Eastern Uttar Pradesh and land reforms in West Bengal increased rice productivity and accelerated growth.
- Cultivation of boro rice in Assam, West Bengal and parts of Bihar resulted in steep increase in rice area. On an average boro rice yields about 3 to 4 tonnes/hectares. Boro rice cultivation, if backed by appropriate interventions, has the potential to bring "Rice revolution" in the region.

Technology intervention and food security status in tribal, backward and hilly areas

Mruthyunjaya, S.K. Pandey and Anil Kumar Dixit

An integrated technology intervention approach under the Household Foods and Nutritional Security Project was followed to improve the food and nutritional security status of poor people of under privileged regions of tribal, backward and hilly areas of India. The food security status of sample households has been assessed on the basis of calories intake through food items consumed and it was compared with NIN standard. The analysis revealed that of the total sample households, about 71 per cent is food insecure (Figure 17). Intensity of food insecurity within the group depicts that on an average almost 33 per cent households were destitute (poorest of the poor), followed by very poor and poor, 19 per cent each. Further, hilly area is more adversely positioned in terms of calorie intake

than that of backward and tribal areas. This might be due to topographically difficult terrain and comparatively lower consumption of milk, edible oil and pulses. The estimated gini coefficients for pulses were high in tribal plain (0.50), followed by hilly (0.49) and backward areas (0.46) (Table 29). Further, the coefficient of relative marginal effect for pulses was negative in all the selected regions and it was highest in tribal hill (-0.97), indicating the scope to increase the pulses consumption for improving nutritional status of the sample households of tribal hills in particular and the other households in general. Deficit for edible oils and fruits were assessed in tribal plain and hill regions. Besides, the major source of the calories consumption is cereals, which contributes more than 75 per cent of the total calories consumed. Table 29 also reveals that the gini coefficient for cereals ranges between 0.23 in backward to 0.29 in hill region, explaining the more or less equal consumption of cereals among the selected households. It is important to note that the share of vegetables, meat and fish is negligible and gini coefficients was also high i.e. 0.72 and 0.95 in tribal, followed by 0.64 and 0.54 in backward and 0.35 and 0.22 in hill regions.

In the backdrop of this situation, an integrated intervention of various technologies involving adoption of nutritional crops, improved practices of horticulture, improved breed, feed and health care of migratory sheep, piggery and backyard poultry, pen culture and carp polyculture in fishery, and post harvest management were initiated under NATP. Their initial impacts are assessed. The results indicated that benefits-cost ratio is higher in case of minor millet namely kutki (2.99) in Jagadalpur district, and ragi (1.80) at Ranchi. In case of migratory sheep in Himachal Pradesh the benefit-cost ratio was 2.25. Pen culture and carp polyculture technologies in fishery have increased production and productivity by 194 per cent. The overall benefit cost ratio is 2.5 and 1.87 for carp polyculture and pen culture, respectively. The said technology was more beneficial on the small ponds, where the fish yield was much higher than the large ponds in Kalahandi and equally well-adopted at ponds of all sizes in Bastar district. Further, income and employment for women and children has increased by about 36 per cent per annum.

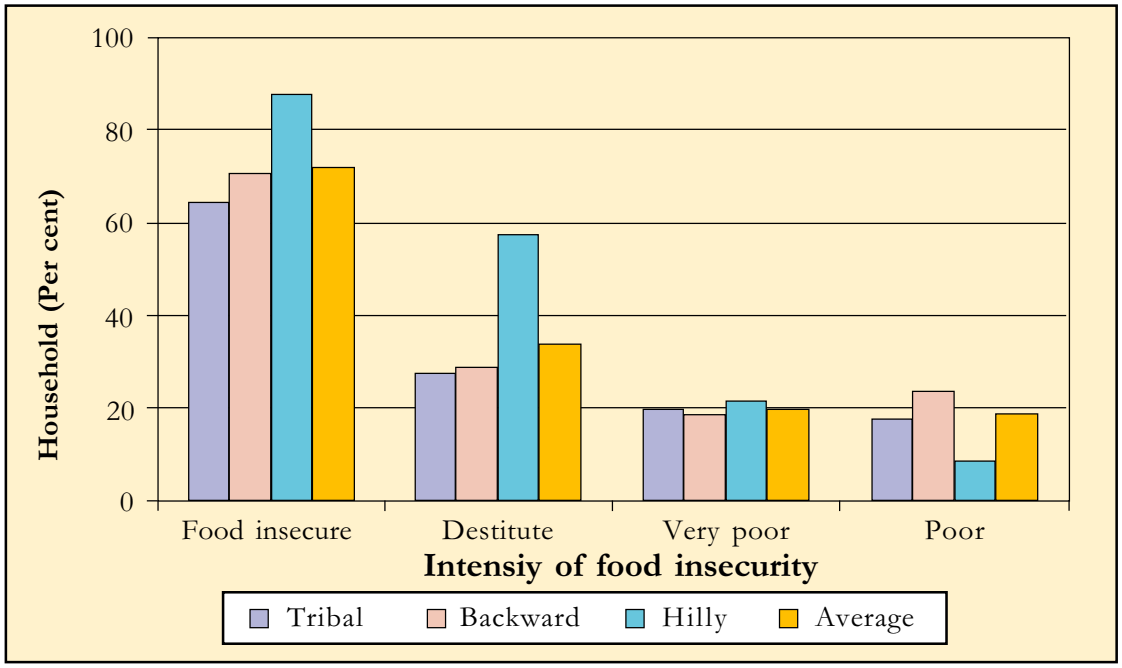
However, target farm households have reported (opinion survey) some constraints hindering the adoption of technology. Lack of irrigation facilities (98 per cent), low price of the produce (65 per cent) and non availability of quality seeds (43.33) are the important constraints in minor millets. In horticulture, the major constraints are lack of cold storage (63.36 per cent), and access to market information and improved technology (39.72 per cent). In the case of migratory sheep and backyard poultry, lack of veterinary facilities was reported, as the most important constraint by 79.8 & 45.24 per cent of respondents respectively. The non-availability of the carp seed and fingerling in the locality

Table 29: Inequality in consumption of major food items in India

Commodity	Tribal Plain Region		Backward Region		Hill Region	
	Share	Gini ratio	Share	Gini ratio	Share	Gini ratio
Cereals	0.83	0.28	0.75	0.23	0.870	0.29
Pulses	0.02	0.50	0.07	0.46	0.040	0.49
Milk	0.02	0.74	0.08	0.66	0.005	0.57
Edible oil	0.04	0.08	0.04	0.63	0.025	0.46
Vegetables	0.00	0.72	0.01	0.64	0.015	0.35
Fruits	0.08	0.11	0.04	0.55	0.030	0.33
Meat and fish	0.00	0.95	0.02	0.54	0.010	0.22
Total	1.00	0.25	1.00	0.22	1.000	0.28

in time is the major limiting factor for technology adoption in fisheries sector. Inadequate facility for storage, drying and agro-processing has lead to lower prices of ginger and pineapple in Meghalaya. The study concluded that the technology interventions are benefiting poor people in the backward, tribal and hilly areas of India. Sample households may benefit more as the project progresses. But to make bigger impact, certain institutional and policy constraints need to be addressed.

Figure 17: Food insecurityy status based on the calorie intake of the target households



Note: i) Destitute families (poorest of the poor); ≥ 5000 k calories deficit / family / day ii) Very poor; ≥ 2500 to <5000 k calories deficit / family / day iii) Poor; < 2500 k calories deficit / family / day as per NIN standard.

Agricultural Development in Bihar- Performance, Constraints and Priorities

Anjani Kumar and Dayanatha Jha

Small farms dominate Bihar agriculture. Foodgrain crops account for 90 per cent of the gross cropped area. The cropping patterns reveal a persistent rigidity over time and continued dominance of subsistence crops. There is some variation across agro-ecological sub-zones, but the above trend dominates all over. Livestock is an important source of income and employment for millions of landless and small landholders in the state. Also, livestock wealth is more equitably distributed than land. Fisheries also provide substantial income and employment in the state.

Growth performance

During nineties production growth of the three major crops—rice, wheat and maize in the state has been respectable. Indeed, for the dominant crop, rice, growth has been outstanding. For rice and maize, productivity growth has been the major factor behind production growth; for wheat, area growth has been more important. For almost all the other crops, negative growth rates were observed for both production and productivity. Among major livestock commodities, only milk and wool have shown significant growth in nineties. However, growth performance recorded by even these two commodities

was not appreciable (1 and 2 per cent respectively). Fisheries sector has performed exceptionally well and the fish production in Bihar increased at a rate of about 8 per cent per annum during 1990s. Growth trends in fish production have not shown substantial variations across zones.

Constraints

Agricultural production in the state suffers due to some generic maladies, which are pervasive. Crucial amongst these, are education, health and the moribund state of rural institutions and infrastructure, most of which are in the public domain. Priority to these sectors and to rural areas will be the prime determinants of agricultural development in the state. Without this, sector-specific investments will be infructuous.

More than 41 per cent area of the state is flood prone. Water logging affects a substantial area in the state. About 40 per cent area of the state is drought prone. Inadequate management of drainage, floods and droughts has turned the state into a scourge even though the state is well endowed with water resources. The adoption of modern varieties of cereals, particularly wheat and maize in the state is quite high. However, due to extremely low seed replacement rates, varieties tend to lose their potential quickly. Public investments in agriculture over the last decade or so has been declining. Research investment intensity is nearly one-fourth of the national average. Investment per hectare is less than half of the national average. Agricultural extension system in the state is in disarray. Reorganisation and consolidation of extension activities along with debureaucratization and professionalism is a must for revival of the extension system in the state. Most of the institutions concerned with agricultural and rural development, whether government or autonomous, have become practically non-functional. Lack of coordination and integration of programmes of various departments results in dissipation of effort and inefficiency.

Investment Priorities

The first tier of priorities for Bihar's development lies in infrastructural upliftment, covering both social (health, education) and physical (roads, power, communication) infrastructure. So far as additional resources during the Tenth Plan are concerned, other investments should be undertaken only after these basic infirmities are addressed. Some of the priority areas for investments are enumerated below:

- In terms of agriculture-specific investments, high priority must be accorded to development of markets, particularly regulation of markets for high-value commodities (fruits, vegetables, spices, aquatic products, jute and other fibre crops) in addition to the conventional crops of the state.
- Agricultural research is another area, which faces severe resource constraints. A target of at least doubling the current level of investment in real terms must be set for the Tenth Plan.
- Extension services in the state need a new agenda, a new face, and a new organization to establish complementary linkages with upstream R&D set up and downstream development apparatus.
- Irrigation will continue to claim a high priority. Irrigation, drainage and flood control need to be considered together in the context of each watershed.
- Diversification towards high-value enterprises—livestock, fisheries, fruits and vegetables, etc., will need to be carefully planned with reference to different areas and support systems will have to be so tuned. This must replace the present omnibus approach for the whole state.
- Agricultural statistics system in the state has literally collapsed and no objective decisions are any longer possible. Even fully centrally funded data collection activities are ignored. A rehabilitation of the agricultural statistics machinery is a pre-requisite for any planning exercise.

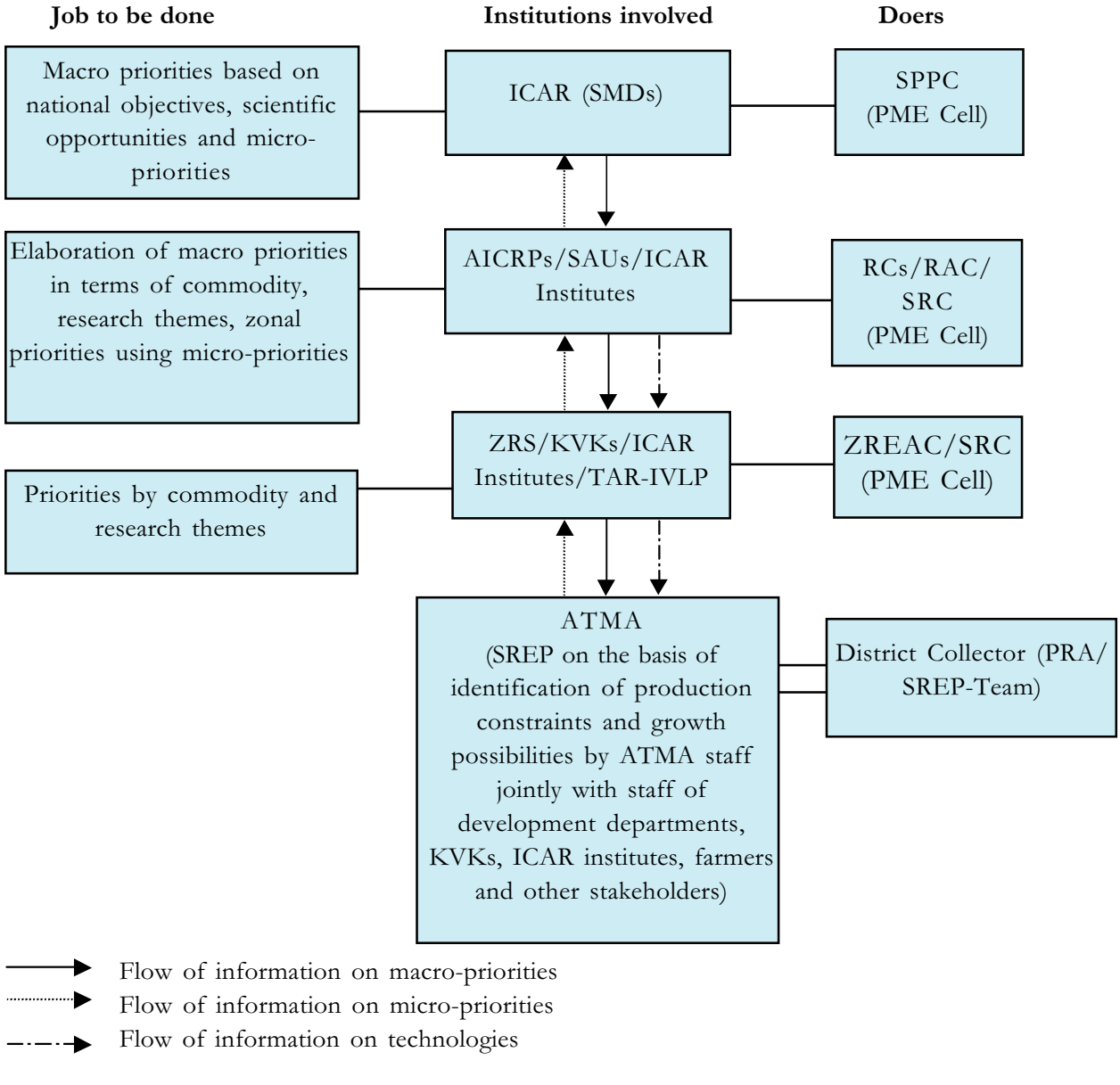
Progress under NATP

Convergence between the Macro and Micro Priorities

Mruthyunjaya, Suresh Pal, Raka Saxena and A.K. Jha

Macro research priorities in terms of commodity and region are assessed based on the national objectives and scientific opportunities, while the micro priorities are based on clients' needs. However, it is generally felt that the micro priorities are not systematically and transparently integrated into the macro-level priorities and a disconnect exists between the two. Therefore, there is a need for convergence between the micro and macro priorities to have a proper alignment and continuous linkage from strategic to applied research. The convergence should emanate through linkages between ICAR, SAUs and other stakeholders. The strategic research priorities in general can be addressed by ICAR, whereas SAUs can deal with regional

Figure 18: Schematic representation of convergence between the micro- and macro-level priority setting



applied research. Research priorities (micro) are to be based on location and system-specific constraints and opportunities identified using objective scientific methods. The priorities should be matched with research agenda of the institutions and necessary corrective measures should be taken to address the mismatch. A schematic diagram showing information flow on research priorities and mechanisms to converge the macro- and micro-priorities at various levels in the system is shown in the Figure 18. It is important that various existing institutions like ICAR Regional Committees and AICRPs at the national level should promote the linkages between the micro and macro priorities. There is a need to look at the roles, functions and powers of these and other institutions such as RACs and SRCs. Inter-institutional linkages with other institutions like ZRS, KVKs, ATMA will help in increasing the effectiveness of functions performed. Simultaneously, revision of mandate of SRCs and RACs of ICAR institutes and training of the staff in PME mechanisms will help in forging the convergence. Capacity for socio-economics research in ICAR/SAU system should also be strengthened to plan and guide PME activities.

