Summary of Policy Papers

May 2005

National Academy of Agricultural Sciences
NASC Complex, DPS Marg, Pusa, New Delhi 110012, India

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Foreword

The National Academy of Agricultural Sciences (NAAS), founded in 1990, serves as a think tank and provides an interactive forum to scientists to present their views on critical issues relating to agricultural research, education and extension. For this, the Academy publishes a quarterly newsletter and organizes workshops, brainstorming sessions, seminars and Agricultural Science Congresses involving experts and all the stakeholders. Agriculture is both the largest living industry and private sector enterprise in the country. Over 115 million families are engaged in crop and animal husbandry, fisheries, forestry and agro-processing. The Academy works in close collaboration with other science academies within the country and abroad to achieve the goal of enhancing scientific excellence and social relevance in the field of agricultural research, education and extension. The Academy accords recognition to scientists in different fields by electing Fellows, Associates and giving Awards in recognition of their scientific contributions.

The crystallized views of the scientists emerging from the interactive sessions are published as Policy Papers, which provide useful inputs to the policy makers, planners, educationists and decision makers. So far, NAAS has published thirty Policy Papers. These cover a wide range of agricultural research and development subjects. The topics span discussions on the empowerment of women to intellectual property rights and the use of transgenics in agriculture. A complete list of the titles is given in the table of contents of this publication. I believe, the knowledge contained in these policy papers is most relevant to tackling the emerging challenges in agricultural science related to technological, ethical, equity, economic and employment issues. This publication gives annotated summaries of the Policy Papers and thus aims to draw attention to the excellent set of policy documents available with NAAS on the one hand, and to encourage the use of the recommendations, on the other. I invite the readers to visit the academy's web page to gain complete information on each of the policy papers.

Enhancing our agricultural competitiveness is an urgent task in the context of increasing globalisation of trade. The pace of agricultural progress can be accelerated only through synergy between technology and public policy. There is an urgent need for mutually reinforcing packages of technology, services and public policies. The NAAS Policy Papers are designed to bring about a symphony approach in agricultural research and development. At a time when there is widespread concern about the steep decline in agricultural growth rates and the increasing distress faced by farm women and men, NAAS hopes that the policy papers summarized in this publication would stimulate both the Central and State Governments to help our farmers and the country through appropriate policies and investment decisions.

NEW DELHI

DATE: 28 May 2005

M.S. Swaminathan

(M.S. SWAMINATHAN)

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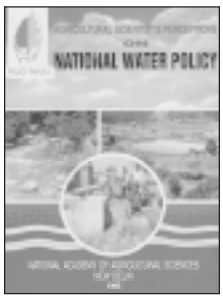
Policy Paper No. 1



Agricultural Scientists' Perceptions on National Water Policy *1995*

Convenor: Dr. P. B. S. Sarma
Agricultural Engineer. Former Project Director, Water Technology Centre, Indian Agricultural Research Institute, New Delhi

Summary

- *Water is an essential life supporting resource.*
- *If unscientific use of water is not halted, India may have to import some 40 mt of food grains by 2025 according to Lester Brown.*
- *India's National Water Policy is an important instrument for the conservation, efficient and equitable use of water.*

This paper reports on the Water status of our country and gives suggestions on how to meet future challenges of water scarcity in the light of the National Water Policy.

Unscientific and unsustainable use of irrigation water has caused conditions which have resulted in continued low productivity in irrigated areas. This can be attributed to large conveyance losses, improper distribution, mismatch between demand and supply and lack of adoption of improved soil and crop management practices. The National Water Policy (1987) outlines the goals and intentions of the Government. It has to be set into action through specific programmes and regulations. Agriculture is a major user of water resources.

Policy Recommendations:

- Water should be treated as a National Resource and its development and use should be determined on sound scientific principles.
- A consultative group comprising scientists and technologists should be constituted on specified zonal basis for optimal allocation, planning and management of water resources.
- Appropriate rainwater quality monitoring system for surface water and ground water can help in identifying the extent and sources of water pollution.
- Environment management system with appropriate infrastructural support needs to be set up.
- There is need to have region specific legislation on ground water.
- There is need to develop and enforce guidelines in the operation of water markets.
- Involvement of farmers' organizations should be increased in respect of decisions on cropping systems, planning and implementation of water release schedules, collection of water rates, maintenance of infrastructure at the farm level, coordination of supply of inputs and marketing of produce. A strong research backup has to be put in place to develop and improve national standards for organic farming.

❑ NAAS (1995): Agricultural Scientists' Perceptions on National Water Policy, [P.B.S. Sarma, Convenor]. Policy Paper # 1. National Academy of Agricultural Sciences, New Delhi. pp 28.

For details please visit Academy's web site: www.naas-india.org

Policy Paper No. 2

Fertilizer Policy Issues (2000-2025) *1997*

Convenor: Dr. J. S. Kanwar
Deputy Director General (Emeritus), ICRISAT and former Vice-President, National Academy of Agricultural Sciences, New Delhi

Summary

♦ *Good seeds, fertilizers and water would be the major determinants of food productivity in future. The judicious and need-based use of fertilizers and manures would trigger accelerated growth of India's agriculture.*

♦ *India has a network of 472 soil testing laboratories. Soil testing should include tissue testing and advisory service for specialized farming in each agro-ecological region of the country.*

This paper gives a glimpse of the fertilizer needs of the country and suggests ways for its judicious use.

In order to meet future food requirements, India has the compulsive need to raise its food grain production rate by more than 6 mt/annum. Technological adoption using improved seeds, fertilizers and water would be the major determinant of growth in future. Among these, the most costly input would be fertilizers, whose judicious use would ensure the required growth.

Policy Recommendations:

- For achieving higher productivity, judicious use of fertilizers is essential.
- A pragmatic pricing policy on fertilizers is essential to promote balanced use of different mineral elements.
- R & D agencies need to intensify efforts on fertilizer use efficiency and minimizing N losses.
- Strategies are needed to enrich organic manures with chemical fertilizers using modern technology on reducing the bulk.
- Use of green manuring and planting plantation and horticultural crops needs to be encouraged in humid, sub-humid areas.
- Micro-nutrient deficiency is growing rapidly in our soils. Strategies need to be evolved to ensure availability of necessary micro-nutrient carriers.
- A critical review of soil-testing system is needed to provide advisory service for general as well as specialized farming.
- Building up of a national networking arrangement to coordinate studies on fertilizer use and soil health in different agro-ecological regions should get higher priority.
- The question of subsidy on fertilizers should be viewed from a national perspective of food security.
- Strategies have to be evolved for assured supply of essential quantities of nutrients.

❑ NAAS (1997): Fertilizer Policy Issues (2000-2025), [J. S. Kanwar, Convenor]. Policy Paper # 2. National Academy of Agricultural Sciences, New Delhi. pp 6.

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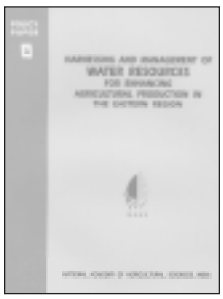
Policy Paper No. 3



Harnessing and Management of Water Resources for Enhancing Agricultural Production in the Eastern Region *1998*

Convenor: Dr. K. Pradhan
Former Vice-Chancellor, Orissa University of Agriculture and Technology, Bhubaneshwar; and former Secretary, National Academy of Agricultural Sciences, New Delhi

Summary

This paper examines various issues related to the inefficient Water Management leading to low productivity in the Eastern Region of India, which is comprised of the States of Bihar, West Bengal, Orissa, parts of Uttar Pradesh and Eastern Madhya Pradesh. It has most fertile soils and abundance of rainfall and river flows yet has the lowest yields in the country.

