Annual Report
2001 - 2002

राष्ट्रीय कृषि आर्थिकी एवं नीति अनुसंधान केन्द्र

NATIONAL CENTRE FOR AGRICULTURAL ECONOMICS AND POLICY RESEARCH

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Annual Report 2001-2002

NCAP

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

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Contents

List of Figures and Tables

Figures

Tables

Preface

The National Centre for Agricultural Economics and Policy Research (NCAP) has stepped into yet another year in the new millennium with a good record of fulfillment. The feed back from the system and the society gives immense satisfaction to all of us at NCAP that it has maintained its brand name. But this increases our responsibility to excel endlessly. Since, NCAP has the mission that "Even the best can be improved", it may not be difficult to come to expectations as a glimpse towards our contributions in this report will indicate.

The contributions of NCAP in the area of research prioritization is now well recognized beyond NARS. At the instance of APAARI (FAO), NCAP identified research priorities for South Asian Region. Other significant achievements include, prioritization of research resources in livestock, natural resource management, biotechnology and competitive grant programme (CGP) areas; impact of watershed programmes, cross-breeding in cattle, IPM, ICM etc.; agricultural investment analysis across states; supply-demand analysis of animal and fish products; total factor productivity studies including future sources of growth in R-W based cropping system in indo-Gangetic plain; physical and financial sustainability, and needed institutional reforms of the irrigation system; inequities in the distribution of irrigation water; production and policy issues in fishery sector; export competitiveness of our agricultural products in the post WTO period and needed strategies for adjustment and negotiations; public sector interventions in food market; nutritional status of people in tribal and backward areas; public and private sector partnerships, and impact of organization and management processes introduced under NATP.

The Centre under its outreach programme interacted with an NGO in Western Uttar Pradesh to facilitate greater interactions among development departments for accelerated development of the area. The Centre is also now recognized as a training Centre under Colombo Plan of Government of India.

The Centre did very well in several national and international collaborative projects, publications and policy dialogue with ICAR and others concerned. The Centre however regrets for having lost a highly reputed peer and a well wisher of the Centre in the demise of Dr. C. C. Maji, the founder Director of the Centre.

This report has been ably compiled by Dr. Rasheed Sulaiman V. Ms. Seema Khattar provided help in preparation of this manuscript. I am highly thankful to them and all others who have helped in various ways in the preparation of this report.

March, 2002

Mruthyunjaya
Director

EXECUTIVE SUMMARY

Annual Report, 2001-2002

The National Centre for Agricultural Economics and Policy Research (NCAP), continued its pursuit for excellence in research and policy interface and achieved more visibility and impact in the current year. The Centre has at present 18 scientists (including one National Professor) and fourteen other staff in position with a budget outlay of Rs. 196.42 lakhs for the year 2001-02. The centre is guided by a high level Research Advisory Committee (RAC) headed by Professor S.S. Johl. 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. Each theme is headed by a senior professional. Salient research achievements during the year 2001-02 are summarized below.

Agricultural research priorities were identified for the South Asian region. Priority commodity groups in this region are cereals, livestock, horticultural crops and plantation crops in that order. Analysis of sector-wise priority groups indicated increasing importance of livestock and horticultural sectors in the region, besides continuing emphasis on food crops: rice, wheat and pulses. In terms of broad research themes: soil and water management, commercialisation and diversification of production systems, market integration, livestock including health and nutrition, mapping of poverty and sustainable seed and technology systems are some of the high priority areas.

Natural Resources Management (NRM) is increasingly recognised as an important research and development area for augmenting agricultural production. Based on loss in agricultural production due to degradation of different natural resources, the allocation of research resources in NRM area, should be in the order of (i) submergence, (ii) drought, (iii) soil fertility, (iv) soil salinity/alkalinity, and (v) soil erosion. Prioritisation of agri-biotechnology project proposals have indicated submergence tolerance and cold tolerance in rice; and salt tolerance in brassica as the top three research priorities for allocating research resources.

Assessment of research priorities in the Indian livestock sector across regions and species indicated, that the highest incremental allocation should go to Uttar Pradesh (14.4%) followed by Maharashtra (12%), Bihar (10.3%), Andhra Pradesh (9.6%), Rajasthan (7.7%) and Madhya Pradesh (7%). In terms of species, maximum incremental research resources should be allocated to buffalo (40.2%), followed by cattle (37.6%), poultry (10%), goat (7.9%) and sheep (1.8%).

Analysis of the research studies on impact of watershed programs revealed its imapct in terms of raising income, generating employment and conserving soil and water resources. Performance of watershed program was the best in zones: with an annual rainfall of 700-1000 mm, joinly implemented by the state and central governments, targetted in low and medium income regions and had effective people's participation.

Evaluation of Integrated Pest Management (IPM) in three crops (cotton, paddy, cabbage) revealed the high potential of IPM technologies (in curtailing use of pesticides without any adverse impact on agricultural productivity). Adoption of IPM technologies were also cost effective. Lack of adequate and timely supply of biologial pesticides and lack of timely expert advice are the main hurdles, farmers faced during the transition from chemical control to IPM. Besides these, the slow effect of biological pesticides was reported as the major technological problem. Integrated Crop Management (ICM) is a holisitc approach in crop production, incorporating production and plant protection issues. Evaluation of adoption of ICM technologies in cotton,

revealed its impressive performance (compared to non-ICM farms) in terms of: reduction in pesticide use and labour, better yields and higher net returns.

Though the country has invested heavily on research and extension of cross breeding of cattle, the adoption of crossbred cattle have been limited. But the impact of the programme in terms of annual internal rate of return (55%), net present value of social gain (Rs.7100 million) and benefit-cost ratio (> 3) suggests that the investment in cross-breeding of cattle have been highly rewarding. The distribution of economic surplus to producers and consumers showed that the producers (about 71% gain) were the primary beneficiaries of the cross-breeding research.

In the case of animal products, the surplus production in 2020, would be about 84.88 million litres of milk, 68.85 billion eggs and 7.96 million tons of beef and buffalo meat. Similarly surplus production of chicken would increase to about 1.89 million tons. But there would be a shortage of about 3.12 million tons of mutton and goat meat.

Several production and socio-economic constraints impede upland maize cultivation. Maximum damage to maize production is caused by: weeds, followed by insects (caterpillars, termites, stem borer, weevils), water stress, Zinc deficiency and seed and seedling blight.

India currently spends barely half the per cent of the value of its agricultural output in agricultural R and D. To raise the S and T capabilities to global standards, this needs to be raised rapidly. There is also an urgent need to step up the planned recruitment of scientists, keeping in view the slow growth in recruitment in the previous decades and the high levels of attrition in the current decade.

Analysis of incremental capital-output ratio (ICOR) in agriculture at disaggregated level showed that ICOR varied considerably across various states and this has not reduced over time. Compared to the northern states, the estimates of ICOR are lower in the eastern and southern states. These are the states where additional investment will have larger impact on agricultural productivity. To realise the target growth rate in the X Plan, the investment in agriculture should grow at an annual rate of 7.91 %, as compared to the present level of 4.95%. If the present trends in investment continue, most of the eastern and north-eastern states will experience negative growth in agriculture and this will further widen regional disparity in agricultural development.

The growth in total factor productivity of crop sector in the Indo-Gangetic Plains (IGP) has been declining at a few places and stagnating at many places. The TFP of crop sector witnessed 2.0% growth per annum in 1980s, which became negative in 1990s. Public policies such as investment in extension (44%), research (36%), education (10%) and infrastructure (8%) are the major sources of TFP growth in IGP. Productivity has contributed to one-third of the total output growth in IGP. However, the contribution of technical change to output growth varied widely from 57 % in the lower gangetic plain to 17% in the middle gangetic plain. Under the assumption of zero growth in TFP, the estimated reduction in domestic supply (compared to potential production) by 2020 will be: 22% in rapeseed/mustard, 16% in maize, 11% in wheat, 8% in rice and 5% in sugarcane.

Analysis of sources of growth of rice-wheat based cropping systems in IGP, revealed that rice area expanded with intensification and use of degraded lands. In the case of wheat, area increase was associated with: expansion in irrigated area and availability of location specific, appropriate and improved varieties. Rice production was significantly associated with markets, fertiliser application and management of degraded lands. Wheat production increase was significantly associated with: irrigated area, high yielding varieties, fertiliser application and utilisation of degraded lands. It was observed that the contribution of yield towards changing the gross revenue of rice and wheat was declining in all the states. The prices of rice and wheat were increasing at a much faster rate than the rise in yield levels. Government intervention, through minimum

support prices, is sustaining the gross revenue of rice and wheat in the IGP. This approach may not sustain in the long-run. Contribution of yield enhancing technologies is warranted to sustain the production of rice and wheat in the IGP, which is the foodgrain production bowl of India.

Cultivation of legumes is one potential option for diversification in the IGP which is currently under continuous cultivation of rice and wheat. Pigeonpea has been a traditional crop in this region but its long duration constrained its cultivation. Studies on the economic feasibility of a newly introduced extra short duration pigeonpea (ESDP) revealed its higher profitability in comparison to the cultivation of existing short duration pigeonpea varieties and pearl millet in the trans and upper IGP. However it was less profitable to rice, though it requires only less water and nutrients. For wider adoption, the yield levels (in farmers fields) of this ESDP variety needs to improve from 1.4 tonnes/ha to 2.5 tonnes/ha.

Despite annual expansion in irrigation potential and capital investments in irrigation sector, the area irrigated by major, medium and minor irrigation systems has been either stagnating or declining from mid-1980s. The physical and financial sustainability of the system has declined considerably due to inadequate operation and maintenance (O & M) expenditure, low water charges and poor cost recovery. Sustained efforts are needed for rehabilitating the irrigation infrastructure and initiating structural and institutional reforms in water sector.

The variability in the distribution of inequality in terms of all flow irrigated areas and all lift irrigated areas among the various states has come down during the period 1970/71 to 1990/91. Most of the states, having higher inequality levels with respect to flow and lift irrigation area, have also realised more than 2/3rd of their surface water irrigation potential by now. Similarly ground water development in these states are also much higher than other states. In majority of these states, watershed approach will have to be the major driving force in future for improving the equity in irrigation distribution.

Inland fish production grew at a rapid pace in the last two decades compared to growth in marine fish production. Growth in inland fish production has been the main driving force for the growth of Indian fish production in the recent decades. However, large sources of inland fish production, namely water bodies under tanks and ponds, remain grossly under utilised. A comparison of productivity of water bodies between West Bangal and Andhra Pradesh clearly illustrates this. The physical and financial sustainability of water bodies need to be ensured through beneficiary led rehabilitation measures and transfer of its management to user associations.

Analysis of fish supply and demand in India have shown that by the year 2020, India would be having about 4.48 million tonnes of surplus fish. This needs to be either exported or domestically consumed. This demands substantial investments in: quality control, post-harvest management, storage, transportation, processing, packaging, export promotion and marketing.

India's agriculture exports responded positively to trade liberalisation that began in 1991. However the rising export trend could not be sustained in the post-WTO period, whereas imports rose steadily. On the one hand, while India is accumulating large surplus of foodgrains, which cannot be sold in the international market, on the other hand, it is becoming more and more deficit in edible oils. There is a need for domestic policy interventions to correct these imbalances as trade is not resulting in achieving balance in domestic supply and demand. International prices of agricultural commodities are highly volatile and are characterised by cyclical variations. Vast majority of Indian farmers do not have resources and capability to frequently shift from one kind of cropping pattern to another in a short period to adjust to changes in international prices. However due to WTO commitments, domestic produce cannot be protected from international price shocks by imposing quantitative restrictions. One way to ensure stable external price environment is to impose tariff on import as well as export whenever international prices goes below or above a certain range or band, which has not been disallowed under WTO regulations.

Export competitiveness is a dynamic phenomenon which would vary depending upon the changes in international and domestic prices. The country need to identify enterprises with high export advantage and high frequency of competitiveness and then pursue policies for maintaining continuity in export. Indian rice is export competitive most of the time and export margins also support pushing its exports. There is neither much scope nor advantage in export of wheat and coarse cereals. However, wheat and maize are efficient import substitutes. Among edible oils, soyabean on an average has been found to be the only slightly export efficient. Soyabean and rapeseed/mustard are efficient import substitutes. In the case of sunflower, it would be more paying to import sunflower than to produce it.

Future negotiations on agreement on agriculture should focus on an array of issues, which should include: market access, domestic support, export subsidy and non trade concerns. India and other developing countries should forcefully seek clubbing of all forms of subsidies in one box to be termed as "TSA" designating total support to agriculture. Export subsidy given by selected group of countries like EU, USA and Canada are totally trade-distorting and need to be abolished. For countries like India, with no provision for export subsidy and compensation to producers for low prices, tariff is the only option to regulate trade. High level of tariff can only check imports but they are of no help in pushing exports, which would depend on improving competitiveness. Technology and infrastructure are the two important factors that decide the export competitiveness of our commodities and measures to augment these capabilities has to be initiated.

Sustainability of Indian economy and society depends crucially on the extent to which agricultural sector can meet the challenges facing Indian society, namely the low labour absorptive capacity, growing regional disparities and persistent poverty. Keeping in view the ongoing liberalisation, Indian agriculture has to keep in view the following aspects. First, it is questionable for India to increase trade dependency ratio, because of its size, and lower than expected capacity to adjust to the rapidly changing external environment. Therefore India should not seek security and stability of product as well as input prices through foreign trade. Increasing competitiveness of agriculture is important and socialisation of existing stock of technologies can contribute in this regard. The gap between product differentiation and price differentiation in domestic market needs to be narrowed. Maintaining continuity of imports and exports and quality to meet international standards also need emphasis.

Buffer stocks has been used by the government as an important instrument for the purpose of price stabilisation. However, this involved heavy cost in terms of: procurements, handlings, carrying, storage etc, which is becoming fiscally unsustainable. As an alternative, it has been suggested that government should use the instrument of variable levies on external trade to stabilise domestic prices. But the latter is found to be costlier than domestic stabilisation in most of the years though it also depends upon fluctuation in international prices. A buffer stock of around 7 million tonnes would be adequate to meet supply shortfalls in most of the years. Though less efficient and more costly, the Food Corporation of India, needs to be retained, as in the absence of public agencies, private trade may turn out to be exploitative. However, the area of operation of FCI should be reduced and its efficiency should be improved by modernisation of its operations on scientific lines and by imparting professionalism to its management.

Investigations on economic and food security status of population in tribal, backward and hilly areas revealed that the productivity levels of crops in these areas are lower by 50 to 60 % than the national average. This is mainly due to low adoption of improved varieties and low levels of input usage. Except for cereals, the consumption of all other food items have been less than the recommended quantity. The farm income was not sufficient to adopt the capital intensive modern farm technologies or to meet the food needs of the family. Greater attention needs to be given to generation and adoption of improved technologies, development of infrastructure and creation of off-farm employment opportunities in these regions.

Analysis of nutrient intake pattern among households under three different production systems, (rice, sugarcane and vegetables) revealed that the nutrient intake is more in the vegetable based production

systems. To promote better nutrition awareness and intake, the line departments, namely health and nutrition, and agricultural and allied departments should have better co-ordination. At present, the level of interaction between these departments is very weak.

Supply analysis of chickpea (gram) and pigeonpea (tur) from 1965-1999 revealed that in rainfed areas, prices and weather conditions positively influenced the area allocation decision of farmers. Though the farmers are price responsive and farm harvest prices of pulses are much higher than the farm harvest prices of competing crops like cereals, still desired growth in pulse area is not seen. This is mainly due to higher yield levels of competing crops which more than offset price advantage in pulses. Demand analysis indicated that price elasticity of demand is less than one in case of gram and tur. This suggests that in situations of scarcity, there will be upward pressure on price of pulses affecting particularly weaker section of the society.

Though the need for closer interaction between the national and international public sector institutions with the private sector has been widely recognised at present, there is still a great need for a clearer understanding of ways to re-map the relationships between the two sectors. Case studies on public-private partnerships brought out a number of specific lessons for research policy and practice. Partnership skills are part of a range of capabilities that help the organisations to innovate, and these are learnt through interaction with partners and networks. Many organisations lack partnership skills. This is often due to lack of a culture of learning resulting from certain institutional and organisational cultures with rigid hierarchy. Successful partners have intuitive ways of identifying each other that relate to the shared values, trust and complementarity.

India has a sizeable area with low agricultural productivity, high incidence of poverty and weak integration into markets, and questions are increasingly being asked over the role that the public sector extension can play in enhancing the livelihoods of the poor and reducing their vulnerability in these areas. Though the public sector extension in Indian states are on a reform path, the poor are unlikely to get benefited, unless the policy towards weakly integrated areas becomes rather less concerned with productivity enhancement alone, and more with the ways in which increased productivity can be linked to reduction in vulnerability and to employment creation. What will also be needed is a greater effort, in trying different approaches to active partnerships between organisations holding complementary skills; to evaluating these at local level and to try more systematic approaches for organisational learning.

NATP aims at decentralisation of administrative and financial powers to Principal Investigators of research projects. For assessing the impact of such NATP processes, a benchmark survey was undertaken in 14 research institutions. The utilisation of these powers is below expectations at present due to: the structural and functional complexities of the system and lack of proper understanding of the new management philosophy and procedures. The position is relatively better in ICAR institutes, whereas it is taking time in SAUs. There is a wider appreciation of the need for improved priority setting, monitoring and evaluation mechanisms in the NARS. The progress in multi-disciplinary and multi-institutional research process, though steady is but slow. Peer review of NATP projects is yielding good results and eco-regional approach in research planning and implementation is greatly appreciated.

The competitive grant programme (CGP) is a new mode of supporting research under NATP. To prioritise the research proposals received under CGP, a set of criteria and scoring approach was developed and used by Programme Implementaion Unit of NATP for screening of the proposals. Through NATP support, a website of agricultural economists was developed and this is updated periodically by the Centre.

As an outreach programme, the Centre has been collaborating with the Society for Education and Social Welfare (SESW), an NGO in Muzaffarnagar District of Western Uttar Pradesh. To share the findings of the NCAP-SESW study on constraints in agricultural development in Western Uttar Pradesh, and to plan

interventions by the concerned departments and organisations, a series of meetings with farmers and development organisations were organised at Muzaffarnagar.

Two visiting scientists were associated with this Centre during this year. The Centre published one Policy Paper, two Policy Briefs, one Workshop Proceedings and one PME Note during the current year. Centre's staff 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 research organisations. The Centre could achieve greater impact and visibility during this period through the above initiatives.

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: 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 Statistics Research Institute (IASRI), which is a sister institute of 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

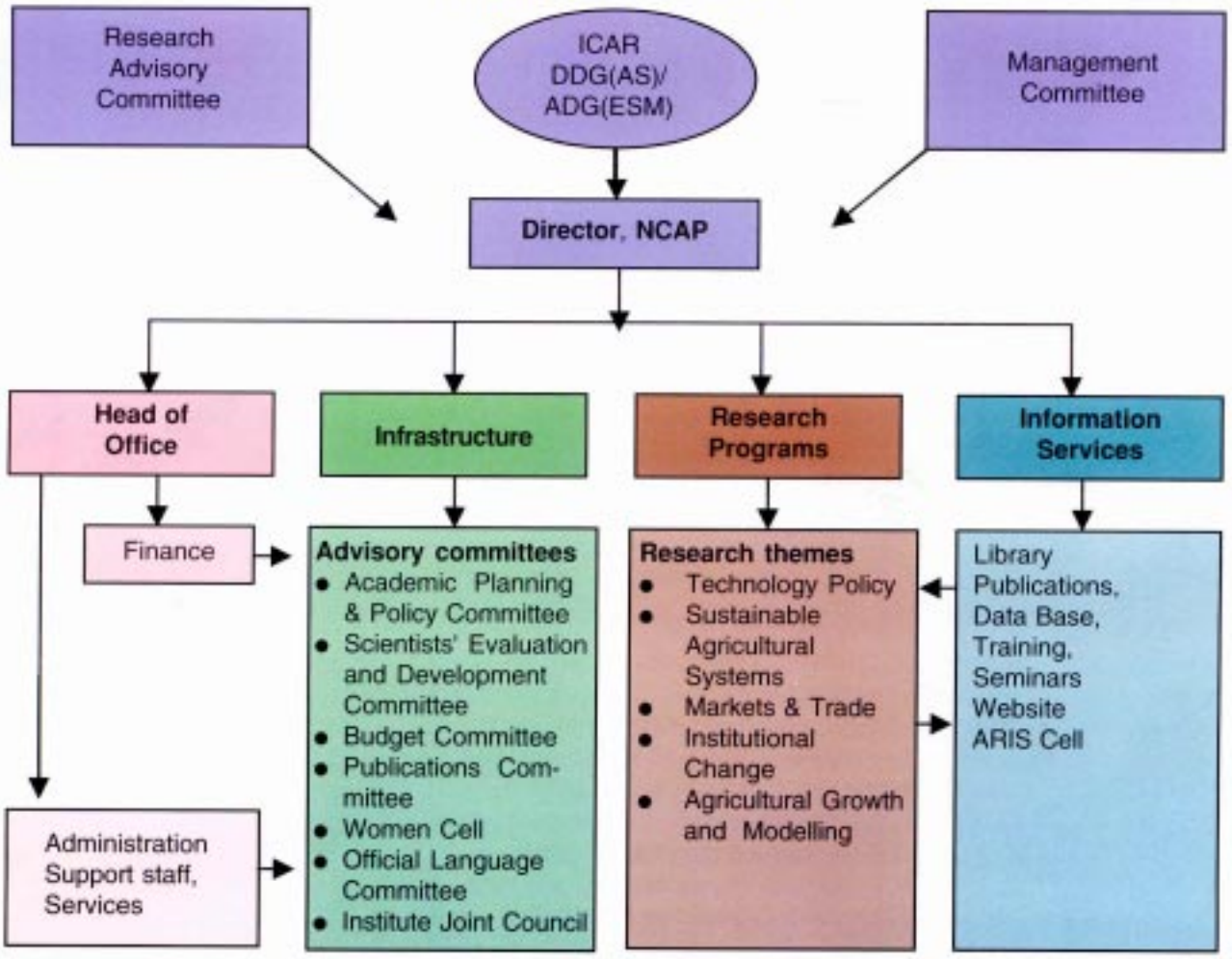
The Centre has at present eighteen scientists. This includes: the Director, one National Professor, five Principal Scientists, two Senior Scientists and nine Scientists

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.S. Johl, 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 decentralised management. Some of these are at the instance of the recently concluded QRT. The Joint Staff Council of the Institute promotes healthy interaction and proper work environment.

Organogram of NCAP



Budget

Expenditure pattern during the year 2000-2001 is shown in Table 1.

Table 1: Expenditure during 2001-2002 (in Lakh Rs.)

Head of Account	Plan	Non-Plan	Total
Pay and allowances	16.45	49.89	66.34
OTA	0.00	0.15	0.15
Travelling expenses	2.94	1.00	3.94
Works	4.58	0.00	4.58
Other charges including equipments	34.96	4.92	39.88
HRD	0.57	0.00	0.57
Total	59.50	55.96	115.46
NATP			52.45
Other projects			26.75
Resource generation			1.76
Grand total			196.42

Staff Position

Table 2: Staff Position (2001-02)

Designation	Nos.
Director	1
National Professor	1
Principal Scientist	5
Senior Scientist	2
Scientist	9
Assistant Administrative Officer	1
Assistant Accounts & 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-II-3)	1
Driver (T-1)	1
Supporting Staff Gr. I	1

II Research Achievments

The centre made significant achievements on the research front in the current year. The significant research achievements under each theme area of the centre are given below.

Technology Policy

Agricultural Research Priorities in South Asia

Mruthyunjaya, Suresh Pal and Raka Saxena

Small holders dominate the agriculture in South Asia. Importance of agriculture is declining over the time in relative terms. Unlike the developed countries, most of the agricultural research in this region is conducted by public research organizations. In the beginning, the main objective of the system was attainment of food self-sufficiency, which has now expanded with the addition of other objectives of: equitable growth, sustainability of production systems, diversification of product-mix, export promotion, etc. In terms of commodity coverage, focus has slowly expanded from crop research to: livestock, horticulture, fisheries, forestry and natural resources.

Research planning based on agro-ecoregions is widely accepted at present, as it helps target research efforts and achieves economies of scale through integration of research efforts. Various studies have identified agro-ecoregions in the South Asia. In this study, we have used available information and our own judgement to identify and characterize major AERs of the South Asia. The identified AERs are: (i) Hot-Arid (HA); (ii) Semi-Arid (SA); (iii) Irrigated Sub-Humid (ISH); (iv) High Rainfall Humid (HRH); (v) Sub-Humid to Humid Coasts (SHC); and (vi) Sub-Humid to Cold Arid Mountains (SCAM). All these AERs are fairly uniform, except the rainfed humid and mountainous regions where there is some variability in climate, soil type and irrigated area. The Semi-Arid, High Rainfall Humid, and Irrigated Sub-Humid AERs are quite large, occupying 38.1, 26.4 and 19 per cent, respectively, of the total net area sown in the South Asia.

Priority by commodity and agro-ecoregions

Priority given to commodity groups in South Asia are: cereals, livestock, horticultural crops and plantation crops, in that order. Figure 1 shows commodity priority scores in South Asia. Cereals are more important in all the AERs, but their priority score is 41 and 51 in the ISH and HRH ecoregions, respectively. Livestock is

Figure 1: Commodity priority score in South Asia

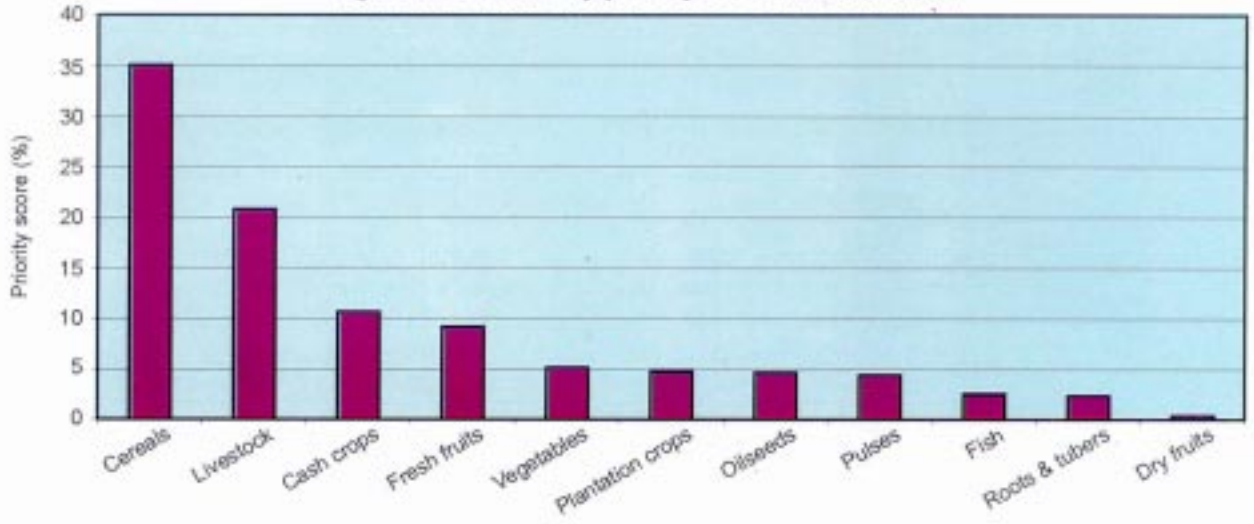
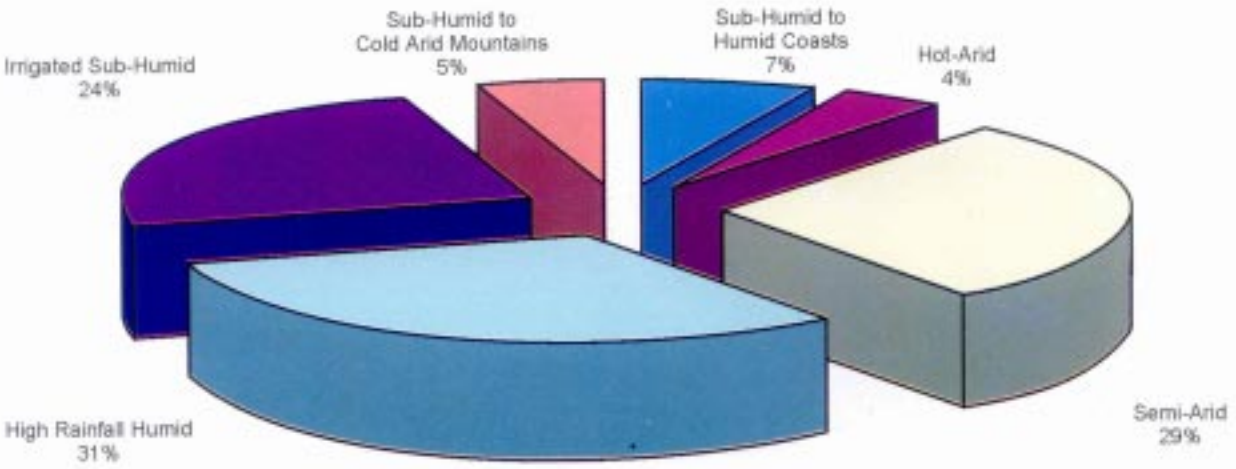


Figure 2: Agro-ecoregion priorities in South Asia



important in all the AERs, but it gets very high priority score in the HA (41) and SCAM (29). Whereas fruits, cash crops and plantation crops are priority commodities for the SA, ISH and SHC systems, respectively. These priority scores are obtained using importable hypothesis for foodgrains, cotton and sugar, as these are not regularly exported from South Asia. Figure 2 shows the agro-ecoregional priority scores for South Asia.

Sector-wise priorities

Agricultural research priorities sector-wise are given in Table 3. The results indicate increasing importance of livestock and horticultural sectors in the region besides continuing emphasis on food crops—rice, wheat and pulses. Based on growth potential and likely impact of poverty, the humid ecoregion comprising eastern India and Bangladesh should get high priority. In terms of broad research themes: soil and water management, commercialization and diversification of production systems, market integration, livestock (including) health and nutrition, mapping of poverty, and sustainable seed and technology systems are some of the high priority areas. These priority areas could also be used to assess: the adequacy of research investments, needs for human resource development, information communication initiatives, partnership and policy support. Of course, some refinements or modifications of these research priorities may be required according to the needs and the goals of the research system.