Impact Assessment of Technologies

Mruthyunjaya, Suresh Pal, L. M. Pandey, A. K. Jha and Raka Saxena

A number of technologies are being refined, sharpened and developed under NATP. The PME Cells select the promising technologies among them for impact assessment. In addition, a number of technologies of national significance are chosen by NCAP in consultation with PIU for impact assessment (Table 30). Impact assessment of these technologies would indicate early Socio-economic and other impacts of projects under NATP. The results for a few technologies like zero-tillage in wheat indicate that farmers are realizing significant economic benefits, whilst promoting sustainability of the production system. The work on impact of vegetable research also shows that a number of useful technologies have been developed, benefiting many vegetable growers in India. Rainwater harvesting in sub-mountainous region has led to increase in wheat yield and also increase in cropping intensity with inclusion of tomato, which is highly remunerative, as an additional crop. High quality cotton variety (e.g. NHH 44, DCH 32) in cotton growing areas of Maharashtra and Madhya Pradesh is more stress tolerant, Eco-friendly (uses less chemicals) and produces high quality cotton fibre.

Table 30: Technologies selected for impact assessment by PME Cells and NCAP

Mode	PME Cells	NCAP
PSR	23	12
IVLP/TAR	4	4
TOE	-	4
MM	2	5
CGP	1	3
ATIC	2	-
Total	**32**	**28**

A quick impact study was conducted for selected promising technologies (14) under NATP. It is realized that the contribution of NATP has largely been in terms of reduction of R&D lag due to increased research intensity, particularly for on-farm research. The economic pay-off of these impacts were quantified, and net present value (NPV), internal rate of return (IRR) and benefit-cost ratio were found very attractive for most of the technologies (Table 31). Since the technologies are spreading now, the analysis provided evidence on early (not full) economic impacts. Besides, there are some evidences of intangible impacts of long-term nature on the sustainability of the production systems.

The study empirically demonstrated that returns to investment in dissemination of available technologies are substantial and should receive due attention in future. Sensitivity analysis done to examine the impacts under different scenarios also establishes favourable impacts. Major initiative for dissemination of technologies has to be taken by public extension system though research-system's role in facilitating this, is no less important. It is felt that the ATMA model if faithfully implemented can achieve this goal to a larger extent.

Table 31: Costs and Returns from NATP Research

Name of Technology	Average annual research cost (Rs. Million)	NPV of incremental benefits (Rs. Million)	Internal rate of return (%)	Benefit-cost ratio
1. Integrated Pest Management	12	350.8	48	9.9
2. Hybrid Vegetables	9.5	104	68	4.3
3. Conservation Tillage in Wheat	3.9	519.9	133	41.3
4. Intercropping with Sugarcane	3.1	193.1	115	19.7
5. Rejuvenation of Old Mango Orchards	3.9	30.8	27	3.4
6. High Yielding Variety of Cotton	3.5	304.2	118	27
7. Biasi Cultivation of Paddy	2.6	52	58	8.8
8. Drought Alleviation, Paddy	3.3	169.3	91	16.7
9. Intercropping of Maize with Aonla	1.6	12.3	25	4
10. Mussel Mariculture	2.5	1.5	14	1.5
12. Cultivation of High Yielding Varieties of Vegetables	0.08	6.4	105	33.9
11. Household Food & Nutrition Security	20	17176.5	176	259.5
13. Cultivation Parctices for Paddy, Coconut, and Banana	0.09	44.2	172	183.5
14. Management of Pest and Diseases in Wheat and Vegetables	0.05	26.3	169	222.4
All Projects	66.12	18,945	127	89

Social Science Information Repository (SSIR)

Anjani Kumar and Mruthyunjaya

This activity proposes to develop a panel database for NARP agro-ecological zones. The main purpose is to monitor changes in farming systems and implications for agricultural research and policy. The farm level panel data will be developed for each agro-ecoregion. The objectives are to monitor the implications of external forces on spatial and temporal changes in agriculture and natural resource management, understand how farmers respond to changing policies and technologies and to provide a forum for farmers' participatory research prioritization in a dynamic framework. The outputs of this study will be helpful in proposing better policies and suitable technologies keeping in view the farmers needs and resource endowments.

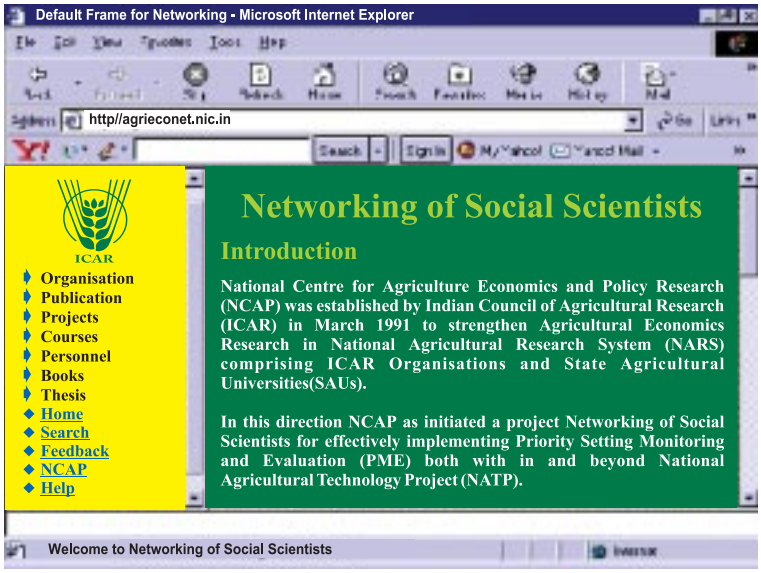
The guidelines for data sampling and data collection have been prepared by NCAP and distributed to the concerned centres for carrying out the work in an effective way. The activity at present is being carried out in seven organizations *viz.*, AAU, Jorhat; CRIDA, Hyderabad; CSAUAT, Kanpur; UAS, Dharwad; TNAU, Coimbatore; PDKV, Akola; and UAS, Bangalore covering about 450 households in 30 NARP zones. Some seed money is also provided for the activity by NCAP under NATP.

Since ICRISAT has vast experience in conducting village level studies, collaboration with ICRISAT has been established to develop common framework for SSIR activities. This will further help in comparative assessment of agricultural sector in different regions of the country. Three new centers (RAU, Samastipur, CAZRI, Jodhpur and ICAR Research Complex for NEH region, Barapani) have joined in this activity from April 2003 and the work is in progress.

Website of Agricultural Economists

Mruthyunjaya and Raka Saxena

The website of agricultural economists **(http://www.agrieconet.nic.in)** was developed and nested. The website covers data on 60 organizations, mainly SAUs and ICAR Institutes. The website contains information about organizations, scientists, publications, profile of research projects, courses offered, thesis submitted, etc. The information is classified under 12 main themes. If one is aware of the theme under which desired information can be classified, they can directly select the theme and get the details. Alternatively, an organization can be selected for detailed information. A search option is also available for exploration. The website is regularly updated.



Institutionalization of Research Priority Setting, Monitoring and Evaluation

Mruthyunjaya, Suresh Pal, A.K. Jha, Raka Saxena and L.M. Pandey

It is necessary to create the permanent functional structure in different institutions to support PME activities. Mechanisms and processes are evolved to ensure that these are effective. Twenty-five multi-disciplinary PME cells have been created for this. PME Cells are:

- Small cells consisting of 3-4 scientists including economist, statistician and agro-biological scientists.
- Drawn from one or more institutions and assigned specific responsibility for identified tasks (clear commitment from respective institutions).

- Supported by computers, Internet, assistance, etc.
- Provided with budgetary support for undertaking activities.
- Acts as node for information flow between levels through network

Several workshops were organized to prepare a concrete workplan and to review the progress. This includes Sensitization-cum-training workshop for scientists associated with PME Cells, Workshop for PME Cells to develop the workplan, Sensitization-cum-training workshop for scientists associated with newly created PME Cells, Sensitization workshop for senior research managers and a review workshop for PME Cells.

PME Cells are currently engaged in impact assessment of selected PSR projects besides O&M processes introduced in the NARS under NATP. Major responsibilities of PME Cells includes sensitization of policy makers, managers, scientists and others about the need for research priority assessment, prioritization of institution's programs, tracking of current resource allocations, interface with ARIS, SREP, ATMA, IVLP/TAR and KVK for research, facilitate monitoring and evaluation of research projects of the institutes/SAUs, participation in monitoring and evaluation (site level) activities of NATP and impact analysis.

A proposal was prepared to create PME Cell at headquarter (apex PME Cell) and also in different institutes and universities to sustain PME mechanisms in NARS. For institute level PME, the Council has decided that the institutes' RACs will perform the role of PME Cells. The proposal to establish PME Cell at ICAR (HQ) is to be further pursued.

Workshops organized

- Sensitization-cum-training workshop for scientists associated with PME Cells, 14-15 January 2002, NCAP, New Delhi
- Workshop for PME Cells to develop the workplan, 8-29 June 2002 NCAP, New Delhi
- Sensitization-cum-training workshop for scientists associated with newly created PME Cells, 5 September 2002 NCAP, New Delhi
- Sensitization workshop for senior research managers, 21 September 2002 NCAP, New Delhi.
- A review workshop for PME Cells, January 16-17, 2003 at Kerala Agricultural University, Trissur.

III. NCAP OUTREACH PROGRAMME

Agricultural Development in Western UP

Harbir Singh, Gordhan Singh and Rasheed Sulaiman V.

This is an on-going project since 1999, in the five villages, *viz.*, Ailum, Bharsi, Bhaneda, Nala and Kaniyan of Muzaffarnagar district (Uttar Pradesh). The Society for Education and Social Welfare (SESW), an NGO based in Kandhla (Muzaffarnagar) is a partner of NCAP in this effort. Based on the results of the survey conducted in these villages in the previous year, a research report "A diagnostic study on constraints in agricultural development in western Uttar Pradesh" was prepared during the current year. The following intervention strategies have been identified for implementation in these study-villages.

1. To conduct farmers' training and educational tours
2. To organize demonstration on farmers' field: (pulses, vegetables, etc.)
3. To establish one permanent group (self-help group) of farmers to work as nodal point for carrying out these activities.
4. To establish linkages with other development organizations

The Centre in collaboration with the Society for Education and Social Welfare (SESW), Kandhla (Muzaffarnagar) organized a meeting on 'Farmers-Scientist' interaction on 16th November 2002 in New Delhi. Scientists from IARI, New Delhi made a detailed presentation on new varieties of vegetables, flowers, cereals, pulses and on other technologies. The farmers appreciated specific characteristics of the some of the new varieties of vegetables. The two major constraints in vegetable cultivation are inadequate availability of good quality seed and poor marketing facilities (as reported by farmers). Scientists exhorted the farmers to diversify their crop portfolio. There have been a discusion on the method of sprinkler irrigation, its benefits and provisions of subsidy. The farmers showed keen interest in trying some of these technologies, especially green house raising of vegetable nursery and round the year vegetable growing and they have agreed to provide their fields for demonstrations. 8 farmers purchased Pusa Naveen variety of cucurbits and each of them tried it in one acre area in early February 2002. The farmers reported that each one of them could obtain a net profit of Rs.3000/- within three months from this crop. This has motivated many other farmers in the area and more farmers are planning to diversify their farming to vegetables.

Kisan Samman Week Celebrations

The centre collaborated actively in the planning and organisation of Kisan Samman Week celebrations held at IARI, New Delhi during 21-23 December 2002. On the directions of ICAR, two farmers from Muzaffarnagar District, (where NCAP and SESW have been working during the last three years), Shri Mohid Anwar and Sh Subash Panwar were selected as the best farmers and were honored with awards during the Kisan Samman Week celebrations.

IV. EMPOWERMENT OF WOMEN

Mainstreaming gender is an important component of the Policy Framework for Agricultural Extension (PFAE) developed by the Ministry of Agriculture (Government of India). The Ministry of Agriculture wanted to offer a cafeteria of programmes to all the states to help them in developing specific programmes for women in agriculture. The cafeteria is essentially a wide selection of approaches and interventions from which states can pick and choose what they require based on the specific ground situations. The Centre in collaboration with the Silsoe Research Institute (SRI), United Kingdom and the Cirrus Management Services (CMS), Bangalore developed a cafeteria for the Ministry of Agriculture, based on a review of the past experiences, field visits and consultations. There is enough evidence to understand that implementation of special programmes had improved farm women's access to information on agricultural technology, led to increased adoption of technology and realisation of economic benefits. But there were several limitations also. New programmes for women in agriculture should be developed based on the following key principles.

- New programmes that are proposed should expand their definition of agriculture beyond crop production and should be based on site specific needs assessments.
- New projects that are proposed, should build on: groups, networks, organisational capacity and resources already in place and functioning from existing project initiatives and should take on and build on lessons from existing projects
- Apart from extending agricultural technologies on production and post harvest to women farmers, new programmes should concentrate their efforts in providing crucial back-up services and support (backward and forward linkages) to help women groups to successfully adopt new techniques, crops and enterprises to increase their incomes and employment opportunities
- New programmes should be planned with adequate resources for mobilising women, forming groups, improving capacity and capability in technical, organisational and commercial (business/micro-enterprises) sectors and support systems (credit, raw materials and markets)
- It should be prepared jointly in consultations with other organisations (public, private, voluntary) that can potentially complement and supplement the efforts of the DoA

The cafeteria provides guidance notes on each of the identified themes, namely: mobilisation of groups; group formation and capacity development; linkages and support; communication and media support; technology development and promotion; staffing; gender sensitisation; and sustainability. It also highlights the importance of obtaining and analysing the right type of information in the development of project proposals, how to select relevant interventions, identify suitable partners, develop better institutional arrangements and ensure transparent functioning.

V. POLICY INTERACTION

The Centre's staff has been involved in a number of activities including informal discussions with academicians, policy makers and analysts. A series of group discussions and brainstorming sessions were organised on important topics, involving peers and policy makers. Some of the staff has been members of important committees. Participations like these have helped the Centre to gains fresh insights and to contribute research findings and professional experiences to the organisation. These details are as follows:

Mrutuyanjaya was Chairman, PME Task Force, and NATP Site Committee and also SAARC coordinator at ICAR. He also served as a member of: SAARC Agricultural Information Centre (SAIC) GB; RAC of NCAP; RAC of AERC, Delhi; College of Agricultural Management, RAU, Bikaner; CAPART, NewDelhi; IMC-NAARM, Hyderabad; O&M Taskforce, NATP, ICAR; NEC Steering Committee; Policy Analysis and Advisory Network for South Asia (PANSA) of IFPRI, USA; Editorial Board of ICAR News, ICAR Reporter and Indian Farming; Site Committee, NATP, Punjab Agricultural University, Ludhiana; Committees on R&D Services; Working Group on Sericulture Extension and Training, CSR&TI, Mysore; AIMA-Programmes Committee and ORYZA Editorial Board, CRRI, Cuttack. He was a member of QRT of NRC for Grapes, CTCRI, Thiruvananthapuram, and CPCRI, Kasaragod, Kerala. He is also the nodal officer and TAC member of CGPRT Centre of ESCAP, Bagor, Indonesia and the Secretary of the AERA.