- ♦ *Watershed Management is the key to efficient water resource development particularly in good marginal lands and more fragile ecosystems; it would stop their degradation and rejuvenate them.*
- ♦ *Village pond, a traditional system of water conservation needs revitalization, and implementation of artificial recharge by cost-effective techniques should be encouraged*

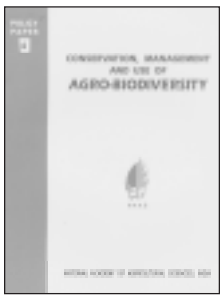
Policy Recommendations:

- ♦ Technological and policy interventions are urgently needed to exploit the vast potential of land and ground water sources.
- ♦ The mechanics of inflow-outflow of water from traditional village ponds needs to be understood to be able to use them for irrigation purposes.
- ♦ The extent of coastal saline and alkali soils should be estimated and appropriate cropping systems developed for such areas.
- ♦ Exchange of information and coordination among Research Institutes and State Agricultural Universities should be encouraged to develop a databank on water resources for evolving strategies to manage them efficiently.
- ♦ High rainfall in this region often results in water logging and flooding. Proper rainwater management, therefore, is essential for effective exploitation of this resource.
- ♦ Field evaluation studies ought to be carried out to evolve economically viable technologies for rainwater management.
- ♦ Water use planning should be done on micro watershed basis with Government's support and peoples' participation on the pattern of land use planning for optimal water resource development. Teams of leading scientists should be formed to explore and develop technology packages for better water resource utilization.
- ♦ Conjunctive use of surface and ground water should be promoted in concert with Farmers' irrigation cooperatives (water users).

❑ NAAS (1998): Harnessing and Management of Water Resources for Enhancing Agricultural Production in the Eastern Region, [K. Pradhan, Convenor]. Policy Paper # 3. National Academy of Agricultural Sciences, New Delhi. pp 8.

For details please visit Academy's web site: www.naas-india.org

Policy Paper No. 4



Conservation, Management and Use of Agro-biodiversity

1998

Convenor: Dr. R. S. Paroda
Former Director General, Indian Council of Agricultural Research and former President, National Academy of Agricultural Sciences, New Delhi. Presently Head, CGIAR Program for Central Asia & Caucasus, Tashkent, Uzbekistan

Summary

This paper is the outcome of the deliberations held at a workshop to discuss the biotic factors related to agriculture, such as, plants, animals, fish, reptiles, insects, birds and microbes related to agro-biodiversity. Conservation, management and sustainable use of these organisms and their wild relatives require specific attention. International developments relating to genetic resources have affected the intellectual property regime, access to bio-resources and related issues. The need to analyze relevant factors and refine workable solutions in the Indian context has been stressed. The workshop deliberated on these issues.

- *The Indian gene - center is amongst the 12 mega diversity regions of the world. About 25 crop species were domesticated here. It is known to have more than 18,000 species of higher plants.*

- *Most of the developing world looks towards India for suitable models for agro-biodiversity conservation, management and use. Our sui generis system for protecting agro-biodiversity is innovative and practical in dealing with all scientific, political, and legal issues.*

Policy Recommendations:

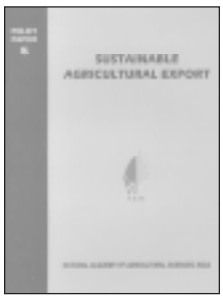
- A sample of all plant genetic resources available with various holder organizations/institutes/universities/communities in the country must be made available to the National Gene Bank for safe conservation for posterity.
- Modern technologies, such as *in vitro* and cryopreservation, are needed for conservation of non-orthodox seed species.
- Suitable mode and mechanisms for providing needed incentives to farmers should be evolved so as to ensure safe and effective *in situ* conservation of genetic heritage through on-farm practices.
- Conservation of available breeds/strains of animals, fish and microbes needs urgent attention.
- Simple, effective and practicable mechanisms for prospecting agro-biodiversity and monitoring should be evolved.
- Genetic variability of native, under-utilized species of food crops, fruits, medicinal, aromatic and other economic plants should be documented on priority.
- Mechanisms should be evolved for legal protection of landraces/traditional varieties.

  A National Policy Advisory Committee with wide representation should be instituted.

❑ NAAS (1998): National Concern for Conservation, Management and Use of Agro-biodiversity, [R. S. Paroda, Convenor]. Policy Paper # 4. National Academy of Agricultural Sciences, New Delhi. pp 8.

For details please visit Academy's web site: www.naas-india.org

Policy Paper No. 5



Sustainable Agricultural Export *1999*

Convenor: Dr. K. Pradhan
Former Vice-Chancellor, Orissa University of Agriculture and Technology, Bhubaneshwar and Rajasthan Agricultural University, Bikaner and former Secretary, National Academy of Agricultural Sciences, New Delhi

Summary

This document analyses critically the prospects and potentials of agricultural exports from India. Agriculture is a core sector of Indian economy and accounts for 30% of its GDP. With increased productivity as a result of 'Green revolution', agriculture is set for a new goal of Agri-Export Revolution. India is the World's largest producer of milk and second largest producer of fruits and vegetables. Fish and marine food production has risen from 7.5 mt to over 50.0 mt. India now holds an important position in the export market for traditional commodities as also for new products. Agricultural exports have already increased from $600 million in 1960-61 to $3520 million in 1990-91. An attempt was made to understand emerging challenges and identify ways to place our country as a major player in the export market.

- *The broad export strategy for Indian Agriculture would entail strengthening and widening the export market for the traditional 'Commercial Commodities' [e.g., tea, coffee, spices, cotton, jute, sugar, oil meals etc.] and to create and capture new export markets for dynamic commodities [eg. meat, dairy products, poultry, fishery, vegetables, fruits, floriculture etc.].*

- *As the agri-business enlarges, the demand for trained manpower would increase. The food-processing industry would have to implement and adhere to quality assurance measures such as ISO 9000, ISO 15000, HACCP, CODES etc. Human resource development would undergrid agri-business enlargement in the years ahead.*

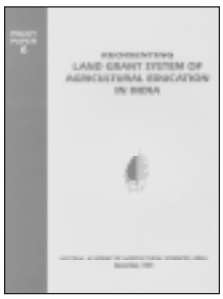
Policy Recommendations:

- Wheat is a major export commodity from developed countries, India will have to face tough competition for its export.
- The potential market for rice lies in the South East Asian countries like Indonesia, Malaysia and the Philippines and in East Asian countries like Japan and South Korea.
- Several spices, condiments and medicinal crops can be marketed abroad at fancied prices.
- Demand for coffee in the world market opens-up splendid opportunities.
- India should continue to work and aspire for leadership in tea exports.
- India holds a great potential for export of tobacco.
- There is need for pushing the dairy sector from an occasional exporter to a regular exporter in the years to come. The quality aspects will have to be strictly addressed to.
- Meat and meat products from buffalo, sheep and goat have a major export potential.
- Creation of quality testing and certification protocols of international standards would be necessary to fully exploit trade opportunities.