Table 3: Agricultural sector-wise research priorities

Sector	*Priority research themes*
Crops	1. Crop varieties for ◆ tolerance to abiotic and biotic stresses ◆ Improving crop yield ceilings in irrigated areas ◆ Better product quality, nutrition and value addition ◆ Dual purpose (food and fodder) crops 2. Short duration varieties of rice and wheat to incorporate other crops, especially legumes in cropping systems 3. Diversifying the production systems 4. Improving input use efficiency through ICM, IPM, INM, precision farming etc. 5. Improving cropping systems for higher yields through: pest management, natural resource conservation, and integration with livestock and trees 6. Sustainable seed and technology transfer systems 7. Small farm mechanization

Horticulture	1. Post-harvest handling, value addition through processing and storage 2. IPM and INM in orchards, vegetables and floriculture 3. Improving root stocks and rapid plant propagation methods in fruit trees 4. Integrated management for off-season vegetables, flowers and peri-urban cultivation 5. Varieties for: better quality, nutrition, shelf-life and suitable for processing 6. Protected cultivation of vegetables and flowers 7. Development of arid (hot and cold) horticulture
Livestock including poultry	1. Technological options for sustainable crop-livestock systems 2. Improving nutrition through • Quality of crop residues and removing anti-nutritional factors • Strategic supplementation • Improved varieties of fodder crops and feed balance 3. Animal health • Epidemiology, diagnosis and vaccine production for major diseases based on biotechnology • Disease-nutrition interactions • Genetic resistance to major diseases 4. Characterization and improvement of local breeds through selective breeding 5. Factors influencing adoption and impact of improved technologies 6. Market development, product processing and biosafety of products with focus on smallholders 7. Socio-economic and environmental impact of crop-livestock systems, including pastoral systems.
Fisheries	*Coastal* 1. Sustainable management of coastal systems and marine protected areas 2. Sustainable management of marine shrimp farming (feed, nutrition, health and seed distribution), including effluent management 3. Crab culture and ornamental fish *Inland* 4. Genetic improvement for growth enhancement and disease resistance 5. Fish health management, particularly for intensive culture of fish and crustaceans 6. Deepwater rice-fish/freshwater prawn 7. Integrated fish farming, and open water culture-based fishery 8. Cold fish water culture *General* 9. Post-harvest issues, and biosafety of seafood products 10. Socio-economic issues, environmental impact analysis and institutional issues of aquatic resources and aquaculture
Forestry	1. Sustainable management of second-growth forests 2. Inventorying, evaluation and development of forest resources 3. Tree and forest health management 4. Promotion and management of agro-forestry 5. Improvement of medicinal and aromatic plants 6. Market development for non-timber and minor forest products 7.. Policy and institutional issues in management of forests 8. Ecotourism and landscape forestry
Natural Resource Manage-ment	1. Conservation of genetic (crop, livestock, fish, tree), water and land resources 2. Improving efficiency in distribution and use of irrigation water (policy, technology and institutional issues) 3. Technological and institutional options for harvesting and use of rainwater (e.g. watershed management) 4. Sustainable land use, organic recycling and soil fertility management 5. Reclamation of degraded/sodic lands, control/management of saline and arsenic contaminated water
Socio-economic	1. Poverty mapping and investment priorities 2. Market integration and trade liberalization with focus on small holders 3. Risk management 4. Empowerment of women and labor migration 5. Policy and institutional aspects of agricultural R&D

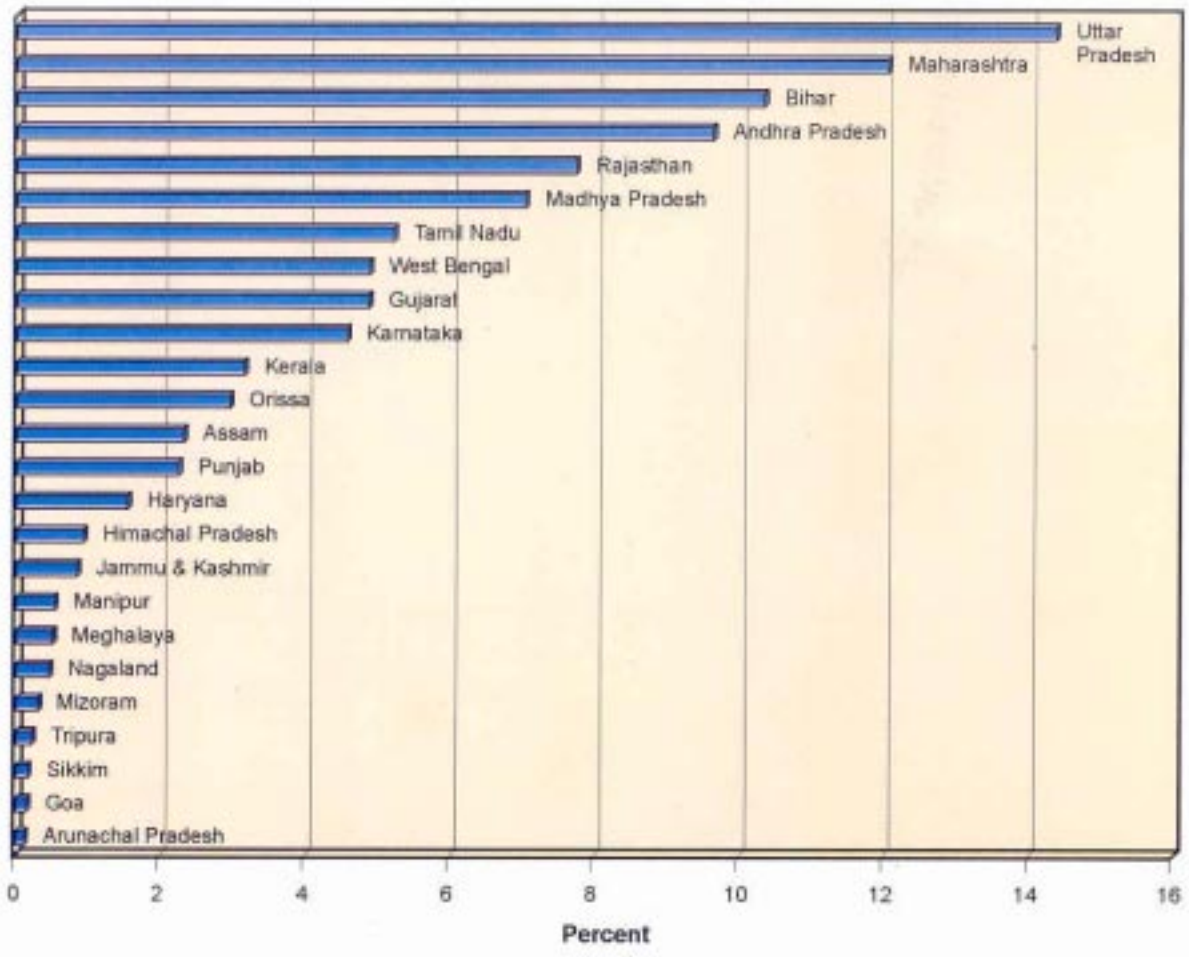
Source: Recommendations of working groups formed during the expert consultations.

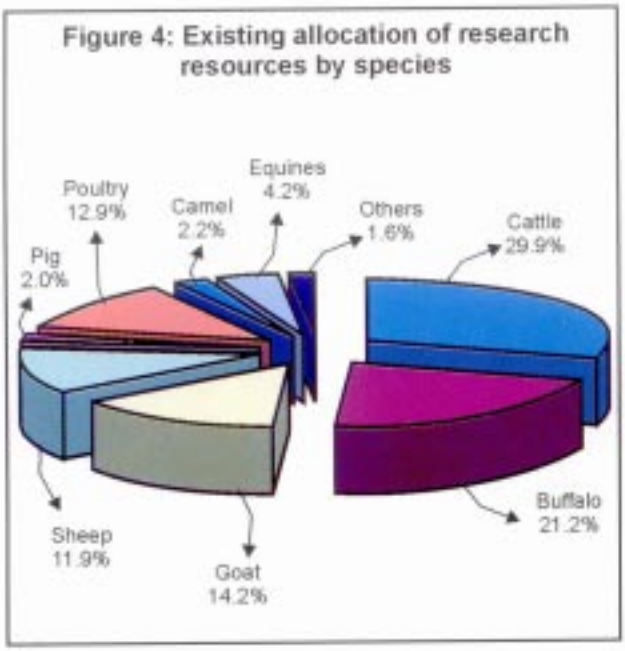
Assessment of Research Priorities for Livestock Sector in India

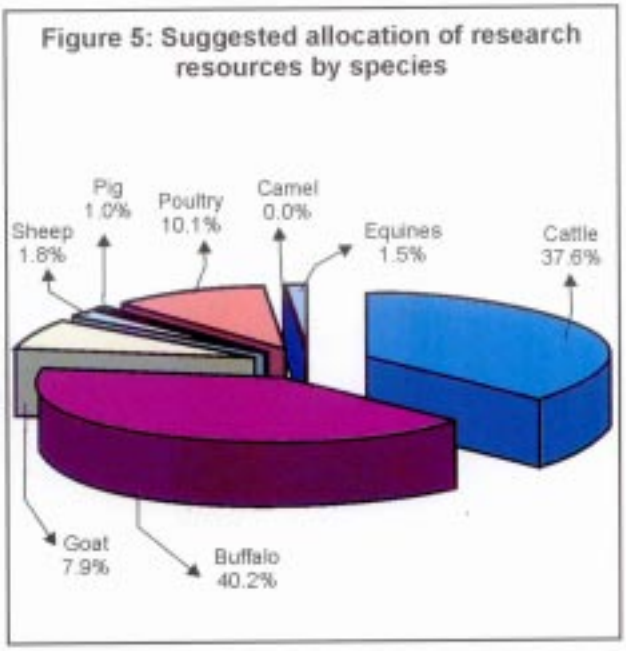
Pratap S. Birthal, P. K. Joshi and Anjani Kumar

India's livestock sector is experiencing a fast growth. The output growth of species such as sheep, goats and buffalo is largely number driven. A technological breakthrough is yet to take place in these species. This study provides quantitative assessment of allocation of livestock research resources across regions and species to achieve the goals of efficiency, equity, nutritional security and sustainability (Fig 3). The regional pattern of suggested allocation of livestock research resources indicates: the highest allocation to Uttar Pradesh, (14.4 %), followed by Maharashtra (12%), Bihar (10.3%), Andhra Pradesh (9.6%), Rajasthan (7.7%) and Madhya Pradesh (7%). The goals other than efficiency improve shares of northeastern states, Bihar, Orissa and Andhra Pradesh. In terms of species, maximum research resources should be allocated to buffalo (40.2%), followed by cattle (37.6%), poultry (10%), goat (7.9%) and sheep (1.8%) (Figure 4 & 5). In case of cattle, 78 percent of research resources should be earmarked for milk production research and 17 percent for draught power. Milk production research should claim most of the buffalo research resources (93%). Goat research should emphasize for meat research (57%) followed by milk (34 %), while more than three-fourths of sheep research resources should be targeted to meat research. Poultry research resources should be allocated between meat and egg research in the ratio of 2:1.

Figure 3: Regional Priorities in livestock research







Assessing Priorities in Agri-Biotechnology Research

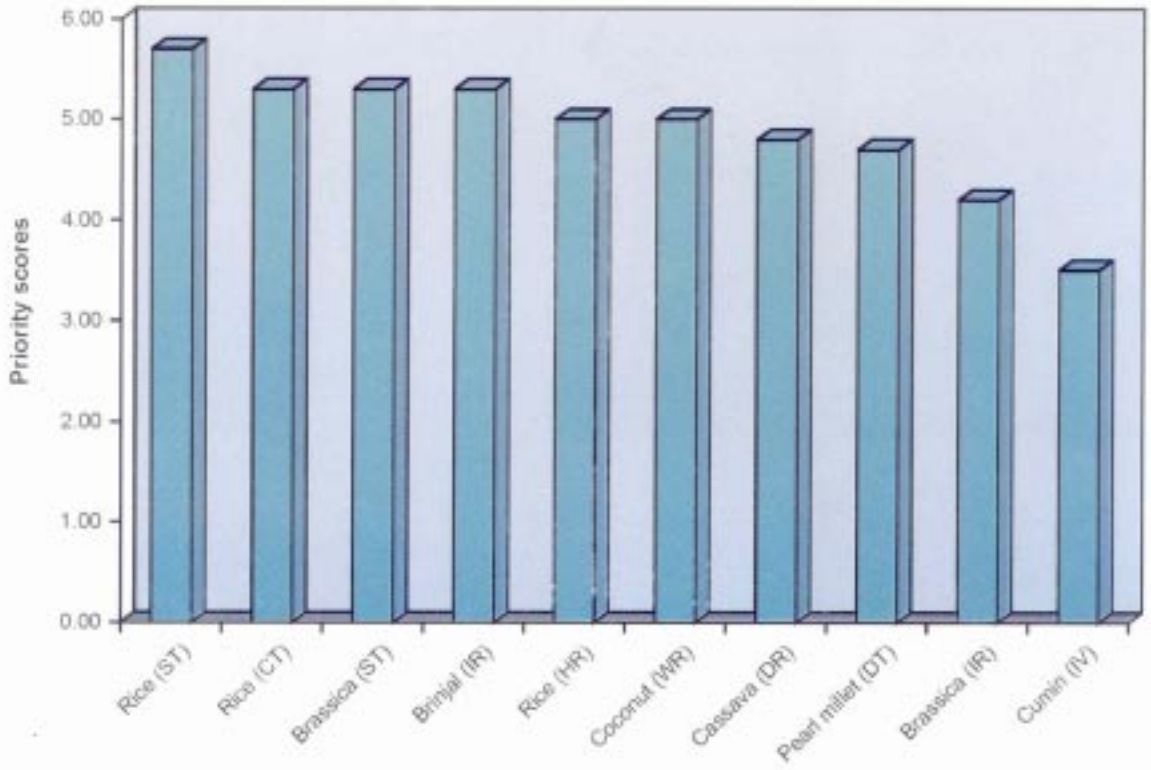
P.K. Joshi, Raka Saxena and Suresh Pal

Biotechnology has emerged as a promising science to meet the expanding demands for food, feed and fibre. Globally, higher emphasis has been focussed on biotechnology research; to raise agricultural production; to augment farm income; to reduce post-harvest losses; to improve quality; to overcome food security, and to conserve natural resources. Most of the research focus and adoption of biotechnology research are currently confined to the developed countries. To meet the future challenges, Indian agricultural research system also gave priority to biotechnology research. Both public and private sectors are allocating more research resources to biotechnology research. The biotechnology research is characterised as complex and highly capital intensive. Since research resources are limited, there is a need to prioritise the research programmes. The data for the study were taken from the research proposals submitted for funding under the Competitive Grant Projects of National Agricultural Technology Project. The information supplied by the Principal Investigators was further verified and discussed with the peers. The objectives of the study were to: (i) develop and/or adapt a conceptual framework for prioritising research portfolio under competitive grant projects, and (ii) pilot application of the approach to assess priorities in agricultural biotechnology research.

The Analytical Hierarchy Process (AHP) is applied to prioritise research portfolio in biotechnology research. The AHP is a decision-support tool to tackle complex multi-criteria problems for deciding research priorities. Seven broad criteria were identified, which were further divided into sub-criteria for deciding the priorities. Each criteria and sub-criteria was given a score depending upon its importance at national or regional level.

Ten research proposals were ranked to establish objective criteria for ranking research priorities for future research funding in a resource-crunch scenario. The results are shown in Figure 6. It was noted that priority scores of all the projects were quite high indicating their relevance at national and regional levels. The ranking of the projects based upon objective criteria shows how incremental research resources should be allocated. Out of the ten research projects; projects addressing submergence tolerance and cold tolerance in rice, and salt tolerance in brassica were among the top three research priorities for allocating research projects.

Figure 6: Priority scores for biotechnology projects (Crops & Traits)



Prioritising Natural Resource Research in India

P.K. Joshi, A.K. Jha and Suresh Pal

Natural Resource Management (NRM) is recognised as an important research area for augmenting agricultural production through the conservation and rehabilitation of the deteriorating natural resources. NRM is a core group of research areas and bears a strong cross-cutting effect on agricultural commodity research. In a scenario when more and more problems are being encountered and research resources are constrained, there is a need to prioritise key areas for future research for optimal allocation of resources. Therefore, a study was undertaken to prioritise the key problem-areas in NRM research. The study is conducted at aggregate all India level to provide some objective and analytical basis for allocating research resources across different problem-areas by the research managers.

The study estimated the losses which occurred in consequence to problems related to NRM. The problems were prioritised based on the estimated production losses as a result of declining quality and quantity of natural resources. Important problems to be managed, which are related to natural resources include: wind and water erosion, flood and waterlogging, drought, soil salinity and alkalinity, soil fertility, ravines and gullies and shifting cultivation. The study attempted to rank different problems as a decision-support to the research managers for the purpose of research resource allocation.

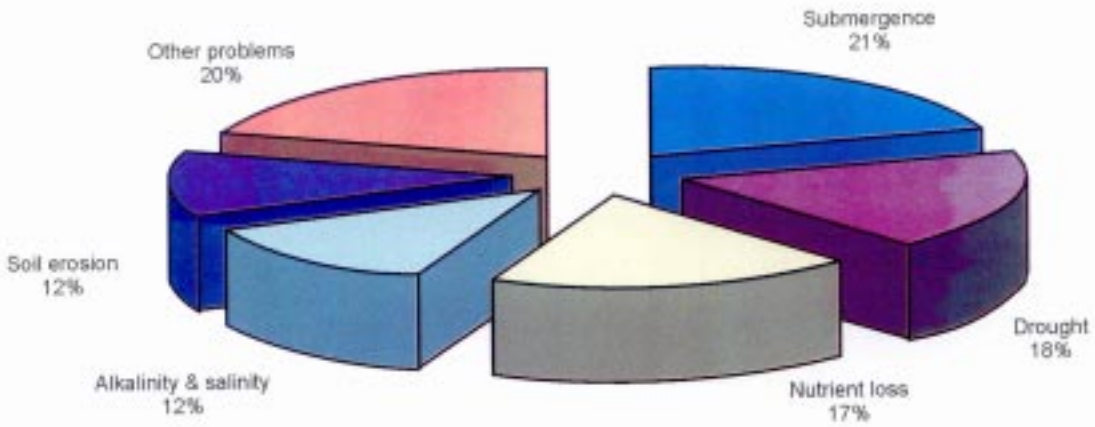
To estimate the losses as a result of different problems, three criteria were used, viz, (i) extent of the area under the specific problem, (ii) probability (or frequency) of occurrences of the problems, and (iii) estimated quantity of losses during the periods of the existence of the problems. These criteria influence the accuracy of the estimates of the possible losses. The approach, followed in this study, provides the results which are

indicative of the nature and seriousness of the problems. This approach needs further refinement. The study relied heavily on the earlier research relating to: the extent of the problem, probability of occurrence, loss in production; and it also developed its own scores in order to arrive at some final estimates. For estimating the extent of different problem areas, important sources were: soil maps developed by the National Bureau of Soil Survey and Land Use Planning, and various Soil Association Groups in India.

The estimated losses as a consequence of different problems related to natural resources are given in Figure 7. Submergence, drought and soil erosion are the three key problem-areas accounting for about 50 per cent of the total loss as a consequence of deteriorating natural resources. Among them, flood and waterlogging; which occurs more frequently in most of the eastern and north eastern regions of the country, shares a larger slice of the losses; accounting for about 20.5 per cent of the total losses. Declining soil fertility, as a result of deficiency of important nutrients, also emerged as an important priority area. A large chunk of soils have also become deficient in N, P and K. Soils affected with salinity and alkalinity also inflicted huge losses.

The results of the study indicate that on the basis of loss in agricultural production, the allocation of research resources should be ranked in order of importance as: (i) submergence, (ii) drought, (iii) soil fertility, (iv) soil salinity/alkalinity, and (v) soil erosion. Accordingly, research resources to these problem-areas may be allocated to minimise losses due to these problems.

Figure 7: Estimated losses due to the problems related with natural resource management



Assessment of Watershed Programs for Prioritisation of Research and Development

P.K Joshi, Laxmi Tewari, A.K. Jha and R.L. Shiyani

Watershed program is reckoned as the engine of agricultural growth and development in, fragile and marginal rainfed areas. Watershed programs have been specifically launched in the rainfed areas with the sole objective to improve the livelihood of poor rural households, who encounter disproportionate uncertainties in agriculture. Their income levels are meagre and uncertain. Their plight is further compounded by acute degradation of soil and water resources.

In the past, several useful studies have been conducted to assess the impact of watershed programs. However, these did not attempt to assess the patterns of multiple benefits from watershed programs across the

geographical regions, sizes, types, and the extent of people's participation. An attempt has been made to scan and dissect earlier micro-level studies to deliver some logical conclusions on the performance of watershed programs. The attempt provides a direction for future research and development on watershed programs.

The study is based on the meta-analysis. The purpose is to collate research findings from previous studies, and to distil from them the broad conclusions. In the present study, an attempt has been made to amass the available micro-level studies from 310 watersheds. Watershed programs were launched with three principal objectives of improving efficiency, equity and sustainability of natural resources in the rainfed areas. To document these benefits, few proxy indicators were chosen and analysed. The benefit-cost ratio and the internal rate of return were used as proxy for efficiency-gains from watershed programs. Additional employment generation in agriculture as a consequence of watershed activities was assessed for equity benefits. Four important indicators were identified to demonstrate the sustainability benefits. These included (i) increased water storage capacity; which augmented the irrigated area, (ii) increased cropping intensity, (iii) reduced run-off; which enhanced groundwater recharge, and (iv) subsided soil loss.

Benefits of watershed programs

Economic gains: Summary of benefits derived from numerous studies are quite impressive (Table 4). The mean benefit-cost ratio of watershed program was quite modest at 2.14. This revealed that investment in the watershed programs under fragile and uncertain rainfed environments yielded more than double. There were about 15 percent watersheds, which attained benefit-cost ratio, more than 3 (Figure 8). The mean internal rate of return on watershed investment was about 22 percent, with a maximum of 94 percent. The mean internal rate of return on watershed investment is comparable with any successful government programs. About 35 percent watersheds yielded more than 30 percent internal rate of return (Figure 9). These evidences suggest that the watershed programs performed reasonably well and the investment was logically justified in the fragile and uncertain environments.

Employment benefits: Another important purpose of the watershed programs was to generate employment opportunities. The mean additional annual employment generated were about 181 man-days. Generating employment opportunities, for the rural poor, means raising their purchasing power, and in turn alleviating rural poverty.

Resource conservation: Watershed programs are largely aimed at conserving soil and water to raise farm productivity. The available evidences revealed that both these objectives were accomplished in the watershed areas. Augmenting water storage capacity contributed in: (i) reducing rate of runoff, and (ii) increasing groundwater recharge. These have direct impact on expanding the irrigated area and increasing cropping intensity. On an average, the former increased by about 34 percent, while the latter by 64 percent. Such an impressive increase in the cropping intensity was not realised in many surface irrigated areas in the country. These benefits confirm that the watershed program is a viable strategy to overcome several externalities arising due to soil and water degradation.

Targeting watershed research and development

The evidences suggest that the watershed program successfully met initial three principal objectives of: raising income, generating employment and conserving soil and water resources. The patterns of benefits vary depending upon: the location, size, type, rainfall, implementing agency and people's participation. The variation in benefits provides directions for targeting investment in watershed development and research across different locations. Box I and 2 list the target domains for investment on watershed development and watershed research. Performance of watershed program was best in rainfall ranging between 700-1000 mm, jointly implemented by state and central governments, targeted in low and medium income regions, and had effective people's participation.

Box 1 : High and low priority target domains for watershed development programms

High	Low
• Western Himalayan Regions	• Trans-Gangetic Plain and Western Plateau zone
• Macro Watersheds	• Micro Watersheds
• Rainfall ranging between 700-1000 mm	• Rainfall<500 and>1000mm
• Rehabilitating degraded lands	• Numerious activities
• Joint program by central and State governments	• Independent centrally sponsored
• Poor income regions	• High income regions
• High people's participation	• Low people's participation

Target population play key role in executing the watershed programs. The returns from watershed program were higher in low and median income regions (Figure 10). The BCR of watersheds in low and medium income states were 2.46 and 2.21, respectively. In low income regions, beneficiaries offer their labour to supplement the investment made in various activities.

Box 2 : High priority target domains for investment in watershed research

- Western Himalayan, Northeast Hills and Southern Zones
- Rainfall <500 mm and 1000-1500 mm
- Rehabilitation of degraded lands and soil-water conservation
- Poverty ridden areas

People's participation is very critical for the success of the watershed program. The results of the study showed that the benefits were highest from the watersheds where people's participation was high (Figure 4). The benefit-cost ratio was much more (2.4) in watersheds where people's participation was high in comparison to the watersheds with low participation (1.24). The other impact indicators were also far ahead in watersheds having greater people's participation.

Table: 4 Summary of benefits from the sample watershed studies

Indicator	Particulars	Unit	No. of Studies	Mean	Mode	Median	Minimum	Maximum	t-value
Efficiency	B/C ratio	Ratio	128	2.14	1.70	1.81	0.82	7.06	21.25
	IRR	Percent	40	22.04	19.00	16.90	1.68	94.00	6.54
Equity	Employment	Mandays/ ha/year	39	181.50	75.00	127.00	11.00	9000.00	6.74
Sustain-ability	Irrigated Area	Percent	97	33.56	52.00	26.00	1.37	156.03	11.77
	Cropping intensity	Percent	115	63.51	80.00	41.00	10.00	200.00	12.65
	Rate of runoff	Percent	36	-13.00	-33.00	-11.00	-1.30	-50.00	6.78
	Soil Loss	Tons/ha/year	51	-0.82	-0.91	-0.88	-0.11	-0.99	39.29

Agricultural Research Resource Allocation

Dayanatha Jha, Sant Kumar, Surabhi Mittal and Parveen Kumar

Underinvestment in Indian agricultural research has been commented upon in a series of recent studies. The country, currently spends barely half per cent of the value of its agricultural output on research and development (R & D). The need and urgency, for raising the country's science and technology (S&T) capabilities to global standards, is widely appreciated and there is a concensus on the need to raise investments rapidly.

Growth in scientific manpower

Another basic determinant of R&D capability is the quantity and quality of scientific manpower resources and their efficient deployment. This has received scant attention from the analysts. Creating indigenous sources of supply of trained scientists has been the historical focus of policy in this area. There is need for a critical look in this area as well. A national census of agricultural scientists was conducted in 2001 under the aegis of the Indian Council of Agricultural Research to provide some information with respect to current status and deployment of scientific manpower. Result of some basic tabulations relating to the institutions under ICAR, are briefly reported below.

For more than a decade and half, since the late seventies, the number of scientists in ICAR grew at less than 0.4 per cent per annum, despite the fact that the Council added 76 new units of research (institutes, centres, directorate, coordinated projects in various fields between 1979 and 1993, and financial resources grew at about 5 per cent per annum in real terms. Between 1993 and 2001, scientific manpower grew at 2.2 per cent (Figure 8) as financial resources continued to grow at historical rates. The main concern of guiding research resource allocation during eighties and early nineties, was for meeting the needs of the infrastructure for the new research initiatives. One needs to note, however, that higher growth in scientific manpower in the nineties was also accompanied by several new research initiatives. The Council added 28 research units between 1993 to 2001. The Council went through a phase of diversification of research portfolios mainly through redeployment of manpower resource in the eighties. From the Eighth Plan onwards, it became necessary to augment human resources to meet expanding research needs.

Figure 8: Growth in scientific manpower in ICAR

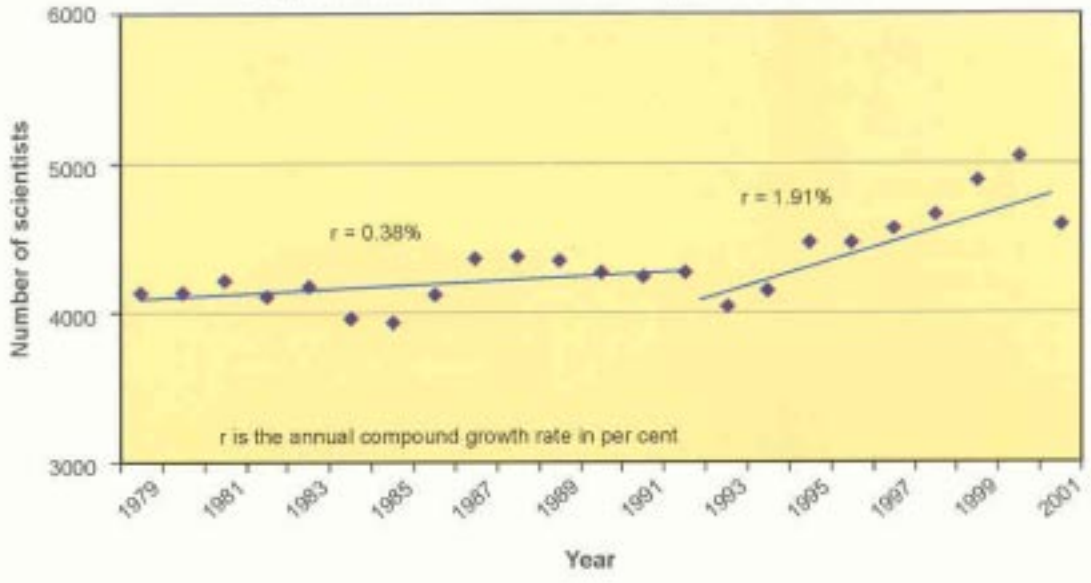
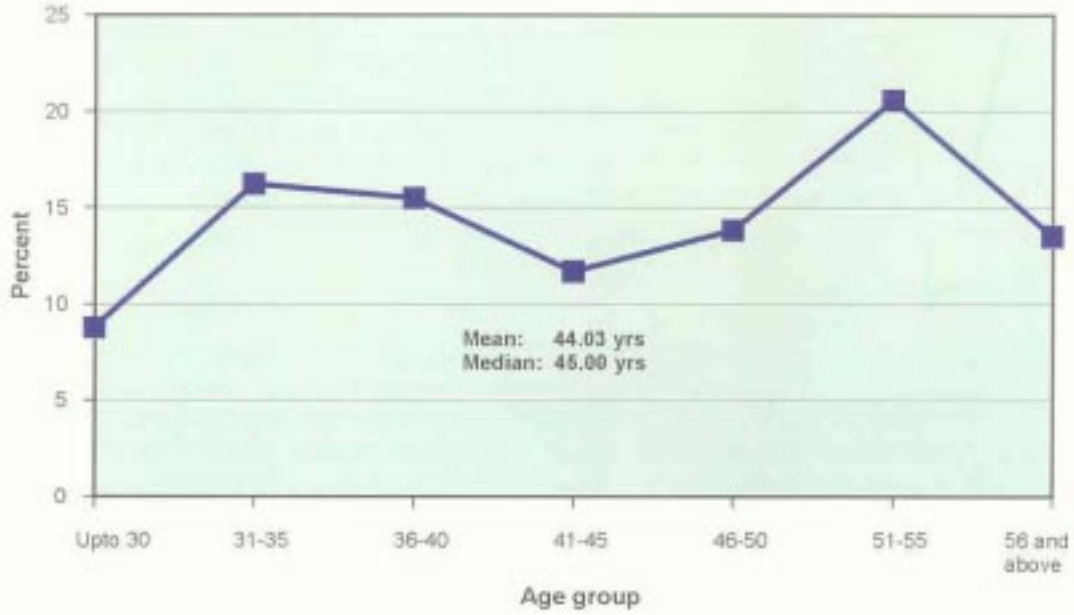


Figure 9: Age distribution of scientific manpower in ICAR (2001)



Age Distribution

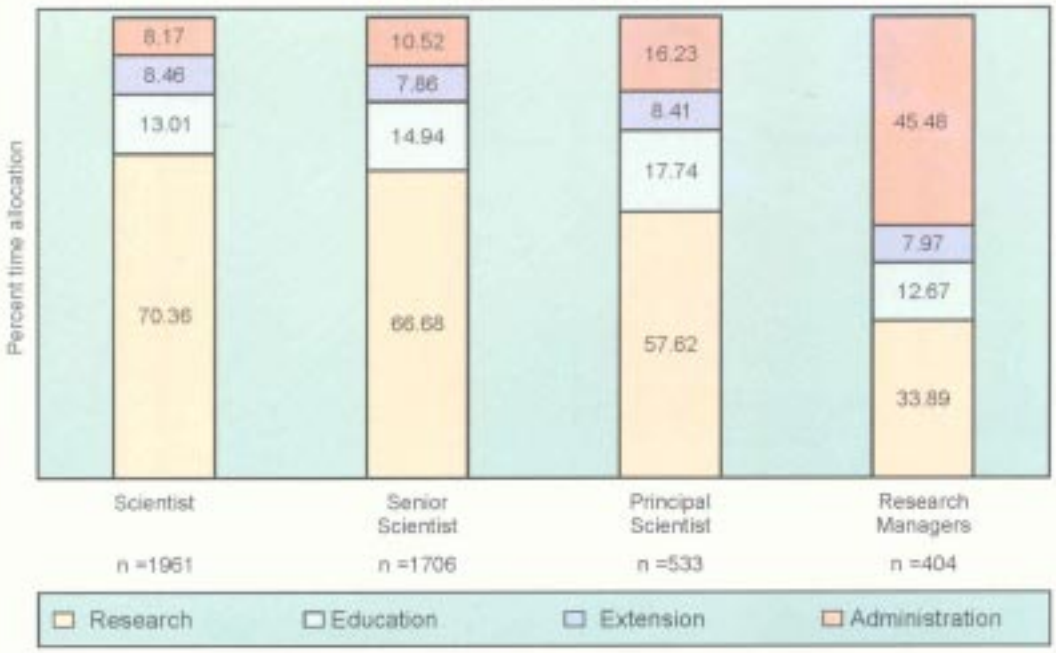
Relatively slow growth over fairly long time implies aging and vintage. The average age of scientists in ICAR is now 44 years (Figure 9) and the median age is 45 years. This has obvious bearing on productivity of the system. One implication of this trend is the high rate of attrition begining from 2000. This will continue throughout the Tenth Plan period (2002-2007) with an attrition rate of 4.4 per cent. It is obvious that ICAR will have to adopt a more aggressive recruitment policy than has been the case in the past just to maintain the current scientific strength. To meet additional needs, planned recruitment of scientists will have to be stepped up further.

Time Allocation

The other important dimension is the time allocation (Figure 3) profile of scientists. The ICAR system takes an integrated view of the R & D process. All scientists are encouraged to participate in research, education (training) and extension activities. Figure 10 provides this information in relation to scientists at various levels. Research managers, whose primary responsibility is to plan, organise, monitor and supervise all the activities of the division, institute or higher levels, spend 45 per cent of their time on administration, and devote relatively less time on research and education.