Dayanatha Jha was the member of: QRT, Project Directorate of Cropping Systems Research, Modipuram; Research Advisory Committee, Directorate of Wheat Research, Karnal; Advisory Group on Bihar Development Report, Planning Commission; Institute of Human Development, Delhi; NATP Task Force on PME; NSS 59th Round Working Group, New Delhi; Inter-Academy Committee on Ethics in Science, INSA, New Delhi; Review Team for Rice-Wheat Consortium. Dr. Jha has also served as the Editor, Agricultural Economics Research Review.

P.K. Joshi continued to be the member of the Editorial Board of the Indian Journal of Agricultural Economics, Mumbai; Research Advisory Committee, Directorate of Rice Research, Hyderabad; Coordination Committee, Commercialization of Technologies, Indian Council of Agricultural Research, New Delhi.; Board of Governors, India Natural Resource Management, Anand; Academic Council, HN Bahuguna University, Srinagar; and Expert Committee, Rainfed Agro-Ecoregion of National Agricultural Technology Project. He is also the Member-Secretary of RAC, NCAP and PME Taskforce, NCAP. He was also the member QRT of Central Soil Salinity Research Institute, Karnal and NRC on Citrus, Nagpur.

S. Selavarajan served as a member of the Review, Appraisal and Technical Assistance missions dealing with Ravine Stabilisation and Integrated Water Resources Management programmes of Uttar Pradesh and Madhya Pradesh.

VI AWARD(S) AND RECOGNITIONS

Harbir Singh received the Best Paper Award from Shyamprasad Institute for Social Service, Hyderabad for the paper, 'Emerging Plant Variety Legislations and their Implications for Developing Countries: Experiences from India and Africa', presented in the National Conference on TRIPS – Next Agenda for Developing Countries, Hyderabad, 11-12 October 2002.

Anjani Kumar received the Young Scientist Award of the National Academy of Agricultural Sciences for the Biennium 2001-02 for outstanding contributions to Social Sciences.

Ramesh Chand has received DK Desai Award from Indian Society of Agricultural Economics for the best paper published in Indian Journal of Agricultural Economics during the year 2001 from agriculture stream.

VII LINKAGES AND COLLABORATION IN INDIA AND ABROAD, INCLUDING EXTERNALLY FUNDED PROJECTS

Name	Purpose	Organisation
Anjani Kumar	Agricultural Diversification in Eastern India: Problems and Prospects.	Institute for Human Development, New Delhi.
Barah B C	Socio-Economic dynamics of Rice Production Systems.	IRRI, Philippines, Manila.
Birthal P S	Increasing productivity of livestock in mixed crop livestock systems in South Asia.	ICRISAT, Hyderabad.
Birthal P S	India's livestock feed balance and its environmental implications.	Society for Economic and Social Research, New Delhi.
Dayanatha Jha Anjani Kumar	State Development Report for Bihar on Agriculture and Allied Sector.	Institute for Human Development (IHD), Delhi Planning Commission, Govt. of India.
Joshi P K Anjani Kumar	Strategies and options for increasing and sustaining fisheries and aquaculture production to benefit the poor households in Asia.	The World Fish Centre, Penang, Malaysia.
Joshi P K Birthal P S	Constraints and opportunities for *rabi* cropping in rice-fallows.	ICRISAT, Hyderabad.
Joshi P K	Section on Agriculture for UP Development Report.	Planning Commission, Government of India.
Joshi P K	Water Vision of Andhra Pradesh.	Government of Andhra Pradesh.

Name	Purpose	Organisation
Mruthyunjaya Pandey S K	Household Food and Nutritional Security for Tribal, Backward and Hilly Areas.	IGAU, Raipur AAU, Jorhat IASRI, New Delhi CICFRI, Barrackpore CISH, Lucknow CIAE, Bhopal.
Ramesh Chand	Government intervention in food grain markets in the new context.	Ministry of Consumer Affairs, Food and Public Distribution, Government of India.
Ramesh Chand	Regional Strategic Frame work for Liberalization of Agricultural Trade Policies in Asia.	FAO RAP, Bangkok.
Rasheed Sulaiman V	Optimizing institutional arrangements for demand-driven post-harvest research, delivery, uptake and impact on the livelihoods of the poor through public and private sector partnerships.	International Crop Research Institute for Semi-Arid Tropics (ICRISAT), Hyderabad
Rasheed Sulaiman V	Innovations in Agricultural Extension in India.	Food and Agriculture Organisation, Rome.
Rasheed Sulaiman V	Cafeteria for Women in Agriculture	Silsoe Research Institute, UK. Cirrus Management Services, Bangalore.
Rasheed Sulaiman V	Agricultural Extension-Involvement of Private Sector.	National Bank for Agriculture and Rural Development (NABARD), Mumbai
Rasheed Sulaiman V Selvarajan S	Impact of BAIF-Livestock Developmental Program: An Institutional Analysis.	BAIF Development Foundation, Pune.
Selvarajan S Roy B C	Developing Decision-Making Tools for Assessment of Vulnerability to Climate Change in India.	United Nations Environment Programme (UNEP), Stockholm Environment Institute, London, UK. IIT, Mumbai.
Selvarajan S Roy B C	Water-food security scenario analysis for 2025: agro-ecological regional approach.	WTC, TNAU, Coimbatore WTCER, Bhubaneswar SWMP, GAU, Navsari. IASRI, New Delhi.
Selvarajan S	Integrated Water Resources Management for Madhya Pradesh.	Operational Research Group, New Delhi.

VIII PUBLICATIONS

A. NCAP Publications

Policy Papers:

Policy Paper 16 : The Funding and Organization of Agricultural Research in India: Evolution and Emerging Policy Issues.
Policy Paper 17 : Agricultural-based Interventions for Sustainable Nutritional Security
Policy Paper 18 : Economic Potential of Biological Substitutes for Agrochemicals.
Policy Paper 19 : Government Intervention in Foodgrain Markets in the New Context

Working Papers:

Working Paper 3 : Export Performance of Fisheries Sector in India: Strengths and Challenges Ahead
Working Paper 4 : Cafeteria for Women in Agriculture

Workshop Proceedings:

Workshop Proceedings : A profile of People, Technologies and Policies in Fisheries sector in India.

Workshop Proceedings : Institutional Change in Indian Agriculture.

PME Notes:

PME Notes 9 : Impact assessment of new research processes under NATP.
PME Notes 10 : Resource allocation in agricultural research using mathematical programming.
PME Notes 11 : Prioritization of production constraints: Concepts and methods
PME Notes 12 : Impact assessment of agricultural research: Concept and measurement

Others:

1. Mechanism of monitoring and evaluation under NATP.
2. Research prioritization, monitoring and evaluation: A peep in to the progress.
3. A Diagnostic Study on Constraints in Agricultural Development in Western Uttar Pradesh (*Research Report*).

B. Research Papers

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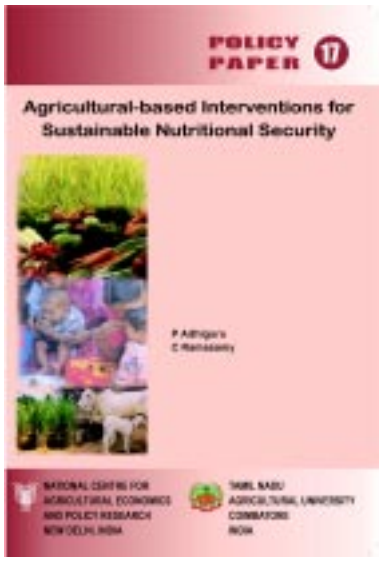

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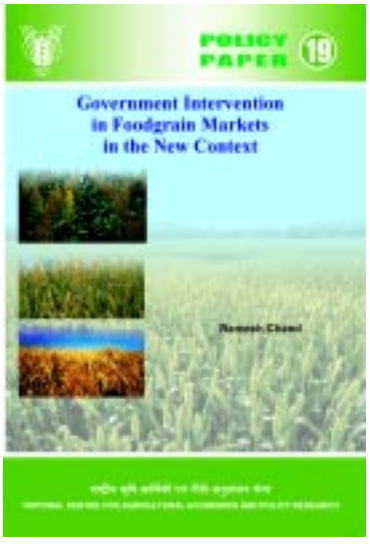

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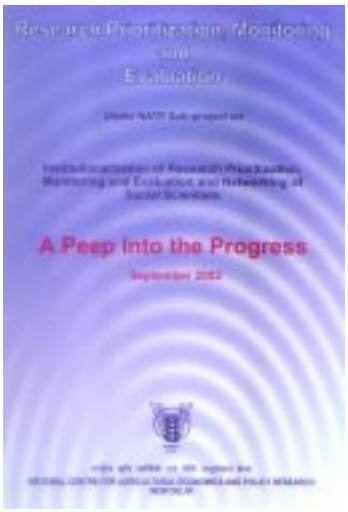

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F. Radio Talks

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Jha, Dayanantha and Suresh Pal. Agricultural Research and Technology in India: Status, Impact and Contemporary issues. IFRPRI-JNU Workshop in Comparative Study of Economic and Agricultural Reforms in China and India, New Delhi, 25-26 March 2003.

Joshi, P.K. and Bantilan, M.C.S. Technology Uptake in Rainfed Areas of India. ICAR-ICRISAT Joint Workshop on Vision for Rainfed Agriculture in Asia: Targeting Research for Development', ICRISAT, Patancheru, Hyderabad, 2-4 December 2002.

Joshi, P.K. and Laxmi Tewari. Agricultural Diversification in Uttar Pradesh: Nature, Constraints and Opportunities. Strategies for Agricultural Production and Marketing in the State of Uttar Pradesh in the Context of WTO, seminar organized by UPCAR, Lucknow, 5 July 2002.

Joshi, P.K. Impact of Vegetable Research: Methodological Issues. XXth Group Meeting of AICRP of Vegetable Crops, Kerala Agricultural University, Trissur, 12 April 2002.

Joshi, P.K. Key Challenges to Sustain Rice-Wheat System. Rice-Wheat Social Scientists Meet, organized by RWC and CIMMYT, New Delhi, 23 May 2003.

Joshi, P.K. Rice-Wheat Food System: Socioeconomic and Policy Issues. Paper presented in the Workshop on Global Environment Change in the Rice-Wheat Food System, Organized by GECAFS, UK and RWC of CIMMYT, New Delhi, 19 November 2002.

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Joshi, P.K., N.P.Singh, and N.N.Singh. Characterization of Maize Production Environment: Issues for R&D. National Workshop on Prioritization of Maize R&D Plan in India, organized by CIMMYT, Mexico and National Centre for Agricultural Economics and Policy Research (NCAP), New Delhi, 20-22 May 2002.

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Mruthyunjaya. and Sonia Chauhan. Economic Viability of Multi-Enterprise System, Sixth Agricultural Science Congress of NAAS, IISS, Bhopal, 13-15 February 2003.

Mruthyunjaya. Impact of the WTO on Oilseeds Sector in India, National Seminar, Directorate of Oilseeds Research, Hyderabad, 28-30 January 2003.

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Mruthyunjaya and Harbir Singh. Policy Issues and Strategies in the Agricultural Development of Rainfed Areas in India', Workshop on A Vision for Rainfed Agriculture in Asia: Targeting Research for Development, International Crop Research Institute for Semi-Arid Tropics, Patancheru, India, 2-4 December 2002.

Mruthyunjaya and Sonia Chauhan. Competitiveness of Indian Farm Produce in Global Market, National Seminar, NIRD, Hyderabad 21-22 February 2003.

Mruthyunjaya. Indian Agriculture – Current Status, Challenges and Strategies, 27th Convention of The Indian Agricultural Universities Association, ANGRAU, Hyderabad 9-11 December 2002.

Mruthyunjaya. Potentials and Prospectus of Trade in Agricultural Goods, 90th Indian Science Congress, Bangalore, 5 January 2003.

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Selvarajan, S., Roy, B.C., Mruthyunjaya., Tom Downing., Ravi Sharma, Anand Patwardhan., Richard Klein and Richard Washington. Climate Change Vulnerability and Adaptive Livelihood, Poster presented in UNFCC Cop8 Conference organised by the Government of India, United Nations Environment Programme, and FICCI Vigyan Bhavan, New Delhi, 23 October –1 November, 2002.

Rasheed Sulaiman V and Andy Hall, Beyond Technology Dissemination-How to Reinvent Agricultural Extension? Workshop on Agricultural Policy: Redesigning R & D to Achieve the Objectives, organised by CASA, NISTADS and NCAP, Indian National Science Academy, New Delhi, 10-11 April 2002.

Roy, B. C. and Selvarajan, S. Future Water Food Security Issues, Planning Cum Methodology Workshop on Water-Food Security Scenario Analysis for 2025: An Agro-ecological Regional Approach, NCAP, New Delhi, 14-15 June, 2002.

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Singh, Harbir, Role of Medicinal Plants in Healthcare: Policy and Institutional Initiatives in India, International Conference on Healthcare and Food: The Challenges of Intellectual Property, Biosafety and Bioethics, NISTADS, New Delhi, 1-5 December 2002.

Singh, Harbir Emerging Plant Variety Legislations and their Implications for Developing Countries: Experiences from India and Africa, National Conference on 'TRIPS – Next Agenda for Developing Countries', Hyderabad, 11-12 October 2002.

Taneja V. K. and Birthal, P. S. Role of Buffalo in Food Security in Asia. Asian Buffalo Congress, New Delhi, 25-28 February 2003.

IX LIST OF APPROVED ON-GOING PROJECTS

Sl. No.	Projects	PI/ CCPI
1.	Innovative institutions for agricultural technology dissemination: Role of information technology	Adhiguru P
2.	Scope of agriculture-based interventions for sustainable nutritional security.	Adhiguru P
3.	Socioeconomic dynamics of rice production in Eastern India	Barah B C
4.	India's livestock feed balance, and its environmental implications	Birthal P S
5.	Micro level priority setting for livestock research	Birthal P S
6.	Relooking of agricultural marketing institutions in the context of Trade Liberalization Regime in India	Dastagiri M B
7.	Resource allocation for agricultural research.	Dayanatha Jha
8.	Analysis of productivity changes and future sources of growth for sustainable rice-wheat cropping system in the Indo-Gangetic plains	Joshi P K
9.	Strategies and options for increasing and sustaining fisheries and aquaculture production to benefit poor households in Asia	Joshi P K Anjani Kumar
10.	Impact of agricultural R&D in India	Joshi P K
11.	Assessment of information needs for watershed projects	Joshi P K
12.	Intensification of maize in Asian upland farming systems: policy options for productivity enhancement, environmental protection and food security	Joshi P K Singh N N
13.	Improving technical efficiency to counter import threat of edible oils in India	Joshi P K Pandey S K
14.	Agricultural diversification in South Asian countries: problems and opportunities	Joshi P K Birthal P S Anjani Kumar P Kumar Mruthyunjaya Suresh Pal
15.	Determinants of performance of Self-Help Groups in rural micro-credit	Lakshmi Prasanna P A
16.	Institutionalizing priority setting, monitoring and evaluation in the NARS and networking of Social Scientists	Mruthyunjaya Pandey S K

Sl. No.	Projects	PI/ CCPI
17.	Impact assessment of Technology intervention and crop Diversification in tribal, backward and hilly areas	Mruthyunjaya Pandey S K
18.	Increasing productivity of livestock in mixed crop livestock system in South Asia	Parthasarathy Rao P Birthal P S
19.	Optimsing institutional arrangements for demand driven post harvest research, delivery, uptake and impact on the livelihoods of the poor through public and private sector partnerships	Rasheed Sulaiman V
20.	Impact of BAIF-Livestock sevelopmental program: An Institutional Analysis	Rasheed Sulaiman V Selvarajan S
21.	Fruit and Vegetable Processing in India: Technological, Institutional and Policy Dimensions	Roy B C
22.	Integrated National Agricultural Resources Information System	Selvarajan S Anjani Kumar Lakshmi Prasanna P A
23.	Water-food security scenario analysis for 2025: An Agro-ecological Regional approach	Selvarajan S Roy B C
24.	Developing decision making tools for the assessment of vulnerability to Climate Change in Indian Agriculture	Selvarajan S Roy B C
25.	Indian Seed System Development- Policy and Institutional Options	Suresh Pal

X CONSULTANCY PROJECTS

The consultancy and contract research activities are undertaken by the Centre to complement the emerging research thrusts and also to supplement the budgetary resources of the Centre. Consultancy proposals are examined by the consultancy processing cell and are finalised as per the Indian Council of Agricultural Research (ICAR) guidelines. Following individual consultancy services and contract research in collaborative mode were provided by the Centre during the year.