❑ NAAS (1999): Sustainable Agricultural Export, [K. Pradhan, Convenor]. Policy Paper # 5. National Academy of Agricultural Sciences, New Delhi. pp 9.

For details please visit Academy's web site: www.naas-india.org

Policy Paper No. 6



Reorienting Land Grant System of Agricultural Education in India *1999*

Convenor: Dr. H. K. Jain
Former Director, Indian Agricultural Research Institute, New Delhi

Summary

♦ *The establishment of agricultural universities on a pattern similar to that of the land grant colleges of the United States has been a landmark in reorganizing and strengthening agricultural education / research / extension system in India.*

♦ *Four decades after the progressive implementation of the land grant pattern, our Agricultural Universities need to redefine their mission. They should take into consideration an enlarged portfolio which includes production with protection of land, water and environmental resources and the tenets of ever-green revolution.*

This paper examines in depth the causes of deterioration in standards of teaching and research in the Agricultural Universities and suggests ways to improve the situation.

The adoption of Land Grant System of education has proved extremely useful. But lately there has been a widespread concern about the sustainability of the system so also the gradual decline in both, academic and research standards. High academic standards of earlier years seem to have suffered an erosion. Accordingly the need for reviewing the system has been felt to have a better understanding of the issues and to take corrective measures in time.

Policy Recommendations:

- The practice of proliferation of Agricultural Universities and colleges needs to be stopped.
- Agricultural universities must lay emphasis in maintaining greater national perspective in faculty building.
- Students should be discouraged from taking more than two degrees from the same university in order to curb inbreeding.
- Agricultural Universities must encourage admission of students on an all-India basis.
- There is a need for rationalization of policies with regard to admission, duration of the programmes, requirement of credits, evaluation and grading and updating as well as revision of curricula at regular intervals.
- With social, economic and scientific changes, several new disciplines such as agri-business management, biotechnology, molecular taxonomy, environmental sciences, plant and animal genetic resources, intellectual property rights in relation to World Trade Agreement, and Biodiversity Convention must find a place in the teaching programmes.
- There is a need to develop proper linkages between Agricultural Universities, ICAR Institutions and agro-based industries and with general universities and the UGC.

❑ NAAS (1999): Reorienting Land Grant System of Agricultural Education in India, [H. K. Jain. Convenor]. Policy Paper # 6. National Academy of Agricultural Sciences. pp 8.

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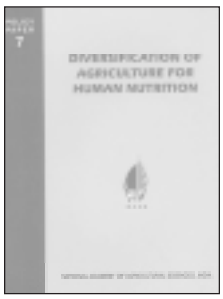
Policy Paper No. 7



Diversification of Agriculture for Human Nutrition *2001*

Convenor: Dr. (Ms.) Mahtab S. Bamji
Clinical and Community Nutritionist. Emeritus Medical Scientist, Dangoria Charitable Trust, Hyderabad

Summary

♦ *Diversification of agriculture can ensure both food security and nutritional security, which means meeting the calorie and protein needs of the people and also implies adequate supply of micro-nutrients, vitamins and minerals.*

♦ *Shifting agricultural resources to higher-valued land-use options is a new paradigm for India's agricultural development. Genetic engineering and bio-tech could be effectively utilized as tools for improving yields and quality of both plant and animal based food.*

This document analyzes nutritional inadequacies of Indian diets and suggests ways of combating the situation because of the lack of micronutrients and vitamins. As overall economic status improves with growth in incomes, special attention will have to be paid to nutritional aspects. Shifting agricultural resources to higher-valued options is the new strategy for agricultural development. Good export prospects reinforce this trend. Non-conventional crops like aromatic and medicinal plants, floriculture, etc. figure importantly in this strategy but the major impetus comes from horticulture, livestock, dairy poultry, fisheries etc which have traditionally been minor constituents of Indian diets. The nutritional implications are obvious.

Policy Recommendations:

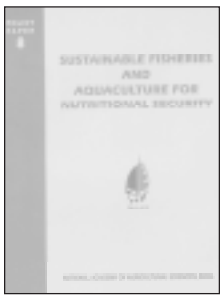
- Thrust on raising productivity of foodgrains, dairy products and fish must remain a central feature of agricultural policy.
- Agro-processing investments must move to the countryside where production is concentrated.
- Nutrition education must be made part of regular curricula in schools. Sustained drives using mass media, particularly in rural areas and urban slums are necessary to create greater awareness.
- Programmes like homestead gardening, urban gardening, household preservation and enrichment of food, etc. must be actively supported. Health and hygiene, sanitation, etc. make significant contributions to nutritional well being and should be accorded greater priority.
- Food enrichment, fortification strategies need to be supported. Assessment and incorporation of indigenous ingredients offers considerable opportunities and should be exploited.
- National nutrition monitoring effort must be further strengthened and focused on target themes and populations.

  Developments in modern sciences, particularly biotechnology, should be exploited for incorporation of marketable and nutritional qualities in food crops of various kinds with appropriate safety norms.

❑ NAAS (2001): Diversification of Agriculture for Human Nutrition, [Mahtab S. Bamji, Convenor]. Policy Paper # 7. National Academy of Agricultural Sciences. pp 10.

For details please visit Academy's web site: www.naas-india.org

Policy Paper No. 8



Sustainable Fisheries and Aquaculture for Nutritional Security *2001*

Convenor: Dr. T. J. Pandian
Former National Professor, School of Biological Sciences, Madurai Kamraj University, Madurai

Summary

♦ *Aquatic resources of India are vast and diversified. Among the Asian countries, it ranks second in culture and third in capture fisheries. Aquaculture is the fastest growing enterprise within the agriculture sector.*

♦ *Human Resource Development for sustainable fisheries development at all levels, is a critical input, since a paradigm shift in our mind-set from mining aquatic resources to their management is needed.*

This document provides an appraisal of meeting nutritional needs of Indian populace through aquatic resources, which are vast and diversified. Different river systems of the country, having a combined length of 20,000 km, offer one of the richest fish genetic resources in the world. Hence, scientific utilization of the vast and diverse aquatic resources should immensely benefit us, especially in the food production sector. Per capita fish availability to an average Indian is about 9 kg, less than the world average (12 kg), and the quantity (11 kg) recommended by the WHO for nutritional security. Fisheries constitute a highly productive sector, a source of valuable food and employment, and a net contributor to the national income.

Policy Recommendations:

- There is an urgent need for the National Water Research Council to take into consideration the requirement of fisheries' sector to promote fisheries and aquaculture development and conservation of aquatic resources. Efforts should be made to utilize the sheltered bays for mariculture.
- There is a need to evolve scientific policies and legal framework for supporting coastal and open-sea aquaculture, particularly with regard to quantity and impact of groundwater abstraction for shrimp culture, extent of conversion of agricultural lands and impact of untreated wastewater from shrimp farms. Coastal aquaculture should be integrated with other activities of the coastal region.
- It is necessary to create a Fishing Regulatory Authority with powers of implementing sustainable fishing. This authority should be bestowed with legal powers.
- There is need to increase commercial production of inexpensive, balanced feeds for finfish and shellfish.
- There is a need to prioritise species and aquatic habitats for conservation.
- Fishermen should be encouraged to carry ice on board to preserve the harvest.

❑ NAAS (2001): Sustainable Fisheries and Aquaculture for Nutritional Security, [T. J. Pandian, Convenor]. Policy Paper # 8. National Academy of Agricultural Sciences, New Delhi. pp 10.