So far as working scientists are concerned, the figure shows that while research dominates the time profile, the proportionate time allocated to education and administration rises as they gain experience and seniority. Sometimes, a concern is expressed that too much time of scientists is wasted on non-mandated activities (administration). The data indicate that such is not the case for working scientists. At the scientist and senior scientist level, which together account for about 80 per cent of the total scientific strength, barely 10 per cent of the time is devoted for administrative chores. Since these scientists take up management responsibilities eventually, this marginal involvement provides at-work training, apart from inculcating participatory management. Moreover, with seniority and experience, scientists begin managing individual projects, organising research related activities like seminars, workshops, trainings, etc. This is reflected in increasing time allocation for non-R & D activities with seniority.

Figure 10: Average per cent time allocation by scientists at different levels (2001)



Intensification of Maize Production in Upland Areas of India— Prioritization for R&D Plans

P.K Joshi and N.P Singh

Traditionally, maize is grown in the rainfed uplands; primarily to meet the subsistence needs of the poorest households. The anticipated expansion, in the demand for maize, can be achieved through the intensification and commercialization of current maize production systems in the agriculturally disadvantaged and non-traditional areas. Nearly 60 percent of maize area and 40 percent of the production comes from the four northern states: namely, Uttar Pradesh, Madhya Pradesh, Bihar and Rajasthan. To intensify maize production in upland areas, a study was conducted to: identify production and socio-economic constraints and prioritise them according to their importance. For that, Rapid Rural Appraisal was conducted in 48 villages spread in the above four states.

Limited areas, under cultivation of the improved cultivars, were found in the study domain. Adoption of improved maize cultivars during rainy season were at low level; in the range of 0-15 percent, with a few exceptions (e.g, Bulandshahar distrct in U.P). Composite Varieties (OPVs) were also spreading but their adoption was sporadic and limited only to one-fourth of the maize area. On the contrary, hybrids were very much popular during winter season, especially in Banswara district of Rajasthan and Begusarai district of Bihar, due to assured irrigation. The seed replacement during rainy season was very poor and recycling rate was very high (Table 5). Compared to winter season yields, the yields in rainy season were too low, compared to winter season yields. The high risk of submergence of crop, due to heavy rainfall during the rainy season, discourages the farmers from adopting HYVs. Weeds were the major problem during the rainy season. Damage due to weeds was reported to be as high as 50-60 percent. Important weeds were: *Cyprus rotendrus*, *Cynodon dactylon* and *Echinocloa* in all locations (Table 6). Among the insects: caterpillar, stemborer and termites were reported to be seriously affecting plant growth and maize production in all the study sites among the insects: weevil and cutworm were also found in Bihar, while jessids, aphids, moths and grubs in Madhya Pradesh and grasshoppers and grubs in Rajasthan. Among the diseases, rust was found common in all the sites. Leaf blight was also reported in Bihar and downey mildew in Madhya Pradesh. Nematodes

Table 5: Area under cultivation of the different maize cultivars in selected districts—2000/2001 (% of total maize area)

State	District	Rainy season			Winter season			Recycled Seed	
		Local	Composite	Hybrids	Local	Composite	Hybrids	Rainy	Winter
Bihar	Munger	75	25	0	0	0	100	90	0
	Siwan	50	25	25	0	40	60	70	20
	Begusarai	10	20	0	5	15	80	25	10
Madhya Pradesh	Chhindwara	75	25	0	50	25	25	90	60
	Mandsaur	40	50	10	50	40	10	80	75
	Jhabua	75	20	5	75	20	5	85	80
Rajasthan	Banswara	60	25	15	4	6	90	80	5
	Bhilwara	94	5	1	Neg.	Neg.	Neg.	95	Neg
	Udaipur	90	6	4	Neg.	Neg.	Neg.	92	Neg
Uttar Pradesh	Behraich	50	40	10	10	15	75	80	15
	Hardoi	70	20	10	10	80	10	80	60
	Bulandshahar	20	30	50	Neg.	Neg.	Neg.	40	Neg.

Note: Neg refers to negligible area

were also damaging maize production in Rajasthan. Further, erratic drought and submergence were the most important abiotic constraints in all the regions.

Farmers in most of the locations were not receiving the Minimum Support Prices announced by the government. The market prices declined by 25-30% in 2000-2001 compared to prices received in the previous year. The sudden dip in prices was due to higher production of maize within the country and import of maize in 1999-2000. The grain prices were found to be slightly higher (2-8%) in the nearest regulated market than in the village market. However, majority of the farmers preferred to sell the produce in the village itself. The non-availability of hybrids and poor dissemination of new technologies were also noted. This calls for the development of a strong seed sector and an effective extension network.

Table 6: Prioritization of major biotic and abiotic constraints in maize production in northern upland areas

Constraint	Yield loss (%)	Area affected (%)	Probability of occurrence	Estimated damage	
				Rs. Million	Per cent
Cyprus rotendrus	15-25	90-100	1.0	3430	19.55
Cynodon dactylon	9-15	75-100	0.6-1.0	2265	12.91
Echinocloa	7.5-15	100	0.8-1.0	1895	10.80
Termites	15-25	50-80	0.6-1.0	1478	8.43
Caterpillar	8-10	80-100	1.0	1525	8.69
Water stress	10-17.5	50-100	0.2-1.0	1155	6.58
Stem borer	7.5	80-100	1.0	1350	7.69
Weevil	6-10	100	1.0	1256	7.16
Zn deficiency	7.5-12.5	75-100	0.8-1.0	761	4.34
Rusts	3.5-12.5	50-75	0.5-0.7	323	1.84
Seed & seedling blight	15	75-80	0.5-0.8	669	3.82
Cutworm	3.5-12.5	25-60	0.4-0.6	298	1.70
Leaf blight	3.5-12.5	50-75	0.25-0.7	176	1.03
Miscellaneous	–	–	–	1050	5.03
Total production losses				17541.0	100.00

Economic Feasibility and Constraints to Adoption of IPM

Pratap S. Birthal

Field investigations were conducted on three crops in Tamil Nadu to validate the experimental results relating to IPM. The results indicated that the application of biological pest management technologies (IPM) was on: 27 percent of the cotton area, 37 percent of the paddy area and 24 percent of the cabbage area. *Trichogramma chilonis*, NPV and neem products were the main biological technologies used in cotton production. Neem products were used in paddy, and *Bacillus thuriengensis* and neem products were applied on cabbage. An overwhelming majority of farmers, both users and non-users of biological technologies, practiced a number of cultural and mechanical techniques, which now comprise components of IPM, as the routine crop management practices.

IPM technologies were evaluated for their impact on use of pesticide yield, cost and return. A comparison of use of pesticide on adopters' and non-adopters' farms indicated considerable potential of IPM technologies to curtail use of pesticide in agriculture, and without any adverse effect on agricultural productivity. Reduction in use of pesticide was 66 percent in cotton and 45 percent in cabbage. In paddy, it could be reduced to almost zero. The yield advantage due to IPM was: 4 percent for cotton, 3 percent for paddy and 5 percent for cabbage.

IPM was also cost-effective (Table 7). Total cost of pest control with IPM on cotton farms was about 7 percent less. It was less by about 30 percent in paddy. Unit cost of production was less by: 7 percent for cotton, 4 percent for paddy and 5 percent for cabbage. The lower unit cost of production was mainly due to higher yield and cost-saving potential of IPM. Net benefits realized with IPM were: Rs. 1531/ha in case of cotton, Rs. 997/ha in case of paddy and Rs. 2009/ha in case of cabbage. These indicate that adoption of biological pest management technology results in higher profitability without demanding any additional financial resources.

Table 7: Unit cost of production with and without IPM (Rs/qtl)

	Insect control cost	Pest control cost	Other cost	Total cost
Cotton				
IPM	127.6	200.0	649.2	849.6
	(46.8)	(29.4)	(226.7)	(275.7)
Non-IPM	150.9	221.8	690.2	912.0
	(71.9)	(88.2)	(238.0)	(302.0)
% change over non-IPM	-15.5*	-9.8*	-5.9	-6.8
Paddy				
IPM	10.6	13.8	227.5	241.3
	(11.5)	(12.7)	(34.6)	(40.5)
Non-IPM	18.3	20.4	231.2	251.6
	(10.2)	(15.5)	(39.1)	(40.3)
% change over non-IPM	-42.1***	-32.3***	-1.6	-4.1
Cabbage				
IPM	10.5	15.2	36.4	51.6
	(5.3)	(4.4)	(6.2)	(8.8)
Non-IPM	11.2	15.9	38.1	54.0
	(3.4)	(4.6)	(6.9)	(10.0)
% change over non-IPM	-6.2	-4.1	-4.6*	-4.4

Figures in parentheses are standard deviations
***, ** and * significant at 1, 5 and 10 percent level respectively

The analysis indicates that in general farmers were aware of biological pest management technologies as well as drawbacks of the existing technologies. A number of factors influenced adoption of IPM technologies. Farmers having higher educational attainment and better land and labour resources exhibited greater tendency to adopt IPM technologies. While fragmentation of land holdings acted as a disincentive to adoption of IPM. Farmers were aware of negative externalities of chemical pesticides but these did not influence their adoption decisions significantly.

Farmers encountered a number of problems in transition from chemical control to IPM. Lack of adequate and timely supply of the biological pesticides, and lack of timely expert advice were the main hurdles. Besides, slow effect of biological pesticides was one of the major technological problems. A majority of the non-adopters was aware of biological pest management technologies, but they did not use these, due to one or another reason. Nevertheless they wished to adopt them provided these technologies provide assured protection against a host of insect pests; have better pest killing efficiency; are available in right quantity, and at right time; and are also cost effective. Besides, they also need more information on biological pest management in respect of target pests of different technologies, and their methods of application.

Role of Legumes in Sustaining the Rice-Wheat System

P.K. Joshi, Laxmi Tewari, S.S. Dhaiya and Y.S. Chauhan

The continuous cultivation of rice and wheat in the Indo-Gangetic plain has resulted in stagnation or decline in farm income and deterioration in soil and water resources. To overcome these problems, the system needs to be diversified in favour of some alternative crops. Legumes are considered to be the most appropriate crops for diversification. Legumes require less water and fix nitrogen from the atmosphere and improve soil fertility. Among several legumes, pigeonpea was considered a potential alternative crop for rice. Pigeonpea has been a traditional crop in the trans- and upper gangetic plain, but its long duration constrained its production. To overcome this constraint, an extra-short duration variety (ICPL 88039) was developed by the Indian national program and the International Crops Research Institute for the Semi-Arid Tropics. The variety was demonstrated under farmers' resource endowments in Sonepat district, Haryana, which is gradually adopted by farmers in the arid and low water availability environment. A study was conducted to assess the economic feasibility of the extra-short duration pigeonpea (ESDP) and to quantify its early impact on farmers' fields. The study also examined the possible externalities as a result of ESDP in the region. Performance of ESDP was compared with the short-duration pigeonpea (SDP) and with other competing crops, like rice, pearl millet and sorghum. Manak variety, a SDP, was popular in the region but it delays wheat sowing and adversely affects the productivity.

Partial budgeting was performed to compare the feasibility of ESDP with SDP and other competing crops. Economic surplus approach in ex-ante framework was also used to assess the distribution of benefits among consumers and producers. It was observed that ESDP was highly profitable (Rs. 8350 per ha) than ESD (cv. Manak: Rs. 4530 per ha) and pearl millet (Rs. 1080 per ha). It was found inferior to rice (Rs. 17600 per ha) with respect to profitability. But it requires less water and nutrients as compared to rice. The subsequent wheat crop with ESDP gained substantially with respect to profit and saving of nutrients and cost. The net profit of wheat in sequence with ESDP was Rs. 16710 per ha, while it was Rs. 8500 per ha without ESDP due to timely sowing of wheat. Assuming that the ESDP covers half of the SDP in the region in next ten years, the net present value of the investment is expected to be more than Rs. 130 million. The share of producers in the economic surplus is estimated to be about 60 per cent, while those of consumers is 40 per cent. For wider adoption as an alternative crop for rice, the yield levels of ESDP need to be raised from existing level at farmers' fields, from 1.4 tonnes per ha to 2.5 tonnes per ha.

Integrated Crop Management for Sustainable Cotton Production: A Case Study in Haryana

Sant Kumar and Pratap S. Birthal

Integrated crop management (ICM) is a holistic approach in crop production, incorporating production and plant protection issues. It also brings in ecological integrity and sustainability dimensions. Like IPM, it incorporates cultural, biological, and, if necessary, chemical means to minimize crop losses. The ICM programme in Cotton initiated by the Excel Industries Limited, a leading pesticides company in the country, was evaluated through a survey of ICM adopters and non-adopters in the Hisar district of Haryana. The overall impact was assessed in terms of reduction in use of pesticides, changes in costs, returns, and labour use, by using the budgeting technique.

Implementation of ICM has resulted in the reduction of use of pesticides. The use of chemical pesticides was about 50 per cent lower under ICM as compared to chemical control (i.e. from about 2.77kg a.i./ha to about 1.39kg a.i./ha). The average yield of cotton lint under ICM was 16.20 q/ha, which was 14 per cent higher than that of the chemical control. The yield difference was, however, uneven across the various farm categories. The cost of variable inputs per hectare was Rs. 12839/-for ICM, which was lower by 8 per cent as compared to control farms. The cost of plant protection was also lower by 38 per cent on ICM farms. However, some of the component cost was also higher on ICM farms. Gross returns on ICM farms were Rs. 32360/ha, which were higher by 14 per cent than the chemically controlled farms. The net return on ICM farms was Rs. 19560/ha, which constituted about 35 per cent higher than control farms.

ICM has resulted in reduction in labour use per unit area. Per hectare labour use on ICM and control farms were 82 and 92 days respectively. By and large, females have contributed more in operations like weeding and harvesting, while males played an important role in spraying pesticides. The mean level of female labour use on both the farm situations was 44 days. ICM technology has been, thus found to be cost effective and superior with respect to the benefits.

Total Factor Productivity of Irrigated Agriculture

Praduman Kumar and Anjani Kumar

The Irrigated agro-ecosystem; concentrated in the Indo-Gangetic Plains (IGP), and dominated by the rice-wheat cropping system, has been significantly contributing to the food security of India. However, there has been serious concerns about the long term sustainability of agricultural production in this region. The need, to increase the input use levels, even for maintaitning the exisitng yield levels, has been reported by many farmers. Results from many long-term experiments on the rice-wheat cropping system has shown declining trends in yield when input levels were kept constant. The total factor productivity of crop sector has been declining at few places and stagnating at many places in the region. The current study analyzes the performance of the irrigated agriculture by measuring the total factor productivity (TFP), and identifies the sources of TFP growth. The Divisia-Tornqvist index was used for computing: the total output, total input and TFP indices, using district level data on crop sector for the period 1981-82 to 1996-97. Decomposition exercise of TFP growth was, undertaken using multiple regression models to identify the important location specific factors in boosting TFP in agriculture.

The TFP growth of crop sector in the IGP has risen at the rate of 1.2 percent per annum during 1980-81 to 1996-97. Output and input indices grew by 3.5 and 2.3 percent respectively (Table 8). Further, TFP contribution in output growth was positive in 65 percent of the gross cropped area (GCA) in the IGP. Remaining 35 percent did not witness any contribution of technological change. The lower gangetic plain (LGP) region has shown the highest growth in TFP (3.1 percent) and it was lowest in the middle gangetic plain (MGP)

(0.37 percent). The annual TFP growths were 1.4 percent in the TGP and 0.9 percent in UGP. Moreover, 5 districts out of 18 in the TGP, 10 districts out of 28 in the UGP, 21 districts out of 36 in the MGP and 2 districts out of 11 in the LGP were showing clear sign of unsustainability.

Table 8: Annual growth in input use, output, and TFP of crop sector by regions in Indo-Gangetic Plain of India (1981-82 to 1996-97)

Agro-Eco Region/Sub Region	Input (%)	Output (%)	TFP (%)	% Share of TFP in output growth
Trans Gangetic Plain	2.68	4.07	1.40	34.25
Upper Gangetic Plain	2.55	3.44	0.89	25.81
Middle Gangetic Plain	1.77	2.14	0.37	17.31
Lower Gangetic Plain	2.34	5.42	3.08	56.83
Indo-Gangetic Plain	2.33	3.54	1.21	34.22

Productivity has contributed to one-third of the total output growth in the IGP. However, the contribution of technical change to output growth varied widely from 57 percent in the LGP to 17 percent in the MGP. The share of TFP in the output growth of crop sector in the TGP and the UGP regions were observed to be 34 percent and 26 percent respectively. The output growth in the UGP and the MGP was input based while in the LGP, the same was technology based. The output growth in the TGP was input as well as technology based.

However, sub-period wise results were more revealing. There was higher growth in input and output indices in 1980s. A decline in growth of input and output was observed in 1990s. Performance of TFP was more impressive in 1980s as compared to 1990s. The TFP of crop sector witnessed 2.0 percent growth per annum in 1980s, which became negative in 1990s (Table 9). Several studies, conducted at the national or state level, had also echoed the same observations.

Table 9: Annual growth in input use, output, and TFP of crop sector by agro-eco regions during 1981-90 and 1990-96 in Indo-Gangetic Plain of India

Agro-Eco Region/ Sub Region	Input		Output		TFP		% Share of TFP in output growth	
	I	II	I	II	I	II	I	II
Trans Gangetic Plain	3.18	1.45	5.32	1.39	2.14	-0.06	40.21	neg
Upper Gangetic Plain	2.66	2.21	3.76	2.58	1.10	0.36	29.28	14.12
Middle Gangetic Plain	2.07	1.24	3.23	0.10	1.17	-1.14	36.12	neg
Lower Gangetic Plain	2.45	2.20	7.58	3.45	5.13	1.25	67.64	36.22
Indo-Gangetic Plain	2.6	1.7	4.61	1.68	2.02	-0.02	43.7	neg

I: Period 1981-90 ; II: Period 1990-96; neg: Negative

The emerging trends in TFP will have far reaching implications on supply of agricultural commodities in future. It is estimated that under the assumption of zero growth in TFP, the loss in domestic supply of rapeseed/mustard by the year 2020 will be 22 percent of its potential production followed by maize (16

percent), wheat (11 percent), rice (8 percent), and sugarcane (5 percent). The study emphasizes the need for strengthening efforts to increase the production by appropriate price policy and enhancing the TFP growth (Table 10).

Table 10: Impact of TFP on supply of cereal and non-cereal crops in the IGP (Million tonnes)

Year	Sustained TFP Growth (S1)	No TFP Growth (S2)	Loss in supply (S2-S1)
Rice 2020	59.1	54.3	-4.8 (8.1)
Wheat 2020	81.2	72.7	-8.5 (10.5)
Maize 2020	5.1	4.3	-0.8 (15.7)
Rapeseed and mustard 2020	4.9	3.8	-1.1 (22.4)
Sugarcane 2020	162.3	153.4	-8.9 (5.5)

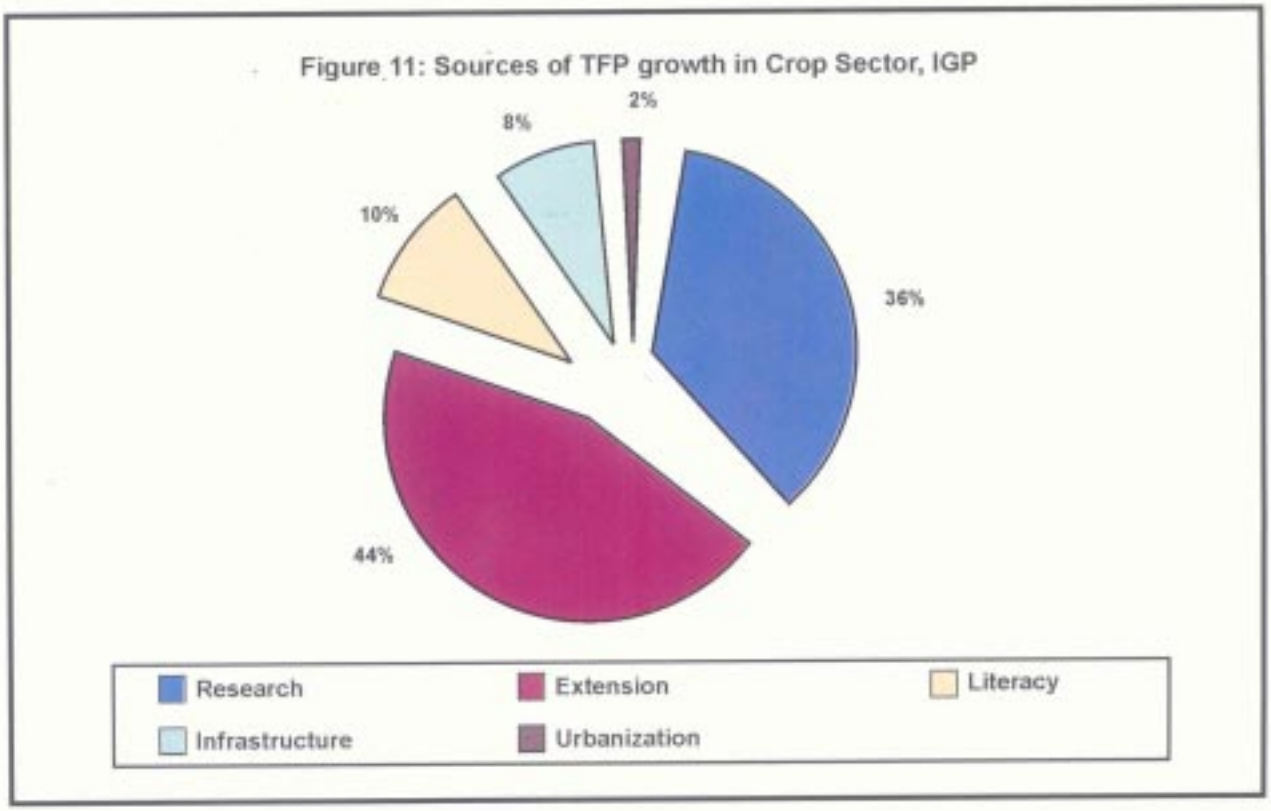
Note: Figures in parentheses are percentage losses

Scenario S1: Assuming growth in sources as observed during 1973-95 with TFP growth.

Scenario S2: Assuming growth in sources as observed during 1973-95 without TFP growth.

Public policies such as investment in research, extension, education and infrastructure (road, electrification, educational institute, health facilities, banking etc.) are the major sources of TFP growth in the IGP (Figure 11). Extension has accounted for about 44 percent of the TFP growth, followed by public research (36 percent), and literacy (10 percent), infrastructure (8 percent), and urbanization (1.5 percent). These results suggest for higher investment in the above items to reverse the declining trends in TFP.

Figure 11: Sources of TFP growth in Crop Sector, IGP



Analysis of Productivity Changes and Future Growth Sources of Rice-Wheat Based System in the Indo-Gangetic Plain

P.K. Joshi and Laxmi Tewari

Sources of growth of rice-wheat based cropping system

An attempt was made to examine the association of production (and area) of rice and wheat with: technological, infrastructural and institutional determinants. The study was confined to the Indo-Gangetic plain of India, which is divided into four agro-ecological zones: (i) trans-gangetic plain, (ii) upper-gangetic plain, (iii) middle-gangetic plain, and (iv) lower-gangetic plain. Rank correlation was computed to assess the relationship between key exogenous variables and production (and area) of rice and wheat. It was noted that rice area expanded with intensification and use of degraded lands. Similarly, rice production was significantly associated with markets, fertilizer application and management of degraded lands (Table 11). There was high correlation between: markets, fertilizer application, irrigation, and adoption of improved varieties.

Table 11: Rank correlation between exogenous variables and production and area of rice and wheat in the Indo-Gangetic plain

Variable	Rice		Wheat	
	Change in production	Change in area	Change in production	Change in area
Irrigation	0.25	0.78	0.88	0.78
HYV	0.31	0.19	0.79	0.67
Fertilizer	0.69	0.79	0.49	0.33
Market	0.70	0.69	0.46	0.28
Degraded lands	0.61	0.52	0.60	0.44

In case of wheat, area increase was associated with: the expansion in irrigated area, availability of location specific, appropriate, and improved varieties. Wheat production increase was significantly associated with: irrigated area, high yielding varieties, fertilizer application and utilization of degraded lands. It was noted that the salt-affected area in the Indo-Gangetic plain (particularly in the trans-and upper gangetic plains), which was limiting agricultural production, became a boon for rice and wheat economy with the availability of reclamation technology.

Sources of change in gross revenue of rice and wheat

There are two sources of change in gross revenue: (i) changes in yield levels and (ii) changes in output prices. Whereas, the former refers to the technological improvement, the latter represents the market forces or the government price policy. To measure the contribution of these two sources, the gross revenue of rice and wheat was decomposed in different states in the Indo-Gangetic plain. The exercise was done for the decades of 1980s and 1990s. The latter decade refers to the period of economic reforms.

It was observed that the contribution of yield towards changing the gross revenue of rice and wheat was declining in all the states (Table 12 and 13). The contribution of yield towards changing gross revenue of rice was 45 per cent in the decade of 1980s that came down to 23 per cent in the decade of 1990s. Contrary to that the price effect was much stronger in raising the gross revenue of rice; its contribution was 55 per cent in the decade of 1980s, which went up to 77 per cent in the decade of 1990s. The trends were similar in all the states though the magnitude varied. The contribution of prices towards enhancing gross revenue of rice in Haryana and Punjab was exceptionally high, which showed complete stagnation in technology.

Table 12: Sources of change in gross revenue (at current prices) of rice in different states under Indo-Gangetic plain

(per cent share in changed gross revenue)

State	1980-90		1990-2000	
	Yield effect	Price effect	Yield effect	Price effect
Bihar	29	71	19	81
Haryana	12	88	4	96
Punjab	27	73	6	94
Uttar Pradesh	60	40	20	80
West Bengal	33	67	31	69
Indo-Gangetic plain	45	55	23	77

Similar results for wheat were observed. The contribution of prices in case of wheat increased from 53 per cent during 1980s to 81 per cent in 1990s. These results are clear indications that the prices of rice and wheat were increasing at a much faster rate than the rise in yield levels. Government intervention, through minimum support prices, is sustaining the gross revenue of rice and wheat in the Indo-Gangetic plain. The approach may not sustain in the long-run. Contribution of yield-enhancing technologies is warranted to sustain the production of rice and wheat in the Indo-Gangetic plain.

Table 13: Sources of change in gross revenue (at current prices) of wheat in different states under Indo-Gangetic plain

(per cent share in changed gross revenue)

State	1980-90		1990-2000	
	Yield effect	Price effect	Yield effect	Price effect
Bihar	47	53	19	81
Haryana	53	47	14	86
Punjab	46	54	16	84
Uttar Pradesh	43	57	23	77
West Bengal	30	70	19	81
Indo-Gangetic plain	47	53	19	81

Impact of Research in Crossbreeding of Cattle in India

Anjani Kumar, Pratap S. Birthal and P. K. Joshi

Cumulative investment in research and extension of crossbreeding of cattle in India has been massive, The significance of its economic evaluation in a developing country like India, with a scarce capital, hardly needs any emphasis. However, a few systematic efforts have been made to measure the returns for the investment in research for crossbreading of the cattle in India. This study measures the returns for the investments in research and extension of programme of crossbreeding of cattle in India, and also examines its impact on social welfare. To quantify the returns to investment in crossbreeding research and extension; economic surplus and distribution of welfare gains were estimated by assuming a parallel shift in supply function. The net present values (NPV), benefit- cost ratios and internal rates of return have been estimated. The study found that the adoption of crossbred cattle in India has been limited. However, the internal rate of return (IRR) was 55 percent annually (Table 14). This is a high financial return for the investment. The NPV of net social gain (Rs 7100 millions) and benefit-cost ratio (>3) suggest that the investment in cross-breeding research were highly rewarding. The distribution of economic surplus to producers and consumers showed

that producers were the primary beneficiaries of the cross-breeding research (Figure 12). Their share in the total gain was about 71 percent. Again, the distribution of livestock is more equitable compared to land and thus improvements in livestock productivity could be an effective mechanism to improve the welfare of resource-poor small and marginal farmers.

Table 14: Economic Surplus, Internal Rate of Return (IRR) and Benefit Cost Ratio (BCR)

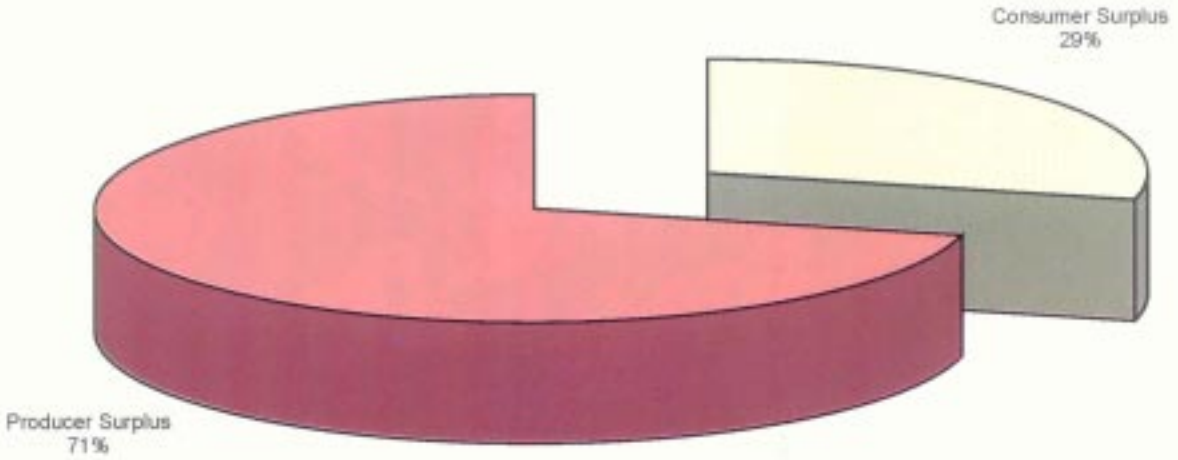
Elasticity		NPV of social gains (Rs. Crores)	IRR (%)	BCR
Supply	Demand			
0.42	1.01@	709	55	3.11
0.42	1.13#	771	56	3.18
0.42	1.35*	734	57	3.29

@ =IMPACT 1993

= Radhakrishna and Ravi 1990

* = Bhalla *et al* 1999

Figure 12: The Distribution of economic surplus
Distribution of Social gains



Sustainable Agricultural Systems

Sustainability Status of India's Irrigation Infrastructure

S. Selvarajan

Increasing demand for multiple uses of water has already manifested in basin, state, district and village level conflicts. These are going to escalate as India's annual per capita water availability is expected to go below the water scarce threshold level of 1700 cubic meter within the next two decades. By 2025, only three out of 20 basins in India will remain water sufficient. Supply-demand management in water sector and efficiency in its every use is crucial for water-food security. Existing and expanding irrigation infrastructure has to be physically and financially sustained first. India's irrigation sector is caught in a vicious cycle. Inadequate funding for operation and maintenance (O&M) led to the deterioration in the quality of

irrigation service. Resultant dissatisfaction coupled with weak institutional linkages led to an under assessment of demand for water rates, and low recovery of water charges. Deferred maintenance of surface irrigation infrastructure over years has manifested in its further deterioration. This has culminated in stagnating or falling irrigation coverage (Figures 13 and 14) affecting agricultural growth in several regions. Despite annual expansion in the created potential and capital investments in irrigation sector, area irrigated by major, medium and minor irrigation systems has been either stagnating or declining from mid-1980s or during 1990s.