Consultancy/Contract Research

Name	Institution to which Consultancy / contract research is provided	Areas of consultancy/ contract research
Joshi P K	Mission Support Unit, Water Conservation Mission, Government of Andhra Pradesh	Resource Economics: AP Water Vision
Rasheed Sulaiman V	International Crop Research Institute for Semi-Arid Tropics (ICRISAT), Hyderabad	Optimizing institutional arrangements for demand driven post-harvest research, delivery, uptake and impact on the livelihoods of the poor through public and private sector partnerships.
	Food and Agricultural Organisation (FAO), Rome	Innovations in Agricultural Extension in India
	Cirrus Management Services, Bangalore	Developing a Cafeteria for Women in Agriculture for the Ministry of Agriculture
	National Bank for Agricultural and Rural Development (NABARD), Mumbai	Agricultural Extension-Involvement of Private Sector
Selvarajan S.	Operational Research Group, New Delhi	Formulating Policy Strategy and Action Plan for integrated Water Resource Management in the State of Madhya Pradesh

XI. RAC, MC AND SRC MEETINGS

Research Advisory Committee (RAC)

Dr. V Rajagopalan (Chairman) Centre for Development and Policy Studies, 18, Gandhi Street, Bhavani Nagar, Medical College Road, Thanjavur Tamil Nadu.	Dr. Mruthyunjaya Director, NCAP, New Delhi
Dr. G.K Chadha ViceChancellor, Jawaharlal Nehru University, New Delhi.	Dr. I.J. Singh 101, Pushpi Apartements, Sharadha Nagar,Gumti No.9, G.T. Road, Kanpur, Uttar Pradesh
Dr. Abhijit Sen Professor, Centre of Socio-Economic Planning, Jawaharlal Nehru University, New Delhi.	Dr. D.K. Marothia Dean, Department of Agriculture and Natural Resource Economics, IGKV, Raipur. Jharkhand.
Dr. G.S. Ram Chief Economic Advisor and Labour Employment Advisor, Ministry of Labour, Sharam Shakti Bhavan, New Delhi.	Prof. Ram Pravesh Singh 167, North Anandpuri, West Boring Canal Road, Patna, Bihar.
Sh. D.S. Ananth No.697/A, First Block, IIIrd Stage, Basvaeshwara Nagar, Bangalore.	Dr. J.P. Mishra ADG (Economics Statistics and Marketing), ICAR, New Delhi.
Dr. Dayanatha Jha National Professor, NCAP, New Delhi	Dr. P.K. Joshi (Member-Secretary) Principal Scientist, NCAP, New Delhi

The major observations of the RAC meeting held on 13 December 2002 are as follows

Keeping in view the changing nature of Indian agriculture from a subsistence mode to a surplus mode, research programme needs to look at how institutional, social and political factors interact with technology, studies on both macro and micro policies are necessary, the committee suggested. NCAP should undertake quick studies to address topical issues. The committee noted that consultancy mode for undertaking research in the mandated areas of the Centre should continue as the stakeholders immediately use the outputs of such studies. It also contributes to the capacity building of the staff and resource mobilisation efforts. The idea of networking and having Memorandum of Understanding (MOUs) with SAUs having strong foundation in micro-economic issues was highly appreciated. But collaboration with non-National Agricultural Research System (NARS) institutions and general universities also needs emphasis. NCAP should also focus on training of agricultural economists in NARS and improving quality of post-graduate education in SAUs. To strengthen these efforts, the possibility of NCAP to be included under AHRD Phase II of ICAR needs to be explored. The Centre should also pursue its X Plan proposal of a higher cadre strength with ICAR.

Management Committee (MC)

The current composition of the Management Committee of the Centre is given below:

Dr. Mruthyunjaya (Chairman) Director NCAP, Pusa, New Delhi.	Dr. R.C. Gautam Head, Division of Agronomy Indian Agricultural Research Institute Pusa, New Delhi.
Dr. J.P. Mishra Assistant Director-General (Economics, Statistics and Marketing), ICAR, Krishi Bhawan, New Delhi	Dr. Harish Gupta Scientist (Senior Scale) ICAR, Krishi Bhawan, New Delhi
Dr. Ramesh Chand Principal Scientist NCAP, Pusa, New Delhi.	The Director Directorate of Economics and Statistics Delhi State Old Secretariat, Delhi.
Director of Horticulture, Govt. of Haryana, Sec 22, Panchkula, Chandigarh.	Dr. Karam Singh Professor & Head, Department of Economics and Sociology Punjab Agricultural University Ludhiana, Punjab
The Finance & Accounts Officer Indian Agricultural Statistics Research Institute, Pusa, New Delhi.	Mr. Narender Kumar (Member Secretary) Assistant Administrative Officer NCAP, Pusa, New Delhi.

A meeting of the Management Committee was held on 30 September 2002. The major observations of the Management Committee meetings are as follows.

The committee appreciated the achievements made by the Centre in different research theme areas and in gaining recognition for training under Colombo Plan of the Government of India. It also approved the expenditure incurred by NCAP for 2001-02 and expenditure till August 2003. The committee requested the Centre to take needed action to expedite construction of the office building on a priority basis.

Staff Research Council (SRC)

Nine meetings of the SRC were held during the year. The SRC is composed of the Director, NCAP, all the Scientists staff of the Centre and the Assistant Director General (Economics, Statistics and Marketing) of ICAR. The SRC discusses the progress of the on-going research programs and some new research proposals. The scientists delivered seminars on new proposals and results of ongoing study in this meeting. The topics are dicussed as follows:

a. Pulses Economy of India: An Integrated approach

b. Resource Allocation for Agricultural Research

c. Impact of Agriculture and Rural Development on Poverty Alleviation in SAARC countries
d. Methods of Analysis Village Survey data in Eastern India
e. Characterization of Maize Production Environment for R&D planning
f. Innovative Institutions for Agricultural Technology Dissemination: Role of Information Technology
g. Insights and Issues in Self-Help Groups project
h. Fisheries Trade in India: Performance, Policies and Competitiveness
i. Proposal for Restructuring Organisation of Research in NCAP
j. Appraisal on Restructuring Organisation of Research in NCAP
k. Research Prioritization: - Missing Dimensions
l. Challenge program on Food and Water
m. Rural Institutions for Agriculture Prosperity in Assam
n. Impact of BAIF Livestock Developmental Program: An Institutional Analysis
o. Implications of Sanitary and Phytosanitary Standards on Fisheries Sector in India
p. Indicators for Impact Assessment of ICAR Extension programs

Seven presentations to share the experiences and the outcome of the foreign deputations were also made in the SRC meetings.

Other committees

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

Academic Planning and Policy Committee

- To strengthen internal planning and policy direction functions.

Scientist Evaluation and Development Committee

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

Budget Committee

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

Purchase committee

- To purchase material and services according to the prescribed official procedures and in accordance with the Budget committee guidelines/directions on utilisation of funds.

Publication committee

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

Consultancy Processing Cell

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

Computer Committee

- To plan and monitor compute facilities at the ARIS cell and its maintenance.
- To facilitate and monitor IT facilities (LAN, E-mail, Internet) at the center.

Women Cell

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

Grievance Cell

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

Official Language Committee

- To monitor the progress of works done in official language from time to time and suggest relevant measures for improvement.
- To organise Raj Basha Week/Day as intimated by the Council from time to time.
- To report to the Council and other agencies on progress from time to time.

PME/NATP Cell

- To plan, promote and monitor PME activities of the NATP.
- To report the progress to the NATP authorities/ Council about the progress from time to time.

Institute Joint Staff Council

Mruthyunjaya	Chairman
M S Chauhan	Secretary
Narender Kumar	Member
Mahesh Kumar	Member
Naresh Kumar	Member
Gordhan Singh	Member
M S Vashist	Member

XII Participation of Scientists in Conferences, Meetings, Workshops, Symposia, etc in India and Abroad

Name	Theme and date(s)	Place
Adhiguru P	International Agronomy Congress on Balancing Food and Environmental Security-A Continuing Challenge, 26-30 November 2002.	IARI, New Delhi.
Anjani Kumar	Annual Conference of Indian Society of Agricultural Economics, 19-21 December 2002.	IARI, New Delhi.
	Annual Conference of Agricultural Economics Research Association (India), 8-9 Nov 2002.	Marathwada Agricultural University, Parbhani.
	Consultative Workshop on Bihar Development Report, 29-30 June 2002.	IAMR, New Delhi.
	Brainstorming session on Agricultural Development in Bihar, 7 May 2002.	NCAP, New Delhi.
	ICRIER-ICAR-IFPRI Conference on Economic Reforms and Food Security – The Role of Trade and Technology, 24-25 April 2002.	India Habitat Center, New Delhi.
Barah B C	Interaction meeting on Socio-economics Changes in rice economy in Eastern India, 22 April 2002.	IRRI, Manila, Philippines.
	Workshop on Water-wise rice production 8-11 April 2002.	IRRI, Manila, Philippines.
Birthal P S	ICRIER-ICAR-IFPRI Conference on Economic Reforms and Food Security – The Role of Trade and Technology, 24-25 April 2002.	India Habitat Center, New Delhi.
	Workshop on Socio-economic constraints and opportunities in rice fallow systems. 27-28 May 2002.	ICRISAT, Patencheru.
	International Congress of Asian and Australasian Associations of Animal Production Societies. 23-27 September 2002.	Hotel Ashok, New Delhi.
	Annual conference of the Indian Society of Agricultural Economics, 19-21 December 2002.	IARI, New Delhi.
	Workshop on State of Indian Farmer: A Millennium study. 4-5 February 2002.	Institute of Economic Growth, New Delhi.
	Interactive workshop on Integrated Pest Management. 26-28 February 2002.	NCIPM, New Delhi.
Dastagiri M B	Annual Conference of Indian Society of Agricultural Economics (ISAE), 19-21 December 2002.	IARI, New Delhi.

Name	Theme and date(s)	Place
Dayanatha Jha	National Agricultural Policy: Redesigning R & D to achieve the objectives, 10-11 April 2002.	INSA, New Delhi.
	Economic Reforms & Food Security–The Role of Trade & Technology, 24-25 April 2002.	IHC, New Delhi.
	Profile of People, Technologies and Policies in Fisheries Sector of India, 1 May 2002.	NCAP, New Delhi.
	Innovations in Innovation: Exploring Partnership and Diversity in the Generation, Diffusion and Use of New Knowledge, 6 May 2002.	ICRISAT, Hyderabad.
	Agricultural Development in Bihar, 29-30 June 2002.	IHD, New Delhi.
	Government Intervention in Foodgrain Markets in the Changing Context, 26 August 2002.	NCAP, New Delhi.
	Characterization and Mapping of Rice-Wheat System: Its changes & Constraint to System Sustainability, 27-28 December 2002.	PDCSR, Meerut.
	The Dragon and the Elephant: A comparative Study of Economic and Agricultural Reforms in China & India, 25-26 March 2003.	IHC, New Delhi.
	International Food Safety Regulation and Processed Food Exports, 27 March 2002.	IHC, New Delhi.
Harbir Singh	National Conference on TRIPS – Next Agenda for Developing Countries, 11-12 October 2002.	Shyamprasad Institute for Social Service, Hyderabad.
	International conference on Healthcare & Food: The Challenges of IPRs, Biosafety and Bioethics, 1-5 December 2002.	National Institute of Science, Technology and Development Studies, New Delhi.
	Annual Conference of Indian Society of Agricultural Economics 19-21 December 2002.	IARI, New Delhi.
	National Interactive Meet on Scope and Opportunities in Research and Business of Medicinal Plants,17-18 May 2002.	Central Institute of Medicinal & Aromatic Plants, Lucknow.
Joshi P K	Issue identification workshop on Global Environment Change in the Rice-Wheat Food System, 15-16 March 2002.	RWC, New Delhi
	Agricultural policy: Redesigning R&D to Achieve the Objectives, 10 April 2002.	INSA, New Delhi.
	Group Meeting of AICRP on Vegetable Crops, 12 April 2002.	KAU, Trissur.

Name	Theme and date(s)	Place
Joshi P K	National Workshop on People, Technologies and Policies in Fisheries Sector of India, 1-2 May 2002.	NCAP, New Delhi.
	National Workshop on Prioritization of Maize R&D Plan in India, 20-22 May 2002.	NCAP, New Delhi.
	Rice-Wheat Social Scientists Meet, 23-24 May 2002.	RWC, CIMMYT, New Delhi.
	Workshop on Promotion of Rainfed *Rabi* Cropping in Rice Fallow of India and Nepal, 28-30 May 2002.	ICRISAT, Hyderabad.
	Monitoring & Evaluation of Production System Research (Rice-Wheat System) under NATP, 31 May 2002.	PDCSR, Modipuram.
	Strategies for Agricultural Production and Marketing in the State of Uttar Pradesh in the Context of WTO, 5 July 2002.	UPCAR, Lucknow.
	Review workshop of ICAR-ICLARM project on 'Strategies and options for increasing and sustaining aquaculture production to benefit poor households in Asia, 10-11 July 2002.	CICFRI, Barrackpore.
	Annual meeting of the Asian Maize Social Scientists, 1-4 August 2002.	Bangkok, Thailand.
	National Workshop on Sustainable Mountain Agriculture, 27-29 September 2002.	Administrative Training Institute, Nainital.
	Review meeting of Mission Mode Project on Household Food and Nutrition Security, 21-22 October 2002.	CRIDA, Hyderabad.
	Characterization of Rice-Wheat System, Global Environment Change and Food System, 19 November 2002.	RWC, New Delhi.
	Workshop on Vision for Rainfed Agriculture in Asia: Targeting Research for Development, 2-4 December 2002.	ICRISAT, Hyderabad.
	International Workshop on Methods for Assessing the Impacts of Natural Resource Management Research, 6-7 December 2002.	ICRISAT, Hyderabad.
	Symposium on Revitalizing Horticultural Sector in India, 18 December 2002.	IARI, New Delhi.
	Annual Conference of the Indian Society of Agricultural Economics, 19-21 December 2002.	IARI, New Delhi.
	Annual Workshop on Characterization and Mapping of Rice-Wheat System, 27-28 December 2002.	PDCSR, Modipuram.

Name	Theme and date(s)	Place
Joshi P K	Seminar on Biotechnology Statistics in India, 18 January 2003.	RIS, New Delhi.
	CGIAR Challenge Program on Water and Food: Kick off Workshop for IGP, 23-24 January 2003.	ICAR and RWC, New Delhi.
	Review workshop of ICAR-ICLARM project on Strategies and options for increasing and sustaining aquaculture production to benefit poor households in Asia, 28-29 January 2003.	CMFRI, Cochin.
	Workshop on State of Indian Farmer: A Millennium study, 4-5 February 2002.	Institute of Economic Growth (IEG), Delhi.
	PME workshop, 7 February 2003.	GBPUA & T, Pantnagar.
Mruthyunjaya	ICAR-ICRISAT Joint Programmes Committee meeting on April 2 2002.	CRIDA, Hyderabad.
	Workshop for M&E of ITD Component of NATP during 18-19 April 2002.	Indian Institute of Management, Lucknow.
	Meeting of the Project Advisory Group, 18 May 2002.	NAARM, Hyderabad.
	Meeting of the ICAR-ICRISAT Collaborative Projects under Genetic Resources, 3 June 2002.	NBPGR Regional Station, Hyderabad.
	Meeting of the Coordinators of PME Cells in ICAR-SAU Systems, 28-29 June 2002.	NCAP, New Delhi.
	Workshop of the ICAR-ICLARM Collaborative Research Project, 9-12 July 2002.	CICFRI, Barrackpore.
	AIMA Seminar on Leveraging Indian Agriculture: Emerging Roles for Corporate and Other Stakeholders 26-27 July 2002.	Hotel Meridian, New Delhi.
	Review Workshop for M&E of ITD Component of NATP, 13-14 August 2002.	Indian Institute of Management, Lucknow.
	Workshop on Drought and *Rabi* 2003 Planning 23 August 2002.	IARI, New Delhi.
	Brainstorming on 'Drought Management' 20 August 2002.	CAZRI, Jodhpur.
	Workshop of Coordinators of New Constituted PME Cells in ICAR-SAU System, 5 September 2002.	NCAP, New Delhi.
	QRT Meeting, 19-20 September 2002.	CTCRI, Thiruvananthapuram.
	Sensitization Workshop for Senior Research Managers in ICAR-SAUs, 21 September 2002.	NCAP, New Delhi.
	XIV PME Task Force Meeting, 26 September 2002.	NCAP, New Delhi.