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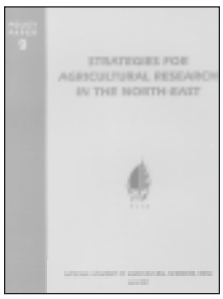
Policy Paper No. 9



Strategies for Agricultural Research in the North-East *2001*

Convenor: Dr. G. L. Kaul
Former Vice-Chancellor, Assam Agricultural University, Guwahati, and Former Director, National Agricultural Technology Project (NATP), ICAR.

Summary

- *The North East region of India is very rich in biodiversity.*
- *Rapid deforestation and floods have resulted in soil erosion, and loss of soil nutrients and biodiversity.*
- *The region has great potential for floriculture and the cultivation of horticultural crops*

This paper analyses agricultural potential of India's North-East and suggests ways of exploiting the unique opportunities offered by this region. It comprises the states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. The region falls under high rainfall zone and the climate ranges from subtropical to alpine. The terrain has wide variations in slopes, altitude, land tenure systems and diverse cultivation practices. The agricultural production system in the region is predominantly rainfed, mono-cropped at subsistence level. Slash and burn agriculture is still practiced in almost all the states except Sikkim, on steep slopes with reduced cycle of 2 to 3 years as against 10-15 years in the past. The region, once richly endowed with rich genetic diversity of plants, has been denuded due to human interference. This has resulted in progressive decrease in forest cover, loss of bio-diversity, serious soil erosion and decline in land productivity. Modernization of agriculture has by-passed this region.

Policy Recommendations:

- Watershed approach of soil and water conservation and development of land-based production programmes in participatory mode need to be propagated.
- Diversity mapping should be done alongwith inventorisation at micro-level for effective management, conservation and use of crop and animal species and their relatives.
- The swamp buffaloes, pigs and goats of the region need to be improved, either through selection or cross breeding.
- Vast expansion of area under rubber is possible where land is denuded and is not suitable for cultivation of other crops.
- Improvement of tea, ornamental plants, medicinal plants, forest trees through application of biotechnology should receive immediate attention.
- Useful plants should be identified and popularized for large-scale cultivation for improving income of large number of tribal and other rural families.

❑ NAAS (2001): Strategies for Agricultural Research in the North-East, [G. L. Kaul, Convenor]. Policy Paper # 9. National Academy of Agricultural Sciences, New Delhi. pp 17.

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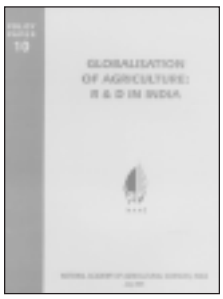
Policy Paper No. 10



Globalization of Agriculture: R&D in India *2001*

Convenor: Dr. K. V. Peter
Vice-Chancellor, Kerala Agricultural University, Trichur, Kerala

Summary

- *With the signing of the GATT, it is imperative for India to work for attaining trade competitiveness in the World market.*
- *Livelihood security of our resource-poor farmers has to be ensured.*
- *Areas of our strength should be identified and exploited.*

This paper highlights that competitiveness of countries in the wake of globalization in individual products/commodities will play a major role in the international trade. India is a signatory to the Uruguay Round Agreement of the General Agreement on Tariffs and Trade (GATT). This makes it mandatory for India to open up its economy to the world market. In this process, agriculture will be a key sector. India is not a major player in the world agricultural commodity market except in the case of a few commodities such as rice, spices, soya meal, cashew, tea and coffee. As there is persistently increasing trade deficit for the country as a whole, increasing net exports of agriculture is a significant contribution to the country's economy.

Policy Recommendations:

- Every measure should be taken to safeguard the livelihood security of the farmers, the vast majority of whom are resource-poor operating on small and marginal holdings.
- Systematic and continuous efforts are necessary to identify and determine the R&D support required in (a) Enhancing competitiveness (b) Standardization of phytosanitary measures, (c) strengthening R&D institutions. Technology research has to be integrated with financing mechanisms.
- Subsidies and bound tariff support measures may be continued by designating these under the Livelihood Box to tide over the initial problems.
- Small farming systems have to be integrated with diversification process which requires working with communities. There is need for policy integration between land, water and crop development factors and financing.
- There is need to develop information systems with which Indian Agriculture can respond quickly in a globalizing phase.
- Planning of agricultural research should take into consideration the opportunities which have now become available for India to emerge as a major exporter of diverse commodities and products.
- WTO Cells should be created by the state governments and in the agricultural universities so that relevant information is collected on a continuous basis.

❑ NAAS (2001): Globalization of Agriculture: R&D in India, [K. V. Peter, Convenor]. Policy Paper # 10. National Academy of Agricultural Sciences, New Delhi. pp 6.

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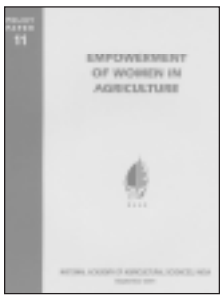
Policy Paper No. 11



Empowerment of Women in Agriculture *2001*

Convenor: Dr. V. P. Gupta
Former Vice-Chancellor, Rajendra Agricultural University, Pusa, Bihar

Summary

- *Women are very deeply involved in all agricultural activities yet their role is hardly recognized.*
- *Women friendly trades and technology need to be developed to give impetus to their increased involvement.*

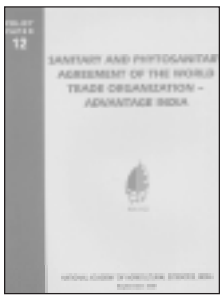
This paper reports on the important role played by women in agriculture and suggests ways of improving their status, as women constitute a major component of agricultural work force. They carry out jobs that are time and labour intensive such as sowing, transplanting, weeding, interculture, harvesting, threshing, and post-harvest operations like shelling, cleaning, grading and processing. They also contribute to decision making process for crop production, seed production and management, post-harvest management of agricultural and horticultural produce, biomass utilization, livestock management, marketing and financial management. They have, however, lagged behind in use of improved crop production and processing tools and machinery.

Policy Recommendations:

- Dairying is compatible with inherent routine chores performed by women. Women's involvement in dairying will not only provide them employment but will also bring in social change.
- Farm women can be encouraged to adopt bee-keeping, mushroom cultivation, coconut processing and broom making to exploit it into a large scale profitable business.
- There is need to design programmes which could gainfully utilize the services and skills of women in relation to their involvement in agri-based allied activities.
- Regional rural banks should play an important role in empowerment of rural women through various micro credit schemes.
- There is need to organize women societies for various activities involving group engagement. A strong and effective women cooperative movement is desirable to boost economic upliftment process of rural women and their families.
- Entrepreneurship Development Centres should be created in Agricultural Universities to integrate entrepreneurial skill among rural folk particularly women for building self confidence and self awareness.

❑ NAAS (2001): Empowerment of Women in Agriculture, [V. P. Gupta, Convenor]. Policy Paper # 11. National Academy of Agricultural Sciences, New Delhi. pp 8.

For details please visit Academy's web site: www.naas-india.org



Sanitary and Phytosanitary Agreement of the World Trade Organization - Advantage India *2001*

Convenor: Prof. Anupam Varma
National Professor, Advanced Centre for Plant Virology, Division of Plant Pathology, Indian Agricultural Research Institute and former Secretary, National Academy of Agricultural Sciences, New Delhi

Summary

♦ *With the trade liberalization there is a growing concern for having appropriate SPS regulations.*

♦ *SPS regulations of the target country need to be understood to be competitive in the export of agricultural produce.*

This document is the outcome of deliberations held during the seminar on the above subject.