Figure 13: Performance of canal irrigation system

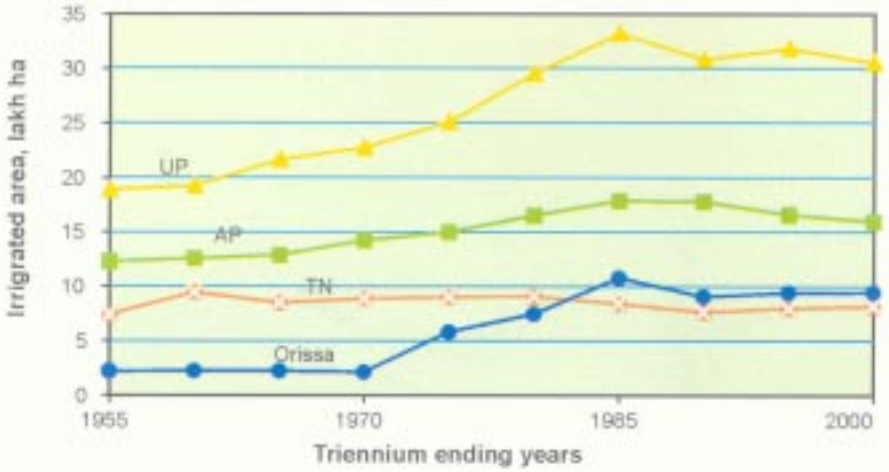
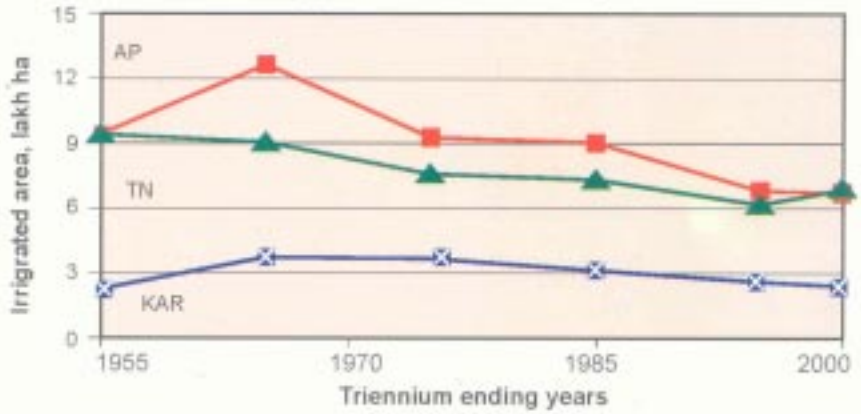


Figure 14: Decilining performance of tank system in south India



Declining Irrigation Infrastructure: Currently, canals in Uttar Pradesh are irrigating 30.6 lakh ha in the triennial ending (TE) 2000 as against 33.3 lakh ha in TE 1985. Similarly, in Andhra Pradesh, canals now irrigate 11% less area than what was irrigated 15 years back. Bihar, Orissa and Tamil Nadu also recorded similar decline in the canal irrigated area. These five states together account for 50% of irrigation potential created and 45% of net area irrigated in the country. On many irrigation commands, effective irrigated area has declined due to deterioration in the distribution infrastructure. Rapid depletion, salinization and pollution related problems threaten regions with sustainable ground water balance, whose area is continuously shrinking. Administrative blocks categorized as 'dark' or critical increased at the rate of 5.5% per annum during mid-1980s to mid-1990s. At this rate, 1/3rd of the blocks in the country would come under 'grey' category within two decades. Groundwater mining has resulted in fluoride contamination in north Gujarat and Rajasthan and

arsenic contamination in southern West Bengal endangering the sustainable livelihood of the poor. In 1995, nearly 90% of the over exploited blocks were located in Gujarat, Haryana, Punjab, Tamil Nadu, Karnataka and Rajasthan.

In A.P, only 1/5th of registered ayacut gets assured irrigation in drought prone regions like Rayalseema and Telengana, which account for 4/5th of 'dark' *mandals* with more than 85% ground water exploitation. Similarly, continuous neglect of tank infrastructure in south India has equity and sustainability implication. Farms in the tank command areas in south India are predominantly small in size; 60% of them less than 1 ha, and 80% of them less than 2 ha. Neglected management of tank systems also led to declining storage and recharging of ground water, more severely in semi-arid and deficit rainfall conditions. Tank water deficits occurs over 50% of the time period due to inadequate rainfall. States of Andhra Pradesh, Tamil Nadu, Karnataka and Orissa; together accounting for 60% of the India's tank irrigated area, have lost about 37% of the area irrigated by tanks during 1965-2000. Physical strengthening and improvements to the inflow, storage and distribution system are needed. Water users, in tank commands, need to be involved in planning and implementing the rehabilitation strategies.

Physical and Financial Sustainability: Currently, irrigation accounts for more than 1/3rd of states' revenue deficits. In many states, O&M expenditure was just enough for staff salaries with little for works. Low water charges and poor cost recovery resulted in secular decline in funding for maintaining water infrastructure, leading to inefficient water allocation and sharpening of conflicts over sharing of water in many regions. Current status of O&M expenditure and cost recovery in some major states (Table 15); when viewed in conjunction with the physical condition of the irrigation system, point towards the evolution of an unsustainable scenario. In Orissa, gross irrigated area from surface irrigation sources accounts for 64% of irrigation potential created. Average O&M expenditure remained low at 30% of the desired level. Weighted water rate, based on revised water tariff in 1998, was low at Rs 104/ha. Current water rate demand from irrigation charges is 50% of potential demand. All these factors culminated in poor cost recovery of 25%. Similar trends exist in other surface irrigation systems of states like Andhra Pradesh, Haryana and Gujarat. In Gujarat, actual O&M expenditure is one-fourth of the requirement. With average water charge remaining at Rs 165/ha, cost recovery is only 33%. Similarly, Andhra Pradesh and Haryana have registered low cost recovery of 26% and 41% respectively under current account.

Physical sustainability of the irrigation infrastructure calls for need based O&M funding. This requires systematic maintenance and monitoring of the physical assets of the irrigation system and their current status on a continuous basis. Financial sustainability calls for generating the needed O&M funding from the users. And more importantly, both need to be linked. That calls for a paradigm shift in the management of water resources. Water user groups need to be empowered with the management responsibilities as well. Several states are indeed in the process of finalizing state water plans, institutionalizing farmer organizations in irrigation

Table 15: O&M cost recovery, TE 2000

Particulars	Unit	Orissa	A.P
Potential created	Lakh ha	25	48
Gross irrigated area	Lakh ha	16	22
Average annual plan outlay	Crore Rs	619	893
Average O&M expenditure	Crore Rs	60	265
Weighted water rate	Rs/ha	104	398
Current water rate demand	Crore Rs	19	116
Receipts, current account	Crore Rs	15	69
Cost recovery, current account	Per cent	25	26

management and periodic review of water charges, improving assessment and collection procedures and prioritizing irrigation expenditures. Experiences so far are, however, mixed and the pace of progress is slow. For instance, performance of participatory irrigation management (PIM) in Gujarat indicates the improved operational performance of water distribution and management. Impact on system related issues, however, is yet to be realized.

Low water rates, under assessment of irrigated area and water rate demand and poor collection rate continue to deprive the irrigation sector from realizing the potential revenue, critical for system's financial sustainability. Sustained efforts are needed for rehabilitating the irrigation infrastructure and initiating institutional reforms in water sector. Specifically, (i) Irrigation systems need to be restored with user involvement and simultaneous institutional development for effective management transfer. (ii) Farmer Organizations need to be empowered to assess irrigation coverage, water charges and collect receipts. (iii) Cost recovery and O&M funding is to be linked in the budgeting process. (iv) Irrigation department should be legally empowered to identify all water user categories for broadening the revenue base and to enforce quantitative measurement of water supply. (v) Any funding for irrigation development with Central assistance should be linked with mandatory institutional development, as above, for smooth transfer of the management of the system to the users.

Equity Impacts of Irrigation Development and Strategies for Future

S. Selvarajan and Lakshmi Prasanna

The spatial and temporal distribution of inequality in: net area sown (NAS), all flow–irrigated area (ALLFLOW) and all lift-irrigated area (ALLLFT) was analyzed for 17 states including small states and union territories (SSUT). Two periods namely, 1970/71 and 1990/91 are covered. The study based on Theil's inequality index (Table.1) revealed the following: Mean inequality index has come down for NAS and ALLFLOW but increased for ALLLFT during the two decades ending 1991. The variability in the distribution of inequality among the states has come down for both irrigation attributes namely, ALLFLOW and ALLLFT. Maharashtra, Gujarat and Andhra Pradesh registered less inequality in ALLFLOW among the states considered here. For ALLLFT, West Bengal led the states with least inequality index followed by Kerala and Gujarat. Haryana, Punjab and Rajasthan are the states with high inequality index for ALLFLOW. Karnataka, SSUT and Andhra Pradesh are the states with high inequality index for ALLLFT during 1991.

Source-wise inequality

Inequality in irrigation distribution emanates from two sources, namely, inequality in distribution of irrigation development across states (BETSTS) and inequality in distribution of irrigation development across farm sizes within states (WITHSTS). Decomposition of the inequality by these two sources is attempted. This analysis revealed the following: There is a considerable inequality in the distribution of NAS in the country, which marginally came down in 1991 as compared to the level in 1971. Out of this, in 1971, 39 per cent of inequality came from BETSTS variability in the distribution of NAS among the States. Remaining 61 percent of the inequality has come from within the state variability in the distribution of NAS across different farm size holdings.

Contribution of WITHSTS to the overall inequality in NAS distribution came down from 61.1 in 1971 to 56.1 percent in 1991. Similarly, contribution of WITHSTS to the overall inequality in ALLFLOW distribution came down from 76.6 in 1971 to 61.5 in 1991. On the contrary, in case of ALLLFT, inequality arising from WITHSTS increased from 46.4 in 1971 to 55.4 per cent in 1991.The implication is that the scope for reducing the inequality in all flow-irrigated area exists more within the state source. For all lift-irrigated area, the scope for reducing the inequality is more between the state source.

State-level inequality

Comparison of state level inequalities of both irrigation attributes with mean level inequalities revealed the following: Punjab, Haryana and Uttar Pradesh are the states to have registered inequality levels higher than the mean levels in respect of ALLFLOW and ALLLFT. In states like Punjab and Haryana, where substantial percentage of the potential is already exploited, this index is limited by the existing inequality in the distribution of farm holdings across the farm sizes and not in terms of the distribution of irrigated area per se. Karnataka and Madhya Pradesh are the other states, with similar trends, exhibiting high inequality levels. In Southern states like, Andhra Pradesh, Tamil Nadu and Karnataka, all lift-irrigated area distribution recorded higher inequality levels than the mean values. In case of Kerala, both flow and lift irrigation attributes have shown higher inequality than their mean values.

Most of these states, wherein, higher inequality levels are observed in both flow and lift irrigation related attributes, have also realized more than two-third of their surface water irrigation potential by now. Similarly, ground water development is also much higher than other states. Such a tightening situation sharpens the equity goals in the context of future irrigation development, which has to encompass all the sources of water. In majority of these states, watershed approach will have to be the major driving force in the coming years for improving the equity in irrigation distribution through direct augmentation of surface flows and improved ground water recharge. Further a paradigm shift in the policy focus, from utilization gap and irrigation gap orientation towards an incentive gap orientation which addresses the current pattern of water utilization by reforms in existing water laws and institutions, is emphasized.

Table 16: Inequity in irrigated area and net sown area distribution by states and sources

States	ALLFLOW		ALLLFT		NAS	
	1970/71	1990/91	1970/71	1990/91	1970/71	1990/91
Andhra Pradesh	0.2568	0.1966	0.6050	0.5336	0.6650	0.5198
Bihar	0.6186	0.2849	0.4536	0.3449	0.5813	0.3198
Karnataka	0.1675	0.2561	0.3782	0.5755	0.5238	0.4938
Madhya Pradesh	0.1685	0.2037	0.3740	0.4890	0.4682	0.4029
Maharashtra	0.0673	0.0467	0.2372	0.2611	0.3113	0.3150
Orissa	0.1803	0.2454	0.2660	0.4934	0.3054	0.4603
West Bengal	0.2979	0.2231	0.3648	0.2170	0.2833	0.2523
Gujarat	0.0590	0.1351	0.1892	0.2567	0.2338	0.4124
Haryana	0.4510	0.5802	0.3042	0.4999	0.3817	0.5358
Kerala	0.3626	0.3467	0.2650	0.2437	0.3431	0.3323
Punjab	0.5486	0.5695	0.4949	0.4127	0.4973	0.4471
Rajasthan	0.5714	0.5367	0.5046	0.3104	0.7486	0.6286
Tamil Nadu	0.2153	0.2254	0.4630	0.4463	0.4111	0.3809
Uttar Pradesh	0.4737	0.3875	0.3996	0.4209	0.4100	0.4106
SSUT	0.3180	0.2354	0.1965	0.5558	0.2916	0.2601
Mean	0.3042	0.3028	0.3600	0.4052	0.4209	0.4013
Standard Deviation	0.1739	0.1536	0.1282	0.1186	0.1434	0.1041
CV (%)	57.2	50.7	35.6	29.3	34.1	26.0
Source-wise contribution						
Between STS	0.1109	0.1895	0.4781	0.3187	0.2911	0.3177
Within STS	0.3631	0.3032	0.4136	0.3959	0.4580	0.4060
Within STS (% of total)	76.6	61.5	46.4	55.4	61.1	56.1

Sustaining inland fish production growth in India

S. Selvarajan and Mruthyunjaya

In India, the growth in fish production has accelerated since 1988 onwards. Over all trend in production growth, during the past three decades (1970-99), is over 4% per annum. Growth of inland fisheries (4.9%) has been significant compared to the growth in marine fisheries (3.3%). Notably, fish production growth during 1988-99, has accelerated to reach a high of 5.1% per annum, aided by an impressive growth (6.5%) of inland fisheries production. Incremental production of one million tonnes of fish was realized once in 14 years in the past but now the same is achieved once in 4 to 5 years as evidenced during 1990s. Composition of fisheries production has been changing over the years. During 1970-75, only one-third of incremental fish production came from inland fisheries. But during 1995-2000, over 4/5th of the incremental fish production has come from inland fisheries.

Production Prospects

India's total fish production potential is estimated at 8.4 MT (4.5 MT from inland sector and 3.9 MT from marine sector). In 2000, India produced 5.6 MT of fish. The realizable production gap is 1/3rd of the potential. Out of this, 61% is accounted by inland sector. The existence of 1.7 MT of unrealized production potential in inland sector provides the scope for driving the future growth in fish production. The estimated potential in inland sector will further increase with continuous expansion in man made water bodies. Within the inland sector, production growth is driven by growth in culture fisheries production, whose share in the inland fish production nearly doubled from 43% in mid-1980s to 84% in mid-1990s. Again, within the culture fisheries, the production growth is driven by impressive growth in freshwater fisheries production, whose share in the culture fisheries production increased from 60 to 80% during the above period. Fresh water aquaculture remains the only option for pursuing the higher growth goals in fisheries sector.

The current production level of freshwater culture fish is far below the potential that can be supported by the extensive network of inland water resources which are available as well as expanding in the country. Out of 2.36 Mha water area available, only around 0.9 Mha are currently used for freshwater aquaculture (Table 17). The vast potential area untapped for aquafarming are also the least protected water bodies. A comparison, of existing production of inland fish vis-à-vis the available inland water resources in the leading states,

Table. 17: Inland water resources of India in the leading states, 1995

Rivers and canals		Reservoirs		Tanks and ponds		Beels, Oxbow & Derelict water		Brackish water	
States	Length, Km	States	Area, Lakh ha	States	Area, Lakh ha	States	Area, Lakh ha	States	Area, Lakh ha
UP	31200	MP	2.94	TN	6.91	KER	2.43	ORI	4.17
J&K	27781	MAH	2.79	AP	5.17	ORI	1.80	GUJ	3.76
MP	20661	ORI	2.56	KAR	4.14	UP	1.62	KER	2.43
PUN	15270	GUJ	2.43	WB	2.76	ASM	1.10	WB	2.10
AP	11514	AP	2.34	ARN	2.76	WB	0.42	ARN	2.10
KAR	9000	KAR	2.20	RAJ	1.80	ARN	0.42	AP	0.64
TN	7420	UP	1.50	UP	1.62	MAN	0.40	TN	0.56
All India	171334		20.50		31.30		8.27		16.32

Source: Hand Book on Fisheries Statistics, 1996. Fisheries Division, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India

reveals an interesting insight into the future prospects for inland fish sector growth (Table 18). In inland fish production, West Bengal, with an annual production of 0.87 MT, clearly dominates this sector. It is nearly 1/3rd of the share of India's inland fish production in 2000. AP accounts for 13 % share of inland fish production.

Table. 18 : Fish production trend in the states, 1985-2000

States	Marine fish ('000 t)			States	Inland fish ('000 t)		
	1984/85	1999/2000	Annual growth (%)		1984/85	1999/2000	Annual growth (%)
GUJ	287.0	671.0	5.8	WB	369.5	865.7	5.8
KER	367.4	575.5	3.0	AP	104.6	380.6	9.0
MAH	331.2	397.9	1.2	BIH	110.0	254.7	5.8
TN	265.4	363.0	2.1	UP	49.7	192.7	9.5
WB	32.0	180.0	12.2	ASM	48.2	159.8	8.3
AP	132.7	166.5	1.5	MAH	29.0	135.4	10.8
KAR	168.1	165.7	-0.1	ORI	51.9	135.3	6.6
ORI	46.1	125.9	6.9	MP	24.0	127.4	11.8
GOA	35.4	62.1	3.8	KAR	39.6	126.6	8.1
All India	1740.3	2833.9	3.3		1103.2	2822.7	6.5

Source: Hand Book on Fisheries Statistics, 1996. Fisheries Division, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India

A comparison of WB and AP provides useful insight into the future prospects for this sector. The base for inland fish production growth in WB is provided by 2.1 lakh ha of brackish water (ranked fourth) and 2.8 lakh ha of area under tanks and ponds (ranked fourth); since it has relatively little area under other categories of available inland water resources. In other words, WB produces 0.87 MT of inland fish production from the potential area of 0.49 M ha of inland water resources @ 1.8 t/ha. As against this, AP produces 0.381 MT of inland fish with 0.52 Mha of area under tanks and ponds (ranked second). If recent spurt in brackish water aquaculture is excluded, it is amply clear that large source of inland fish production, namely, water bodies under tanks and ponds, remains grossly under utilized. The tank infrastructure has been allowed to deteriorate in the recent decades. With the continuous physical deterioration both in the catchment and storage area, impairing the functioning of these tanks over years; the ecological function of maintaining the water bodies by these tanks has also considerably weakened.

Maintenance of inland water bodies both quality and quantity wise, in an area of 6 Mha, should be treated as national priority, particularly in view of looming water crisis, creating conflicting scenario among various uses and users of water. Such an approach should be dovetailed with watershed programmes, since most of these water bodies are rainfed depending on rainfall, surface and sub-surface flow. For ensuring the physical and financial sustainability of water bodies; it is essential to initiate beneficiary-led rehabilitation measures for restoring the physical performance first and then transfering its management to the user associations. The experience, of institutional reforms currently underway in the irrigation management transfer in major, medium and minor irrigation programmes, offers hope for such experiments to encompass fishery sector also. Similar experience in case of the tank infrastructure has been documented from several states like Tamil Nadu and Karnataka. Consequently, despite these states together having over 1 Mha of water bodies under tanks and ponds, their inland fish production is only at 0.1 MT per year. Conserving the large water bodies and ensuring their sustained physical performance; through appropriate management strategies, with focus on institutional, technological and developmental interventions, should receive greater attention for realizing the production potentials of inland freshwater sector.

Markets and Trade

Indian Agriculture in the Post WTO Period

Ramesh Chand

Trade trends in Post WTO period

India's agriculture exports responded positively to trade liberalisation that began in 1991. However, the rising export trend could not be sustained in the post WTO period, whereas, imports rose steadily. This has raised serious concerns about implications of trade liberalization and competitiveness of Indian agriculture. Among various commodities, exports of non-basmati rice, wheat and oil meals have been hit most severely. The adverse impact on rice and wheat resulted mainly because of rise in their domestic prices due to increase in their support prices. Despite adverse price situation in post WTO period, India has been able to maintain steady flow of export of those commodities, which are consistent with emerging global demand patterns, like fresh and processed fruits, fish products and meat products. Similarly, export of commodities that experienced high technological gains have not been adversely affected. Among imports, edible oils have shown very high growth in post WTO period. Share of imported edible oils in domestic consumption has exceeded 40 percent. On the one hand, India is accumulating large surplus of foodgrains, which cannot be sold in the international market. But, on the other hand it is becoming more and more deficit in edible oils. There is a need for domestic policy interventions to correct these imbalances as trade is not resulting in achieving balance in domestic supply and demand.

International price tends and adjustments

International prices of agricultural commodities are highly volatile and are characterised by cyclical variations. Among these, prices of foodgrains, edible oils, sugar and cotton have fluctuated around a static mean whereas prices of dairy products and fish have been moving up and down around a rising trend. Most of the decline in agricultural prices witnessed during post WTO period is due to cyclical nature of prices and does not have much to do with WTO. However, due to WTO commitments, domestic produce cannot be protected from international price shocks by imposing Quantitative Restrictions (QRs). If such shocks are transmitted to farm level, it would destabilise crop pattern and supply of agricultural produce. Since the vast majority of Indian farmers are either small or marginal, they do not have resources and capability to frequently shift from one kind of cropping pattern to another kind, in a short period, to adjust to the changes in international prices. Since under WTO obligations temporary imports and price shocks can't be checked through QRs, there is a need to develop mechanism to regulate unwanted imports and exports. While domestic producers should be encouraged to compete with stable level of international prices to improve efficiency, they need to be protected against volatility. One way to ensure stable external price environment is to impose tariff on import as well as export whenever international price goes below or above certain range or band. This kind of mechanism to regulate export as well as import is neither protectionist nor discriminatory against producers. In fact, WTO regulations do not prevent any country from adopting such a mechanism.

Trade competitiveness of Indian agriculture

Export competitiveness, of most of the commodities, has undergone significant changes during 1990s. This shows that export competitiveness is a dynamic phenomenon which would vary depending upon the changes in international and domestic prices. During the beginning of implementation of the GATT accord in 1995, international agricultural prices were moving on to a rising trend. Prices reached peak levels either in 1996, which happens to be the year when WTO came into being, or in 1997. The prices followed a decline thereafter. This had serious impact on export competitiveness. Not only the export competitiveness declined, in some

cases drop in international prices is so high that it has turned domestic market attractive for imports. In such situations, the country need to identify enterprises with high export advantage and high frequency of competitiveness and then pursue policies for maintaining continuity in export. Indian rice is export competitive most of the time and export margins also support pushing its exports. There is neither much scope nor advantage in export of wheat and coarse cereals. However, wheat and maize are efficient import substitutes. Among edible oils, soyabean on an average has been found to be only slightly export efficient. Soyabean and rapeseed/mustard are efficient import substitutes. In the case of sunflower, it would be more paying to import sunflower than to produce it.

A comparison, of DRC for wheat under exportable hypothesis with rapeseed/mustard under importable hypothesis, presents a very interesting picture. In mid 1990s, comparative advantage favoured promoting wheat export and importing rapeseed/mustard and thus shifting resources from rapeseed/mustard to wheat. However, this was true only for a particular price situation. DRC based on average of range of international prices indicates that substitution of import of rapeseed/mustard is as attractive as export of wheat from states like Haryana. As international prices do not follow a rising trend, the only way to improve our competitiveness is to ensure that domestic prices in $ terms are brought down. This can be done by reducing cost of production which calls for improvements in production efficiency through technological innovations, or, by shifting production from less efficient areas to more efficient areas. There is a need to undertake studies on such aspects.

Global agricultural subsidies and contentious issues in AOA

High level of subsidy in OECD countries is trade-distorting and classification of subsidies in various boxes is discriminatory. This works against the concept of level playing field. India and other developing countries should forcefully seek clubbing of all forms of subsidies in one box to be termed as "TSA" designating total support to agriculture. There should then be some parity in TSA by different countries. Export subsidy given by selected group of countries like EU, USA and Canada are totally trade-distorting and need to be abolished. Future negotiations on Agreement on Agriculture (AOA) need to focus on an array of issues, which should include: market access, domestic support, export subsidy and non trade concerns. For countries like India, with no provision for export subsidy and compensation to producers for low prices, tariff is the only option to regulate the trade. Reduction in tariff may be justified, when international prices are normal or on trend, to improve their efficiency, but there is a need to maintain high bound tariff to protect against volatility.

Domestic factors in trade competitiveness

Harnessing export opportunities and import substitution would largely depend upon the action on the domestic front. The most important one is the role of technology and infrastructures that enable the country to reduce cost of commodities and their domestic prices. High level of tariff can only check imports but they are of no help in pushing exports, which would depend on improving competitiveness. Thus, in order to smoothly adjust to the emerging trade scenario, India needs to do a lot in terms of domestic policy reforms and action. New liberalised environment would require competing with new global technologies. Due to the fast developments in bio-technology and the lead being taken by other countries in adopting such technologies, India cannot afford to be slow and orthodox in taking decision on new innovations and technologies. Besides technology, infrastructure is a key factor in the long term growth of output and total factor productivity. As the supply price of agricultural commodities is affected by: transport cost, statutory charges, market handling charges, processing cost etc., the infrastructure and provisions associated with these items play an important role in determining competitiveness of domestic production. India needs to promote healthy competition between public sector and private agencies. These two agencies have different roles to play, and existence of one should not cause elimination of the other.

Government Intervention in Foodgrain Markets

Ramesh Chand

The changing context

Demand and supply scenario for agriculture in India has undergone profound changes during last 10-15 years. However, farm price policy and policy for food management have not been changed to adjust to new situation. This has created serious imbalances in production and has raised several other problems like: accumulation of huge grain stocks, increase in food subsidy bill, neglect of efficiency and quality, setback to private trade and strong regional bias in government support to agriculture.

Average availability of cereals has followed a decline in the recent years. The decline in per capita availability of cereals is not a result of slack in production nor has it resulted from the export of the cereals. This is entirely due to accretion to stock of cereals held by government agencies. There are two reasons for production going to stock rather than being consumed. One, PDS prices during 1990s have increased in jumps and second, at a faster rate compared to open market prices and prices of other food and commodities which caused a decline in per capita PDS demand in the recent years. The decline in per capita demand for cereals in open market is possibly caused by diversification in consumption pattern, which is associated with improvement in per capita income and shift in food preferences. An important reason for high policy support to grains to continue, till recently, is that the demand projections for grains did not take note of diversification in consumption pattern experienced in rural as well as urban areas. This has resulted in fast growth of the import of edible oils, while pulse deficit is reflected in both imports as well as in the increase in domestic prices of pulses. There is a need for suitable policy to address these imbalances.

Price regulation

It is being proposed that government should use regulatory mechanism only when price movements are outside the desired price band representing width between the ceiling and floor price, which permits reasonable marketing margin for profitable public sector operations. This underscores the need to evolve new kind of mechanism, for government intervention in food grains markets, which allows and encourages active participation of the private trade but keeps a check on exploitative tendencies of private trade. The study has prepared the estimates of price band between farm harvest prices of wheat and paddy in surplus states and wholesale and retail price in subsequent months in all major states of the country; that are required/justified for participation of the private trade in grain marketing.

At existing structure of statutory charges/taxes, and transport and other costs, retail price for wheat in surplus states should be higher than farm harvest price by 36 to 60 percent in various months to attract private trade. In the deficit state like Maharashtra, retail price before harvest need to be more than double the farm harvest price in surplus states to provide reasonable incentive to private trade. Similarly, the band suggests that retail prices of rice should be 96 to 213 percent higher than the farm harvest price of paddy to attract private trade to buy paddy and supply rice in various months and in various states. Price difference beyond this band would imply exploitation by private trade which would need government intervention. Transport cost and statutory charges are the main elements of the price spread and the price band can be narrowed down by curtailing these costs.

Buffer stocks vis-à-vis variable levies on external trade

Buffer stocks have been used by the government as an important instrument for the purpose of price stabilisation. However, this involved heavy cost in terms of: procurements, handling, carrying, storage etc. which is becoming fiscally unsustainable. As an alternative, it has been suggested that government should use the instrument of variable levies on external trade to stabilise domestic prices. A comparison, of domestic

stabiliation measures and trade, shows that selling and buying wheat in international market to stabilise domestic output does not result in large changes in international prices of wheat due to large volume of world trade in wheat. However, in the case of rice, stabilising domestic supply through trade caused sharp fluctuation in international price of rice. Among the two options, viz., domestic stabilisation through buffer stock and stablisation through trade, the latter is found to be costlier than domestic stabilisation in most of the years, though it also depends upon fluctuation in international price. If the relationship between domestic and international price in future remains the same, as observed during the last 26 years, then policy of price stabilisation through buffer stock seems to be better option than trade.

Support price and deficiency payment

Minimum support prices for various commodities must reflect the society's preference for the produce and should promote efficiency and quality. In the present form, the guaranteed prices have given rise to several problems. As it is not feasible to ensure that prices would not fall below MSP in any commodity, only selected crops should be covered under MSP. 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 pay to the farmers as a "deficiency payment" a part of the difference between actual price received by farmers and MSP. In order to ensure that the resale of produce does not take place, the magnitude of deficiency payment should be kept less than the charges involved in first sale of produce; like mandi fee, auction, labour charges etc. This kind of mechanism would not suffer from problems like regional bias and commodity bias. Government intervention in the form of procurement should be selective. In a normal production year, quantity of procurement should not exceed PDS requirement. There is a need to maintain food security buffer stock which should be maintained by purchasing grains during above normal production and releasing stock during low harvest years. A buffer stock of around 7 million tonne would be adequate to meet supply shortfalls in most of the years.

Improving the performance of FCI

Food Corporation of India (FCI) has remained in the centre stage of government intervention in agricultural marketing due to the scale of its operation and due to its role in food security. The inefficiency and high cost of FCI are often used to make a case for winding up FCI and to pave the way for greater private sector participation. In this context, it is worth mentioning that in the absence of public agencies, private trade may turn out to be exploitative and what now goes as inefficiency of FCI would go as excessive profit of private trade. Therefore, this public agency should be retained but it should plan its operations in such a way so as to keep check on private trade to avoid exploitation of market situations. However, the area of operation of this parastatal should be reduced and its efficiency should be improved by modernisation of its operations on scientific lines and by imparting professionalism to its management.

The Demand - Supply Projections of Livestock Products for India Towards 2020

Dastagiri M. B.

This study estimates supply and demand functions for major livestock products, and makes projections towards 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. Supply analysis is based on time series data on: quantity, prices and technologies 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 a time and then declines. This polynomial distributed lag model allows a great degree of flexibility to detect this type of phenomenon. Linear model was also used to estimate supply response. Seemingly Unrelated Regression Equations (SURE) model was used to estimate effect of income and prices on demand.

The production of livestock products is mainly demand driven unlike cereals where it is mainly supply driven. The commodity groups for which supply was studied included: milk, mutton, beef, chicken, egg and pork. In both models, time variable, which represents technological and other structural changes in the livestock sub-sector, is highly significant indicating that technological progress will be crucial to usher in livestock revolution in India. Mutton feed coefficient in linear model and egg feed price coefficients in polynomial price model were negative and significant, indicating that the rise in feed price would reduce production of these commodities. Similarly, mutton, beef and pork price coefficients in linear model and mutton and egg price coefficients in polynomial model are significant at 1 per cent level, implying that higher prices stimulate the production of livestock products. Price policy could be suitably reoriented to encourage farmers to invest more towards improving productivity of their livestock.

In case of polynomial price lag model, the price impact in the first period is positive and significant. This indicates that immediate previous lag prices are influencing production of these products. It is interesting to note that the dynamic price impact (as depicted by the delayed price coefficients) increases first with lag, then decreases and again increases; indicating rise and fall of production in response to price changes every alternate year.

Table 19: Demand-Supply Projections of Livestock Products*

Livestock Products		Year 2000	Year 2020	Growth Rate
Milk	Production	78.56	232.09	5.56
(million litres)	Consumption	60.77	147.21	4.77
	Surplus	17.79	84.88	
Mutton &Goat meat	Production	0.67	9.85	14.40
(million tonnes)	Consumption	1.36	12.72	13.62
	Deficit	-1.31	-3.13	
Beef & Buffalo meat**	Production	3.29	9.11	5.22
(million tonnes)	Consumption	0.61	1.15	3.39
	Surplus	2.68	7.96	
Chicken	Production	0.65	2.70	7.38
(million tonnes)	Consumption	0.33	0.81	4.72
	Surplus	0.32	1.89	
Egg **	Production	32.75	102.91	5.89
(billion numbers)	Consumption	13.88	44.06	6.12
	Surplus	8.87	68.85	
Pork	Production	0.55	8.22	14.44
(million tonnes)	Consumption	N.E	N.E	N.E
	Surplus			
Mutton	Production	0.55	8.21	14.44
(million tonnes)	Consumption	N.E	N.E	N.E
	Surplus			
Beef**	Production	1.48	5.61	6.87
(million tonnes)	Consumption	N.E	N.E	N.E.
	Surplus			

* Production and Domestic Consumption under the Assumption that the Exogenous Variables grow at the Trend Rate

***Production projections based on linear model and rest of them are based on polynomial price lag models. Beef and buffalo prices are based on real price growth rates.