Name	Theme and date(s)	Place
Mruthyunjaya	Round Table on Indian Fisheries on Aquaculture 27 September 2002.	Hotel Ashoka, New Delhi.
	Workshop on Good Governance: A framework for Improving Work Culture, Performance and Accountability in NARS, 28 September 2002.	NAAS, New Delhi.
	CACP's National Seminar on Methodological Issues in the Fixation of Minimum Support Prices, 6-7 November 2002.	SCOPE Building, CGO Complex, New Delhi.
	Annual Conference of Agricultural Economics Research Association (India), 8-9 November 2002.	Marathwada Agricultural University, Parbhani.
	Meeting on Networking of Social Scientists, 10 November 2002.	Marathwada Agricultural University, Parbhani.
	QRT Meeting at NRC for Grapes, Pune 14-15 November 2002.	NRC for Grapes, Pune.
	Symposia on Food and Nutritional Security, 26-30 November 2002.	IARI, New Delhi.
	Workshop on A Vision for Rainfed Agriculture in Asia: Targeting Research for Development, 2-4 December 2002.	ICRISAT, Hyderabad.
	International Symposium on Policy Issues in Fisheries and Aquaculture 19 December 2002.	CIFE, Mumbai.
	Meeting with PGT Teachers of Multipurpose Schools of Delhi Administration, 13 January 2003.	NCAP, New Delhi.
	PME Cells Review Workshop at Kerala Agricultural University,	Kerala Agricultural University, Trichur
	Launching Website under PME Cell activity, 15-19 January 2003.	IISR, Calicut.
	National Seminar on Stress Management in Oilseeds for Attaining Self-Reliance in Vegetable Oils, 28-30 January 2003.	Directorate of Oilseeds Research, Hyderabad.
	State of the Indian Farmer: A Millennium Study, 4-5 February 2003.	Institute of Economic Growth (IEG), Delhi.
	PME Sensitization Meeting, 7 February 2003.	GBPUA&T, Pantnagar.
	SSIR Meeting, 24 February 2003.	NCAP, New Delhi.
	Consultation Meeting of CAPART, 25 February 2003.	CAPART, New Delhi.
	Meeting of the Delhi based Fellows of the Academy and Heads of Delhi based ICAR Institutes, 5 March 2003.	NAAS, New Delhi.
	Meeting of Principal Investigators of NATP Research Projects, 10 March 2003.	NCAP, New Delhi.

Name	Theme and date(s)	Place
Mruthyunjaya	Final QRT Meeting during 10-14 March 2003.	NRC for Grapes, Pune.
	Joint Indian Council of Agricultural Research (ICAR)-ICRISAT Workshop on 'Village Level Studies 27-28 March 2003.	ICRISAT, Hyderabad.
	25th meeting of National Standing Committee on Rural Technology (NSCRT) of CAPART, 31 March 2003.	CAPART, India Habitat Centre, New Delhi.
Pandey S K	ICRIER-ICAR-IFPRI conference on Economic Reforms and Food Security-The Role of Trade and Technology, 24-25 April 2002.	India Habitat Centre, New Delhi.
	Workshop on Profile of People Technology and Policies in Fisheries Sector of India an ICAR-ICLARM collaborative project, 1-2 May 2002.	NCAP, New Delhi.
	CIMMYT-ICAR collaborative National Workshop on Prioritizing Maize Research and Development in India, 20-22 May 2002.	NCAP, New Delhi.
	Second Annual Workshop on Household Food and Nutritional Security for Tribal, Backward and Hilly Areas, 30 May to 1 June 2002.	NBPGR, New Delhi.
	Workshop of the Coordinators of PME Cells in ICAR-SAUs System, 28-29 June 2002.	NCAP, New Delhi.
	Brainstorming session on Impact Assessment of NATP Research Project, 12 August 2002.	NCAP, New Delhi.
	NCAP-PIU, NATP 'Sensitization Workshop for Senior Research Managers of ICAR-SAUs, 21 September 2002.	NCAP, New Delhi.
	Review meeting of ICAR-IFPRI collaborative project on Agricultural Diversification in South Asia, 20 February 2003.	NCAP, New Delhi.
	Review meeting of NATP Research Projects in India, 10 March 2003.	NCAP, New Delhi.
Rasheed Sulaiman V	National Agricultural Policy: Redesigning R & D to achieve the objectives, 10-11 April 2002.	INSA, New Delhi.
	AIMA Seminar on Leveraging Indian Agriculture: Emerging Roles for Corporate and Other Stakeholders, 26-27 July 2002.	Hotel Meridian, New Delhi.
	Innovations in Innovation: Exploring Partnership and Diversity in the Generation, Diffusion and Use of New Knowledge, 6 May 2002.	ICRISAT, Hyderabad.

Name	Theme and date(s)	Place
Rasheed Sulaiman V	Best Practices for Sustainable NGO/ CBO Agricultural Marketing Initiatives, 27-28 March 2003.	Ecumenical Christian Centre, White Field, Bangalore.
	Technology Dissemination for Women, 27-29 November 2002.	Gramin Vikas Trust, Bhubneshwar.
	Rural Livelihood Futures, 17-19 October 2002.	India Habitat Centre, New Delhi.
	Identifying themes for the Cafeteria for Women in Agriculture, 18 April 2002.	Hotel Connaught, New Delhi.
Roy B C	Planning Cum Methodology workshop for the project, Water-Food Scenario Analysis for 2025: An Agro-ecological Regional Approach, 14-15 June 2002.	NCAP, New Delhi.
	International Conference on Science and Technology Capacity Building for Climate Change, 20-22 October 2002.	FICCI, New Delhi.
	Eighth Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCC COP8), 23 Oct – 01 Nov 2002.	Vigyan Bhavan, New Delhi.
	Annual Conference of Indian Society of Agricultural Economics, 19-21 December 2002.	IARI, New Delhi.
	Consumption Module Refinement workshop for the project Water-Food Scenario Analysis for 2025: An Agro-ecological Regional Approach, 15-21 January 2003	WTC, TNAU, Coimbatore.
Suresh Pal	Annual conference of the Indian Society of Agricultural Economics, 19-21 December 2002.	IARI, New Delhi.
	Annual Conference of Agricultural Economics Research Association (India), 8-9 November 2002.	Marathwada Agricultural University, Parbhani (Maharashtra)
	JNU-IFPRI workshop on A Comparative Study of Economic and Agricultural Reforms in China and India, 25-26 March 2003.	IHC, New Delhi.
	AIMA Seminar on Leveraging Indian Agriculture: Emerging Roles for Corporate and Other Stakeholders, 26-27 July 2002.	Hotel Meridian, New Delhi.
Selvarajan S	South Asia Workshop on Climate Change	Vigyan Bhavan, New Delhi.

XIII. VISITS ABROAD

Name of the Official	Purpose	Place	Duration
Adhiguru P	To participate in pre-project phase on Golden rice	BATS, Switzerland	17 March - 16 June 2003.
Anjani Kumar	To participate in IIFET biennial Conference on Fisheries in the Global Economy.	Wellington, New Zealand	20-25 August 2002
	To participate in the MoA Bhutan-NCAP-IFPRI Collaborative Workshop on Agricultural Diversification in South Asia.	Paro, Bhutan	21-23 November, 2002
Birthal P S	NCAP-IFPRI workshop on Agricultural Diversification in South Asia	Bhutan	November 21-23, 2002
Dayanatha Jha	To attend Resource Conservation Technology meeting on Rice-Wheat System,	Kathmandu	4-6 March 2003.
Joshi P K	Review the progress and develop workplan for ICAR-CIMMYT project	Bangkok, Thailand	1-4 August 2002
	To participate in the MoA Bhutan-NCAP-IFPRI Collaborative Workshop on Agricultural Diversification in South Asia.	Paro, Bhutan	21-23 November 2002
Mruthyunjaya	Special Workshop on 'Pathways of Impact and Squeezing the Product from Research and Training in ICLARM'	ICLARM, Penang, Malaysia	11-13 September 2002
	16th Meeting of GB of the SAARC Agriculture Information Center (SAIC)	SAIC, Dhaka, Bangladesh	6-8 October 2002
	To participate in the MoA Bhutan-NCAP-IFPRI Collaborative Workshop on Agricultural Diversification in South Asia.	Paro, Bhutan	21-23 November 2002
Rasheed Sulaiman V	To participate in the International Conference on Institutional Learning and Change organised by the International Food Policy Research Institute (IFPRI).	Washington	4-6 February 2003

XIV . WORKSHOPS / SEMINARS ORGANISED

Review cum planning workshop on Increasing Production and Productivity of Life Support Crop Species and Allied Enterprises of Tribal, Backward and Hilly Areas.

NCAP, New Delhi; 12 April 2002.

A mid-term review meeting on Household food and Nutritional Security for Tribal, Backward and Hilly Areas was held at National Centre for Agricultural Economics and Policy Research (NCAP), New Delhi on 12 April 2002 to plan activities for the remaining phase. The objective of the meeting was to review the progress of project so far and prepare for the Annual Review Meeting of the project.

National Workshop on A Profile of People, Technologies and Policies in Fisheries Sector of India

NCAP, New Delhi; 1-2 May 2003.

The Centre organised a National Workshop under the aegis of ICAR-ICLARM collaborative project on Strategies and Options for increasing and Sustaining Fisheries and Aquaculture Production to benefit poorer households in Asia on 1-2 May 2002. The specific objective of the workshop was to formally launch the above project and to have a comprehensive review of the profile of fisherfolk, technologies, institutions, policies and support system in the Indian fisheries sector in India.

30 participants having wide experiences on fisheries sector participated in this workshop. The workshop highlights the following issues for further follow-up. The following issues emerged during the discussions:

- Tremendous growth potential in inland fisheries.
- Scope for investment in fisheries extension.
- Relook at price policy for providing better price to fisher folk vis-à-vis middleman.
- Database management and development of spices wise data.
- Upgradation of post harvest technologies.
- Better seed for fry production.
- Community participation in management of fisheries resources.
- Deterioration in water quality and overtapping of water resources.

Panel discussion on the role and the functions of Commission on Agricultural Costs and Prices (CACP)

NCAP, New Delhi; 2 May 2002.

A panel discussion on the role and the functions of the Commission on Agricultural Costs and Prices (CACP) in the changed scenario was organised at NCAP, on 2nd May 2002. Prof. S.S.Johl, an eminent economist and former chairman CACP, chaired the panel discussion.

Recommendations:

1. The roles and functions of the commission need to be recast and the entire system of food management should be re-assessed. The needed changes can be brought about within the present set-up of CACP provided strong initiatives are taken on urgent basis.
2. Favourable price environment (the policy of minimum support prices) for production of foodgrains need to be maintained as food security shall remain important in the coming years also. But there should be adequate shift in the focus towards achieving balanced crop production pattern.
3. There is need to redefine the present approach of the Commission for encouraging a broad-based growth in agricultural incomes besides increasing production.
4. The commission should examine the pros and cons of alternatives such as crop insurance, future markets, deficit payments and encouraging efficient private trade for management of food economy.
5. Since about 50 per cent of the off-take for public distribution system is accounted for by the well-to-do states, proper infrastructure in marginal areas should be developed on urgent basis so that, these poor areas get access to foodgrains.
6. A well thought-out strategy of diversification with due attention to the principle of comparative advantage need to be evolved to deal with mounting food stocks.
7. The commission should develop in-house capacity for more analytical work. It should monitor the implications of Agreement on Agriculture of WTO on the Indian economy.
8. The commission should broaden its function, for example, to suggest ways to dispose off the food-stocks.
9. The commission should strive to evolve as a truly professional body to address the concern of all the stakeholders besides being independent and answerable only to the parliament.

Water-Food Security Scenario Analysis for 2025: An Agro-ecological Regional Approach- Planning cum Methodology Workshop

NCAP, New Delhi; 14-15 June 2002.

The objective of this workshop was to review the progress and to finalize plan of work in order to accomplish the objectives of the project within the timeframe. 18 delegates representing each of the collaborating centres attended the workshop: TNAU, WTCER, GAU, IASRI and NCAP.

An overview of the project was presented and this was followed by a detailed presentation on review of methodologies for assessing water and food security at various levels. After critically analysing the merits and demerits of different approaches and models, the group arrived at the conclusion that the Policy Dialogue Model (PODIUM) developed by the International Water Management Institute (IWMI) be adapted with necessary refinements to address the future water-food security related issues at AER level. Several issues regarding the temporal and sectoral coverage of the study, functioning of various modules of the model, need and possibilities of refinement in the existing model, and data requirements and their availability were discussed. Major recommendations and the decisions taken are as follows:

- Necessary refinements will be made in two phases. In the 1st run only those changes will be made which are absolutely necessary. However, in the next run onwards all possible changes should be incorporated.
- For critically examining the possible refinements, three sub-groups were formed one each for the three different modules of the model namely consumption module, production module, and water balance module. Each group will critically examine the model and will suggest required refinements in the respective module.
- The sectoral coverage will be only cereal crops in the 1st run. However, in the subsequent runs it should also include non-cereal food crops, major livestock products, fish, fruit & vegetables.
- Data will be collected at district level. A list of variable on which data is required is distributed to the team members. All team members are requested to check the list and inform the Lead Centre, if any changes are needed.
- For calculating the historical trends/growth rates for major variables TE1985-TE1995 period be used. However, for final run this should be updated to TE2000

The concept and definitions of various variables/parameters/estimates used in the model should be fine tuned wherever required and possible. However in the first run, the model will use original definitions unless it is going to affect the analysis significantly. For examples the concept of 75% rainfall probability; and the assumption of 10% recycling need and 25% water demands from non-irrigation sectors to be re-examined in the subsequent runs.

Review Cum Planning Meeting of Household Food and Nutritional Security for Tribal backward and hilly areas

NCAP, New Delhi; *5-6 July 2003.*

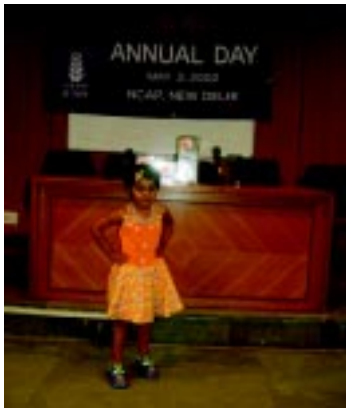
A two-day review cum planning meeting was organised on Household Food and Nutritional Security for Tribal, backward and hilly areas at NCAP, New Delhi. The basic objective of the meeting was to review the progress of area/ group specific studies on food security, income, and employment and gender aspects and to reflect on conventional sources/ commodities for food and nutritional security. Thirteen participants representing various ICAR institutes and State Agricultural Universities had attended the meeting.

Major decisions:

1. To bring out a book "Food and Nutritional Security in underprivileged regions of India" primarily based on the findings of the project.
2. Overall responsibility for this task was assigned to Dr.Dinesh K Marothia, IGAU, Raipur, and provide him all supports and cooperation required.
3. The book should cover the historical trends and evidences on food and nutritional security and micro level evidences.