Sanitary and Phytosanitary (SPS) Agreement of the World Trade Organization (WTO) is aimed at developing measures which would ensure protection of human, animal or plant life or health, and equivalence and transparency in global agricultural trade. SPS measures are applied to both domestically produced and imported goods to protect, (i) humans from animal and plant-carried diseases, (ii) plants and animals from pests or diseases, and (iii) territory of a country from spread of a pest or disease. To achieve these objectives, SPS measures must have adequate quarantine regulations. Genetically modified organisms which may negatively impact human and animal health and environment, adds another dimension to be addressed through SPS measures.

Policy Recommendations:

- There is an urgent need to establish referral laboratories for testing the international standards for their suitability to the Indian situation. The key issues are the chemical/pesticides residue limit and detection of food-borne pathogens.
- The Directorate of Plant Protection needs strengthening and complete reorganization so that it is able to address various SPS related issues effectively.
- The mechanism of issuing SPS certificates for the export of meat and fish products in various parts of the country requires harmonization.
- We must undertake pest risk assessment (PRA), identify areas/regions free from such pests both of plants and animals, take appropriate measures to maintain disease-free status and develop eradication programme for diseases.
- India needs to play a proactive role in utilizing the provision of Mutual Recognition Agreements (MRAs).
- We should post a technically sound Agricultural Attaché at the diplomatic missions in the countries of interest for providing information on existing SPS regulations in target markets.

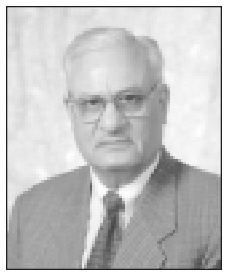
❑ NAAS (2001): Sanitary and Phytosanitary Agreement of the World Trade Organization - Advantage India, [Anupam Varma, Convenor]. Policy Paper # 12. National Academy of Agricultural Sciences, New Delhi. pp 13.

For details please visit Academy's web site: www.naas-india.org

Policy Paper No. 13

Hitech Horticulture in India *2001*

Convenor: Dr. K. L. Chadha
Former Deputy Director General (Horticulture), Indian Council of Agricultural Research and former Vice-President, National Academy of Agricultural Sciences, New Delhi



Summary

This paper examines potential of Indian horticulture and gives recommendations for exploring the new possibilities as India is the second largest producer of both fruits and vegetables and the largest producer of coconut, cashew, tea and spices, with a total production of 149,248 million nuts, 0.46 million tonnes, 806 million Kg and 2.90 million tonnes respectively. India has also made noticeable advance in production of flowers. India exported horticultural produce and product worth Rs. 90315 million during 1998-99. Horticulture today is not merely a means of diversification but forms an integral part of food and nutritional security.

- *Horticulture is not merely a means of diversification but forms an integral part of nutritional security.*
- *India is the second largest producer of fruits and vegetables.*
- *Competitive horticulture will require production of quality products.*

Policy Recommendations:

- There is an urgent need for intensification of collection and conservation of germplasm of horticultural crops.
- Molecular characterization of accessions is very important for IPR, patenting and safeguarding against gene piracy. Use of molecular methods of transferring male sterility need to be explored for development of hybrids.
- Greenhouse design, structure and technology for producing high quality planting material need to be fine-tuned to suit Indian conditions.
- Efforts are needed to isolate/develop male-sterile/gynoecious lines in important vegetable crops for hybrid seed production.
- A much greater effort is required for utilizing the full potential of biological control and transgenic crops.
- Use of healthy and quality planting material is the key to improving production of horticultural plants. This can be achieved through establishment of a network of micro- and macro-level diagnostic laboratories around the country.
- Market information database, market intelligence, marketing system and use of information technology are essential components for modernizing horticultural produce marketing in the country.

❑ NAAS (2001): Hi-tech Horticulture in India, [K. L. Chadha. Convenor]. Policy Paper # 13. National Academy of Agricultural Sciences, New Delhi. pp 12.

For details please visit Academy's web site: www.naas-india.org

Policy Paper No. 14

Conservation and Management of Genetic Resources of Livestock *2001*

Convenor: Dr. P. N. Bhat
Chairman, World Buffalo Trust, New Delhi

Summary

- *India is a major biodiversity resource centre of livestock.*
- *Proper identification and cataloguing of the germplasm is essential.*
- *Traditional knowledge for maintenance of different animals should be discreetly utilized.*

The Indian subcontinent is amongst the 12 mega bio-diversity resource centres in the world where domestication of flora and fauna took place in the antiquity. The spectrum of bio-diversity is exceedingly vast and varied in this subcontinent. In domesticated livestock and birds, a large number of breeds/types of cattle, buffaloes, sheep, goat, pig, horses, camels, mithuns, yak, dogs, cats, poultry, duck, geese, turkey, guineafowls and pheasants have evolved over time through natural selection and human effort. Improvement in livestock has been made from time to time to meet changing demands. This shift will have to be taken into account while developing policies for improvement and conservation of cattle.

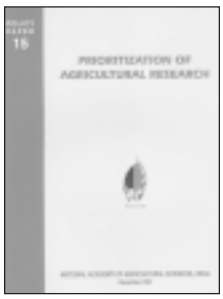
Policy Recommendations:

- Research institutions should initiate programmes to study and identify valuable adaptive traits at all levels (phenotypic, genotypic) and locate structural genes/QRTs responsible for these traits.
- "Wise use" forms a highly desirable form of conservation and should form the basis for framing conservation policies.
- It is necessary that identification, characterization, evaluation and documentation of the livestock genetic resources is completed on priority.
- A complete database should be developed on populations of different breeds within each livestock species of the country. The database should also identify factors threatening the extinction of breeds.
- The basic strategy will have to be conservation through sustainable improvement and management.
- Restriction on export of genetic resources out of India should be considered in a manner that does not hinder reasonable exchange.
- Cattle breeds such as Red Sindhi and Sahiwal should be further improved and conserved and cataloguing and preservation of breeds of other animals, like goat, sheep etc., be made.

❑ NAAS (2001): Conservation and Management of Genetic Resources of Livestock, [P.N. Bhat, Convenor]. Policy Paper # 14. National Academy of Agricultural Sciences, New Delhi. pp 12.

For details please visit Academy's web site: www.naas-india.org

Policy Paper No. 15



Prioritization of Agricultural Research *2001*

Convenor: Dr. I. P. Abrol
Director, Centre for Advancement of Sustainable Agriculture,
New Delhi

Summary

- *Research needs in changing scenario requires reorientation and prioritization of goals.*
- *Optimal use of available human and financial resources to meet the emerging needs is very important.*

India's agricultural research system has evolved over a period of time to match the emerging demands. However, it is now being felt that there is need to bring about changes that will enhance our ability and capacity to deal with emerging challenges in a more efficient and effective manner. Over time, the demand on India's agricultural research and education system have been fast changing. The system is now faced with the task of not only increasing the productivity of selected crops but also to address issues such as increasing disparity in agricultural growth, maintaining and enhancing the quality of natural resource base and reducing environmental degradation, poverty alleviation, emerging trade regimes etc.