N.E — In case of pork, mutton and beef, consumption could not be estimated due to non availability of the data.

The baseline scenario revealed that the actual production trends for all the commodities closely follow actual consumption. However, in 2020, surplus production is expected to increase by about 84.88 million litres of milk, 68.85 billion eggs and 7.96 million tonnes of beaf and buffalo meat. Similarly, surplus production of chicken would increase to about 1.89 million tonnes. These results indicate that in 2020, India would be surplus in these products as projected production figures are more than consumption figures. But there would be a shortage of about 3.12 million tonnes of mutton and goat meat.

Analysis of Fish Supply and Demand in India

Dastagiri M.B. and Mruthyunjaya

Fish production in India has increased steadily from 7.52 lakh tonnes in 1950-51 to 56.6 lakh tonnes in 1999-00. Till, 1990-91, marine fisheries remained the major contributor to this production increase. The share of inland fisheries increased drastically, reaching to 50 per cent in 1999-00. These changes were due to deceleration in growth of marine fish production and a policy shift in favour of inland fisheries, particularly aquaculture.

This study, on the basis of estimates of fish supply, demand and their projections, examines the policy imperatives by 2020. For demand analysis, the study uses consumer expenditure data from 50th round of National Sample Survey Organisation pertaining to the year 1993-94. For supply analysis: time series data on quantity, prices, fish seed, and technologies of fish for the period 1970 to 1998 are used. Polynomial distributed lag model was employed to determine the lagged response of fish supply production to changes in fish prices and double log function was used to estimate the effect of income and prices on the demand. Estimates of fish supply response through linear and polynomial price lag models (transformed) is indicated in Table 20.

Table 20: Estimates of the Fish Supply

Equations/ Variables	Linear regression	Polynomial regression (transformed model)
Constant	-246.98	574.23
	(-0.719)	(1.117)
Price/ Price $t-_0$	0.1976*	0.8467*
	(2.697)	(2.396)
Price $t-_1$	–	-1.1673
		(-1.004)
Price $t-_2$	–	0.4979
		(0.56)
Fish seed	0.2978*	0.3968*
	(5.818)	(5.933)
Time	0.133	-0.282
	(0.762)	(-1.085)
R^2	0.972	0.978
R^{-2}	0.968	0.968

Figures in parentheses represent t values

*1 per cent level of significance

The expenditure and price elasticities of demand model are given in Table 21.

Table 21: Estimates of the Fish Demand

Elasticity	Rural	Urban	Pooled
Intercept	-5.815 (-2.246)	-0.186 (-0.090)	-1.273 (-0.918)
Expenditure	2.689* (2.866)	0.600 (0.80)	1.046** (2.006)
Own price elasticity	-0.702*** (-1.755)	-1.004** (-2.587)	-1.040 (-0.651)
R^2	0.735	0.46	0.525
R^{-2}	0.646	0.34	0.473

Figures in parentheses represent t values

*1 per cent level of significance

** 5 per cent level of significance

*** 10 per cent level of significance

The demand model clearly shows that both income and price changes affect the demand for fish. In conformity with theory, supply price coefficients are positive and highly significant. It clearly shows that production elasticity of fish is highly price-elastic, suggesting reorientation of price policy to create the environment in which the fish farmers will increase investments for further improving production. Since, fish seed availability has positive impact on fish production, supply of quality fish seed should receive greater attention.

Projected production (supply) and consumption (demand) figures for fish during 2020 are shown Table 22.

Table 22: Projections of Fish Production and Domestic Consumption

Supply/demand	2000	2020	Growth Rate
Production* (Million Tonnes)	5.66	13.0	4.4
Consumption** (Million Tonnes)	4.45	8.52	3.3
Surplus (Million Tonnes)	1.21	4.48	

* The production growth rate is assumed to grow at 4.4% p.a. it was during 1990-2000

** Consumption figures are weighted averages (weighted by rural and urban population and dividing by total population)

The study clearly indicated that in 2020, India would be having about 4.48 million tonnes of surplus fish. This needs to be either exported or domestically consumed. This calls for substantial investments in: quality control, post harvest management, storage, transportation, processing, packaging, export promotion and marketing. For promoting exports, quality control of both inputs and output, should receive greater attention.

Finally, future studies in this area should consider the demand system as a whole and estimate the elasticities to gain better insights for effective policy analysis. However, such studies require detailed and accurate information which are at the moment fragmented and the most inadequate.

Institutional Change

Scope of Agriculture Based Intervention for Sustainable Nutritional Security

P. Adhiguru, C. Ramasamy and D. Malathi

The study was undertaken to assess the nutrient intake pattern and its determinants among rural households under different production systems. It also explored the possibilities of institutional linkages among: the state Departments of Agriculture, Health, and Nutrition for achieving sustainable nutritional security. The study area was Dharmapuri district of Tamil Nadu. The food intake deficit was found to be comparatively lower in the vegetable production system than the rice and sugarcane production systems, especially in the case of green leafy vegetables and other vegetables. Farming systems, growing micro nutrient rich vegetables, favour nutritional security. The vegetable production system has highly favoured the increased intake of calcium, iron, vitamin A and vitamin C. Frequency of consumption of vegetables is higher in vegetable system. Women labourers in vegetable system received more diversified kind wages, which has enabled them to attain better household nutritional security. In the case of rice and sugarcane systems, the kind wages are predominantly cereal based. This has no direct contribution towards nutritional security especially in the case of vitamin intake.

The extent of interaction among the line departments, namely, health and nutrition department and agriculture department has been very weak. Linkages need to be established between health and nutrition department and agricultural and allied departments for formulating nutritional security strategies. Better coordination in terms of sharing information on targets, groups, and dovetailing agricultural programmes in consultation with health and nutrition departments is also essential.

Partnerships in Agricultural R and D

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

The need for closer interaction between the national and international public-sector institutions with the private sector has been widely recognised at present. Although public-private interaction is starting to develop, there is still a need for a clearer understanding of ways to re-map the relationship between the two sectors. This is required to ensure that effective collaboration can take place on research topics that are at the interface between public and private interests and expertise. Case studies, to explore the relationship between these two sectors and to document alternative patterns and principles of innovation, were undertaken adapting the principles of the Innovations 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 / cultural environment; and that shapes the nature of the relationship / partnership between the actors. Since relationships are socially iterative processes, a system, that produces innovations evolves.

There are a number of specific lessons for research policy and practice that emerge from these studies, which are as follows: (a) Not all organisations have the appropriate skills to be good partners; (b) Not all organisations have a culture of learning. This restricts both their ability to partner and generate institutional innovations; (c) Rigid institutional and organisational structures, particularly those with hierarchical designs, tend to mitigate learning and iterative relationship with broader set of partners; (d) While it is easy to stereotype public, private and NGO organisations, and the organisational culture that goes with them, there is a need to examine these more closely in the analysis of project partnership viability; (e) Successful partners have intuitive ways of identifying each other that relate to the shared values, trust and complementarity. Shared history built up over previous partnerships obviously contributes to this; (f) Partnership skills are part of a

range of capabilities that help the organisations to innovate, and these are learnt through interaction with partners and networks; (g) How organisations learn and build up these skills is not yet entirely clear and so more detailed analysis and synthesis of experiences are required; (h) The strengthening of learning processes among the project partners would appear to be a key area of the capacity development. The related issues are that the activities that widen the interaction of organisations with other partners and networks are likely to be an important way of building up innovation capabilities, both in individual organisation and in wider national systems.

Extension, Poverty and Vulnerability in India

Rasheed Sulaiman V and Georgina Holt

India has a sizeable area with low agricultural productivity, high incidence of poverty and weak integration into markets, and questions are increasingly being asked over the role that the public sector extension can play in enhancing the livelihoods of the poor and reducing their vulnerability in these areas. Public sector extension in Indian States started adopting different approaches in the post T and V period. The last decade has also seen an increased involvement of private extension providers but their presence and activities are skewed towards well-endowed regions. To perform new roles with wider scope, extension services must change fundamentally, not only in personnel and resources, but also in fundamental perceptions and practices relating to the role of the state in agricultural and rural development. A newly-released consultation document at the Government of India level indicates awareness of the broad type of changes needed. However, change in the practice of extension will be slow in India for complex reasons rooted in long-held perceptions concerning the rural poor, the private sector and the role of the state. Despite the foresight of the new consultation document, and examples of institutional innovations from within India, the great majority of extension remains publicly funded and publicly delivered, geared predominantly to the delivery of messages and (although recently less so) subsidies. Isolated innovations offer insights into potential ways forward for extension in the new millennium, but to reform a system in which there are many entrenched actors across different states within the federal system is clearly going to be a major challenge. Reforms favouring the poor are unlikely to be achieved unless agricultural policy towards the weakly integrated areas becomes rather less concerned with productivity enhancement alone, and more with the ways in which increased productivity can be linked to reductions in vulnerability and to employment creation. What will also be needed is a greater effort, in trying different approaches to active partnership between organizations holding complementary skills; to evaluating these at local level, and to try more systematic approaches for organizational learning.

Agricultural Growth and Modelling

Changing Pattern of Efficiency of Use of Capital in Indian Agriculture

B. C. Roy and Suresh Pal

Investments in agriculture have contributed to growth in agricultural production and made the country self sufficient in food production. However, this pattern of growth is uneven across regions. Achieving balanced growth requires resources to be allocated across the regions in such a manner that the total benefit is maximised and at the same time inequality in agricultural development is reduced. An analysis of incremental capital-output ratio (ICOR) in agriculture at disaggregated level would be of great help for this purpose. It would also be useful for estimation of capital requirements to achieve a target rate of growth in output, or to derive the expected growth rate, once the resource position is known. Therefore, ICOR values were calculated at the country and the state levels for each year from 1969/70 to 1998/99. The study, also assesses the adequacy of current level of investment for attaining the target rate of growth in the agriculture sector by states.

The realization of target growth rate in agriculture depends, not only on the quantum of investment in agriculture alone, but also on its regional pattern of deployment and its efficiency of use. The analysis of ICOR demonstrates considerable variability in the ICOR across the states and this variability has not reduced over the time. Therefore, using a single ICOR estimate for the entire country by the Planning Commission has altered the normative allocation of resources for agricultural development across the states. Compared to the northern states, the estimates of ICOR are lower in the eastern and southern states (Figure 15). These are the states where additional investment will have larger impact on agricultural productivity. The result also shows that the investment requirement in agriculture is much higher than that assumed by the Planning Commission on the basis of its much lower estimates for ICOR. With the current trend in investment growth, agriculture will grow only at the rate of 3.01 per cent per annum. This falls short of the targeted 4.5 per cent level. To realize the target growth rate in the X Plan, the investment in agriculture should grow at an annual rate of 7.91 per cent, as compared to the present level of 4.95 per cent. Another dimension to this issue is its regional variability. If the present trends in investment continue, most of the eastern and north-eastern states will experience negative growth in agriculture (Figure 16). This will further widen regional disparity in agricultural development and thus, calls for immediate attention. Thus, these states offer both the challenges and opportunities to our policy planners. These states would require special emphasis, not only because of their higher efficiency of use of capital, but also these are the states where majority of our rural poor are concentrated. On the other hand, in hilly and large states, improvement in the efficiency of use of capital should be the priority. This requires more than proportional rise in the private investment and the judicious use of the investment resources. For this, institutional arrangements with which the capital and other inputs are managed, and the incentive framework for the agricultural sector needs to be carefully monitored, in order to take appropriate policy intervention.

Figure 15: Estimates of incremental capital output ratio in agriculture by states (1992-97)

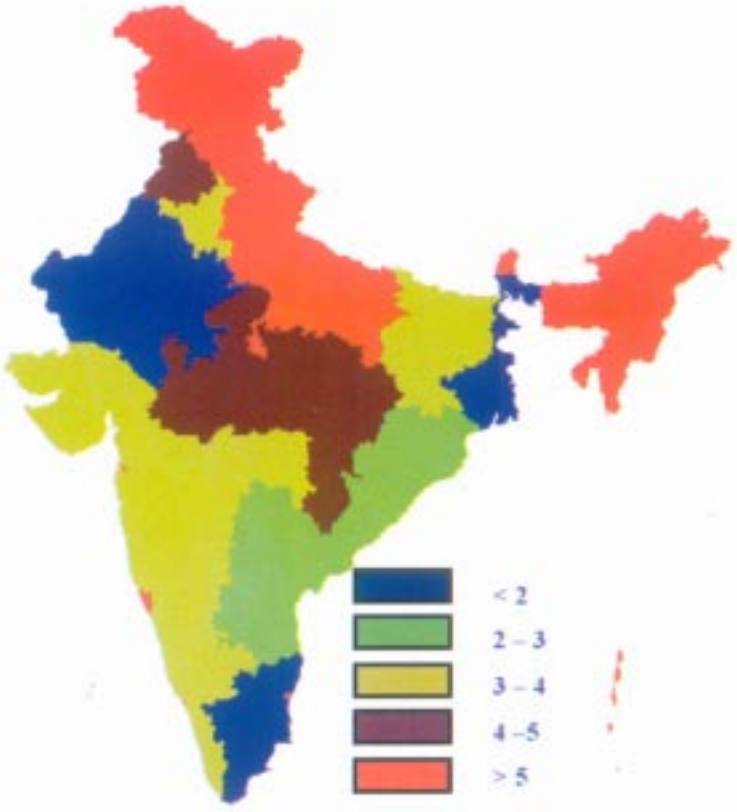
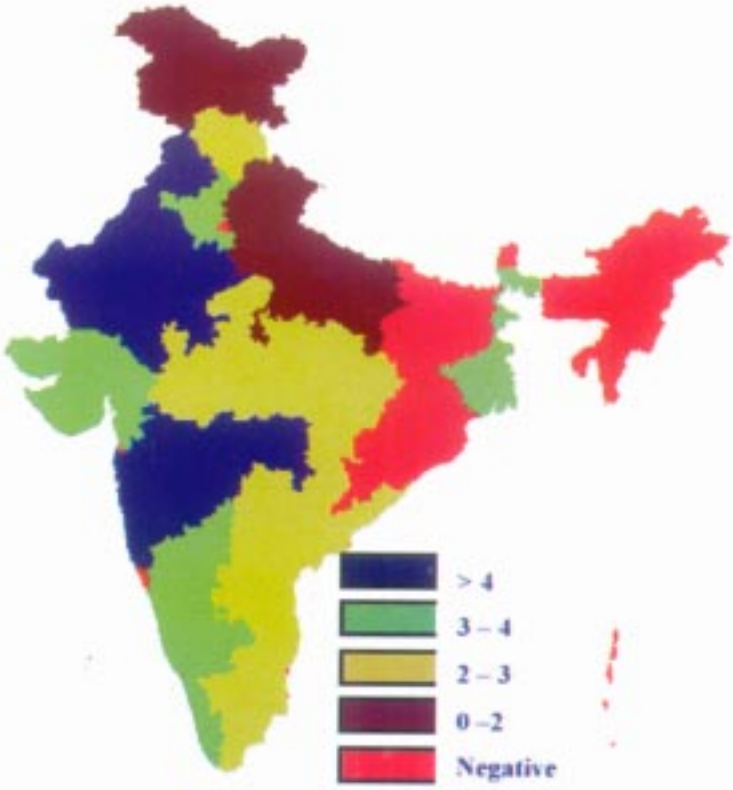


Figure 16: Achievable growth in agriculture by states during X Plan (per cent/annum)



Economic and Food Security Status of the Target Population in Tribal, Backward and Hilly Areas

Mruthyunjaya, Sant Kumar and Anil K. Dixit

Despite the near food self-sufficiency in the country, a large chunk of Indian population living in harsh and difficult terrains, particularly in tribal and hilly areas, does not have an easy and adequate access to food. As a result, they suffer from chronic nutrition insecurity. Availability of suitable technologies and their adoption are quite low in these under-privileged areas despite the efforts made through different programmes. It is felt, that the socio-economic conditions and food security status of these people could be raised, if an integrated mission approach is followed in these programmes. Further, such programmes /interventions should be based on assessment of status and the need of the target population. Keeping this in view, information for this study was collected from 95 villages in 21 districts of 16 states. The findings are as follows:

At the district and village level

a) The target area was relatively backward in terms of literacy rate and less urbanized as compared to the national average. The forest area was reported to be more than double the national average, particularly in tribal and hill region. About 2/3rd of the total cropped area was under cereals.

b) The productivity of crops in general was lower, 50 to 60 per cent lower than the national average in different crops. Lower use of inputs like irrigation, fertilizer and improved/high yielding varieties of seeds were responsible for lower productivity. For instance, fertilizer consumption in all these regions

are lower than that of the country average (about 68 kg./ha), in some cases as low as one-fourth of it, particularly in hilly region. Irrigated area as per cent of gross cropped area is about 14 per cent in tribal plain and rainfed pocket of the backward region as compared to the all India level (36.68 per cent). The area under HYVs is also very less, and varying (11 to 43 per cent) in relation to the country average of 74 per cent (all crops).

At the household level

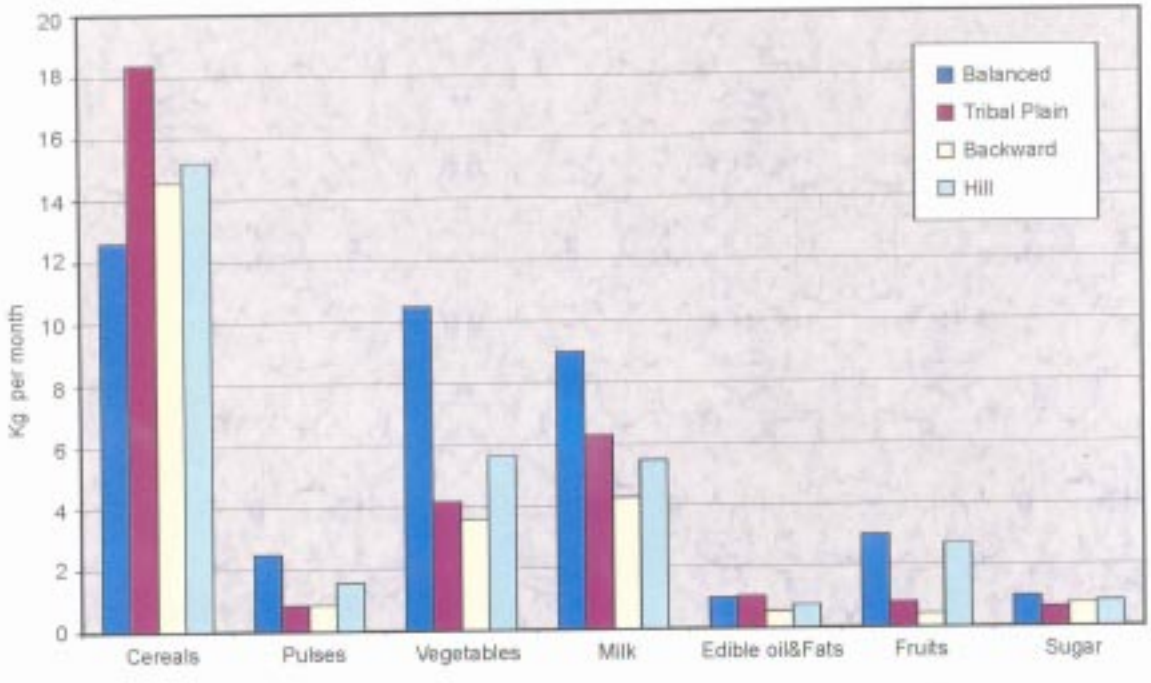
a) In general, quantity of food items consumed is below the recommended level in almost all the food items except cereals. (Figure 17). It was further observed that the deficit in consumption was more in case of vegetables, fruits and milk. For instance, vegetable consumption in selected households was only about 50 per cent of the recommended quantity. Similarly, very low consumption of milk was observed in the households of backward pockets, particularly in the rainfed regions.

b) The marketed surplus of staple cereals like rice, wheat and maize varied between 7 to 40 per cent. Both the tribal plain and hill regions, in general, had higher marketed surplus of non-food crops like: groundnut, oilseeds, potato, vegetables, fruits and sugarcane than in the backward region.

c) Farm employment formed the major source of employment and varied between 67 to 83 per cent of total employment. The off-farm opportunities were meagre. The farm income was not sufficient to adopt the capital intensive modern farm technologies, which adversely affected: use of modern inputs, the farm productivity, and ultimately the food security status.

The analysis reveals the need for greater attention to: address the backwardness of these regions through the generation, and wider adoption of improved technologies, development of infrastructure, promotion of farm diversification and creating off-farm employment opportunities. Location specific proven technologies need to be widely disseminated to bridge the yield gaps. There is also a need for creating an enabling environment through relevant polices and sustained infrastructural support.

Figure 17: Food security status (per adult person) in selected regions (1999-2000)



Progress under NATP

Eight NATP projects: namely, Institutionalization of Research Priority Setting, Monitoring and Evaluation, and Net-working of Social Scientists (O &M Reform), Socio-economic Dynamics of Rice Production System in India (PSR), Analysis of Productivity Changes and Future Sources of Growth in Rice-Wheat cropping System (PSR), Analysis of TFP of Agriculture by Districts and States (PSR); Household and Nutritional Security (MM), Integrated National Agricultural Research Information System (INARIS) under Mission Mode, Indias Livestock Feed Balance and its Environmental Implication (CGP) and Water Food Security Scenario Analysis for 2025- Agroecological Approach (CGP), are being undertaken by the centre. Significant research contributions are made under these projects and the salient findings are presented in this report under respective research themes. This section describes broader issues like impact of NATP and networking of social scientists.

Benchmark Status for Assessing Impact of NATP

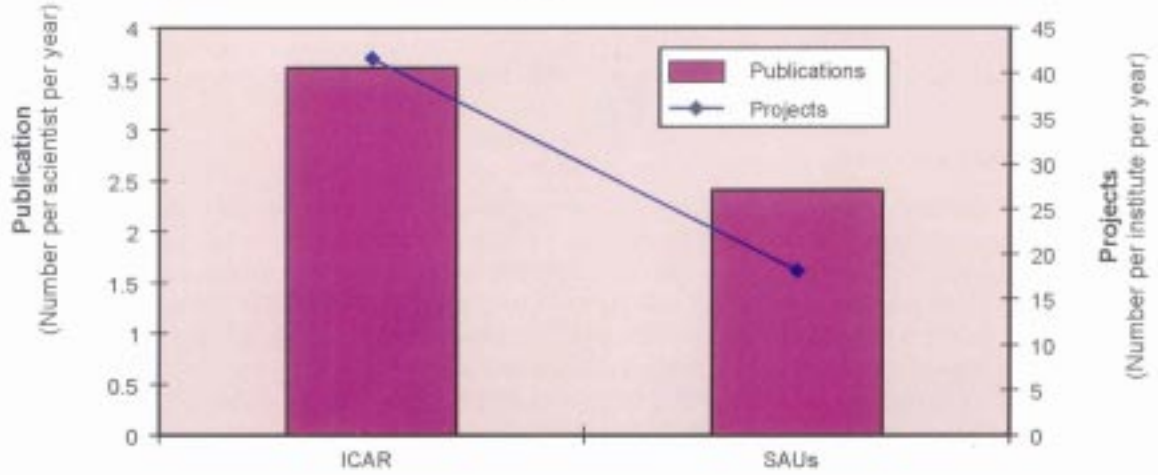
Mruthyunjaya, P. K. Joshi, Sant Kumar Pandey, Suresh Pal, L. M. Pandey, A. K. Jha and Raka Saxena

For assessing the impact of NATP processes, a benchmark survey was undertaken in 14 research institutions: (2 ICAR institutes and 2 state agricultural universities (SAUs) each from Rainfed and Irrigated Agro-ecosystems, 1 ICAR institute and 1 SAU, each from Arid, Coastal, and Hill & Mountain Agro-ecosystems). Three criteria were used for selecting a research institution: (i) financial resources received by the institution under NATP, (ii) number of projects sanctioned for the institution under NATP, and (iii) share of NATP budget in the total budget of the institution. After selecting the institutions, 5 NATP and 5 non-NATP projects were selected for more indepth study. All scientists working for the sample projects were interviewed/contacted for this exercise. The benchmark status was assessed with respect to: technology development, publications, research facilities, financial resources, management reforms etc.

Technology Development

Research publications are the major indicators for assessing scientific productivity. Figure 18 gives details about the projects and research publications in ICAR institutes. The numbers are quite low in SAUs as compared to ICAR institutes, probably due to the main emphasis on teaching in SAUs.

Figure 18: Publications and projects in ICAR institutes and SAUs



Scientific productivity in terms of technology developed in ICAR Institutes and SAUs is given in Table 23. In ICAR institutes, the total number of technologies developed per scientist per year was 0.17. This indicates that a scientist in ICAR institutes develops a technology once in 6 years. In SAUs, total number of technologies developed per scientist per year was 0.15 indicating that a researcher in SAUs develops a technology in about 7 years time.

Table 23: Development of technology **(Number per scientist per year) (1998-99)**

Particular	ICAR institutes	SAUs
Identification of improved varieties	0.16	0.14
Identification of intermediate products	0.15	0.13
Agricultural and livestock processes/ practices	0.21	0.17
Agricultural and livestock inputs	0.12	0.18
Development of machines/equipments	0.14	0.11
Development of scientific methodologies	0.19	0.12
Total	0.17	0.15

Expenditure pattern

Improving financial management of the system and rationalizing expenditure pattern are crucial for enhancing the productivity and the efficiency of the NARS. It is expected that the implementation of NATP would significantly contribute to this objective. Table 24 presents the pre-NATP financial scenario in SAUs and

Table 24: Expenditure pattern in pre-NATP period **(TE 1998-99)**

Particular	ICAR	SAUs
Annual expenditure per institute (Rs million)	157	134
Proportion of		
Salary	74	71
Equipments	10	6
Operational expenses	8	5
HRD	<1	<1
Other	7	18

ICAR institutes. It is noted that the establishment expenses dominate in the total expenditure in both ICAR Institutes (74 per cent) and SAUs (71 per cent). The expenses on travelling, HRD and recurring contingencies, which are crucial for improving scientific productivity, were very low. Similarly, HRD expenditure was only 0.43 per cent of the total expenditure in SAUs and 0.69 per cent in ICAR Institutes.

Delegation of powers

Decentralization of powers and smooth delivery of financial resources are essential for timely flow of funds and successful implementation of research programs. It helps in assessing the additional requirement of funds, manpower, equipments and training needs for successful completion of research projects. It also creates an obligation on the part of research managers to provide the required resources in time and leave the execution task with the project leader. The delegation of powers to the: Principal Investigators(PIs), co-ordinating centre principal investigators (CCPIs) (in SAUs and ICAR Institutes), and their responses during the initial stage of introduction of the reform are, given in Table 25. The delegation of powers and their utilization is below the expectations at present due to: the structural and functional complexities of the system and lack of proper understanding of the new management philosophy and procedures.

Table 25: Implementation status of delegation of powers to PIs/CCPIs under NATP, 1999-2000

(percent of total responses)

Powers	ICAR institutes	SAUs
I. *Administrative*		
Sanctioning tour programs and counter signature of T.A. bills	69.93	10.80
Sanctioning tour advances for self and other staff	73.26	21.62
Power to restrict the frequency and duration of journey	79.92	21.62
Sanctioning casual leave	76.59	48.64
II. *Financial*		
Powers to sanction:		
a. Expenditure on holding workshops, meetings/conferences	86.58	21.62
b. Expenditure on registration charges at symposia/seminars at national level	69.33	32.42
c. Recurring contingent charges for management and operating laboratories and farms including consumables not covered under other items	69.33	32.42
d. Conveyance	79.92	35.13
e. Hire-Purchase of books, publications and reprints of scientific papers	79.92	37.83
f. Expenditure on purchase of chemicals, glassware, tools, equipment, insecticides including consumables for research work	79.92	43.23
g. Maintenance of computers and other peripherals	69.93	32.42

Evaluation of research

Research evaluation, as a management tool for improving planning and implementation of research in the system, has not been very successfully adopted in the past partly due to inadequate attention paid to structural and functional complexities of the system. The elements of emerging paradigm shift such as: research prioritization, multi-disciplinary research, inter-institutional collaborations, manpower development, site-specific technology generation and dissemination, project-based financial arrangements, and cost-effectiveness of research are, therefore, currently weak in the Indian NARS. Mechanisms for research priority setting lack objectivity and transparency, and involve judgement of scientists and top-down allocation of research resources. The process of monitoring and evaluation is ineffective, as it is not properly linked with evaluation of the scientist, the research program and the institute. Improving the productivity and performance of the NARS requires that their structural and functional complexities are given due considerations in designing a broad framework of priority setting, monitoring and impact assessment. There is a need for changing the mindset so as to adopt the new processes of research management. Speeding up the reform process and more effective delegation of financial and administrative powers may require a better information flow through training and popularization of the philosophy, concept and importance of the new paradigm and tools for research management.

Impact of Research Management Processes Initiated Under NATP-A Mid Term Assessment

Mruthyunjaya, Suresh Pal and L.M. Pandey

The NATP was launched with the aim of introducing major changes in agricultural research and extension in the country and to support agricultural research and extension in high priority areas. The main idea is to improve efficiency of the NARS, so as to: address effectively the national goals of alleviation of household

food and nutritional insecurity and poverty, sustain an efficient and diversified growth, and conserve environment and natural resources. This is being done through initiation of a number of new 'business processes' and funding of research and extension activities. The study provides a mid-term assessment of the impact of NATP with particular reference to: research planning, capacity development, competitive research funding, management issues and early socio-economic impact of promising technologies.

There is a wider appreciation of the need for improved priority setting, monitoring and evaluation (PME) mechanisms in the NARS. The progress in multidisciplinary and multi-institutional research approach, though steady but is slow on account of some problems, which are considered as transitional. To accelerate this process further, there is much scope for improving reliability, functionality and efficiency of electronic connectivity in the system. Peer review of NATP projects is yielding good results and eco-regional approach in research planning and implementation is greatly appreciated.

Box 3: Impact of NATP Processes

Process	Impact	Suggestions
PME	Change in mindset; Case studies; Evidence of impact	Link with funding decision
Project-based planning	Widely appreciated	Need for decentralization
Multidisciplinary collaborative research	Breaking institutional rigidities	Need for decentralization and effective communication
Peer review	Sharpening of research focus and improvement of research quality	Streamlining of process
Competitive grant program (CGP)	Objective criteria for evaluation; timely processing	Need for realization of specific objective of CGP
Fund utilization	Allocation congruence with norms; emphasis on marginal environment	Low utilization rate; need for financial reforms
Decentralization	Better in ICAR; slow in SAUs	Lack of clarity; dual command
Human resource development (HRD)	Improvement in skills, publication, and teaching	Streamline international training

Human capital development is the greatest opportunity under NATP. Despite concrete outputs from previous training programs, the progress is very slow. It will be a missed opportunity, if progress cannot be made under this soon. Competitive research funding is doing very well, though there is scope to improve it further. The allocation of funds under NATP largely to support operational funds, and priority research (areas, ecosystems, themes, etc.) is welcomed widely. But the progress in utilization at the project level is picking up

Box 4: Early expected impact of technologies

Agro-ecosystem	Name of Technology	Yield Gains(%)	Adoption (%)	Target group
Arid	Backyard poultry	25	90-95	Small and marginal farmers landless labourers
	Feed machine	25-50	40-50	Women, animal farmers
	Integrated nutrient management	32-96	10-15	–
Irrigated	Zero tillage in rice-wheat system	10	60	–
	Inter-cropping in sugarcane	57	85	Small farmers, women
	Sowing machine	38	35	–
Rainfed	Rainwater harvesting	900	63	Tribal farmers
	Inter-cropping in mango	41	65	Small farmers
	Integrated nutrient management	145-226	80	–

Table 26: Fund Utilization at the Project Level, 2000-2001

Sl. No	Particular	Arid (N=25)	Irrigated (N=36)	Rainfed (N=38)
1.	**Funds Utilized** (Rs. lakhs per project)	12.01	14.40	13.54
2.	**Fund Utilization as Percent of**			
	a. Budget Sanctioned	31.48	21.74	22.54
	b. Amount Released	61.65	44.58	42.25
3.	**Constraints in Fund Utilization**			
	Delays in release of funds from AED/PIU: late receipt of audit utilization certificate and statement of expenditure.	12	53	39
	Cumbersome procurement modality	80	47	26
	Inadequate funds: further break-up of funds under different heads, transaction cost, and inflation.	0	17	16
	Delays within institute: non-delegation of powers.	44	28	16

N = number of projects in the sample.
Source: Compiled from Agro-ecosystem Directorates and project progress reports.

at a slow pace (Table 26). Reforms in financial management including simplification of rules and procedures hold the key. Another important determinant is decentralization of powers at all levels. The position is relatively better in ICAR Institutes, whereas it is taking time in SAUs.