NCAP Annual Day Celebrations, 2 May 2002.

The NCAP Annual Day was celebrated on 2 May 2002. Prof. Dayanatha Jha delivered the annual day lecture "Change is Difficult, But Change We Must: Organizations and Management in Agricultural Research". The session was chaired by Dr. M.A. Murlidharan, former Professor, Division of Agricultural Economics, IARI, New Delhi. The entire NCAP staff with their families participated in the cultural programme and the annual day dinner.



XV. SPECIAL LECTURES

Speaker	Title	Venue
Dastagiri M B	Demand Projections for Livestock Products in India, 2 September 2002.	IARI, New Delhi.
	Supply Projections for Livestock Products in India, 9 September 2002.	IARI, New Delhi.
Dayanatha Jha	Resource Conserving Technologies – The New Opportunities for Sustaining the Rice-Wheat Production System, 27 April 2002.	IARI, New Delhi.
	Change is Difficult, But Change We Must: Organizations and Management in Agricultural Research, 2 May 2002.	NCAP, New Delhi.
	Research Priorities in Agricultural Marketing in India – A Policy Issues, 7 September 2002.	IARI, New Delhi.
	National Agricultural Policy, 10 October 2002.	IEG, New Delhi
Mruthyunjaya	Indian Agricultural Science Policy and Practice, 24 July 2002.	Jawaharlal Nehru University, New Delhi.
	Marketing Policy for Agricultural Produce: Now and Ahead, 3 September 2002.	IARI, New Delhi.
	Recent Vistas in NRE Research, 25 October 2002.	UAS, Bangalore.
Suresh Pal	Agricultural Research Priority Assessment, Monitoring and Impact, 7 February 2003.	GBPUAT, Pantnagar.
P K Joshi	Measuring impact of social science research, 1 April 2002.	IARI, New Delhi.
	Prioritization of R&D portfolio, In: Training Program on 'Systems Analysis and Modelling of Crop Production and Management, 27 August 2002.	Central Soil Salinity Research Institute, Regional Station, Lucknow.
	Impact of agricultural technologies. In :Training Program on Systems Analysis and Modelling of Crop Production and Management, 27 August 2002.	Central Soil Salinity Research Institute, Regional Station, Lucknow.

Speaker	Title	Venue
	Prioritization, monitoring and evaluation of research in National Agricultural Research System. (Management Development programme for Comptrollers of State Agricultural Universities), 6 January 2003.	NAARM, Hyderabad.
	Impact of agricultural research (Sensitization workshop on PME), 7 February 2003.	GBPUAT, Pantnagar.
Rasheed	Participatory Technology Development –	College of Agriculture,
Sulaiman V	Policy issues and implications, 23 September 2002.	Padannakad, Kasaragod, (KAU).
Selvarajan S	Water-Food Security Scenario Analysis for 2025	Gujarat Agricultural University, Navsari.

XVI DISTINGUISHED VISITORS

Ashok Gulati, International Food Policy Research Institute (IFPRI), Washington DC, USA.

Jock Anderson, The World Bank, Washington DC,USA

Norman Uphoff, Director, Cornell International Institute for Food Agriculture and Development.

R S Paroda, CGIAR Programme for CAC, Taskent.

Prabhu Pingali, CIMMYT, Mexico

Ravi Sharma, UNEP, Nairobi SA.

Rohat Moss, Synergy OCFI, Oxford

Stein W Bie, Director General, Institutional Service for National Agricultural Research (ISNAR), The Hague, Netherlands.

Suresh Babu, IFPRI, Washington, DC, USA

Tom Downing, Stockholm Environment Institute, Oxford.

William Jansen, Institutional Service for National Agricultural Research (ISNAR), The Hague, Netherlands.

XVII PERSONNEL

Scientific

Mruthyunjaya	Director
Dayanatha Jha	National Professor
P.K. Joshi	Principal Scientist
S. Selvarajan	Principal Scientist
Ramesh Chand	Principal Scientist
B.C. Barah	Principal Scientist
Gordhan Singh	Principal Scientist
Suresh Pal	Senior Scientist
P.S. Birthal	Senior Scientist
Rasheed Sulaiman V	Scientist (Sr. Scale)
Adhiguru P	Scientist (Sr. Scale)
B.C. Roy	Scientist (Sr. Scale)
Anjani Kumar	Scientist (Sr. Scale)
S.K. Pandey	Scientist (Sr. Scale)
Harbir Singh	Scientist (Sr. Scale)
Dastagiri M B	Scientist (Sr. Scale)
Lakshmi Prasanna P A	Scientist
Rajani Jain	Scientist

Administrative

Narender Kumar	Assistant Administrative Officer
Naresh Arora	Assistant Finance & Accounts Officer
Vasisht M S	Assistant
Umeeta Ahuja	Stenographer
Seema Khatter	Junior Stenographer
Yadav S K	Upper Division Clerk
Inderjeet Sachdeva	Lower Division Clerk
Sanjay Kumar	Lower Division Clerk

Technical

Prem Narayan	T-5
Khyali Ram Chaudary	T-4
Mangal Singh Chauhan	T-4
Sonia Chauhan	T-4
Satender Kataria	T-1

Supporting

Mahesh Kumar	S.S.Gr I

XVIII TRAINING ATTENDED

Scientific Staff

Name of the official	Theme	Duration	Place of Training
Adhiguru P	To participate in training Technology/ Need Assessment	17 March-16 June 2003	BATS, Switzerland
Dastagiri M B	M S Office 2000 and SPSS	13 February-5 March, 2003	IASRI, New Delhi.
Dastagiri M B	Workshop on Gahan Hindi Prashikshan	19- 22 June 2002	NAARM, Hyderabad.
Anjani Kumar	Introduction to ArcGIS-Arc View 8.x	5-6 May 2003	NIIT GIS, New Delhi
Lakshmi Prasanna P A	Relational Data Base Management System (RDBMS)	13 March - 12 April 2002	NIIT, New Delhi
Suresh Pal	Agri Business management for Senior functionaries (Satguru Foundation)	1-8 July 2002	Taj Blue Diamond, Pune
Rasheed Sulaiman V	M S Office 2000 and SPSS	13 February to 5 March 2003	IASRI, New Delhi.
Roy B C	Developing Capacity for Strategic Research: Adapting the Food and Water Model for Analysis of SAT Futures and Development Opportunities	24-31 January 2003	ICRISAT, Hyderabad
Harbir Singh	International Training Programme in Intellectual Property Management and Technology Transfer	19-25 January 2003	Science and Technology Park, University of Pune, Pune

Administrative Staff

Name of the official	Theme	Duration	Place of Training
Inderjeet Sachdeva	Refresher Course for Assistants and UDCs	16-18 October 2002	IASRI, New Delhi.
M S Chauhan	IT Security	14-15 March 2003	CMC Ltd., Janakpuri New Delhi
Naresh Kumar Arora	Management Development Programme	16-17 January 2003	NIFM, Faridabad
Naresh Kumar Arora	Technical Workshop on Cash / Accounts	21-23 April 2003	ISERA, New Delhi
Naresh Kumar Arora	The Financial Act, 2002	3 August 2002	ISERA, New Delhi
Seema Khattar	Refresher Course for Assistants and UDCs	16-18 October 2002	IASRI, New Delhi.
Sonia Chauhan	Web Programming	24 June –7 July 2002	IASRI, New Delhi.

XIX PROMOTION OF OFFICIAL LANGUAGE

The official language committee of the Centre provides suggestion for implementation of the official language policy of the Government of India. The Committee organized a 'Hindi Day' on 16th September, 2002. Dr. Dayanatha Jha, National Professor, NCAP, Mr. Mukesh Kumar Meena, IPS, Deputy Commissioner of Police, New Delhi and Mr. Anil Kumar Dubey, Director official language, ICAR attended this function. Mr. Khyali Ram Chaudhary, Dr. Harbir Singh and Dr. A. K. Jha won the first, second and third prize respectively for the essay writing competition. For the poem competition Dr. A. K. Jha, Mr. M.S. Vashist and Ms. Sonia Chauhan won the first, second, and third prize respectively. Ms. Sonia Chauhan, Mr. Naresh Kumar, Dr. Praveen Kumar won the first, second, third prize respectively. Dr. P. Adhiguru and Mr. M T Rajsekharappa won the consolation prizes in this category.

Dr. M. B. Dastagiri and Mr. Khyali Ram Chaudhary participated in the Hindi workshop organized by the National Academy of Agricultural Research Management (NAARM), Hyderabad, held during 18-22, June 2002. Mr. Narander Kumar and Mr. Khyali Ram Chaduhary participated in the Hindi Progamme organized by Rajbhasha Sansthan during 25–27 September 2002 at Nanital. Members of the official language committee, ICAR, Mr. Surendera Kumar Uniyal, Asstt. Director, Mr. Manoj Kumar and Mr. Hari Om visited the Centre on 2nd December 2002 for monitoring the progress in implementation of official language at NCAP.

XX PARTICIPATION IN ICAR SPORTS COMPETITION

NCAP team comprising, Inder Jeet Sachdeva, Sanjay Kumar, Mahesh Kumar and Satinder Singh participated in ICAR Zonal Tournament (Zone IV) at National Dairy Research Institute (NDRI), Karnal, Haryana from 2-5 December, 2002.

XXI INFRASTRUCTURAL DEVELOPMENT

The centre got approval for construction of office building and staff quarters in the IX Plan and the first installment for this work, Rs.1 crore and Rs.23 lakhs respectively was deposited with CPWD in the year 2000-01. For construction of the office building, all necessary approvals from Delhi Urban Arts Commission, Municipal Corporation of Delhi and Delhi Vidyut Board have been obtained. The construction work is expected to start shortly after obtaining the approval of the council. However the construction of quarters could be started only after getting the Master Plan of Pusa campus approved from civic authorities. Efforts are on to get this approval.

विशिष्ट सारांश

वार्षिक प्रतिवेदन : 2002–2003

राष्ट्रीय कृषि आर्थिकी एवम् नीति अनुसंधान केन्द्र ने वर्ष 2002–03 में अनेक संस्थाओं के साथ अपने अनुसंधान एवं सम्पर्क क्षेत्र का विस्तार किया है। केन्द्र में वर्तमान में 18 वैज्ञानिक (एक राष्ट्रीय प्राध्यापक सहित) और 14 अन्य कार्मिक कार्यरत हैं। केन्द्र का वर्ष 2002–03 का बजट परिव्यय 331.5 लाख रूपये था।

केन्द्र की शोध नीतियों का मार्गदर्शन एक 'उच्चस्तरीय अनुसंधान सलाहकार समिति' करती है एवम् 'प्रबंध समिति' केन्द्र के नियमित क्रियाकलापों का निर्धारण करती है। केन्द्र के विकेन्द्रीकृत प्रशासन प्रबंध हेतु अनेक आंतरिक समितियाँ कार्यरत हैं। केन्द्र में अनंसधान कार्य मुख्यतया पाँच क्षेत्रों – तकनीकी नीति, सतत् कृषि प्रणाली, विपणन एवं व्यापार, संस्थागत बदलाव और कृषि वृद्धि एवं माडलीकरण में होता है। उपर्युक्त वर्णित अनुसंधान क्षेत्रों में शोध कार्य वरिष्ठ स्तर के वैज्ञानिकों की देख–रेख में किये जाते हैं। वर्ष के दौरान प्रमुख अनुसंधान उपलब्धियों एवं जारी शोध कार्य का सारांश निम्नवत है :

दक्षिण एशियाई देशों में कृषि में अधिक मूल्यवाली फसलों के संबंध में विविधीकरण आया है। इस क्षेत्र के अन्य देशों की तुलना में बंग्लादेश, भूटान तथा नेपाल में कृषि विविधता की गति में कमी आयी। इस क्षेत्र के अधिकांश देशों में फसल विविधीकरण की प्रक्रिया को क्षेत्र विस्तार के माध्यम से किया गया। जबकि भारत और श्रीलंका में विविधीकरण फसल प्रतिस्थापन के माध्यम से किया गया। भारत के अर्धशुष्क उपोष्ण क्षेत्रों में विशेष रूप से फल, सब्जियाँ, दूध, मांस, अण्डे आदि कृषि विविधीकरण प्रक्रिया के प्रमुख स्त्रोत्र रहे हैं। उच्च सिंचित तथा अधिक वर्षा वाले क्षेत्रों में कृषि विविधीकरण की गति कम थी, जबकि लघु प्रक्षेत्रों पर कृषि विविधिता काफी अधिक देखने को मिली। बागवानी तथा पशुधन के प्रति कृषि में विविधीकरण हेतु बुनियादी ढाँचा के रूप में सड़क की महत्ता को एक प्रमुख कारक के रूप में चिन्हित किया गया है।

पिछले दो दशकों के दौरान भारत में विभिन्न पशुधन उत्पादों की प्रतिव्यक्ति खपत में काफी वृद्धि हुई है। दूध एवं अण्डों की प्रतिव्यक्ति खपत दो गुनी हो गयी है जबकि मांस एवं मछली की प्रतिव्यक्ति खपत में वृद्धि काफी कम हुई है। विश्लेषण से स्पष्ट है कि आय एवं पशुधन उत्पादों की प्रतिव्यक्ति खपत के बीच एक सकारात्मक संबंध है। पशुधन उत्पादों में वृद्धि, पशुओं की संख्या एवं इनकी उत्पादकता में वृद्धि से आई है। खाद्य एवं चारे की अत्यंत कमी, प्रतिव्यक्ति घटती भूमि की उपलब्धता के अतिरिक्त इनके पर्यावरण पर प्रतिकूल प्रभाव आदि पर विचार करते हुए पशुधन उत्पादों की वृद्धि हेतु पशुओं की बढ़ती संख्या का प्रथम विकल्प व्यावहारिक प्रतीत नहीं होता। जबकि द्वितीय विकल्प के रूप में चारे की पैदावार में वृद्धि तथा उपलब्ध प्रौद्योगिकी के अनुरूप पशुधन वृद्धि की स्थिति स्पष्ट होती है। विश्व की औसतन उत्पादकता की तुलना में वर्तमान में पशुधन की विभिन्न प्रजातियों की उत्पादकता काफी कम है। विश्लेषण से स्पष्ट है कि उत्पादकता सुधार के उपायों के प्रयोग में लाने से उत्पादन बढ़ने की प्रबल संभावना है।

वर्ष 2020 के लिए प्रमुख पशुधन उत्पादों की मांग और आपूर्ति के क्रियाकलापों का आंकलन किया गया है । वर्ष 2020 में 84.9 मिलियन लीटर दूध, 68.9 बिलियन अण्डे, 7.9 मिलियन टन गोमांस तथा भैंस का मांस, 4.5 मिलियन टन मछली तथा 1.9 मिलियन टन मुर्गे के मांस का उत्पादन बढ़ जाएगा जबकि

भेड़ तथा बकरी के मांस में 3.1 मिलियन टन की कमी हो जाएगी। पशुधन उत्पादों में मांग–आपूर्ति के अंतराल को कम करने के लिए पशुधन क्षेत्र में चारा आपूर्ति, पशुधन उत्पादों के लाभकारी मूल्य और प्रौद्योगिकी सुधार में निवेश महत्वपूर्ण हैं।

भारत में गरीबी को कम करने के लिए पशुधन के क्षेत्र में वृद्धि करना महत्वपूर्ण होगा, क्योंकि भूमि की तुलना में पशुधन अधिक समान रूप से वितरित हैं। सीमांत और छोटे किसानों (2 हेक्टेयर से कम) का प्रतिशत कुल खेतिहर किसानों का 63 प्रतिशत है और इनके हिस्से में 34 प्रतिशत भूमि आती है। इसके मुकाबले इनका हिस्सा गोजातीय पशुओं में 67 प्रतिशत, भेड़ में 65 प्रतिशत, सुअर में 70 प्रतिशत तथा कुक्कट में 75 प्रतिशत है। अध्ययन विश्लेषण से यह सुनिश्चित होता है कि कृषि के दूसरे क्षेत्रों में हुई वृद्धि की तुलना में पशुधन क्षेत्र में सुधार करना गरीबी को कम करने में ज्यादा सहायक होगा।