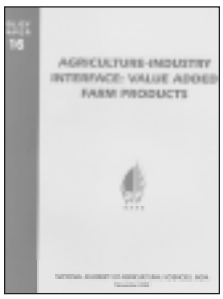
Policy Recommendations:

- In defining and refining research programmes, ICAR leadership should seek inputs from best of the available expertise.
- There is need to sensitize professional bodies to assume a role in defining and prioritizing research agenda. In this task National Academy of Agricultural Sciences can play an important role.
- It is recommended that Competitive Grant Program (CGP) be initiated in relation to identified priorities on a few major themes of importance.
- There is need to take careful view of the system-wise manpower requirements in the area of social science both in the short-term and over a longer term periods.
- There is immediate need to organize short duration management oriented training courses and awareness workshops aimed at bringing about change in the mindset of research managers.
- ICAR should consider initiating a system-wide program on 'database creation and management' cutting across all the subject matter divisions at the ICAR headquarters, Institutes and the SAUs.
- Availability of adequate and reliable information particularly agroecological data is a primary need for developing a comprehensive framework for priority setting.

  Efforts are needed to improve priority setting methodologies by systematically integrating the social and economic parameters.

❑ NAAS (2001): Prioritization of Agricultural Research, [I. P. Abrol, Convenor]. Policy Paper # 15. National Academy of Agricultural Sciences, New Delhi. pp 8.

For details please visit Academy's web site: www.naas-india.org



Agriculture-Industry Interface: Value Added Farm Products

2002

Convenor: Prof. Akshey Kumar Gupta
Former Director, Institute of Himalayan Bioresource Technology, Palampur

Summary

- *For agriculture to be remunerative, value addition to agricultural produce is essential.*
- *With globalization of trade, technologies to ensure quality products must be adopted.*
- *India has an advantage as it is the second largest producer of fruits & vegetables.*

Since nineties, the cost of agricultural inputs has increased faster than the market price of the outputs. As a result farmers are about 15-20% worse off, even after taking into account the gains in productivity. The problem of improvement in agriculture needs to be tackled from two different angles, first, to increase the productivity of the agriculture and delivery system, and, second, to increase the farmer's earning through efficient and effective value addition. In India the food processing industry is plagued by high-risk profile, poor infrastructure and outdated technologies and taxation laws. Value addition is often understood as how a consumer perceives the value delivered to him through a bundle of product/services.

Policy Recommendations:

- There is a great scope of developing some of our traditional food items from cereals, fruits, milk and fish. Appropriate and cost-effective packaging technology for these items is needed to ensure safety and prolonged shelf life.
- Policy and legislation must be reformed to allow processors to purchase their produce requirement directly from the farmers.
- Location of food processing units should be strategically placed depending upon the raw material availability, labour, product utilization and domestic and/or export marketing.
- Effective linkages need to be built between farmers and processors.
- Contract farming and small processing units should be promoted in a manner that processing firms are not able to exploit an un-equal relationship with growers.
- Experimental protocols for converting waste into usable co-products need to be developed into commercially viable technologies.

  There is an urgent need to develop low cost technologies for mechanization to hermetically pack milk products.

❑ NAAS (2002): Agriculture-Industry Interface: Value Added Farm Products, [Akshey Kumar Gupta, Convenor]. Policy Paper # 16. National Academy of Agricultural Sciences, New Delhi. pp 12.

For details please visit Academy's web site: www.naas-india.org

Policy Paper No. 17

Scientists' Views on Good Governance of An Agricultural Research Organization *2002*

Convenor: Dr. J. C. Katyal
Deputy Director General (Education), Indian Council of Agricultural Research, New Delhi

Summary

- *Attainment of self-sufficiency in food is a cause for complacency.*
- *In order to achieve the targeted 4% growth, more infusion of science, funding and commitment is necessary.*
- *Good governance is key to good performance.*

The National Policy on Agriculture (NPA) sets a goal of 4% growth in agriculture. While attempting that, agricultural science and technology must not lose sight of issues related to sustainability. Attainment of self-sufficiency in food is a cause for creeping in a sense of complacency in the minds of planners, policy gurus and fund administrators. If agriculture has to attain a growth rate of 4%, it will require far more infusion of science and funding commitment. More than ever, National Agricultural Research System (NARS) have to become increasingly responsive, participatory and transparent in internal decision-making and governance. Alignment of their findings to external scrutiny from the point of measurable contribution and high degree of social responsibility will be necessary. Public research systems must, therefore, find ways to continually improve performance and accountability.

Policy Recommendations:

- ICAR's autonomous status, as enshrined in the Societies Act of 1860, must be reassured and reaffirmed by the ICAR leadership. Intimately connected to the question of autonomy at the ICAR organization level are issues related to decentralization and delegation of powers to Institutes, Coordinated Research Projects and Scientists.
- ICAR must rewrite its rules and procedures so as to allow flexibility and speed in decision making.
- In order to strengthen technical support to Governing Body, a Standing Sub-Committee of Professionals should be created to assist it in Science and Technology related decisions.
- Convergence of technical, administrative and finance functions is necessary to reach the scientific goals in a time bound fashion and with efficiency.

  In place of annual assessment reports, participating scientists perceived to introduce a performance management system, which is non-punitive but focuses on individual building in deficient areas, is more desirable. ICAR must launch a comprehensive human resource development programme to serve the training needs of functionaries at all levels.

❑ NAAS (2002): Scientists' View on Good Governance of An Agricultural Research Organization, [J. C. Katyal, Convenor]. Policy Paper # 17. National Academy of Agricultural Sciences, New Delhi. pp 15.

For details please visit Academy's web site: www.naas-india.org

Policy Paper No. 18

Agricultural Policy: Redesigning R&D to Achieve its Objectives *2002*

Convenor: Dr. I. P. Abrol
Director, Centre for Advancement of Sustainable Agriculture, New Delhi

Summary

The National Agricultural Policy visualizes technological upgradation of Indian agriculture. Sustainable agriculture, food and nutritional security and agricultural trade depend critically on improved R&D. It endorses the concept of regionalization of agricultural research based on identified agro-eco regions, use of frontier sciences, participatory and proprietary approaches in R&D, strengthening research-extension linkages, and a "well-organized, efficient and result-oriented agricultural research and education system to introduce technological change in Indian agriculture". It calls for a redefinition of the partnership between central and state governments. It has also to chart a pathway of incentives, support systems to actualize the vast untapped potential of Indian agriculture.

- *Sustainable agriculture, food and nutritional security and trade depend upon improved R&D.*
- *There is need to strengthen and reorient research management systems to enhance social and ecological learning capacity of R&D Organizations.*
- *Roles of Public-private & International players need to be clrealy spelt out.*

Policy Recommendations:

- There is need for major paradigm shifts in (e.g. analytical framework) agricultural R&D, education and extension. Systems can guide the transition of traditional research hierarchies to these goals.
- The changes in organization and management of agricultural innovation that are needed to meet the policy goals must begin with an understanding of the previous record of organizational changes.
- Changes in the organization and methods of extension, as well as the research-extension partnerships and linkages need analysis.
- There is a need to strengthen social science research in agricultural innovation systems to enhance the social and ecological learning capacity of R&D organizations.
- System oriented, inter-disciplinary, issue-based research is the need of the day.
- There is need to shift from a hierarchical and linear technology generation-diffusion model to a non-linear and holistic learning mode.
- There is urgency of redesigning the agricultural innovation system in a new mode.