Some of the management issues relating to poor performance in utilization of funds are attributed to PIU (NATP) itself. Issues like: delays in release of funds, complexities in purchase of equipments, completion of audit and submissions of statement of expenditure (SOE), etc are the important ones. But some problems are within the organisations themselves like: delay in release of grants to PIs, completion of audit and submission of Statement of Expenditure, compatibility with non-NATP projects, etc.

It may be too early to track the socio-economic impact of the projects sponsored under NATP. But the early information, on the trends of expected impacts of selected technologies as provided by the PIs in all the agro-ecosystems, is encouraging. There is a need to document and report the socio-economic information so that impact assessment of the technologies becomes easy later.

Guidelines for screening and priortizing projects under Competitive Grant Program of NATP

U.C. Sharma, Suresh Pal and P. L. Gautam

The Competitive Grant Program (CGP) is a new mode of supporting research under NATP. The purpose is to attract short-term, demand-driven, and result-oriented research projects on competitive basis. The criteria were developed for prioritization of the research proposals received under CGP. Based on the importance, they can be categorized into two categories. First, the proposals are subjected to administrative prescreening for their completeness, conformity with CGP requirements and classification into appropriate themes by the national coordinator. The proposals meeting these requirements are evaluated by the Project Screening Committees using the following criteria:

Primary criteria - These are applied for assessing relevance and scientific strength of the proposal. A successful proposal must satisfy the following criteria.

(a) Relevance: This is assessed based on the consistency of the proposal with the identified priorities, and expected contribution to the advancement of science or to research objectives (for instance, yield

increase or cost reduction, sustainability of production systems including conservation of natural resources, benefits accruing to marginal areas and poor people, welfare of women, etc.)

(b) Scientific strength: The problem, hypotheses, critical review of past studies, technical program and expected output of the proposal should be clear, consistent and technically sound.

(c) Competence of the investigator(s) and advantage of the host institution in undertaking the proposed work are accorded due weightage.

(d) Probability of research success should be reasonably high, i.e. the chances of accomplishing research targets in stipulated time are high.

(e) The proposal should not lead to any duplication of on-going research programs, but must bridge the gaps as identified through critical review of past studies.

(f) The proposal should justify for expenditure to be met from public funds (i.e. the proposed research would not be done by the private sector under normal circumstances).

Secondary criteria- These criteria examine expected contribution of the proposal to the thrust areas of NATP. The proposals meeting these criteria will get additional weight.

(a) An evidence of the system perspective in identification of research problem

(b) Research implementation in a multidisciplinary and inter-institutional framework.

(c) Research institutions from outside ICAR/SAU system; private research institutions and NGOs, are encouraged.

(d) The proposal submitted by a newly established institution or an institution located in the northeast region.

(e) Either principal investigator is a woman scientist or proposed research is expected to improve welfare of women.

Since a large number of proposals are received at the synopsis stage, a checklist of the above criteria is used for their screening. For screening the detailed proposals, the scoring approach is used. All the proposals are assessed against the above mentioned criteria using a scale of 1 to 10 (1 least important; 10 most important). The proposals are ranked based on a composite score obtained using an appropriate weighting scheme (e.g. 0.4 for relevance; 0.3 for scientific strength of the proposal, including comparative advantage of the researcher(s) and host institution; 0.3 for concerns of equity and NATP philosophy). The secondary criteria are considered only when the proposal meets all the primary criteria (score>6).

Website of Agricultural Economists

Rajni Jain and Raka Saxena

A Website of agricultural economists (http://www.agrieconet.nic.in) was developed and nested with support from NATP. The website covers data of 60 organisations (28 SAUs, 31 ICAR Institutes and one miscellaneous category). The website contains 7 modules relating to organizations, scientist, publications, projects, courses, theses and books. All categories of information in this site are classified by 12 themes. If one is aware of the theme under which desired information is classified then he/she can directly select the theme and get the details. Alternatively, organization can be selected according to needs for details of information. A search option is also available for exploration. The objectives are research information exchange, resource sharing, and optimization of response time for addressing methodology related problems. The website was launched by prof. M.S. Swaminathan on 28th December 2000 at Tamil Nadu Veterinary and Animal Sciences University (TNVASU), Chennai. The website was updated in June 2001. The preparations for next update in June 2002 and further additions are in process.

III NCAP Outreach Programme

Gordhan Singh, Harbir Singh, Rasheed Sulaiman V. and B. S. Panwar

The Centre, in collaboration with an NGO, Society for Education and Social Welfare (SESW) Kandhla, Muzzafarnagar district of Uttar Pradesh, initiated in 1999; a diagnostic study on constraints in agricultural development in Western Uttar Pradesh. This part of the Indo-Gangetic belt, which had been one of the most agriculturally productive areas and mainly growing sugarcane and wheat, has been witnessing a crisis in its agricultural front over the last few years. This study, covering five villages in the Muzaffarnagar District of Western Uttar Pradesh, revealed the major constraints affecting agricultural development in this region. Important among them include: deteriorating soil nutrient status, declining profits from sugarcane-wheat farming, irregular and unreliable supply of power and canal water, falling water tables, and problems in marketing sugarcane due to delayed crushing season and delayed payments. There exists a broad consensus among all concerned that keeping in view the ecological and economic situations, farming in this area has to diversify. But lack of dependable advice on agriculture (technology, marketing, value addition) and lack of organisations that can support farmers, have effectively blocked the prospects of diversifying to other crops or enterprises. Addressing these constraints requires concerted efforts of a number of institutions. Though several organisations exist in the district, their activities are not coordinated at the field level. This is also a major challenge.

To share the findings of this study and to ponder upon the possible activities of intervention, a series of meetings were arranged by NCAP with farmers in these villages. Officials representing: IARI, the Department of Agriculture, Banks, UP Diversified Agricultural Support Programme (UPDASP), Village Panchayat, Krishi Vigyan Kendra, Agricultural University etc., also participated in these deliberations. The Centre is presently facilitating the formation of groups of farmers and in linking these groups: with organisations involved in training (KVKs), Agricultural University , research (IARI), credit (NABARD and banks) and other support services (UPDASP, Department of Agriculture, Department of Horticulture, Animal Husbandry). While the SESW and the SHGs of farmers are actually implementing the programme, NCAP is playing the role of a facilitator. This is considered as a field laboratory for the Centre and the experiences with the implementation of this project is expected to provide lessons on how the recommendations of a research project are implemented in the field.

Interaction meeting at Muzaffar Nagar

IV 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 have been the members of the important committees. Participations like these have helped the Centre to: gain insight, contribute towards research findings and experinces. The details are as follows:

Mruthyunjaya was the Chairman of the PME Task Force of ICAR and the NATP Site Committee. He also served as a member of the: NATP CGP Screening Committee, O and M Task Force, RAC of the Agro-Economic Research Centre, Delhi; Institute Management Committee of NAARM, Technical Advisory Committee of CGPRT Centre, Bogor, Indonesia; Committee to formulate guidelines for the assessment of AICRPs, AHRD Impact analysis review team, Governing Body of SAARC Agricultural Information Centre, Dhaka, Bangladesh; and Committee for the development of the ICAR Strategic Plan to translate ICAR vision 2020 into action. He also acted as the SAARC nodal officer of ICAR and the Member Secretary of the X Plan Working Sub-Group on: Organization, Finance, Management, Agro-Economics, Rural Development. He is also the Secretary of the Agricultural Economics Research Association (India).

Dayanatha Jha was the Chairman of the Screening Committee for Competitive Grants Projects of NATP. He also served as a member of the: Expert Committee on Rural Credit, National Bank for Agricultural and Rural Development, QRT for Central Arid Zone Research Institute, Jodhpur; QRT for Project Directorate of Cropping Systems Research, Modipuram; Review Team for Punjab Agricultural University, Ludhiana: Research Advisory Committee for Directorate of Wheat Research, Karnal; Advisory Group on Bihar Development Report, Planning Commission; NATP Task Force on PME; and NSS 59th Round Working Group.

P.K Joshi was the member of the X Plan Working Sub-Group on: (a) agricultural mechanisation and (b) agricultural economics and policy. He also served as: a member of the Research Advisory Committee of the Directorate of Rice Research, Hyderabad; QRT of the Central Soil Salinity Research Institute, Karnal; member of the Board of Governors of the India Natural Resource Management, Anand and continued as member of the editorial board of the Indian Journal of Agricultural Economics.

S.Selvarajan served as member of the Reviews and Appraisal missions dealing with irrigation investment prioritisation, O and M funding and cost recovery related policy issues under the water resources consolidation project of Orissa, Tamil Nadu and Uttar Pradesh. He also served as a member QRT for Water Technology Centre for Eastern Region, Bhuvaneswar.

Ramesh Chand served as member of the Expert Committee on Strengthening and Developing Agricultural Marketing constituted by the Government of India. He also served as a member of the Economic Advisory Committee to the Chief Minister, Himachal Pradesh.

VI Awards and Recognitions

NCAP Annual Report 1999-2000 received the prize for the Best Annual Report instituted by the Indian Council of Agricultural Research.

Anjani Kumar, (Scientist) received the R.T. Doshi Foundation Prize for the best paper presentation in the 9th Annual Conference of Agricultural Economics Research Association (21-22 November 2001). The paper has been on Economic Liberalisation and Agricultural Exports in India and was co-authored with A.K. Jha.

B.C.Roy, (Scientist) received the Gold medal for his PhD work and the best student award for outstanding overall performance in Ph. D. degree programme, from the Indian Agricultural Research Institute, New Delhi. Roy did his Ph D work on "Investment and Productivity in Indian Agriculture" under the supervision of Dr. Suresh Pal, Senior Scientist, of this Centre.

Pratap S Birthal (Senior Scientist) received the D. K. Desai Award for the best research article published in the Indian Journal of Agricultural Economics, 2001-01. This paper entitled "Economics of Integrated Pest Management: Evidences and Issues'" was written in co-authorship with O.P Sharma and Sant Kumar.

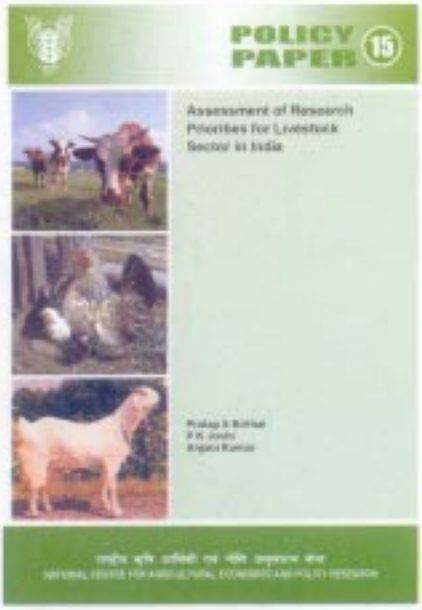
VII. Linkages and Collaboration in India and Abroad including Externally Funded Projects

Name of the Official	Purpose	Organisation
P. Adhiguru	Scope of Agricultural based interventions for Sustainable Nutritional Security.	TNAU, Coimbatore.
B.C. Barah	Research Project on Socio-economic dynamics of rice-production system.	International Rice Research Institute, Philippines.
P.S. Birthal	Increasing productivity of livestock in mixed crop-livestock system in South Asia.	ICRISAT, Hyderabad.
	India's Livestock Feed balance and its environmental implications.	Society for Economic and Social Research, Delhi.
Dayanatha Jha Anjani Kumar	Preparation of State Development Report for Bihar on Agriculture and Allied Sector.	1. Institute for Human Development (IHD), Delhi 2. Planning Commission, Govt of India.
P.K. Joshi Anjani Kumar	Research Project on Strategies and Options for Increasing and Sustaining Fisheries and Aquaculture Production to Benefit the Poor Households in Asia.	International Centre for Living Aquatic Resources Management (ICLARM), Penang, Malaysia.

P.K. Joshi	Intensification of maize in Asian upland farming systems—Policy Options for: productivity enhancement, environmental protection and food security	CIMMYT, Mexico.
P.K. Joshi P.S. Birthal Anjani Kumar	ICAR-IFPRI Collaborative Project on Agricultural Diversification in South Asia: Problems and Opportunities.	International Food Policy Research Institute, Washington.
P.K. Joshi	Analysis of productivity changes and future sources of growth for sustaining rice-wheat system in the Indo-Gangetic Plains.	BCKV, Kalyani; CSAUAT, Kanpur; GBPUAT, Pantnagar; HAU, Hisar; NDUAT, Faizabad; PAU, Ludhiana; RAU, Pusa.
Lakshmiprasanna	Determinants of performance of Self-help Groups in rural-microfinance	IASRI, New Delhi.
Mruthyunjaya Sant Kumar	Research Project on Household Food and Nutritional Security for Tribal, Backward and Hilly Area.	1. Indian Agricultural Statistics Research Institute, Pusa, New Delhi. 2. Indira Gandhi Agricultural University, Raipur, Chattisgarh. 3. Assam Agricultural University, Jorhat, Assam. 4. Central Inland capture Fishries Research Institute, Barrackpore, West Bengal. 5. Central Institute for Subtropical Horticulture, Lucknow, UP. 6. Central Institute of Agricultural Engineering, Bhopal, MP.
Ramesh Chand	Research Project on Government Intervention in food grain markets in the new context.	Ministry of Food, Consumer Affairs and Public Distribution, Government of India.
	Research Study on Competitiveness of Indian Agriculture.	Indian Institute of Foreign Trade, New Delhi.
	Prepare a research paper on Regional Strategic Framework for Supporting Agricultural Trade policy in Asia and the Pacific.	Food and Agricultural Organisation, Bangkok.
	Prepare a paper on Development of Agriculture and Allied Sectors in Punjab.	Centre for Research in Rural and Industrial Development, Chandigarh.
Rasheed - Sulaiman V	Research Project on: Optimising Institutional Arrangements for demand—driven post-harvest research, delivery, uptake and impact on the livelihoods of the poor through public and private sector partnerships.	ICRISAT, Hyderabad.
	Review Study on Agricultural Extension for the Ministry of Agriculture— (Millennium Study on the State of Indian Farmers).	Indian Institute of Management, Ahmedabad: Annamalai University, Annamalai, Tamil Nadu.
S. Selvarajan B.C. Roy	Water food security scenario analysis for 2025 ; Agro-ecological regional approach.	1. Water Technology Centre, TNAU, Coimbatore. 2. Water Technology Centre for Eastern Regions, Bhuvaneshwar. 3. Gujarat Agricultural University, Navsari.
S. Selvarajan Anjani Kumar Lakhsmiprasanna	Integated National Agricultural Resources Information System—Socio-economic database development.	Indian Agricultural Statistical Research Institute, New Delhi.

VIII Publications

A Research Papers



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Birthal, P.S and Parthasarathy Rao, P. (2002) Economic contribution of livestock sector in India. In: Pratap S. Birthal and Parthasarathy Rao, P (eds) *Technology Options for Sustainable Livestock Production in India,* ICRISAT, Patancheru and ICAR, New Delhi

Birthal, P.S. (2002) Technological change in India's livestock sector: Evidences and issues. In: Pratap S. Birthal and Parthasarathy Rao, P (eds) *Technology Options for Sustainable Livestock Production in India,* ICRISAT, Patancheru and ICAR, New Delhi

Birthal, P.S. (2002) Technological change in India's livestock sector and its impact, In: Pratap S Birthal, Anjani Kumar and Laxmi Tewari (eds) *Technology options for sustainable livestock production in India,* Agricultural Economics Research Association (India), and Advance Publishing Concept, New Delhi.

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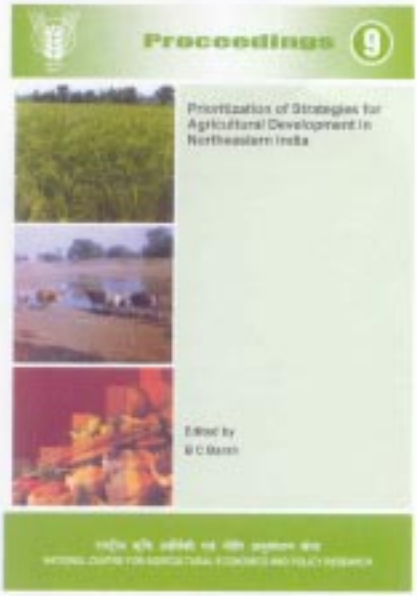

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S.Selvarajan, Increasing Inland Fish Production in India; Role of water and other policy issues, FAO/NACA/CIFA Expert Consultation Meeting on Intensification of Food Production through fresh water aquaculture in low income food deficit countries, Central Institute of Freshwater Aquaculture, Bhubaneswar, 16-19 October, 2001.

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IX List of Approved on-going Projects, 2001-02

Sl. No.	Projects	PI/CCPI
1	Resource allocation for agricultural sector in India	D. Jha
2	Improving productivity of livestock in mixed crop–livestock systems	P. S. Birthal
3	Optimising institutional arrangements for demand-driven post-harvest research, delivery, uptake and impact on the livelihood of the poor through public and private sector partnerships	Rasheed Sulaiman V
4	Government Intervention in foodgrains market in the changing context	Ramesh Chand
5	Intensification of maize in Asian Uplands: Production components for India	P. K. Joshi
6	Agricultural component of UP Development Report	P. K. Joshi
7	Economic analysis of Total Factor Productivity of agriculture by District and Region	Anjani Kumar
8	Socio-economic dynamics of rice production in Eastern India	B. C. Barah
9	Institutionalizing Priority setting, monitoring and evaluation in the NARS and networking of social scientists	Mruthyunjaya
10	Impact assessment of technology intervention and crop diversification in tribal, backward and hilly areas	Mruthyunjaya
11	Impact of agricultural R&D in India	P. K. Joshi
12	Analysis of productivity changes and future sources of growth for sustainable rice-wheat cropping system in the Indo-Gangetic plains	P. K. Joshi
13	India's livestock feed balance and its environmental implications	P. S. Birthal
14	Integrated National Agricultural Resources Information System	S. Selvarajan
15	Impact evaluation of Integrated Crop Management in Cotton	Sant Kumar
16	Diagnostic study on constraints in agricultural development in Western UP	G. Singh
17	The demand supply projections of livestock products towards 2020	M. B. Dastagiri
18	Scope for agriculture based intervention for sustainable nutritional security	P. Adhiguru
19	Research priorities in animal science research	P. S. Birthal
20	Water Food Security Scenario Analysis	S. Selvarajan
21	Determinants of performance of Self Help Groups in rural micro-credit	P. A. Laxmiprasanna
22	Networking of social scientists using internet technologies	Rajni Jain
23	Agricultural diversification in South Asia: Emerging challenges and opportunities	P.K Joshi
24	Strategies and options for increasing and sustaining fisheries and aquaculture production to benefit the poor households in Asia	P.K Joshi
25	Effectiveness of CGIAR Institutions– Country perspective	Mruthyunjaya

X Consultancy Projects

The consultancy and contract research activities have been formalized as per the Council's guidelines and specifically designed to complement the ongoing emerging research thrusts and also to supplement the budgetary resources of the Centre.

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. and Birthal, P.S.	ICRISAT, Hyderabad	Constraints and opportunities for rabi cropping in rice fallows
Joshi, P.K.	Planning Commission Government of India	Section on Agriculture: UP Development Report
Mruthyunjaya Suresh Pal	Asia Pacific Association of Agricultural Research Institutions	Prioritization of Agricultural Research in South and West Asia
Mruthyunjaya	World Bank	CGIAR's Effectiveness: NARS Perspective
Ramesh Chand	Indian Institute of Foreign Trade	Export Competitiveness of Indian Agriculture
	FAO Regional Asia Pacific Bangkok	Regional Starategic Framework for Support of Agricultural Trade Policy in Asia and the Pacific
Rasheed Sulaiman V	ICRISAT, Hyderabad	Optimising institutional arrangements for demand driven post-harvest research, delivery, uptake and impact on the livelihood of the poor through public and private sector partnerships
Suresh Pal	Rapid Agri-Biotech Consultants, New Delhi	Technological and developmental strategies for agricultural growth in marginal areas with a focus on poverty alleviation

XI RAC, MC and SRC Meetings

Research Advisory Committee(RAC)

The Research Advisory Committee of the Centre comprises the following members

Dr. S. S. Johl
Chairman
21, Gurudev Nagar
Ludhiana (Punjab)

Dr. G. S. Bhalla
Centre for Studies in Regional
Development,
Jawaharlal Nehru University
New Delhi

Dr. Ashok Gulati
Professor
Institute of Economic Growth
Delhi University
Delhi

Dr. J.C. Kanwar
Rtd. Jt. Addl. Registrar
Cooperative Societies
Department of Cooperation
Government of Punjab
Chandigarh

Dr. P. K. Joshi
Principal Scientist
National Centre for Agricultural
Economics and Policy Research,
Library Avenue, New Delhi
(Member Secretary)

Dr. Mruthyunjaya
Director
National Centre for Agricultural
Economics and Policy Research
Library Avenue
New Delhi

Dr. S.S.Acharya
Director
Institute of Development Stuides
8-B, Jhalana Institutional Area
Jaipur
Rajasthan

Dr. S.S. Bisaliah
Vice Chancellor
University of Agricultural Science
Hebbal
Bangalore

Dr. J.P. Mishra
ADG (ESM), ICAR
Krishi Bhawan
New Delhi

The major observations of the RAC meeting held on 16 October, 2001 are as follows:

NCAP should initiate research on: cash crops, land and labour markets, labour migrations, efficiency of marketing institutions, augmenting oilseeds productions, and institutional changes for managing surplus grain production. The need for studying the implications of WTO on different sectors of the economy: such as, shifts in investments patterns on growth and equity, changes in each sector to overall economic growth, and IPR on seed sector was also emphasised by the RAC. On the livestock sector, the committee suggested studies looking at factors influencing demand for livestock products and relationship between feed-fodder and productivity of animals. A critical review of the NCAP cadre strength to include more senior level scientific positions, concerted attempts for training scientists in advance research centres, and the need for developing linkages with teaching institutions was also stressed by the Committee.

XI RAC, MC and SRC Meetings

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Dr. S. S. Johl
Chairman
21, Gurudev Nagar
Ludhiana (Punjab)

Dr. G. S. Bhalla
Centre for Studies in Regional
Development,
Jawaharlal Nehru University
New Delhi

Dr. Ashok Gulati
Professor
Institute of Economic Growth
Delhi University
Delhi

Dr. J.C. Kanwar
Rtd. Jt. Addl. Registrar
Cooperative Societies
Department of Cooperation
Government of Punjab
Chandigarh

Dr. P. K. Joshi
Principal Scientist
National Centre for Agricultural
Economics and Policy Research,
Library Avenue, New Delhi
(Member Secretary)

Dr. Mruthyunjaya
Director
National Centre for Agricultural
Economics and Policy Research
Library Avenue
New Delhi

Dr. S.S.Acharya
Director
Institute of Development Stuides
8-B, Jhalana Institutional Area
Jaipur
Rajasthan

Dr. S.S. Bisaliah
Vice Chancellor
University of Agricultural Science
Hebbal
Bangalore

Dr. J.P. Mishra
ADG (ESM), ICAR
Krishi Bhawan
New Delhi

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Management Committee (MC)

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

Dr. Mruthyunjaya
Director
National Centre for Agricultural
Economics and Policy Research
Library Avenue
New Delhi
(Chairman)

Dr. J.P. Mishra
Assistant Director-General
(Economics, Statistics and Marketing)
ICAR
Krishi Bhawan
New Delhi

Dr. Ramesh Chand
Principal Scientist
National Centre for Agricultural
Economics and Policy Research
Library Avenue
New Delhi

Director of Horticulture
Govt. of Haryana, 30, Bays Building
Sec 17, Chandigarh

The Finance & Accounts Officer
Indian Agricultural Statistics
Research Institute
New Delhi

Dr. R.C. Gautam
Head
Division of Agronomy
Indian Agricultural Research Institute
Pusa, New Delhi

Dr. Harish Gupta
Scientist (Senior Scale)
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The Director
Directorate of Economics and Statistics
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Dr. Karam Singh
Prof. & Head
Deptt of Economics and Sociology
Punjab Agricultural University
Ludhiana, Punjab

Mr. Narender Kumar
(Member Secretary)
Assistant Administrative Officer
National Centre for Agricultural
Economics and Policy Research
Library Avenue, New Delhi.

Two meetings of the Management Committee were held during the current year, the first one on 30 May, 2001 and the second on 5 February, 2002.

Major observations of Management Committee meetings are as follows:

MC meeting held on 30 May, 2001

The Committee approved the revised cadre strength of the Centre and suggested to expedite matters with respect to the construction of office building and quarters. The Committee also suggested to explore the possibilities of getting a few quarters from the ICAR/ IARI pool for the NCAP staff.

MC meeting held on 5 February, 2002

The Committee expressed satisfaction with the efforts made by the Centre in expediting the construction of office building and quarters. It was suggested by the Committee to include a plan for guest house in the X Plan as an additional wing of IASRI guest house.

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 Centre'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 to time and to recommend appropriate action.

Women Cell

- To recommend measures for 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 work done in official language from time to time and suggest relevant measures for improvement.
- To organize Raj Bhasha 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 from time to time.

NATP Site Committee

- To guide and monitor the progress of NATP projects in the Centre.
- To report to the NATP authorities / Council about the progress from time to time.

Institute Joint Staff Council

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

XII Participation in Conferences, Meetings, Seminars and Workshops in India

Name	Theme and Duration	Place
Adhiguru P.	Seminar on Economic empowerment of women 18-19 February, 2002.	National Institute of Science Technology and Development Studies New Delhi
	Seminar on EU-India Cross Innovation Network workshop on Action research: From women empowerment to community building–A case of Dairy Movement 19-22 February, 2002.	National Institute of Science Technology and Development Studies New Delhi
Anjani Kumar	Consultation workshop on Hunger Free India jointly organized by Planning Commission (Govt. of India), MS Swaminathan Research Foundation and World Food Programme of United Nations 24-26 April, 2001.	Vigyan Bhawan New Delhi
	Bihar's Strategic Direction for Economic Development organised by Bihar Industries Association, 23-24 May, 2001.	Maurya Hotel Patna
	National Workshop on Fisheries Economics Research and Education in India: An Overview, 28-29 June, 2001.	CIFE, Mumbai
	IXth Annual conference of Agricultural Economics Research Association (AERA) on WTO and Its implication for Indian Agriculture, 21-22 November, 2001.	IARI, New Delhi
	NCAP-IIVR collaborative workshop on Impact of Vegetable Research in India 1-2 March, 2002.	IIVR, Varnasi
B. C. Barah	Workshop on Socio-economic dynamics of rice production system in eastern India, 9-11 July, 2001.	CRRI Cuttack
	Delhi Summit for Sustainable Development 9-11 February, 2002.	Tata Energy Research Institute, New Delhi
B. C. Roy	Review Workshop of NATP project Analysis of Total Factor Productivity 14 July, 2001.	IARI New Delhi-110012
	National Seminar on WTO, Trade Liberalization and Future of Indian Agriculture, 25 July, 2001.	Farmers Education and Welfare Society, New Delhi
	Applications Using SPSS, 27 December, 2001.	SPSS South Asia & Symbiosis, New Delhi
	National Workshop on NATP CGP Projects, 1-2 March, 2002.	CCS Haryana Agricultural University Hissar

Dastagiri, M.B	Conference on Impact of WTO on Indian Agriculture, Agricultural Economics Research Association, 21-22 November, 2001.	IARI New Delhi
Dayanatha Jha	National Workshop on Impact of Vegetable Research in India 1-2 March, 2002.	IIVR Varanasi
	5th Agricultural Science Congress, 4-7 April, 2001.	Assam Agricultural University, Jorhat
	Seminar on Managing Agri-Business in the New Millennium, All India Management Association, 20-21 July, 2001.	New Delhi
	International Conference on Food and Nutrition Security and Sustainability in Sugarcane Based Systems, 15-16 February, 2002.	IISR Lucknow
	National Symposium on Agriculture in Changing Global Scenario, Indian Society of Agricultural Science, 21-23 February, 2002.	IARI New Delhi
Harbir Singh	National Symposium on Biodiversity vis-à-vis Resource Exploitation: An Introspection, 23-24 April, 2001.	CARI Port Blair
	Panel Discussion on WTO and New International Trade Regime: Implications for Indian Agriculture, 25 August, 2001.	IARI New Delhi
	Brainstorming Session on Implications of Sanitary and Phytosanitary Measures of WTO, 7 September, 2001.	IARI New Delhi
	Workshop on Rural Transformation in India: The role of non-farm sector, 19-21, September, 2001.	India Habitat Centre, New Delhi
	Conference on Impact of WTO on Indian Agriculture, Agricultural Economics Research Association, 21-22 November, 2001.	IARI New Delhi
Mruthyunjaya	Workshop on Sharing Perspective on check home Public-Private Interactions in Agricultural Research 9-10 April, 2001.	Hyderabad
	Meeting for formulation of research programmes in fisheries sector with ICLARM, 12-13 April, 2001.	NBFGR Lucknow
	(X Five Year Plan working group on Agricultural Research and Education) meeting of the Sub-group on "Organization, Finance and Management" 14 May 2001.	NCAP New Delhi
	X Five Year Plan working group on Agricultural Research and Education meeting on the Sub-group on "Agro-Economics and Rural Development" 17 May, 2001.	NCAP New Delhi
	Meeting to finalise South West Asian Research Priorities, Asia Pacific Association of Agricultural Research Institutions, 5-7 July 2001.	ICRISAT Patancheru
	Meeting of the Competitive Agricultural Research Programme (CARP) Grant Committee, 19 August, 2001.	U.P. Council of Agricultural Research, Lucknow
	XII meeting of Priority Setting, Monitoring and Evaluation Task Force of NATP, 20 August, 2001.	NCAP New Delhi
	Workshop on Integrated National Agricultural Resources Information System : Development of Socio-economic database 30-31 August, 2001.	NCAP New Delhi

	Meeting on India-ACIAR consultations on Agricultural Research and Development Priorities, 10-11 September, 2001.	Hotel Nikko New Delhi
	Priority Setting, Monitoring and Evaluation Training Workshop, 7-9 October, 2001.	TNAU Coimbatore
	Conference on Impact of WTO on Indian Agriculture, Agricultural Economics Research Association, 21-22 November, 2001.	IARI New Delhi
	Evaluation of the Socio-Economics and Policy Programme of ICRISAT, 9-17 November, 2001.	ICRISAT Patancheru
	Workshop on Impact Assessment of Agricultural Human Resources Development Study Report, 10 December, 2001.	ICAR New Delhi
	FAO sponsored Expert Group Consultation on Farming Systems and Best Practices for Drought Prone Areas in the Asia and Pacific Region, 22-23 January, 2002.	CRIDA Hyderabad, Andhra Pradesh
	Brainstorming session on WTO in Fisheries, 6-7 February, 2002.	CIFE, Mumbai
	National Seminar on Marketing Problems and Strategies for Agricultural Produce, 24-27 February, 2002.	Agricultural College Nagpur
	National Workshop on Impact of Vegetable Research in India 1-2 March, 2002.	IIVR Varanasi
	Seminar on Managing Agri-Business in the New Millennium, All India Management Association, 20-21 July, 2001.	New Delhi
	National Symposium on Agriculture in Changing Global Scenario, Indian Society of Agricultural Science, 21-23 February, 2002.	IARI New Delhi
P.K. Joshi	Sensitization Workshop on Research Priority Setting and Impact Assessment 28-29 September, 2001.	CRRI Cuttack
	Workshop on 'Policy and Institutional Options for Sustainable Watershed Management, 1-2 November 2001.	ICRISAT Patancheru
	Networking of Social Scientists, 20 November 2001.	NCAP, New Delhi
	Conference on Impact of WTO on Indian Agriculture, Agricultural Economics Research Association, 21-22 November, 2001.	IARI New Delhi
	National Workshop on 'Impact of Vegetable Research in India', 1-2 March 2002.	IIVR Varansi
	Workshop on 'Issue Identification for Global Environment Changes and the Rice-Wheat Food System', 15-16 March 2002.	New Delhi
Ramesh Chand	Conference on Impact of WTO on Indian Agriculture, Agricultural Economics Research Association, 21-22 November, 2001.	IARI New Delhi
	Workshop on Agricultural Marketing Extension, 19-20 July, 2001.	National Institute of Agricultural Marketing Jaipur