मौसम प्रभावित प्राकृतिक महाविपदा (सी आई एन डी) जैसे सूखा, बाढ़ तथा चक्रवात उड़ीसा राज्य के लिए गंभीर समस्याएं हैं तथा यहां की जनता इनका सामना करने के लिए एक या अनेक रणनीतियां अपनाती है। सामान्य रणनीतियों के क्रम में खाद्य और आय संसाधनों में विविधीकरण, फसल अनुक्रिया में सामंजस्य, पशु पालन संबंधी कार्यों में सामंजस्य, अंशदायी –फसलीय तथा स्टाक एवं प्रविष्टियां तैयार करके नुकसान की कमी, संगठनात्मक सहायता का पता लगाना जैसे मदद की मांग, कम होते जल संसाधनों का प्रबंधन इत्यादि हैं। इसके अलावा सरकारी सहायता तथा पुनर्वास कार्यक्रम भी सी आई एन डी की अति संवेदनशीलता के जोखिम को कम करने में सहायक होते हैं। साथ ही खाद्य सहायता से ध्यान हटाकर दीर्घकालीन उपायों जैसे सूखा रोकने, प्रतिरोधी किस्मों के विकास (सूखा, बाढ़ और लवणता के प्रति प्रतिरोधी), सड़क और सिंचाई के बुनियादी ढांचे में सुधार, और अकृषित क्षेत्र में रोजगार के अवसर उत्पन्न करने पर ध्यान केन्द्रित करना होगा।

टिकाऊ जीविकोपार्जन सूचकांको की सहायता से 52 कृषि परिस्थितकीय उप क्षेत्रों (ए ई एस आर एस) की अक्षुणता का मानचित्रण किया गया। 16 ए ई एस आर में 142 जिले शामिल हैं इनमें अक्षुणता/स्थिरता का स्तर काफी कम है और इन क्षेत्रों में प्राथमिकता के आधार पर तत्काल ध्यान और वरीयता देने की जरूरत है।

हरियाणा राज्य में स्थापित उप सतही जल निकासी प्रबंध के मूल्यांकन से अनेक लाभों का पता लगा है। इससे फसल पैदावार में 29 से बढ़कर 35 प्रतिशत की आकर्षक वृद्धि हुई है। फसल सघनता तथा अधिक मूल्य वाली फसलों का विविधीकरण, गैर जल निकासी वाली भूमि में लवण तत्व की 2.2 प्रतिशत वृद्धि तथा जल निकासी वाली भूमि में लवण तत्व में 35 प्रतिशत की कमी, जल स्तर में सुधार, तथा 85 व्यक्ति/हेक्टेयर लाभप्रद रोजगार में वृद्धि हुई है। अध्ययन विश्लेषण के परिणामों से यह पता चला है कि पैदावार वृद्धि में जल निकासी का योगदान 40 से 70 प्रतिशत तक है और आर्थिक, सामाजिक तथा पर्यावरणीय लाभों के बावजूद इस प्रौद्योगिकी का अंगीकरण काफी ज्यादा नहीं है। इस प्रौद्योगिकी के बेहतर अंगीकरण के लिए सहभागिता के दृष्टिकोण के आधार पर एक उपयुक्त संगठनात्मक प्रबंधन की जरूरत है।

मध्य प्रदेश राज्य को शामिल करते हुए कृषि पारिस्थितिकीय उप क्षेत्र 4.4 के लिए जल खाद्य सुरक्षा परिदृश्य का विश्लेषण किया गया। मध्य प्रदेश की प्रमुख फसलों में जल के महत्व का तुलनात्मक विश्लेषण करने से पता चलता है कि खरीफ फसलों में मक्का और मूंगफली के बाद रबी फसल के रूप में सोयाबीन की बुवाई करने से धान उगाने की तुलना में अधिक लाभ मिलता है, क्योंकि इससे दो से तीन गुणा प्रति क्यूबिक मीटर कम जल का उपयोग होता है। रबी फसलों में सरसों और चना, गेहूँ के उत्पादन से श्रेष्ठ हैं। सोयाबीन और रबी फसलों के बीच जल की खपत की तुलना करने पर यह पाया

गया कि सोयाबीन के लिए इस्तेमाल किया गया प्रति क्यूबिक मीटर जल के मूल्य का शुद्ध लाभ लगभग चने और सरसों के बराबर था और रबी में गेहूँ तथा खरीफ में धान की तुलना में काफी अधिक आकर्षक था। जल की बढ़ती हुई कमी के बावजूद राज्य में जल की उत्पादकता काफी कम है। और कुछ हद तक जल की बर्बादी चरमराते बुनियादी ढांचे के कारण होती है किंतु इससे ज्यादा महत्वपूर्ण नियम निर्धारण की कमी, वैकल्पिक फसलों के तुलनात्मक लाभ के अनुसंधान की कमी आदि हैं।

भारत के आदिवासी, पिछड़े तथा पहाड़ी क्षेत्रों के विशेष सुविधा प्राप्त क्षेत्रों के अंतर्गत आने वाले गरीब लोगों के खाद्य सुरक्षा स्तर को सुधारने के लिए एक समेकित तकनीकी दशष्टिकोण के प्रभाव का अध्ययन करने पर यह पता लगा है कि लगभग 71 प्रतिशत जनता खाद्य सुरक्षा की श्रेणी में नहीं आती। इस वर्ग के अंतर्गत खाद्य असुरक्षा की तीव्रता से लक्षित हुआ है कि औसतन 33 प्रतिशत जनता निस्सहाय हैं (गरीबों में अत्यंत गरीब) इसके साथ–साथ प्रत्येक अति गरीब तथा गरीब श्रेणी में 19 प्रतिशत हैं। विभिन्न प्रौद्योगिकी हस्तक्षेपों में मोटे अनाज के साथ–साथ प्रवासी भेड़, पैन–कल्चर तथा कार्प पोलीकल्चर के मामले में आगत–निर्गत अनुपात ज्यादा है। मोटे अनाजों की खेती में सिंचाई सुविधाओं की कमी, उत्पाद का कम मूल्य तथा गुणवत्ता वाले बीजों का अभाव प्रमुख समस्याएं हैं। प्रवासी भेड़ों के मामले में पशुचिकित्सा सुविधाओं की कमी भी एक प्रमुख समस्या है जबकि सही समय पर स्थानीय क्षेत्र में कार्प बीज एवं फिंगरलिंग की अनुपलब्धता मत्स्यिकी क्षेत्र में नवीन प्रौद्योगिकी अपनाने की दिशा में एक प्रमुख घटक हैं।

पूर्वी भारत में चावल की अर्थव्यवस्था के सामाजिक–आर्थिक पहलू पर एक समीक्षा अध्ययन से यह पता चला है कि 80 तथा 90 के दशक के दौरान अन्य महत्वपूर्ण क्षेत्रों जैसे कृषि में स्थिरता एवं जोखिम तथा लिंग आदि पहलुओं पर ध्यान देने के बजाय कृषि प्रौद्योगिकी मूल्यांकन पर अधिक ध्यान दिया गया। धान एक प्रमुख फसल है जिसकी खेती पूर्वी भारत में 50 प्रतिशत से अधिक फसलीय क्षेत्र में की जाती है, परंतु उत्पादकता और उत्पादन काफी कम और अस्थिर हैं। बोरो धान की खेती को अपनाकर कुल धान उत्पादन में आकर्षक वृद्धि की जा सकती है।

पिछले 5–6 वर्षों के दौरान गेहूँ में 'कर्षण विहीन प्रौद्योगिकी' के प्रदर्शनों से हरियाणा, पंजाब, उत्तर प्रदेश तथा बिहार राज्य के किसानों को इस प्रौद्योगिकी के व्यापक रूप से अपनाने में सुविधा मिली है। प्रदर्शन के अलावा शून्य– टिल–ड्रिल फ्रेम में मामूली संशोधन, ड्रिल उत्पादन में निर्माणकर्ता की क्रियाशील हिस्सेदारी, इसके निर्माण पर सरकार और अनुसंधानकर्ताओं द्वारा दिया गया प्रशिक्षण तथा सरकार द्वारा सब्सिडी के प्रावधान, कुछ ऐसे घटक हैं जिनके चलते इस प्रौद्योगिकी को अपनाने में काफी सफलता मिली है। यह प्रौद्योगिकी परिष्करण तथा प्रसार प्रयासों और प्रौद्योगिकी के विकास और अंगीकरण में सार्वजनिक–निजी भागीदारी की जरूरत के महत्व को दर्शाता है।

1985–1995 की अवधि के दौरान गंगा के मैदानी क्षेत्र में कुल फसलीय क्षेत्र में चावल–गेहूँ आधारित फसल–चक्र के क्षेत्रफल में वृद्धि हुई है। चावल–गेहूँ फसल–चक्र के अंतर्गत क्षेत्रफल में वृद्धि से इस क्षेत्र में रोजगार के बड़े अवसर पैदा हुए हैं। यद्यपि कि मध्य और ऊपरी गंगा वाले मैदानी क्षेत्रों में गेहूँ और चावल की उत्पादकता का स्तर कम है, फिर भी इन क्षेत्रों ने गंगा–पार के मैदानी क्षेत्रों की तुलना में अधिक कुशलतापूर्वक उत्पादन किया है जहां कि उत्पादकता काफी अधिक थी। गंगा–पार के मैदानी क्षेत्रों में आयी उच्च लागत, पोषक तत्वों, सिंचाई जल तथा ऊर्जा के अविवेकपूर्ण उपयोग के कारण थी। दूसरी ओर गंगा–पार के मैदानी क्षेत्रों की तुलना में मध्य गंगा के मैदानी क्षेत्रों में संसाधनों का काफी कम उपयोग किया गया।

सरकार की खाद्यान्न संग्रहण, वितरण तथा बफर स्टाकिंग कार्यक्रमों का 1990 के दशक के दौरान निजी खाद्यान्न विपणन और दीर्घावधि खाद्य सुरक्षा के संभावित योगदान में कमी पर नकारात्मक प्रभाव पड़ा है। कृषि जिंसों के उच्च न्यूनतम समर्थन मूल्यों की सिर्फ घोषणा, जिससे खाद्यान्न संग्रहण काफी बेहतर रूप में प्रभावित नहीं होता है ऐसे बढ़ते हुए कृषि उत्पाद मूल्य उत्पादकों के वास्तविक उद्देश्य को पूरा नहीं करते। खाद्य संग्रहण के उच्च मूल्यों के कारण निजी व्यापार के लाभ पर प्रतिकूल प्रभाव पड़ा है इससे मंद गति से बाजार से निवर्तन आरंभ हो गया है। खाद्यान्न विपणन में निजी क्षेत्र की भागेदारी पर उचित ध्यान दिया जाना चाहिए। दीर्घकाल में देश को किसानों की आय को सुरक्षा प्रदान करने के लिए नयी प्रक्रिया को विकसित करने की जरूरत है क्योंकि मात्र मूल्य हस्तक्षेप के परिणाम अच्छे नहीं रहे हैं। 'व्यावहारिक फसल बीमा सुविधा' तथा 'अपूर्ण मूल्य भुगतान' आदि उपायों को विकसित करना किसानों के हितों की रक्षा के लिए जरूरी हैं।

वैश्वीकरण के वर्तमान संदर्भ के अंतर्गत एशियाई देशों के लिए यह अत्यंत जरूरी हो गया है कि व्यापार के आपसी लाभों के लिए क्षेत्रीय व्यापार सहमति तथा संभावित उप–क्षेत्रीय समूह की पहचान करें। 'खाद्य एवं कृषि संगठन' (एफ ए ओ) को आपसी व्यापार के लाभ के बारे में एशियाई देशों की सरकारों को बताना चाहिए तथा कृषि व्यापार के क्षेत्रीय समेकित कार्य को सरल बनाना चाहिए। इसमें विभिन्न कृषि जिंसों, नीतिगत विपणन के लिए निष्कर्षों का प्रसार, जानकारी हासिल करने के लिए तकनीकों का विनिमय तथा व्यापार अवसरों और इस क्षेत्र के देशों में व्यापारिक वातावरण में सुधार, व्यापार अन्वेषण एवं प्रोत्साहन के लिए दक्षता के विकास (कैपेसिटी बिल्डिंग) पर अध्ययन करने की जरूरत है।

मत्स्य उत्पादों की निर्यात में पर्याप्त विविधता है। मूल्य के मामले में विविधता सूचकांक में वृद्धि हुई है, विविधता सूचकांक वर्ष 1989 में 0.40 से बढ़कर वर्ष 2000 में 0.54 हो गई है। प्रदर्शित तुलनात्मक लाभ विश्लेषणों में यह पाया गया है कि मत्स्यिकी क्षेत्र काफी प्रतिस्पर्धात्मक है। विश्व मत्स्यिकी व्यापार में 1 प्रतिशत की वृद्धि के साथ भारतीय मत्स्यिकी के निर्यात की मांग में लगभग 0.42 प्रतिशत की बढ़ोतरी हुई है। भारतीय निर्यात मूल्य में 1 प्रतिशत की कमी के साथ भारतीय मत्स्यिकी क्षेत्र में 1.13 प्रतिशत की वृद्धि हुई है।

विश्व व्यापार संगठन (डब्ल्यू टी ओ) के समझौते पर हस्ताक्षर करने के पश्चात बहुत से मत्स्य उत्पाद 'विशेष आयात लाइसेंस' के अंतर्गत आ गए हैं जिन्हें वर्ष 1997 से मुक्त रूप से आयात किया जा रहा है। मत्स्य क्षेत्र में सीमा–शुल्क ढांचा भी बढ़ती हुई समुद्री स्थितियों के अंतर्गत आता है। यद्यपि मत्स्यिकी क्षेत्र में व्यापार पर 'मात्रात्मक प्रतिबंध' को हटाने के प्रभाव का अनुमान लगाना जल्दबाजी होगी और उच्च सीमा शुल्क के साथ भारतीय मत्स्य और मत्स्य उत्पादों को प्रतिस्पर्धात्मक रूप से बेहतर बनाकर ही हम मत्स्य और मत्स्य उत्पादों के आयात के प्रवाह को रोक सकते हैं।

कृषि जिंस को हमेशा घरेलू और विश्व बाजार में प्रतिस्पर्धात्मक बनाए रखने के लिए उत्पादकता के साथ–साथ कारकों के प्रयोग में कुशलता बढ़ाना जरूरी है। उदाहरण के लिए मध्य प्रदेश, जिसमें लगभग 4.5 मिलियन हेक्टेयर क्षेत्र में सोयाबीन उगाई जाती है और इसका कुल उत्पादन में 70 प्रतिशत हिस्सा है। वर्तमान समय में सोयाबीन की उत्पादकता 1.1 टन/हेक्टेयर है। किंतु यदि बड़े तथा छोटे बांधों में भंडारित जल से यदि 10 से.मी. की एक सम्पूरक सिंचाई की जाए तो इसके पैदावार में 0.42–0.55 टन/हेक्टेयर की अतिरिक्त वृद्धि होगी। इस प्रकार पैदावार में हुई वृद्धि भारतीय सोयाबीन को, संयुक्त राज्य अमेरिका की सोयाबीन के मुकाबले प्रतिस्पर्धात्मक बनाएगी जिसके मौजूदा समय में प्रतिस्पर्धात्मक मूल्य हैं।