❑ NAAS (2002): Agricultural Policy: Redesigning R&D to Achieve Its Objective, [I. P. Abrol, Convenor]. Policy Paper # 18. National Academy of Agricultural Sciences, New Delhi. pp 12.

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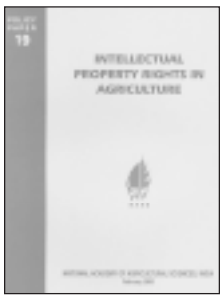
Policy Paper No. 19



Intellectual Property Rights in Agriculture *2003*

Convenor: Dr. Mangala Rai
Director General, Indian Council of Agricultural Research and Secretary Department of Agricultural Research and Education, New Delhi

Summary

♦ *In the wake of India becoming a partner in the WTO it is important to recognize our strengths and weaknesses.*

♦ *We have to be well aware of the various patent legislations to be competitive in research and trade.*

The Uruguay Round of negotiations (1986-1994) led to the establishment of the World Trade Organization (WTO) which has at least half a dozen intergovernmental agreements that directly affect agriculture. These are, Agreements on Agriculture (AoA), Applications of Sanitary and Phytosanitary Measures (SPS), Technical Barriers to Trade (TBT), and Trade Related Aspects of Intellectual Property Rights (TRIPs). An understanding of the implications and the application of these agreements, particularly the TRIPs, has become more important than ever before at every stage of planning, research, and commercialization of agricultural technologies.

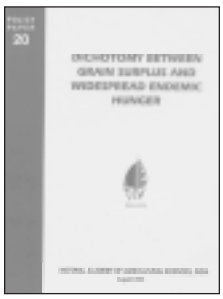
Policy Recommendations:

- High priority should be given to generation, evaluation, protection and effective commercial utilization of tangible products of intellectual property in agriculture.
- Use of trademarks for brand development of Indian agricultural products should be encouraged as safety net in agri-business.
- Rights to equitable sharing of benefits must be suitably balanced with the rights to IPR protection wherever applicable.
- Enforcement of new Acts and Amendments related to IPR in agriculture should be speeded up.
- Parallel laws like the Seeds Act should be strengthened. Contract Law should be reviewed to strengthen the law on Trade Secret, and the law related to land ownership of small farm holders.
- Inventors and innovators should be provided with their share commensurate with the worth of a commercialized invention.
- Elaborate Clearing House Mechanism (CHM) should be developed and strengthened in relation to IPR in agriculture.
- Quick action should be taken to record and document farmers' varieties in the country.
- Voluntary or concessional legal advice should be provided in partnership deals of strategic importance.

❑ NAAS (2003): Intellectual Property Rights in Agriculture, [Mangala Rai, Convenor]. Policy Paper # 19. National Academy of Agricultural Sciences, New Delhi. pp 16.

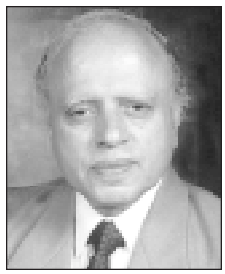
For details please visit Academy's web site: www.naas-india.org

Policy Paper No. 20



Dichotomy Between Grain Surplus and Widespread Endemic Hunger *2003*

Convenor: Prof. M. S. Swaminathan
Chairman, M. S. Swaminathan Research Foundations, Chennai, and President, National Academy of Agricultural Sciences, New Delhi



Summary

♦ *India faces a paradox of huge stock of food grains with a large section of population not getting enough food.*

♦ *Continuous rise in MSP and rise in cost have led to increase in food subsidy.*

India is now faced with the paradox of a huge buffer stock of food grains, while also harbouring the largest population of hungry and undernourished in the world. As per the Economic Survey of India, 2002-2003, we had a buffer stock of 63 million tonnes of food grains as against a requirement of 24 million tonnes. The Food Corporation of India has become the sole buyer, seller and stockist of food grains. Continuous rise in the Minimum Support Price (MSP) and the consequent rise in economic cost without rise in issue price have led to continuous rise in food subsidy. Low off take from the system due to various reasons, viz. poor quality, poor delivery and lack of purchasing power, to cite a few, call for a re-look at the whole system.

Policy Recommendations:

- There are now unique opportunities for launching a Food for Sustainable Development Initiative, in the form of a "grain for green" movement.
- Community Food Banks (CFB) address issues relating to chronic, hidden and transient hunger.
- Appropriate schemes will be necessary to provide support to enable mothers to breastfeed their babies for atleast 6 months, as recommended by WHO.
- Developing and spreading a Holistic Action Plan to achieve sustainable nutrition security at the level of each individual is necessary.
- The huge stock of food grains provides a unique opportunity for launching a National Alliance against hunger.
- A job-led economic growth strategy will help to reduce protein-energy malnutrition, and at the same time stimulate farming systems' diversification.
- There is a need for Organization of a National Consortium for Sustainable Food Security.

❑ NAAS (2003): Dichotomy Between Grain Surplus and Widespread Endemic Hunger, [M. S. Swaminathan, Convenor]. Policy Paper # 20. National Academy of Agricultural Sciences, New Delhi. pp 15.

For details please visit Academy's web site: www.naas-india.org

Priorities of Research and Human Resource Development in Fisheries Biotechnology *2003*

Convenor: Dr. T. J. Pandian
Former National Professor, School of Biological Sciences, Madurai Kamraj University, Madurai

Summary

- *16% of the world's population has to be sustained on 2.4% of land. Aquatic resources, thus acquire importance.*
- *Present technology in India is good for rearing of 15 fish species while China and Korea rear 39 and 52 species, respectively.*
- *Biotechnology offers great possibilities of rapid strain improvement and disease diagnosis.*

Capture fisheries from rivers is declining due to water abstraction, sedimentation, habitat destruction and pollution. Hence India has to depend heavily on aquaculture. At present, the technology exists for rearing of only 15 fish species. Asian countries suffer an annual loss of more than $ 3,000 million owing to disease problems. Selective breeding is known to enhance the expression of desired traits by 3 to 5 times. However, selective breeding may result in transmission of unwanted traits, due to mixing of whole genome of parents. On the other hand, transgenesis allows the introduction of novel genes by just transferring the tailored copies of gene from the same or other species. Research in genetics and molecular biology of fish is expected to yield probiotics and vaccines to eradicate or contain microbial diseases. Biotechnological research may also lead to superior methods of preservation, production of value added products and bioactive compounds.

Policy Recommendations:

- Use of molecular markers provides a powerful tool for determination of breeding strategies, gene manipulation, thus, could be speed up process of developing better strains.
- For mariculture, there is a need for developing markers for molecular taxonomy of the genus *Epinephelus*, *Amphiprion* and *Hilsa ilisha*.
- Reference and/or resource family lines, genetically distinctive populations/ strains of Indian major carps and identified penaeid and palaemonid species by crossing and rearing under controlled conditions need to be developed.
- Isolation, cloning, sequencing and construction of vector for genes responsible for salinity tolerance and their introduction into eggs to generate a salinity-resistant fish or shrimp is very important.
- Transgenesis through gonadal stem cells should be explored.
- In order to make most efficient use of existing manpower and infrastructure, it is necessary to encourage multidisciplinary programmes.