	Workshop on State of Indian farmers: A Millenium Study, 30-31 January, 2002.	ISEC Bangalore
	Workshop on WTO and Sustainable Development, 29 September, 2001.	Department of Business Economics, University of Delhi, Delhi
	National Seminar on WTO, Trade Liberalisation and Future of Indian Agriculture, 25 May, 2001.	Farmers Education and Welfare Society, New Delhi
Rasheed Sulaiman V	Workshop on Sharing Perspectives on Public-Private Sector Interaction, 10 April, 2001.	ICRISAT Hyderabad
	9th All India People's Science Congress, 19-22 December, 2001.	All India People's Science Network, Chennai
	Review Seminar on State of the Indian Farmer : A Millenium Study, 30-31 January, 2002.	ISEC Bangalore
	Seminar on Interface with Private Sector Organisations on Policy Framework on Agricultural Extension, 30 October, 2001.	FICCI New Delhi
	Workshop on Private Sector Initiatives in the Agriculture Services-Emerging Issues from Stakeholder Studies, 6-7 July, 2001.	Institute of Applied Manpower Studies, New Delhi
	Workshop on Rural Enterprise Technology Facility, 15 November, 2001.	National Agricultural Science Centre New Delhi
Sant Kumar	1st annual meeting of the Project Household food and nutritional security for tribal, backward and hilly areas, 3-4 May, 2001.	NBPGR New Delhi
	Conference on Impact of WTO on Indian Agriculture, Agricultural Economics Research Association, 21-22 November, 2001.	IARI New Delhi
	Impact of Vegetable Research in India, 1-2 March, 2002.	IIVR Varanasi
S.Selvarajan	FAO/NACA/CIFA Expert Consultation Meeting on Intensification of Food Production through fresh water aquaculture in low income food deficit countries, 16-19 October, 2001.	CIFA Bhubaneswar
	India-ACIAR consultations on Agricultural Research and Development Priorities, 11 September, 2001.	Hotel Nikko Delhi
	Launching workshop of NATP Mission Mode Project on Integrated National Agricultural Resources Information System, 12 April, 2001.	IASRI New Delhi
	Requirement Analysis Workshop on Climatic Data Base Development under INARIS Project, 12-13 July, 2001.	CRIDA Hyderabad

XIII Visits Abroad

Name of the Official	Purpose	Place	Duration
Anjani Kumar	To participate in the planning workshop of the project on Strategies and Options for Increasing and Sustaining Fisheries and Aquaculture Production to benefit poor households in Asia	International Centre for Living Aquatic Resources Managemant (ICLARM), Penang, Malaysia.	20-25 August 2001
B. C. Barah	To attend the workshop on water-wise rice production	IRRI, Philipines	8-11 April, 2002
	To work on the on-going project on Socio-economic dynamics of Rice-Production System	IRRI, Philippines	24, March- 24 April, 2002
	To attend the Agricultural Outlook Conference organised by USDA	Washington	21-28 Feb 2002
Mruthyunjaya	To study the R&D set up and their preparedness to meet the emerging challenges	Mexico, USA, Netherlands	9-24 June 2001
	19th session of the Technical Advisory Committee of ESCAP-CGPRT Centre,	CGPRT Centre Bogor, Indonesia	6-10 January, 2002
	To participate in the planning workshop of the project Strategies and Options for Increasing and Sustaining Fisheries and Aquaculture Production to Benefit Poor Households in Asia	ICLARM, Penang, Malaysia	20-25, August, 2001
P.K. Joshi	As a resource person in the study meeting on Diversification of agriculture in more competitive environment	APO, Tokyo Japan	16-23 May 2001
	Present the progress and develop workplan in the workshop on Upland maize intensification in Asia, under ICAR-CIMMYT project	Kathmandu, Nepal	4-8 June 2001
	To participate in the planning workshop of the project Strategies and Options for Increasing and Sustaining Fisheries and Aquaculture Production to Benefit Poor Households in Asia	ICLARM, Penang, Malaysia	20-25 August 2001
	Prepare a discussion paper on Diversification of agriculture in South Asia: problems and opportunities, under ICAR-IFPRI project.	IFPRI, Washington, DC, USA.	26 Dec., 2001 to 26 Jan., 2002
Ramesh Chand	To Present the theme paper on Grain Trade Liberalisation and Food Security Issues in Asia and the Pacific in the seminar on Stabilizing Domestic Grain Markets for Food Security in Trade Liberalisation Mode organized by Food and Agriculture Organisation Regional office for Asia and Pacific, Bangkok,	Association of Food Marketing Agencies in Asia (AFMA), Thailand and FAO, Bangkok	3-6 December, 2001
Sant Kumar	To attend the Japan South West Asia Youth Friendship Training Programme in Agriculture	Japan	20, September-16, October 2001.
Suresh Pal	Expert Consultation Meeting on Agricultural R & D Priorities for the Asia-Pacific	APAARI, FAO, Bangkok	12-14 Nov. 2002
	Peer Review Workshop on Agricultural R & D Policies in Developing World	IFPRI, Canberra, Australia	16 Feb, 2002

XIV Visiting Scientists Programme

Professor S.Hirashima, Professor, Meiji-Gakuin University, Japan and Dr. Mrs. Pushpa M. Savadatti, Reader, Karnataka University, Dharwad, Karnataka were associated with this Centre as Visiting Scientists during the year. A brief account of their contributions is given below.

Role of Agriculture in India's Development-A Medium Term Perspective

S. Hirashima

Sustainability of Indian economy and society depends crucially on the extent to which agricultural sector can meet the challenges facing Indian society, namely the low labour absorptive capacity, growing regional disparities and persistent poverty. India has a large untapped potential in agricultural sector and this could be tapped by rigorously socializing existing technologies. Instead of encouraging a uniform pattern of agricultural development in every state, attention should be in identifying and strengthening the natural advantages in each area. Small scale mixed farming is effective in the Indian context and this needs to be recognised. Integration of crop and livestock sector in this farming system contributes to higher income, better utilisation of by products, adds to sustainability, leads to better and balanced diets and provides fuel for cooking. Public investments in and for agriculture should attempt to equalize productive capacity of land base.

Sharing of research results by Prof. Hirashima

Economic aspects of the non-farm households in Indian villages have not been paid due attention in the past. Considering the large proportion of these households and their relative deprivation (compared to farm households), more systematic information and more reliable statistics are badly needed. The growth rate of land value has historically been faster than the rent derived from the land and this has continuously squeezed out the prospective peasants. Keeping in view the ongoing globalisation, Indian agriculture has to keep in view the following aspects. First it is questionable for India to increase trade dependancy ratio because of its size, and lower than expected capacity to adjust to the rapidly changing external environment. Therefore, India should not seek security and stability of product as well as input prices through foreign trade. Increasing competitiveness of agriculture is important and socialisation of existing stock of technologies can contribute in this regard. The gap between product differentiation and price differentiation in domestic markets needs to be narrowed. Maintaining continuity of imports and exports and quality to meet international standards also needs emphasis.

Econometric Analysis of Pulse Economy and their Export Competitiveness

Pushpa M. Savadatti

The study focuses on supply, demand, pricing mechanism and export competitiveness of gram (chickpea) and tur (pigeonpea). Supply aspects has been examined at the regional and national level. For this purpose,

major pulse growing Indian states have been classified into two regions on the basis of agro-eco regions and other socio-economic considerations. The demand and pricing mechanism have been studied at the national level using Classical Linear Regression Model with some necessary assumptions with respect to residuals. The analysis has been done with the help of annual time series data covering the period 1965-66 to 1998-99.

Supply analysis results revealed that in rained areas, prices and weather conditions positively influenced the area allocation decision of the farmers. Though the farmers are price responsive and farm harvest prices of pulses are much higher than the farm harvest prices of competing crops like cereals, still, desired growth in pulse area is not seen. This is mainly due to higher yield levels of competing crops which more than offset price advantage in pulses. This acts as a disincentive for farmers from taking up cultivation of pulses on increased area. For the same reason, whenever more irrigation facilities are available, farmers allocate more land to other remunerative crops in place of pulses. Existing pulse technology has also been found to be marginally effective particularly due to poor extension efforts. Since 80 to 90 per cent of the gram and tur areas are rainfed, widespread and effective system of dissemination of available scientific knowledge to farmers for higher and stable yields of gram and tur becomes important.

Demand analysis indicated that price elasticity of demand is less than one in case gram and tur. This suggests that in situations of scarcity, there will be heavy upward pressure on prices of pulses affecting particularly weaker section of the society. The study found that that domestic and international market for gram are well integrated signaling the competitive pricing behavior, which would benefit pulse growers.

XV Workshops/Seminars Organised

Workshops, seminars and brainstorming sessions were organised periodically on policy related issues of current importance. These were organised either by this Centre alone or in collaboration with national and international institutions. These are given below.

Institutional Change for Greater Agricultural Technology Impact

NCAP, New Delhi; 13-14 March, 2001.

This national workshop was organized to understand institutional requirements for technology-led growth in agriculture. The major objectives of the workshop were to document institutional diversity, to identify key areas for innovations in institutions and to identify research gaps. The workshop was organized in five sessions, *viz*, management of: common property resources, agricultural marketing institutions, agrarian institutions, agricultural credit institutions and agricultural R&D system. Following are important recommendations of the workshop:

- Recognise the role of non-governmental organizations as important partners in management of resources.
- Encourage guided private sector participation in marketing of horticultural products.
- Delink governance and management of public organizations for improving efficiency wherever possible.
- Common property regime is better for natural resources, as defining private property rights would lead to conflicts.
- Encourage participation of stakeholders in the management of common property resources.

- Marketing organizations and regulations should shift focus from policing to development and facilitating functions like provision of information, infrastructural facilities, finance etc.
- Region specific targeting of land reform, developing package of reforms and effective implementation.
- Focus on demand-side management of credit.
- Strengthen micro-finance by supplementing existing institutions; targeting poor people and less developed regions; and diversification of activities.
- Enhance research funding and autonomy of research system for cost effectiveness.
- Make extension system demand-driven and farmer controlled.

Research gaps

- Study of working of institutions to identify inefficiencies.
- Appropriate institutional mechanism for groundwater, fisheries and biodiversity.
- Scope for future trading to reduce price risk.
- Welfare and diversity impact of contract farming.
- State Interventions—role of centre vs. states.

Brianstorming meeting on Union Budget 2001-2002 — Implications on Agriculture

NCAP, New Delhi; 15 March, 2001.

This meeting discussed in detail the implications, on Agriculture, of the observations and recommendations of: Union Budget 2001-2002, the Economic Survery 2000-2001 and the National Agricultural Policy. The major observations of this meeting are as follows:

The budget has positive implications for agricultural credit, agro-processing, protections of oilseed sector and management of food economy. Further increase in agricultural productions should go hand in hand with increase in purchasing power of the poor. Employment generation programmes should thus, receive increasing attention. The meeting expressed concern at the low growth in public investment in agriculture. There is a need to restructure and target subsidies. Though, the increase in outlay for agricultural credit is a positive move, measures to improve the access to agricultural credit should receive more attention. There is a need to go for increased coverage under Kisan Credit Card Scheme and to form more number of Self Help Groups for credit management. Decentralised food management system is an important step in the right direction. The budget has not given any indications on tackling issues, such as, pollution control, natural resource management, land reforms, crop insurance and legal framework to support agriculture. These issues need to be addressed.

Brainstorming meeting on Major Policy Issues needing reform in Agricultural Sector

NCAP, New Delhi ; 2, May 2001

As part of the NCAP Annual Day Celebrations, a brainstorming meeting on major policy issues needing reform in agricultural sector was organised at NCAP on 2 May, 2001. Several eminent economists working in several institutions in Delhi (Delhi University, Jawaharlal Nehru University, Commission on Agricultural Costs and Prices and the Indian Council of Agricultural Research) participated in this meeting. The major recommendations of this workshop are as follows.

- All controls on the movement and stocking of agricultural commodities across the country should be abolished based on a critical review of state specific laws on food grain movement and in consultation with state governments

- Levies on commodities like rice, sugar, etc., should be abolished but in a phased manner
- Credit margin requirements for stocks of agricultural commodities should be reduced. Farmers should be extended credit against hypothecation of their stocks. A warehouse receipt system should be introduced in food grain marketing.
- Introduce future markets in all agricultural commodities being traded in bulk, especially wheat and rice to contain wide fluctuations in commodity prices and cutting down their cost of marketing by hedging their risk.
- All controls on the distribution of sugar be abolished and its marketing be allowed freely-the system of state Advised Prices may be phased out and the distribution of sugar under PDS should be taken out in phases.
- Present procurement policy should be drastically revised so as to limit Government purchase only for preventing a sharp fall in prices of Government buying all that is offered at pre-determined prices. FCI role should be limited to minimum buffer stocking of not more than 10 million tonnes.
- Fertiliser subsidy should be reduced in phases and the retention price scheme of fertilisers to be abolished

  Public expenditure on agricultural R and D need to be increased. Agricultural R and D needs to be prioratised and directed to meet new challenges and opportunities in the context of globalisation and WTO.
- Institutional changes in agricultural R and D organisations and human resource development for agriculture should get more emphasis.
- Encourage private seed companies and initiate joint ventures in seed production and distribution. To facilitate entry of seed companies on a large scale, contentious issues related to Intellectual Property Rights will have to be resolved in a transparent manner, keeping the interests of farmers in mind.
- Review policies in the agro-processing area related to de-reservation, contract farming, marketing, taxation, infrastructural development, packaging, finance, land use norms, licensing, quality control etc to promote this sector. Regions having comparative advantage in agro-processing should be identified and the appropriate institutional arrangements to facilitate processing needs to be identified for promotion.

Integrated Pest Management in Indian Agriculture

NCAP, New Delhi; 2-3 August, 2001.

A workshop on Integrated Pest Management in Indian Agriculture was conducted jointly by NCAP and NCIPM at New Delhi to take stock of IPM technologies, to assess their technical and economic feasibility, and the progress of the IPM program. The following recommendations emerged from the workshop.

- Prioritize regions and crops for implementation of IPM
- Ensure availability of year-round-pest-monitoring and surveillance information including short term and long term pest forecasting.
- Relax registration norms for registration of bio-pesticides.
- Improve functioning of state biological control laboratories with private sector participation.
- Establish quality control laboratories at state level for bio-agents and bio-pesticides.
- Exempt bio-pesticides and bio-control agents from octroi, excise and sales taxes, etc.

- Financial institutions should accord bio-pesticide industry high priority for financing.
- Increase budget for promotion of IPM.
- Adoption of bio-village concept by industry, and encourage the community participation.
- Provide incentives to individuals /community achieving excellence in IPM implementation.
- Appoint nodal officer for IPM in each state.

Integrated National Agricultural Resources Information System (INARIS)—Requirement Analysis Workshop for Socio-economic database development

NCAP, New Delhi; 30-31 August, 2001.

The objective of this workshop was to discuss the draft proposal on socio-economic database prepared by the NCAP project team. The workshop was attended by 45 delegates representing: NATP, IASRI, IARI, PDCSR, DWMR, NBFGR, NBPGR, CRIDA, CSSRI, NIAN&P, UAS, ADMAS, DWR, BAU and NCAP; representing diverse fields of specialization: namely, crops and cropping systems, horticulture, fisheries, livestock, agro-forestry, natural resources, climate, plant genetics, animal genetics, agricultural engineering, economics, extension and policy research.

An overview of the INARIS project was presented and this was followed by presentation of the draft proposals covering five economic databases: namely, agricultural statistics, agricultural prices, socio-economics, agricultural inputs & costs and infrastructure. Several issues regarding the availability of database, data gaps, data sources, frequency of updating the data, storage level, coverage, overlapping and modifications needed were discussed. Based on these inputs, the proposal for socio-economic database development to be implemented by NCAP under INARIS project was finalised. The major recommendations and the decisions taken are as follows:

- Temporal coverage for most of the annual data may be limited to latest 10 years, and only for critical parameters it can go beyond ten years.
- For few important parameters or priority zones, possibility of database development below district level may be considered.
- Proposed coverage of area and production of crops, farm machinery and livestock data should be dropped, since these are to be covered by other co-operating centres.
- The data on the following aspects to be included:
  - Migration of agricultural labour and nutrition related data.
  - International prices of important agricultural commodities, including tariffs, subsidies and production costs.
  - Import and export of important agricultural commodities by major countries.
  - Market arrivals of selected commodities.

- Net state domestic product and capital formation related data.
- Prices in both absolute values and index numbers.
- Distribution of certified seeds and distribution centres.
- Ongoing socio-economic research project details in ICAR institutions.
- Investment in agricultural R& D.

Sensitization Workshop on Agricultural Research Prioritization

CRRI, Cuttack; 28-29 September, 2001.

A sensitization workshop was organized on agricultural research prioritization for eastern India at Central Rice Research Institute, Cuttack on 28-29 September, 2001. The major recommendations of the workshop are as follows.

- Individuals to incorporate the elements of improved research prioritization and impact assessment in planning of their research work.
- Participants may sensitize their research managers in their respective institutions, and if possible; develop the work plan for priority setting and impact assessment.
- NCAP should provide necessary technical support for undertaking research prioritization and impact assessment work.

Networking of Social Scientists in ICAR-SAU System

NCAP, New Delhi; 20 November, 2001.

A workshop was held on 20th November 2001 at NCAP, New Delhi for networking of social scientists in ICAR-SAU system. The workshop was attended by Heads of Divisions of Agricultural Economics or their representatives. The workshop was organized in five sessions. Papers were presented by the participants relating to: marketing of agricultural products, impact of agricultural research and cost studies in Indian agriculture. There was one presentation regarding the website of agricultural economists. The major recommendations of the workshop are as follows:

Recommendations

- Studies to focus on exportable surplus of commodities and value addition.
- In depth analysis of determinants of trade, advantages and export competitiveness of agricultural commodities are essential.
- Policy intervention in support of export of medicinal plants would, go a long way, in addressing the sagging agricultural exports.
- Vigorous efforts needed for documenting the successful technologies developed in NARS and its profound impact.
- Social science information repository needs further strengthening.

Training-cum-sensitization workshop for scientists of PME Cells

NCAP, New Delhi; 14-15 January, 2002.

A two-day training-cum-sensitization workshop was organized for scientists of PME Cells at NCAP, New Delhi. The specific objectives of this workshop were to appraise the scientists with new initiatives taken under NATP, especially for improving research management system; to sensitize the scientists about improved PME methods, and mechanisms adopted under NATP; and to develop workplan to carry out PME activities under NATP. The following tentative workplan was agreed:

- Organizing sensitization meeting in the institute/university.
- Taking a look at the current resource allocation of the institution, including source of funding, manpower deployment etc.
- Participating in institute and state X Plan preparations.
- Plan for prioritization at the institute level—assessing the scope for prioritization.
- Developing IVLP, TAR & KVK interface with ARIS, SREP, ATMA.
- Benchmark study of NATP.
- Identification of important technologies from crop, livestock etc. for study of impact of technologies.
- Develop an understanding of the role of PME Cell in the monitoring of NATP in particular, institute in general; and tie up with Site Committee

Impact of Vegetable Research in India

IVRI, Vamasi; 1-2 March, 2002.

Vegetable research in India has been able to generate a number of production technologies. However, there is a gap between the production technologies developed at experimental farms and adopted at farmers' fields. Identifying viable technologies and understanding their impact and constraints in adoption is thus important.

To examine some of the above issues, the Centre organized a two-day workshop on 'Impact of Vegetable Research in India' jointly with the Indian Institute of Vegetable Research (IIVR), Varanasi on 1-2 March 2002. The main objectives of the workshop were to: (i) develop an inventory of success-ful, potential and pipe-line technologies of different vegetables in various target domains, (ii) document evidences of impact of improved vegetable technologies, and (iii) list key economic and marketing constraints in larger impact of vegetable research. 70 scientists attended this workshop.

Following were the major recommendations of the Workshop:

- Initiate impact assessment studies of successful and potential technologies for justifying past and future research fundings.

- The impact assessment should be an integral part of each research project. The Research Advisory Committees and the Staff Research Councils should ensure this.
- Impact assessment efforts should be in a multi-institutional and multi-disciplinary framework.
- Guidelines on Impact Assessment Methodologies need to be developed and widely circulated by the NCAP.
- To begin with, the most important technologies may be tracked for adoption and impact assessment by adapting simple indicators like effect on enhancing income, profitability and employment.
- Horticulture Division of the ICAR may consider funding-support to at least two research projects on impact assessment through AP Cess fund.
- To institutionalize the process of impact assessment, there has to be a separate session on Impact Assessment of Improved Technologies in the annual/biannual workshop of the All India Co-ordinated Research Improvement Project on Vegetables

Brainstorming Workshop on Rice Outlook

NCAP, New Delhi; 5 March, 2002.

The main objective of the workshop was to formulate the strategies for the future work on agricultural outlook in India. About 15 researchers, currently engaged in agriculture sector modeling; from various research institutions: such as, Institute of Economic Growth, National Council for Applied Economic Research, National Centre for Crop Forecasting, Ministry of Agriculture, Directorate of Marketing and Inspection, Indian Agriculture Research Institute, United States Department of Agriculture and NCAP participated in this one day brain storming work-shop. The meeting made the following recommendations to support agricultural outlook and policy analysis work:

- Generate information on: prospects of demand, supply, balances and statistical tools to supports outlook analysis.
- Provide estimates of income, own, researchers and cross elasticities for major food commodities for use in agricultural outlook and policy analysis.
- Provide opportunities for capacity building in agricultural modelling and outlook tools.
- Provide supply estimates for major commodities with special emphasis on input-output pricing policy, technology, infrastructure and other semi fix factors.
- Bring out periodic publications on demand-supply outlook for major commodities.

XVI Special Lectures

Speaker	Title of the Lecture	Venue
Anjani Kumar	Total Factor Productivity in Livestock Sector in India, 26 May, 2001.	IASRI, New Delhi.
	Livestock Trade in India: Trends, Performance and Competitiveness, 9 October, 2001.	Division of Agricultural Economics, IARI, New Delhi.
B. C. Roy	Investment for sustainable agriculture 17 October, 2001.	IARI, New Delhi.
	Research Prioritization for Sustainable Agriculture 18 October, 2001.	IARI, New Delhi.
	Yield Gap Analysis and Research Planning 18 March, 2002.	IARI, New Delhi.
	Investment, Institution, and Policy for Agricultural Growth and Equity, 26 March, 2002.	IARI, New Delhi.
Dayanatha Jha	Economic Policies for Agri-business Development, 20 July, 2001.	AIMA, New Delhi.
	Economics of Wheat Production and Trade 23 August, 2001.	Directorate of Wheat Research, Karnal.
	Dr. Daroga Singh Memorial Lecture *Krishi Anusandhan Prabandhan Mein Nayi Chunoutiyan*, 14 September, 2001.	IASRI, New Delhi.
	IARI, on Current Issues in Agricultural Economics Research, 20 October, 2001.	Division of Agricultural Economics, IARI, New Delhi.
	New Economic Policy and Agricultural Development New Delhi, 23 February, 2002.	Indian Society of Agricultural Science, IARI, New Delhi.
	Current Status of Research Priority Setting in NARS 14, March, 2001.	Division of Agricultural Economics, IARI, New Delhi.
Harbir Singh	Emerging Intellectual Property Rights Regime: Challenges and Opportunities for Indian Agriculture 21 May, 2001.	IASRI, New Delhi.
Mruthyunjaya	Getting the work done in R&D – My experience 4 April 2001.	Division of Agriculture Economics, IARI, New Delhi.
	Agricultural Economics and Policy Research Agenda in the Coming Years, 14 May, 2001.	Division of Agriculture Economics, IARI, New Delhi.
	Total Factor Productivity Measurement and Analysis 29 May, 2001.	Indian Agricultural Statistics Research Institute, New Delhi.
	Impact Assessment in Fisheries Research 7, February , 2002.	CIFE, Mumbai.
P.K. Joshi	Prioritization of agricultural research, 26 June' 2001.	PKV, Akola.
	Impact of agricultural R&D: production function approach and case study on NRM research, 20 Sep, 2001.	NAARM, Hyderabad.
P.S. Birthal	Assessment of research priorities for livestock sector 11 October, 2001.	TNAU, Coimbatore.
	Impact of Integrated Pest Management, 12 October, 2001.	TNAU, Coimbatore.
Ramesh Chand	WTO Agreement on Agriculture and India: Implementation and Impact, 29 July, 2001.	Rajasthan College of Agriculture Udaipur.

S. Selvarajan	Simulation techniques in Production Economics Research, 21 May, 2001.	IASRI, New Delhi.
	Mathematical Programming and Simulation for Research Priority Setting, 8 October, 2001.	TNAU, Coimbatore.
	Irrigation Development in India: Equity Impacts 29 October, 2001.	Division of Agricultural Economics, IARI, New Delhi.
	WTO and Indian Agriculture, 12, July 2001.	DRR, Hyderabad.
	WTO Regime and Its Impact on Agribusiness, 20 July, 2001.	All India Management Association, New Delhi.
	WTO Impact on Indian Agriculture : Issues in Agricultural Research and Policy, 27 April 2001.	ICAR, Krishi Bhavan, New Delhi.

XVII Distinguished Visitors

Ashok Gulati, IFPRI, Washington.
M. Sahadad Husain, Bangladesh Agricultural Research Council, Dhaka.
Veena Nayyar, Member, National Commission for SC/ST.
V.K. Taneja, Animal Husbandry Commissioner, Government of India.
C.H. Hanumantha Rao, Former Member, Planning Commission, and Chairman, Institute for Social and Economic Studies, Hyderabad.
Klaus Von Grebmer, IFPRI, Washington. D.C.
S.Hirashima, Meiji Gakuin University, Japan.
Tej Pratap, Vice Chancellor, Himachal Pradesh Krishi Viswa-Vidyalaya, Palampur.
Shashi Mishra, Additional Secretary, DARE and Secretary, ICAR.
Rod Parker, Information Agricultural Service Ltd, United Kingdom.
Bino Ieme I.E.R. Bamko.
Galia T. Castillo, Philippines.
Derek Byerlee, World Bank, Washington.
Mahaboob Hossain, Social Sciences Division, IRRI, Phillipines.
Chris Delgado, IFPRI, USA.
Rip Landes, USDA , ERS, New Delhi.
Suresh Babu, IFPRI, Washington.
J I Richardson, Natural Resources International, U.K.
R.J. Haggar, U.K.
John Morton, NRI, UK.
Rai Trewin, ACIAR, Australia.
Lin Corri, LA Trobe University, Australia.
Robert Moss, Synergy, OCFI, Hills Oxford, U.K.
Stephen D. Biggs, Nepal Agricultural Research Council, Kathmandu.
G.Kalloo, Deputy Director General (Horticulture), ICAR.
J.C.Katyal, Deputy Director General (Education), ICAR.
Kiran Singh, Deputy Director General (Animal Sciences), ICAR.

XVIII Personal

Scientific

Mruthyunjaya	Director
D. Jha	National Professor
P.K. Joshi	Principal Scientist
S. Selvarajan	Principal Scientist
Ramesh Chand	Principal Scientist
B.C. Barah	Principal Scientist
G. Singh	Principal Scientist
Suresh Pal	Senior Scientist
P.S. Birthal	Senior Scientist
Rasheed Sulaiman V.	Scientist
P.A. Lakshmi Prasanna	Scientist
P. Adhiguru	Scientist
Rajni Jain	Scientist
B.C. Roy	Scientist
Anjani Kumar	Scientist
Sant Kumar	Scientist
Harbir Singh	Scientist
M.B. Dastigiri	Scientist

Administrative

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

Technical

Khyali Ram Chaudhary	T-4
Mangal Singh Chauhan	T-4
Sonia Chauhan	T-4
Arun Kumar	T-II-3
Satender Kataria	T-1

Supporting

Mahesh Kumar	S.S. Gr I

XIX Training Attended

Scientific

Name of the Official	Theme	Duration	Place of Training
Adhiguru, P.	Summer Institute on "Project Management for Research and Development	22 March to 11 April 2001	Division of Agricultural Extension, IASRI, New Delhi
Pandey, S.K	Japan South West Asia Youth Friendship Training Programme in the field of Agriculture	21 September to 16 October 2001	Hokkaido, Japan
Lakshmi Prasanna	Statistical package for social sciences	April 30–May 5, 2001	IASRI, New Delhi.
Harbir Singh	Oracle: Development Tools	14 - 26 May, 2001	IASRI, New Delhi
	Training on IPR and WTO to NARS Scientists	20 - 22 June, 2001	IARI, New Delhi
	Designing Vortals for NARS	6 – 26 Feb., 2002	IASRI, New Delhi

Administrative

Name of the Official	Theme	Duration	Place of Training
Narender Kumar	Systematic Problem Solving	6-10 June, 2001	National Productivity Council, Mussurie
Naresh Kumar Arora	Systematic Problems Solving	6-10 June, 2001	National Productivity Council, Mussurie
Yadav, S.K	Purchase policy procedures in Government Departments, Autonomous Bodies and PSUs	16-18 May, 2001	Centre for Training and Social Research, New Delhi
Vasisht, M.S	Vigilance Awareness	6-9 November, 2001	IASRI, New Delhi
Khyali Ram	Library Interconnectivity within ICAR/SAU Libraries	30-31, January, 2002	IASRI, New Delhi

XX Promotion of Official Language

Several initiatives to promote the use of Hindi language were made during the year. The official language implementation committee of the Centre provides suggestions for implementation of the official language policy of the Government of India. As a part of the Golden Jubillee Celebration of the official language, the Committee organised a "Hindi Day" on 14 September, 2001. For the Hindi elocution competition, Rajni Jain, Anjani Kumar and S.K Yadav won the first, second and third prize respectively. Sant Kumar, Scientist of this Centre received the first Prize for the learning course curricula, for non-Hindi speaking officials, he developed, at the Workshop organised by the Raj Bhasha Sansthan at Dalhauzi, Himachal Pradesh on 1-3 August, 2001. As a part of the "Hindi Awareness Month", the Centre celebrated Hindi Chetna Month during September, 2001.

XXI Participation in ICAR Sports Competition

The NCAP team comprising, Inderjeet Sachdeva, M.S.Chauhan, Sanjay Kumar and Mahesh Kumar participated in the ICAR Zonal IV Sports Meet at Central Institute of Research on Buffaloes (CIRB), Hissar from 3-7 November, 2001.

NCAP Team at the ICAR Zonal Tournament held at CIRB, Hissar

e Development

ening physical infrastructure has been approved in the Ninth Five-Year Plan. A piece
- sqm has been transferred to NCAP in the IASRI campus. An amount of Rs. 300
ed in the Ninth Five-Year Plan allocation. The construction work has been handed
Works Department (CPWD). All the necessary approvals from civic authorities have
CPWD would be issuing the tender for this work shortly.

uct 20 staff quarters for NCAP in association with NBSSLUP. An amount of Rs. 70
d in the Ninth Five-Year Plan. The drawings are being prepared for obtaining the
m the civic authorities.