हालांकि अनेक अध्ययनों से यह साबित हुआ है कि औषधीय पौधों की आर्थिक रूप से प्रबल संभावनाएं मौजूद हैं किंतु हर्बल उद्योग की मांग को पूरा करने के लिए इनकी खेती पर नियमित रूप से और जरूरी ध्यान नहीं दिया गया है। औपचारिक विपणन सम्पर्क तथा प्रबंध औषधीय पौधों की खेती के क्षेत्र की प्रमुख बाधाएं हैं । विभिन्न स्टेक होल्डरों अर्थात सरकारी विभाग, अनुसंधान संगठन, पारंपरिक औषधीय क्षेत्र तथा निजी औद्योगिक घराने में परस्पर समन्वय भी एक प्रमुख समस्या है। भारत में औषधीय पौधों की खेती की दक्षता का पूर्ण रूप से दोहन करने के लिए विश्व व्यापार संगठन परिदृश्य के बाद की स्थितियों तथा व्यापक प्रौद्योगिकी पोर्टफोलियों से निपटने के लिए नवीन संगठनात्मक प्रबंध, प्रभावी वैधानिक और नीतिगत साधनों की जरूरत है।

विकासशील देशों में पौधों की किस्म के संरक्षण और खाद्य सुरक्षा पर किए गए एक अध्ययन से पता चला है कि पादप प्रजनक अधिकारों का फसल पर एक खास प्रभाव पड़ता है। हालांकि पादप प्रजनक अधिकार कई मामलों में सुधरी हुई विदेशी किस्मों तक पहुंचने का मार्ग प्रशस्त करते हैं किंतु खाद्य सुरक्षा में इसका योगदान किया जाना अभी बाकी है। विकासशील देशों के पादप आनुवंशिक संसाधनों के संरक्षण के लिए अपना कानून बनाना और उसे लागू करना व खाद्य सुरक्षा पर इनके प्रभाव का आकलन करने के समय इन अनुभवों पर बराबर ध्यान देना होगा।

तिलहन उत्पादन दुगने से ज्यादा हो गया है जो कि 1981 में 10 मिलियन टन से बढ़कर 2000 में 21.3 मिलियन टन हो गया। तिलहनों की उत्पादन में हुई वृद्धि क्रमशः सोयाबीन (55 प्रतिशत), तोरिया एवं सरसों (28 प्रतिशत), मूंगफली (7.44 प्रतिशत) तथा कुसुम (6.16 प्रतिशत) को मिलाकर हुई है। पिछले दो दशकों के दौरान पूर्वी और उत्तरी राज्यों से मध्य तथा पश्चिमी राज्यों तक क्षेत्रीय रूप से तिलहन उत्पादन में स्पष्ट गतिमान देखा गया है । लगभग 56 प्रतिशत तिलहन क्षेत्र उन्नत बीजों तथा कुल सुधरे बीजों के अंतर्गत आते हैं, इनमें प्रमाणित बीजों का हिस्सा 35 प्रतिशत है। तोरिया एवं सरसों के उत्पादन को बढ़ाने के लिए कारको के उपयोग में हुई अधिकाधिक वृद्धि एक प्रमुख कारण है। उत्पादन बढ़ाने में न्यूनतम तकनीकी दक्षता एक चिंता का विषय है तथा इस पर उत्कृष्ट अनुसंधान एवं विकास कार्य करते हुए ध्यान देने की जरूरत है।

विभिन्न कृषि क्षेत्रों में बढ़ते हुए मक्के की खेती के अनुसंधान जरूरतों को प्राथमिकता दी जानी चाहिए। पूर्वी क्षेत्र में कम गुणवत्ता के बीज और उपयुक्त पौध संख्या में कमी तथा दक्षिणी क्षेत्र के उच्च वर्षा वाले क्षेत्र में सूखा और गुणवत्ता वाले बीजों की कमी, अनुसंधान की दशष्टि से अधिक महत्वपूर्ण मुद्दे हैं।

'राष्ट्रीय कृषि प्रोद्योगिकी परियोजना' के अंतर्गत बहुत सी प्रौद्योगिकियां विकसित और परिष्कृत की गई हैं। इन प्रौद्योगिकियों के प्रभाव के आकंलन में यह पाया गया है कि किसानों ने बेहतर और महत्वपूर्ण लाभ अर्जित करने के साथ–साथ उत्पादन प्रणाली की स्थिरता और टिकाऊपन में वृद्धि को महसूस किया है। अध्ययन से यह स्पष्ट रूप से प्रदर्शित हुआ है कि उपलब्ध प्रौद्योगिकी के प्रसार में निवेश से भारी लाभ प्राप्त हुआ है तथा भविष्य में इस पर आवश्यक ध्यान दिए जाने की जरूरत है। सार्वजनिक विस्तार प्रणाली द्वारा प्रौद्योगिकियों के प्रसार के लिए व्यापक पहल की जरूरत है यद्यपि इसे सुगम बनाने के लिए अनुसंधान प्रणाली की भूमिका भी काफी महत्वपूर्ण है। नवीन कृषि प्रणाली के विस्तार में सुधार हेतु सृजन, वितरण और नई तकनीक के अंगीकरण में कार्यकताओं की भागीदारी और प्रबंधीय तथा संस्थागत जानकारी कृषि अनुसंधान एवं विकास की प्रमुख चुनौतियाँ हैं।

नवीनता प्रणाली में कार्यकताओं की भागीदारी पर किए गए अध्ययन से शोध नीति और इनकी व्यावहारिक उपयोगिता के लिए विशेष सबक मिलता है कि ऐसी परियोजनाएं सफल रही हैं जिन्हें विशेष लक्ष्य व समस्याग्रस्त क्षेत्र के लिए स्थानीय कार्यकर्ताओं के सहयोग को ध्यान में रखकर कार्यान्वित किया गया

है। मौजूदा कृषि प्रणाली की संस्थागत विशेषताओं की व्यापक दूरियों पर ध्यान देने की जरूरत है जो कि इन सम्पर्कों को विकसित करने से रोकती हैं। स्थिर और विभाजित भूमिका के साथ निम्न श्रेणी की शिक्षण व्यवस्था ऐसे मुद्दे हैं जिन पर विशेष रूप से ध्यान देने की जरूरत है। ऐसे संगठन जो परीक्षण करने के साथ–साथ सीखने के इच्छुक हैं, ही सफल होंगे, इसलिए इन्हें प्रोत्साहित करने की जरूरत है। ऐसी संस्थागत सीख व बदलाव का समर्थन करने वाली अनुसंधान विधियों को मान्यता देने की जरूरत है जिन्होंने नवीन तंत्र अपनाकर बहुमूल्य योगदान किया है ।

भारतीय कृषि अनुसंधान परिषद् के कृषि वैज्ञानिकों की वर्ष 2001 में की गई मानव शक्ति की गणना से यह चित्रित हुआ है कि परिषद् के वैज्ञानिकों की औसत आयु 45 वर्ष है साथ ही में 43 प्रतिशत वैज्ञानिक मानव शक्ति औसत आयु से ऊपर हैं। उच्च औसत आयु के साथ–साथ वैज्ञानिकों के उच्च समानुपात तथा कार्य क्षमता में कमी के संदर्भ में यह जरूरी है कि युवा वैज्ञानिकों की संख्या बढ़ायी जाए। परिषद् के वैज्ञानिकों में से मात्र 12 प्रतिशत महिला वैज्ञानिक हैं। वैज्ञानिकों में तीन–चौथाई से अधिक वैज्ञानिक फसल विज्ञान, प्राकृतिक संसाधन प्रबंध तथा पशु विज्ञान श्रेणी के हैं; शेष बागवानी, मात्स्यिकी तथा समाज विज्ञान के हैं। परिषद् के संस्थानों में से लगभग आधे संस्थानों में 30 से कम वैज्ञानिक हैं तथा यह संख्या कुल वैज्ञानिकों की संख्या का लगभग 1/6 भाग है। यह संख्या अनुसंधान दक्षता में सुधार के लिए वैज्ञानिकों के आबंटन में वैज्ञानिकों की संख्या के पुनर्गठन की जरूरत पर बल देती है।

यद्यपि पिछले एक दशक के दौरान विभिन्न राज्यों द्वारा अनेक नवीन प्रसार विधियों को अपनाया है फिर भी राज्यों के कृषि विभागों के समक्ष कृषकों तक पर्याप्त प्रसार तकनीको के पहुँचाने के मार्ग में अनेक समस्याएं हैं। प्रौद्योगिकी प्रसार को मुख्य कार्य समझा जाता रहा है और किसानों की दूसरी समान महत्वपूर्ण सहायता जरूरतों जैसे बाजार तक पहुंच, कृषि ऋण, बुनियादी ढांचा तथा व्यापार विकास सेवाएं आदि पर ध्यान नहीं दिया गया है। सार्वजनिक क्षेत्र की विस्तार एजेंसी को ये विस्तृत सीमा वाली सेवाएं प्रदान करनी चाहिए और इसके लिए सार्वजनिक एवं निजी क्षेत्र की विभिन्न एजेंसियों को हिस्सेदार बनाया जाना चाहिए। जिला और विकास खण्ड स्तर के कार्मिक नवीन प्रसार कार्यक्रम की योजना और कार्यान्वयन में एक महत्वपूर्ण भूमिका निभा सकते हैं और इस कार्य को करने के लिए इनकी क्षमता को सुदृढ़ करने की जरूरत है।

खेतिहर महिलाओं के लिए विगत और जारी कार्यक्रमों को लागू करने से प्राप्त अनुभव के आधार पर इस केन्द्र ने कृषि मंत्रालय के लिए कृषि में महिलाओं के लिए एक कैफेटेरिया विकसित किया है। कृषि में महिला कार्यक्रमों के कार्यान्वयन से खेतिहर महिलाओं तक प्रौद्योगिकी की जानकारी पहुंचने में सुधार हुआ है जिससे प्रौद्योगिकी के अंगीकरण में वृद्धि हुई है तथा व्यावहारिक रूप में आर्थिक लाभ भी हुए हैं। कैफेटेरिया में मौजूदा समय में चल रहे कार्यक्रमों के निष्पादन में सुधार लाने के लिए अनेक सुझाव दिए गए तथा मार्गदर्शन के लिए विभिन्न घटकों के विकास को नोट किया है, ये धटक नामतः दलों की गतिशीलता, समूह निर्माण तथा क्षमता विकास, सम्पर्क व सहायता, दूर संचार और मीडिया सहायता, प्रौद्योगिकी विकास तथा प्रोत्साहन, स्टाफिंग, महिलाओं को जानकारी कराना आदि हैं।

ग्रामीण गरीब जनता के बीच नवीन कृषि तकनीकों के हस्तक्षेप का कुपोषण के निवारण पर प्रभावी एवं टिकाऊ प्रभाव पड़ता है। विभिन्न सम्बद्ध विभागों में निम्न स्तरीय सम्पर्क हैं तथा "जोखिम से प्रभावित घरों" की पहचान के लिए संयुक्त कार्यक्रम आयोजित करने की कमी है और इससे पोषणता के कार्यक्रमों पर प्रतिकूल प्रभाव पड़ता है।

विभिन्न विषयों जैसे मृदा, जल, मौसम, पशु, मछली, फसल तथा फसलीय प्रणाली के साथ–साथ सामाजिक–आर्थिक एवं भौगोलिक स्थितियों पर एक स्थान (सिंगल प्लेटफार्म) पर एक डाटावेयर

हाउस प्रदान करने के लिए वर्तमान समय में एक समेकित राष्ट्रीय कृषि संसाधन सूचना प्रणाली (आई एन ए आर आई एस) विकसित की गई है। केन्द्र ने इस डाटाबेस को विकसित करने में कृषि के सामाजिक–आर्थिक पहलुओं को भी शामिल किया है। इसमें 5 डाटाबेस शामिल हैं – राष्ट्रीय लेखा सांख्यिकी, कृषि विपणन और व्यापार, सामाजिक आर्थिक विविधताएं, कृषि इनपुट एवं लागत और बुनियादी ढांचा। यह डाटावेयर हाउस उपभोक्ता एजेंसियों की जरूरत के अनुसार योजना बनाने और विकास के उद्देश्य लिए केन्द्रीय डाटावेयर हाउस के जरिए एक आंतरिक संपर्क डाटा की व्याख्या करने के लिए एक कार्यविधि तैयार करेगा।

कृषि अनुसंधान एवं नीति के लिए कृषि प्रणाली में हो रहे परिवर्तनों के आशयों को समझने के लिए निगरानी हेतु 'अंतर्राष्ट्रीय अर्धशुष्क उपोष्ण फसल अनुसंधान संस्थान' (ICRISAT), हैदराबाद के साथ यह केन्द्र विभिन्न राष्ट्रीय कृषि शोध परियोजनाओ के पारिस्थितिकीय क्षेत्रों के लिए एक कालश्रेणी डाटाबेस विकसित करने में सहयोग कर रहा है।

विगत एक दशक से भारतीय बीज प्रणाली में अनके परिवर्तन हो रहे हैं। निजी क्षेत्र में बीज उद्योगों की वृद्धि से सार्वजनिक क्षेत्र की बीज एजेंसियों की बाजार में साझेदारी कम हो गई है। उद्योगों के ढांचे में परिवर्तन का प्रमुख कारण अनुसंधान एवं विकास प्रयासों के माध्यम से विकसित उत्कृष्ट सामग्री की उपलब्धता, प्रत्यक्ष विदेशी निवेश और बहुराष्ट्रीय बीज कम्पनियों के साथ सहयोग है। हाल ही में देखे गए परिवर्तन अपने मुख्य व्यवसाय में सहायता करने के लिए बीज के क्षेत्र में निर्यातोन्मुख अथवा कृषि प्रसंस्करण में विविधता के कार्य/व्यापार को निजी कम्पनियाँ पूर्ण समर्थन दे रही हैं। वर्तमान समय में इन परिवर्तनों का अध्ययन किया जा रहा है।

पी एम ई की सहायता से भारतीय कृषि अनुसंधान परिषद की विभिन्न संस्थाओं तथा राज्य कृषि विश्वविद्यालयों में 25 पी एम ई प्रकोष्ठों की स्थापना की गई है। इन प्रकोष्ठों की सहायता से एक सशक्त कार्ययोजना तैयार कर बहुत सी कार्यशालाएं आयोजित की गई हैं। कृषि आर्थिक विज्ञान की वेबसाइट (http://www.agrieconet.nic.in) विकसित की गई हैं तथा इसमें 60 संगठनों को शामिल किया गया है, जिसमें प्रमुख हैं राज्य कृषि विश्वविद्यालय तथा परिषद् के विभिन्न संस्थान। वेबसाइट को नियमित रूप से अद्यतन किया जाता है। आउटरीच कार्यक्रमों के अन्तर्गत केन्द्र ने उत्तर प्रदेश के मुज्जफ्फनगर जिले में कार्यरत 'शिक्षा एवं सामाजिक कल्याण समिति' नामक एक गैर सरकारी संगठन के साथ सहयोग कर रहा है।

केन्द्र ने इस वर्ष 4 नीतिगत शोध पत्र तथा 2 वर्किंग पेपर, 2 कार्यशालाओं के कार्यवृत्त तथा 4 पी एम ई टिप्पणियां प्रकाशित की हैं। केन्द्र के वैज्ञानिक अनेक व्यावसायिक और नीतिगत परस्पर संबंधों और परामर्श परियोजनाओं में शामिल रहे हैं तथा केन्द्र और केन्द्र के बाहर अनेक कार्यशालाएं और बैठकें आयोजित की हैं। केन्द्र ने अनेक राष्ट्रीय और अंतर्राष्ट्रीय संगठनों के साथ सहयोग भी किया है।

राष्ट्रीय कृषि आर्थिकी एवं नीति अनुसंधान केन्द्र
NATIONAL CENTRE FOR AGRICULTURAL ECONOMICS AND POLICY RESEARCH
(Indian Council of Agricultural Research)
POST BOX No. 11305, LIBRARY AVENUE, PUSA, NEW DELHI-110012.
Phone : 91-11-25847628,25848731 Fax : 91-11-25842684 E-mail : ncap@asri.delhi.nic.in
http: // www.icar.org.in/ncap/index.htm