निस्पादित सारांश

वार्षिक प्रतिवेदन 2001–2002

राष्ट्रीय कृषि आर्थिकी एवं नीति अनुसंधान केन्द्र ने शोध एवं नीति निर्धारण के क्षेत्र में अपनी विशिष्टता को कायम रखते हुए इस वर्ष पिछले वर्षों से अधिक प्रभाव एवं प्रत्यक्षता दर्शायी है। केन्द्र में 18 वैज्ञानिक (एक राष्ट्रीय प्राध्यापक सन्निहित) एवं 14 अन्य कर्मचारी कार्यरत हैं। केन्द्र का वर्ष 2001-02 का कुल बजट 196.42 लाख रूपये था। केन्द्र के शोध कार्यक्रमों का मार्गदर्शन एक उच्च स्तरीय अनुसंधान सलाहकार समिति करती है जिसके अध्यक्ष प्रोफेसर एस. एस. जोहल हैं। केन्द्र के क्रिया–कलापों का निर्धारण प्रबन्ध समिति करती है। इसके अतिरिक्त कई अन्य आंतरिक समितियाँ केन्द्र के दैनिक कार्यों को सुचारूपूर्वक संचालित करती हैं।

केन्द्र में शोध कार्य मुख्यतया पाँच क्षेत्रों–तकनीकी नीति, सतत् कृषि व्यवस्था, विपणन एवं व्यापार, संस्थागत बदलाव, तथा कृषि वृद्धि एवं माडलीकरण में होता है। उपर्युक्त वर्णित क्षेत्रों के महत्वपूर्ण मुद्दों से सम्बन्धित शोध कार्य वरिष्ठ विज्ञानियों की देख–रेख में प्रतिपादित किये जाते हैं। वर्ष 2001-02 के दौरान केन्द्र की शोध उपलब्धियाँ एवं जारी शोध कार्यों का संक्षिप्त अंश निम्नवत है:

दक्षिण एशिया में कृषि में शोध प्राथमिकताओं के निर्धारण करने हेतु एक अध्ययन किया गया । शोध अध्ययन से पता चलता है कि इस क्षेत्र में खाद्य फसलों, पशुधन, बागवानी, एवं रोपण फसलों को क्रमानुसार शोध एवं विकास के कार्यों में प्राथमिकता दी जानी चाहिए। क्षेत्रवार विश्लेषण में खाद्य फसलों जैसे धान, गेहूँ, दलहन आदि के प्रति प्राथमिकता जारी रखते हुए पशुधन एवं बागवानी फसलों पर भी ध्यान दिया जाना चाहिए। व्यापक स्तर पर उच्च शोध प्राथमिकता क्षेत्रों के क्रम में मृदा एवं जल प्रबन्धन, उत्पादन व्यवस्था का विविधीकरण एवं वाणिज्यीकरण, बाजार समन्वय, पशुधन स्वास्थ्य एवं पोषण, गरीबी, उपयुक्त बीज एवं तकनीकी व्यवस्था आदि आते हैं।

कृषि उत्पादन में सतत् बढ़ोतरी बनाये रखने के लिये प्राकृतिक संसाधन प्रबन्धन एक महत्वपूर्ण शोध एवं विकास क्षेत्र है। एक शोध अध्ययन में नुकसान के आधार पर, प्राकृतिक संसाधनों में आयी कमी को आँका गया। अध्ययन से स्पष्ट है कि प्राकृतिक संसाधन प्रबंधन क्षेत्र में, शोध संसाधनों का निवेश प्रमुख रूप में (i) जलमग्नता, (ii) सूखा, (iii) मृदा उर्वरता, (iv) मृदा अम्लता/क्षारीयता, और (v) मृदा क्षरण, आदि समस्याओं के निवारण में किया जाना चाहिए। कृषि जैव तकनीकी परियोजनाओं की प्राथमिकता निर्धारण से संकेत मिलता है कि चावल की जलमग्न एवं शीत प्रतिरोधी किस्में तथा सरसों (ब्रेसिका) में क्षारीय प्रतिरोध हेतु शोध संसाधनों के निवेश पर ध्यान दिया जाना चाहिये।

भारतीय पशुधन के समुचित विकास हेतु क्षेत्र एवं प्रजाति आधारित शोध प्राथमिकताओं के निर्धारण से निष्कर्ष निकलता है कि शोध संसाधनों का राज्यवार वितरण क्रमशः उत्तर प्रदेश (14.4%), महाराष्ट्र (12%), बिहार (10.3%), आन्ध्र प्रदेश (9.6%), राजस्थान (7.7%) और मध्य प्रदेश (7%) होना चाहिये। पशु जातियों के क्रम में शोध संसाधनों का वितरण क्रमशः भैंस (40.2%), पशुधन (37.6%), कुक्कुट पालन (10%), बकरी पालन (7.9%) तथा भेड़ पालन (1.8%) होना चाहिए।

जलविभाजक कार्यक्रमों के शोध अध्ययन से ज्ञात हुआ है कि ऐसे कार्यक्रम आय तथा रोजगार बढ़ाने एवं मृदा तथा जल संसाधनों के संरक्षण पर महत्वपूर्ण प्रभाव डालते हैं। जलविभाजक कार्यक्रमों का प्रभाव उन क्षेत्रों में अधिक पाया गया, जहाँ वार्षिक वर्षा 700-1000 मि.मी. थी, तथा कार्यक्रम क्रियान्वयन में प्रदेश एवं केन्द्र सरकारों का पारस्परिक सहयोग, निम्न एवं मध्यम आय क्षेत्र और कार्यक्रम में लोगों की समुचित भागीदारी थी।

कपास, धान तथा बन्दगोभी में "समन्वित नाशीजीव प्रबन्धन" के अध्ययन से उसके उच्च प्रभावी संभाव्यता का पता चलता है जो कि कृषि उत्पादकता पर बिना कोई प्रतिकूल प्रभाव डाले, रासायनिक जीवनाशियों के प्रयोग को कम कर देता है। अध्ययन से स्पष्ट है कि "समन्वित नाशीजीव प्रबन्धन" तकनीक को प्रयोग में लाने से न केवल कृषि उत्पादन लागत में कमी लायी जा सकती है वरन् प्राकृतिक संसाधनों का समुचित संरक्षण एवं उपयोग भी सुनिश्चित किया जा सकता है। शोध विश्लेषण से स्पष्ट है कि कृषकों द्वारा कृषि रसायनों से 'समन्वित नाशीजीव प्रबन्धन' की तरफ उन्मुख होने में प्रमुख रूप से जैविक जीवनाशियों का उचित समय एवं मात्रा में आपूर्ति तथा सही समय पर विशेषज्ञों की सलाह न मिलने जैसी कठिनाइयाँ, इसके समुचित एवं बड़े स्तर पर प्रयोग में बाधक है। इसके अतिरिक्त, जैविक जीवनाशियों का धीमा प्रभाव भी इसके व्यापक स्तर पर प्रयोग में एक मुख्य समस्या है। "समन्वित फसल

सी तकनीक है जो कि उत्पादन तथा सुरक्षा सम्बन्धी विषयों की तरफ ध्यान देती है। कपास में 'समन्वित प्रयोग से रासायनिक जीवनाशियों के उपभोग में कमी के साथ–साथ मानव श्रम शक्ति के प्रयोग में भी ते इकाई उत्पादकता के बढ़ने से शुद्ध लाभ में भी आकर्षक वृद्धि होती है।

क शोध अध्ययन से निष्कर्ष निकलता है कि पशु उत्पादों में वर्ष 2020 में 84.88 मिलियन लीटर दूध, .96 मिलियन टन गाय तथा भैंस के माँस, एवं 1.89 मिलियन टन मुर्गी के माँस के अतिरिक्त उत्पादन भेड़ और बकरी के माँस में 3.12 मिलियन टन की कमी आने की संभावना है।

ो में अनेक तकनीकी एवं सामाजिक आर्थिक समस्याएं आती हैं। मक्का के उत्पादन में सर्वाधिक उपज है। कीट पतंगों (जैसे: कैटर पिलर, दीमक, तना छेदक, वीविल्स, आदि), सूखा, जस्ता की कमी तथा याएं भी फसल की उत्पादकता को काफी नुकसान पहुँचाती हैं।

स हेतु कृषि से प्राप्त आय का मुश्किल से आधा प्रतिशत हिस्सा खर्च किया जाता है। कृषि विज्ञान एवं स्तरीय विकास हेतु खर्च के हिस्से में क्रमिक बढ़ोत्तरी किया जाना जरूरी है। पिछले दशकों में कृषि गति एवं नब्बे के दशक में उनके सेवा मुक्ति की अधिक दर से आयी गिरावट को पूर्व स्तर पर लाने के रूप में योजनाबद्ध तरीके से वैज्ञानिकों की भर्ती पर ध्यान दिया जाना चाहिए।

पाद अनुपात' (ICOR) का विश्लेषण विभिन्न राज्यों में काफी असमानता दर्शाता है और समय के साथ हीं आयी है। उत्तरी राज्यों की तुलना में 'अतिरिक्त पूँजी–उत्पाद अनुपात' की स्थिति पूर्वी एवं दक्षिणी ध्ययन दर्शाता है कि पूर्वी तथा दक्षिणी राज्यों में अतिरिक्त पूंजी निवेश का कृषि उत्पादकता पर अनुकूल पंचवर्षीय योजना में प्रस्तावित लक्षित वृद्धि दर प्राप्त करने के लिए कृषि निवेश को 7.91% तक बढ़ाना 95% है। यदि भविष्य में भी निवेश की दर पूर्ववत रहती है तो अधिकतर पूर्वी और उत्तर–पूर्वी राज्यों की हो सकती है, तथा कृषि विकास में क्षेत्रीय विषमतायें और बढ़ सकती हैं।

लोत्पादन की 'सम्पूर्ण संसाधन उत्पादकता' वृद्धि दर में बहुत से स्थानों पर स्थिरता आ गई है एवं कुछ है। फसल क्षेत्र के 'सम्पूर्ण संसाधन उत्पादकता' वृद्धि दर में अस्सी के दशक में प्रतिवर्ष 2 प्रतिशत की के दशक में यह वृद्धि दर ऋणात्मक हो गयी। 'सम्पूर्ण संसाधन उत्पादकता' में वृद्धि के स्रोतों में विस्तार शत), शिक्षा (10 प्रतिशत) और संसाधन विकास (8 प्रतिशत) आदि में पूँजी निवेश प्रमुख रहें हैं। इन क्षेत्रों कता का योगदान एक तिहाई रहा है, जबकि तकनीकी बदलाव का योगदान गंगा के निचले भागों में 57 17 प्रतिशत रहा है। यह मानते हुए कि 'सम्पूर्ण संसाधन उत्पादकता' वृद्धि शून्य है तो वर्ष 2020 तक पूर्ति में क्रमशः सरसों में 22 प्रतिशत, मक्का में 16 प्रतिशत, गेहूँ में 11 प्रतिशत, चावल में 8 प्रतिशत और आने की संभावना व्यक्त की गई है।

–गेहूँ आधारित फसल–चक्र में वृद्धि के स्रोतों के विश्लेषण से ज्ञात हुआ है कि धान फसल में क्षेत्र विस्तार वेत प्रबन्धन के फलस्वरूप हुआ है, जबकि गेहूँ की फसल में क्षेत्र का विस्तार सिंचाई क्षेत्र में वृद्धि और स्मों के विकास के संयुक्त प्रयास से हुआ है। चावल उत्पादन में वृद्धि विपणन सुविधा, उर्वरक प्रयोग और वेत प्रबन्धन के कारण हुआ है। शोध विश्लेषण से पता चलता है कि इस क्षेत्र के सभी राज्यों में धान एवं दकता में आई गिरावट के कारण कुल आमदनी में कमी आयी है। परन्तु गेहूँ और चावल की उपज वृद्धि ों में वृद्धि दर अधिक तेजी से हुयी है। इस क्षेत्र की कुल आमदनी को बनाये रखने में सरकारी स्तर पर प्रयास के रूप में जारी है, परन्तु ऐसा प्रयास अधिक समय तक प्रभावी नहीं रह पायेगा। इन क्षेत्रों में, जो न के मुख्य क्षेत्र हैं, चावल और गेहूँ की उत्पादक को बनाये रखने के लिए, उपज बढ़ाने वाले तकनीकी पर बल दिया जाना चाहिए।

में विविधीकरण लाने के लिए दलहन फसलों की खेती एक सम्भावित विकल्प है। अरहर इस क्षेत्र की किन फसल की लम्बी अवधि इसकी खेती मे बाधक है। आर्थिक सम्भाव्यता से सम्बन्धित अध्ययन से

प्रतीत होता है कि अति–न्यून अवधि की अरहर की नई विकसित प्रजाति, कम अवधि की प्रचलित अरहर प्रजाति एवं बाजरा की खेती से ज्यादा लाभदायक है। सीमित जल और पोषक तत्वों की जरूरत के बावजूद इसकी खेती चावल की खेती से कम लाभदायक है। अरहर की कम अवधि की प्रजातियों को अपनाने के लिए इनकी प्रति हेक्टेयर उत्पादकता को 1.4 से बढ़ाकर 2.5 टन होना आवश्यक है।

सिंचाई क्षेत्र में सिंचाई संसाधनों की संभावित क्षमता और पूंजी निवेश में वार्षिक वृद्धियों के बावजूद, अस्सी के मध्य के दशक से अब तक दीर्घ, मध्यम और लघु सिंचाई साधनों से सिंचित क्षेत्रफल या तो स्थिर रहा है, या घट रहा है। अपर्याप्त संचालन और अनुरक्षण व्यय, कम जल शुल्क और कम लागत वसूली के कारण सिंचाई की भौतिक एवं आर्थिक स्थिरता को कायम् नहीं रखा जा सकता है। सिंचाई संसाधनों को पुनः स्थापित करने और संरचनात्मक और संस्थात्मक सुधार लाने हेतु कारगर प्रयत्नों की जरूरत है।

विभिन्न राज्यों में 1970 एवं 1990 के दौरान प्रवाहित एवं पम्प सिंचित क्षेत्रफल की असमानता में गिरावट आयी है। अधिकतर राज्यों में प्रवाहित और पम्प सिंचित क्षेत्रफल में काफी असमानता के बावजूद दो तिहाई से ज्यादा प्रवाहित सिंचाई की क्षमता को प्राप्त कर लिया गया है। साथ ही साथ इन राज्यों में भू जल विकास अन्य राज्यों की तुलना में ज्यादा है। ऐसे अधिकतर राज्यों में जलविभाजक कार्यक्रम के प्रस्ताव भविष्य में जल वितरण में समानता लाने में प्रमुख भूमिका निभायेंगे।

पिछले दो दशकों में अन्तःस्थलीय मछली उत्पादन, समुद्री मछली उत्पादन की तुलना में ज्यादा तीव्र गति से बढ़ा है। हाल के दशक में अन्तःस्थलीय मछली उत्पादन में वृद्धि, सम्पूर्ण भारतीय मछली उत्पादन में वृद्धि का मुख्य स्रोत रही है, जबकि, अधिकतर अन्तःस्थलीय मछली उत्पादन के साधनों जैसे कि जल स्रोत जैसे कुएँ और तालाब का प्रयोग क्षमता से कम रहा है। ऐसा आन्ध्र प्रदेश और पश्चिम बंगाल प्रान्तों के जल स्रोत की उत्पादकता की तुलना से पूर्णतः सिद्ध होता है। जल स्रोतों की भौतिक और आर्थिक सततता, लाभन्वितों के अधिकार सम्बन्धी उपायों और उपभोक्ता समूहों को प्रबन्धन की जिम्मेदारी स्थानान्तरित करके बनाये रख जा सकता है।

भारत में मछली की माँग और आपूर्ति का शोध विश्लेषण प्रदर्शित करता है कि वर्ष 2020 तक देश में 4.48 मिलियन टन अतिरिक्त मछली का उत्पादन होगा, जिसको या तो निर्यात या देश में उपभोग करने हेतु गुण नियन्त्रण, उत्पाद प्रबन्धन, भण्डारण, परिवहन, प्रसंस्करण, पैकिंग, विपणन एवं निर्यात में प्रोत्साहन आदि उपायों की आवश्यकता होगी।

भारत में वर्ष 1991 में प्रारम्भ कृषि व्यापार उदारीकरण की प्रक्रिया कृषि उत्पादों के निर्यात को बढ़ाने में सकारात्मक रही है। यह वृद्धि दर 'अन्तर्राष्ट्रीय व्यापार संगठन' के अस्तित्व में आने के बाद के वर्षों में कायम नहीं रह पायी है और आयात में अधिक वृद्धि हुई है। एक तरफ जहाँ भारत का अतिरिक्त खाद्यान्न अन्तर्राष्ट्रीय बाजार में बिक्री हेतु स्थान नहीं बना पा रहा है, वहीं दूसरी तरफ खाद्य तेलों का आयात निरन्तर बढ़ता जा रहा है। इस प्रकार व्यापार असंतुलन को सही करने के लिए घरेलू नीतियों में हस्तक्षेप की जरूरत है, क्योंकि व्यापार, माँग और आपूर्ति में संतुलन कायम रखने में असमर्थ रहा है। कृषि उत्पादों के अन्तर्राष्ट्रीय मूल्य बहुत ज्यादा अस्थिर और चक्रीय परिवर्तन वाले हैं। अस्थिर अन्तर्राष्ट्रीय मूल्यों के साथ सामंजस्य स्थापन में अधिकतर भारतीय किसान न तो समर्थ है और न ही इनके पास पर्याप्त साधन हैं जिससे कि वे कम समय में एक फसल–चक्र से दूसरे फसल–चक्र में आसानी से परिवर्तन लाकर अपने हितों की रक्षा कर सकते हैं। अन्तर्राष्ट्रीय व्यापार अधिनियम की वचन बद्धता के कारण घरेलू उत्पाद को अन्तर्राष्ट्रीय मूल्यों के प्रतिकूल प्रभाव से मात्रात्मक रूकावटें लगाकर नहीं बचाया जा सकता। अस्थिर अन्तर्राष्ट्रीय मूल्यों के निर्धारित स्तर से घटने या बढ़ने पर आयात व निर्यात कर लगा कर मूल्यों को स्थिर किया जा सकता है जो कि अन्तर्राष्ट्रीय व्यापार अधिनियम के अन्तर्गत मान्य है।

निर्यात प्रतियोगिता एक गतिशील स्थिति है जो कि अन्तर्राष्ट्रीय एवं घरेलू मूल्यों के साथ बदलती रहती है। देश में निर्यात को बढ़ावा देने हेतु ऐसे उद्यमों को चुनने की आवश्यकता है जिनसे कि निर्यात अधिक प्रतियोगी एवं लाभकारी साबित हो सके। भारतीय चावल निर्यात सदैव लाभकारी रहा है एवं निर्यात उपाय इसको बढ़ावा देने में सहायक रहे हैं। गेहूँ तथा अन्य मोटे अनाजों के निर्यात में न तो कोई लाभ है और कोई संभावना भी नहीं है जबकि गेहूँ तथा मक्का आयातपूरक रूप में प्रयोग किये जा सकते हैं। खाद्य तेलों में, सोयाबीन तेल निर्यात के लिए कुछ हद तक ठीक है। सोयाबीन तथा सरसों को खाद्य तेलों के आयातपूरक के रूप में प्रयोग किया जा सकता है। सूरजमुखी के संदर्भ में आयात, इसकी पैदावार करने से अधिक लाभदायक है।

शोध विश्लेषण से पता चलता है कि भविष्य में कृषि व्यापार संबंधी समझौते में वार्तालाप के दौरान निम्न बिन्दुओं पर ध्यान दिया जाना चाहिए, जैसे बाजार तक पहुँच, घरेलू और निर्यात सहायता तथा अन्य व्यापार सहायता। भारत और अन्य विकासशील देशों को चाहिए कि सभी प्रकार के राहत उपायों को एकत्रित करके 'सम्पूर्ण कृषि सहायता' की अवधारणा को प्रतिपादित करें। कुछ चुनिन्दा देशों जैसे यूरोपीय संघ, संयुक्त राज्य अमेरिका और कनाडा, जो कि अपने निर्यातकों को निर्यात सहायता दे रहे हैं तथा जो पूर्ण रूप से 'विश्व व्यापार समझौते' के प्रतिकूल है को खत्म करने की आवश्यकता है। भारत जैसे देश में, जहाँ कि निर्यात आर्थिक सहायता का अभाव है और उत्पादकों को कम कीमतों की क्षतिपूर्ति का कोई प्रावधान नहीं है, विश्व व्यापार को अनुकूल बनाने हेतु, व्यापार कराधान ही एक मात्र विकल्प है। ऊँची कर दरें न केवल आयात को बाधित करती हैं बल्कि निर्यात, जो कि प्रतिस्पर्धात्मक सुधार पर निर्भर करता है, को बढ़ावा देने में सहायक नहीं हैं। प्रोद्योगिकी एवं ढाँचागत सुविधाएँ, ऐसे कारक हैं जो कि हमारी निर्यात प्रतिस्पार्धात्मक क्षमता को सुनिश्चित करते हैं अतएव इन क्षमताओं को बढ़ाने हेतु कारगर उपायों को शुरू करने की आवश्यकता है।

भारतीय अर्थव्यवस्था एवं समाज का सतत् विकास मुख्यत: इस बात पर निर्भर करता है कि किस हद तक हमारी कृषि भावी चुनौतियों, जैसे श्रम प्रदान करने की क्षमता, बढ़ती क्षेत्रीय असमानता, और गरीबी को दूर करने में सक्षम् है। उदारीकरण प्रक्रिया की बढ़ती सीमा को ध्यान में रखते हुए भारतीय कृषि को निम्नलिखित बातों को ध्यान में रखना होगा। प्रथम, भारत के लिए खाद्य की व्यापार पर निर्भरता प्रश्नवाचक है, क्योंकि इसमें आकार और तेजी से बदलती स्थिति के अनुरूप बदलाव के लिए अपेक्षित क्षमता का अभाव है। इसलिए भारत को अपने उत्पादों एवं फसल कारकों की कीमतों की स्थिरता एवं सुरक्षा के उपाय, अन्तर्राष्ट्रीय व्यापार के माध्यम से नही ढूंढनी चाहिए। वरन् कृषि की प्रतिस्पर्धात्मक क्षमता को वर्तमान प्रोद्योगिकी के स्तर में वृद्धि करके बढ़ाने पर ध्यान देना चाहिए। घरेलू बाजार में उत्पाद–भेद एवं कीमत–भेद के अन्तर को कम करना जरूरी है, साथ ही साथ अर्न्तराष्ट्रीय व्यापार स्तर की प्राप्ति हेतु आयात, निर्यात गुणवत्ता नियंत्रण को कायम रखने के लिए सतत् प्रयास जरूरी हैं।

कृषि उत्पादों की कीमतों के स्थिरीकरण हेतु सरकार ने खाद्य भण्डारण को एक साधन के रूप में अपनाया है। वर्तमान परिवेश में खाद्यान्नों के संग्रह, परिवहन, भंडारण एवं रख–रखाव आदि के उपाय काफी खर्चीले हैं जो कि सरकारी कोष पर आर्थिक बोझ साबित हुए है एवं अवहनीय हैं। अत: विकल्प के रूप में यह सलाह दिया जाता है कि घरेलू बाजार में मूल्य स्थिरता हेतु अन्तर्राष्ट्रीय व्यापार को अनुकूल बनाने हेतु सरकार को सुविधानुसार सीमा शुल्क का प्रयोग करना चाहिए। किन्तु यह उपाय घरेलू मूल्य स्थिरीकरण की तुलना में प्राय: महँगा पड़ता है तथा यह कुछ सीमा तक अन्तर्राष्ट्रीय मूल्यों के उतार–चढ़ाव पर भी निर्भर करता है। शोध निष्कर्ष से स्पष्ट है कि 7 मिलियन टन के आस–पास खाद्य भण्डारण खाद्यान्नों की आपूर्ति में कमी आने पर भी काफी रहेगा। आर्थिक रूप से अक्षम एवं अधिक खर्चीला होने के बावजूद भी 'भारतीय खाद्य निगम' को बनाये रखने की आवश्यकता है, क्योंकि इसकी अनुपस्थिति में निजी व्यापार अहितकारी साबित हो सकता है। अतएव 'भारतीय खाद्य निगम' को बनाये रखने के लिए इसकी वर्तमान क्षेत्र विस्तार की सीमा में कमी किये जाने की आवश्यकता है तथा इसके आधुनिकीकरण तथा वैज्ञानिक विधि द्वारा परिचालन से इसके व्यावसायिक प्रबन्धन एवं कार्यकुशल बनाने की कोशिशें की जानी चाहिए।

आदिवासी, पिछड़े एवं पर्वतीय क्षेत्रों की आर्थिक एवं खाद्य–सुरक्षा के अध्ययन से स्पष्ट है कि इन क्षेत्रों में फसलों की प्रति इकाई उत्पादकता, औसत राष्ट्रीय उत्पादकता के 50 से 60 प्रतिशत के करीब है। ऐसा मुख्यत: कृषकों द्वारा उन्नत किस्मों एवं उत्पादन कारकों के अल्प स्तर पर प्रयोग किये जाने के कारण है। अनाजों को छोड़कर, अन्य सभी खाद्य पदार्थों का उपभोग निर्धारित मात्रा से कम है। कृषिगत आमदनी, पूँजी–जनित आधुनिक कृषि प्रोद्योगिकी को अपनाने तथा पारिवारिक खाद्य जरूरतों को पूरी करने के लिए पर्याप्त नहीं हैं। अत: प्रोद्योगिकी सुधार एवं ग्रहण, ढांचागत सुविधाओं का विकास और कृषि क्षेत्र से बाहर रोजगार के अवसरों की तरफ ध्यान देने की अधिक आवश्यकता है।

शोध विश्लेषण से पता चलता है कि तीन विभिन्न कृषि उत्पादन पद्धतियों (धान, गन्ना एवं सब्जियों) में सब्जी उत्पादन पद्धति में पोषक तत्व प्रदान करने की अधिक क्षमता है। अध्ययन से ज्ञात होता है कि पोषक तत्वों की उचित जानकारी एवं प्रयोग को बढ़ाने हेतु संबंधित विभागों यथा स्वास्थ्य एवं पोषण, और कृषि तथा संबंधित विभागों में नियमित पारस्परिक समन्वय की जरूरत है। वर्तमान में इन विभागों के बीच पारस्परिक समन्वय की सर्वाधिक कमी है।

चना एवं अरहर की 1965 से 1999 के दौरान आपूर्ति विश्लेषण प्रदर्शित करता है कि बारानी क्षेत्रों में मूल्य एवं मौसम की स्थिति किसानों द्वारा इन फसलों के प्रति क्षेत्रफल निर्धारण की स्थिति को प्रभावित करते हैं। वैसे तो किसान कीमतों के प्रति अधिक

संवेदनशील होते हैं और दलहनी फसलों की कीमतें इनकी प्रतिस्पर्धी फसलों (जैसे गेहूँ, तिलहनों आदि) की अपेक्षा बहुत ऊँची हैं, फिर भी दलहनी फसलों के क्षेत्र में आवश्यक बढ़ोत्तरी नहीं हुई है। माँग–विश्लेषण से पाया गया है कि चना और अरहर की माँग की मूल्य लोच एक से कम है। दलहनों की घरेलू आपूर्ति में कमी आने की दशा में इनकी कीमतों में उर्ध्वगामी प्रभाव होगा जो कि समाज के कमजोर वर्गों के हितों पर प्रतिकूल प्रभाव डालेगा।

यद्यपि वर्तमान में सरकारी क्षेत्र की राष्ट्रीय एवं अन्तर्राष्ट्रीय संस्थाओं एवं निजी क्षेत्रों के बीच समीपता की महत्ता व्यापक रूप में बतायी जा रही है, लेकिन अभी भी सरकारी एवं निजी क्षेत्रों के बीच संबंधों को फिर से बढ़ाने के लिए और अधिक स्पष्ट रूप से समझदारी की आवश्यकता है। सरकारी एवं निजी क्षेत्रों के अध्ययनों से कई आवश्यक दिशा–निर्देश मिलते हैं। भागीदारी की समझ संगठन की उत्तरोत्तर प्रगति में मदद देती है और यह भागीदारों एवं कार्मिक तंत्र के तालमेल से सीखी जा सकती है। सफल भागीदारी एक दूसरे की आपसी समझबूझ, विश्वास, एवं आदान–प्रदान से बढ़ती है।

देश में वृहत् कृषि क्षेत्र होने के बावजूद, कम कृषि उत्पादकता, व्यापक गरीबी एवं असमन्वित बाजार जैसी समस्याएं व्याप्त हैं। बार–बार यह प्रश्न पूछा जाता है कि सरकारी विस्तार तंत्र इन समस्याओं के निवारण, विशेष रूप से गरीबों को रोजगार दिलाने एवं उनको सुदृढ़ करने में क्या भूमिका अदा कर सकता है। यद्यपि देश के कई राज्यों में सरकारी विस्तार तंत्र में व्यापक सुधार हो रहा है, लेकिन देश में गरीबों की बड़ी संख्या इस लाभ से वंचित है। जब तक वास्तविक रूप में संबंधित नीतियाँ उत्पादन बढ़ाने के अलावा, इनको अधिक सुदृढ़ एवं रोजगार दिलाने के प्रति ध्यान नहीं देती, कोई अपेक्षित लाभ मिलने की संभावना नहीं है। इसके अतिरिक्त इस बात पर भी बल देने की जरूरत है कि विभिन्न संगठनों के बीच भागीदारी के विभिन्न उपायों एवं स्थानीय स्तर पर इनके मूल्यांकन एवं व्यवस्थित शिक्षा हेतु प्रयास किये जाएं।

"राष्ट्रीय कृषि प्रौद्योगिकी परियोजना" का एक उद्देश्य शोध परियोजना के प्रधान पर्यवेक्षक को प्रशासनिक एवं वित्तीय अधिकारों का वास्तविक रूप में विकेन्द्रीकरण भी है। इस सन्दर्भ में अधिकारों के विकेन्द्रीकरण की जाँच के लिए देश के 14 कृषि अनुसंधान संस्थानों में एक मूलाधार सर्वेक्षण किया गया। सर्वेक्षण में यह पाया गया कि पुरानी शोध प्रबंध शैली, कार्यसंबंधी जटिलताओं, तथा नई प्रबंधन पद्धति की समझ में कमी आदि कारणों से अधिकारों का प्रयोग अपेक्षा से कहीं अधिक कम था। भारतीय कृषि अनुसंधान परिषद की शोध संस्थाओं में यह स्तर अपेक्षाकृत कुछ अच्छा है जबकि राज्य कृषि विश्वविद्यालयों में काफी सुधार की आवश्यकता है। वर्तमान में राष्ट्रीय कृषि अनुसंधान प्रणाली में संस्थात्मक विकास, निगरानी एवं मूल्यांकन आदि प्रक्रियाओं को मजबूत करने पर व्यापक बल दिया जा रहा है। बहुविभागीय एवं बहु–संस्थानोन्मुखी अनुसंधान प्रक्रिया पर बल दिया जाता रहा है फिर भी इसमें कम सफलता मिली है। वरिष्ठ शोध वैज्ञानिकों द्वारा 'राष्ट्रीय कृषि प्रौद्योगिकी परियोजनाओं' के शोध परिणामों के मूल्यांकन से परियोजनाओं के उत्पादों की गुणवत्ता में वृद्धि हो रही है और अनुसंधान की क्षेत्रीय परियोजनाओं एवं प्रयोग के तरीकों को अधिक सराहा जा रहा है।

'राष्ट्रीय कृषि प्रौद्योगिकी परियोजना' में 'प्रतिस्पर्धी अनुदान कार्यक्रम' अनुसंधान की उपयोगिता, क्षमता एवं दक्षता में प्रतिस्पर्धा विकसित करने में साबित हुई है। इस परियोजना के तहत आये शोध प्रस्तावों को गुणवत्ता एवं प्राथमिकता के आधार पर चयन के लिए 'परियोजना कार्यान्वयन इकाई' ने कई आधारभूत एवं अंक आधारित तरीकों का प्रयोग किया है एवं इसके परिणाम काफी पारदर्शी मिले। इसके अतिरिक्त 'राष्ट्रीय कृषि प्रौद्योगिकी परियोजना' के सहयोग से कृषि अर्थशास्त्रियों के मध्य संगणक (कम्प्यूटर) आधारित सूचना तंत्र विकसित किया गया है जिसका इस केन्द्र द्वारा समय–समय पर नवीनीकरण किया जाता है।

वर्तमान में गैर–सरकारी संस्थाओं के साथ मिलकर कार्य करने की प्रवृति पर बल दिया जा रहा है। इस क्रम में केन्द्र ने दूरगामी कार्यक्रमों में, एक गैर–सरकारी संस्था 'शिक्षा एवं समाज कल्याण समिति', मुज्जफ्फरनगर के साथ पश्चिमी उत्तर प्रदेश में ग्रामीण एवं कृषि विकास में अवरोधों की जानकारी हेतु एक अध्ययन किया। अध्ययन से पता चला है कि संबंधित विभागों एवं संगठनों के सामूहिक प्रयास से इन अवरोधों को दूर किया जा सकता है।

इस वर्ष केन्द्र से दो आगुन्तक वैज्ञानिक (Visiting Scientist) कुछ समय तक जुड़े रहे। इसके अतिरिक्त केन्द्र ने एक नीति प्रपत्र (Policy Paper), दो नीति सार (Policy Brief), एक कार्यशाला कार्यवाही (Workshop Proceedings), एक पी. एम. ई. टिप्पण (PME Note) प्रकाशित किया है। केन्द्र के वैज्ञानिक अनेक व्यवसायिक एंव नीति संबंधी कार्यों एवं वैचारिक कार्यक्रमों से जुड़े रहे तथा केन्द्र एवं केन्द्र से बाहर कई कार्यशालाओं एवं बैठकों का आयोजन भी किया। केन्द्र ने कई राष्ट्रीय एवं अन्तर्राष्ट्रीय संस्थाओं के बीच पारस्परिक सहयोग भी बढ़ाया है। उपर्युक्त उपलब्धियों एवं क्रियाकलापों के कारण इस वर्ष भी केन्द्र व्यापक ख्याति अर्जित कर पाने में सफल रहा है।

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