❑ NAAS (2003): Priorities of Research and Human Resource Development in Fisheries Biotechnology, [T. J. Pandian, Convenor]. Policy Paper # 21. National Academy of Agricultural Sciences, New Delhi. pp 7.

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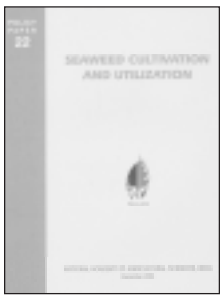
Policy Paper No. 22



Seaweed Cultivation and Utilization *2003*

Convenor: Dr. S. Ayyappan
Deputy Director General (Fisheries), Indian Council of Agricultural Research and Secretary, National Academy of Agricultural Sciences, New Delhi

Summary

♦ *Seaweeds form an important source for a number of industrial, domestic and food products.*

♦ *India has a coastline of more than 8,000 kms and harbours 844 species of seaweeds. There is a vast scope of their commercial exploitation.*

Macroscopic marine algae, popularly known as seaweeds, form one of the important living resources of the ocean. Seaweed polysaccharides are employed in the manufacture of toothpastes, soaps, shampoos, cosmetics, milk, ice cream, meat, processed food, air fresheners and a host of other items. In several oriental countries like Japan, China, Korea, etc., seaweeds are a staple part of the diet. India has a coastline of more than 8,000 kms and harbours about 844 species of seaweeds. Commercial cultivation has not yet taken place in India because of lack of infrastructure and absence of policy support.

Policy Recommendations:

- Commercial cultivation and processing of macro marine algae should be a national priority and taken up as a mission mode project.
- A Nodal Agency should give clearance for cultivation of specific species of macro-algae as ecologically safe and maintain a list of such species.
- As the cultivated macro-algae have to be globally competitive in their pricing, the levy for the use of coastal waters should be similar to that charged by other major global producers of macro-algae such as Philippines, Indonesia and China.
- Integrated cultivation of shrimp and seaweeds should be encouraged in aquaculture.
- Proper scientific methods should be devised and used for harvesting seaweeds so that sustainable utilization can be done without damaging the ecosystem.
- Creation of a Biodiversity database on seaweeds is essential.
- There is need for periodic resource evaluation and biomass estimation on a national basis.
- Diversified uses of seaweeds as feed, fodder, feed additives, fertilizers, biocides and antimicrobials need to be assessed.
- Exotic species/strains may also be introduced to widen the range of macro-algae.

❑ NAAS (2003): Seaweed Cultivation and Utilization, [S. Ayyappan, Convenor]. Policy Paper # 22. National Academy of Agricultural Sciences, New Delhi. pp 7.

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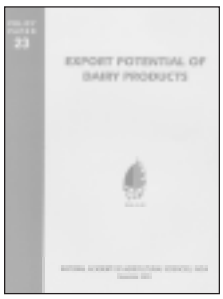
Policy Paper No. 23



Export Potential of Dairy Products *2003*

Convenor: Dr. B. N. Mathur
Former Director, National Academy of Agricultural Research Management, Hyderabad

Summary

- *India is endowed with unique attributes which put it in an advantageous position to emerge as an exporter of dairy products.*
- *Our traditional dairy products have a great potential for international market.*
- *Our country has the largest number of cattle but their productivity is low.*

This document explores the potential of export of some of our dairy products because after having attained self-sufficiency in food grain production, there is a need to plan for strategic diversification of Indian agriculture to ensure sustainability and nutritional adequacy. Agriculture focused on dairying particularly export of dairy products has excellent potential. The livestock constitute more than 50 per cent of the buffaloes and 20 per cent of the cattle in the world, yet our average milk production is far below their genetic potential. With a well-crafted strategic approach, this huge animal wealth could be utilized in right perspective for enhancement of milk production without many incremental inputs. Fifty four per cent of India's milk comes from buffaloes, which is endowed with unique processing qualities. These attributes render buffalo milk especially suitable for commercially important dairy products such as Mozzarella cheese, cream, butter, dairy whiteners, paneer, khoa, etc. India can emerge as the leading supplier of these products in the world market.

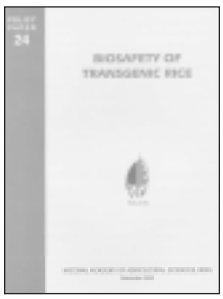
Policy Recommendations:

- A monitoring and steering group needs to be set up, which is empowered to fund, and support research studies for policy interventions.
- Initiative should be taken for forging strategic partnerships at the international level.
- National and international databases of production, prices, quality requirements, consumer preferences, and demand should be developed.
- Model Villages be established in the 16 Agro-climatic Zones of the country, focused on dairy development.
- Concerted efforts should be made to train marketing personnel on attractive packaging and labeling to compete globally.
- Dairy industry should adopt TQM processes based on the Codex standards and integrate the GHP, HACCP and ISO systems into milk collection, processing, product packaging, storage, transport, and shipping of dairy products.

❑ NAAS (2003): Export Potential of Dairy Products, [B. N. Mathur, Convenor]. Policy Paper # 23. National Academy of Agricultural Sciences, New Delhi. pp 19.

For details please visit Academy's web site: www.naas-india.org

Policy Paper No. 24



Biosafety of Transgenic Rice *2003*

Convenor: Prof. V. L. Chopra
Former President, National Academy of Agricultural Sciences, New Delhi. Presently Member, Planning Commission, Govt. of India, New Delhi

Summary

- *Rice is the major staple food of more than half of the world's population.*
- *Rice production is gradually declining.*
- *Transgenics offer unique opportunities of meeting the future challenges.*
- *Biosafety aspects of transgenic rice needs to be scientifically assessed before release.*

Rice is the most important staple food for over half of the world's population where chronic hunger is endemic. While the world population is continuously growing, rice production is decreasing. Recognizing this crisis, the FAO, declared, 2004 as the International Year of Rice. Developing new rice varieties with higher yield potential is vital for bridging the production gap. Developments in modern biology have ushered in the era of biotechnology which enables us to discover novel genes of importance for human welfare from anywhere in the plant or animal kingdom. Genetic engineering enables us to move these genes between organisms and produce transgenics. However there are concerns in respect of any potential harm to human health and environment.

Policy Recommendations:

- Strengthening of conventional plant breeding through incorporation of new scientific and technological tools is essential.
- A broad-based consultative process must be conducted to rank priorities for transgenic rice development suited to national needs on an ongoing basis.
- Developing rice varieties having tolerance to drought, submergence and salinity, better resistance to pests and diseases, and rich in micronutrients should be pursued actively.
- A comprehensive science-based risk assessment system must be practiced for genetically engineered crops.
- Regulatory agencies must develop and put in place a comprehensive monitoring mechanism to assess long-term environmental/ ecological impacts from the release of transgenic rice.
- The regulatory process relating to genetically engineered crops needs to be made transparent, participatory (involving all stakeholders), effective and efficient.

❑ NAAS (2003): Biosafety of Transgenic Rice, [V. L. Chopra, Convenor]. Policy Paper # 24. National Academy of Agricultural Sciences, New Delhi. pp 6.

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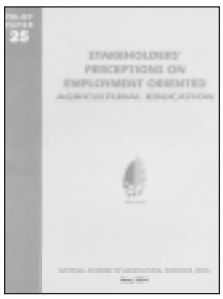
Policy Paper No. 25



Stakeholders' Perceptions on Employment Oriented Agricultural Education *2004*

Convenor: Dr. J. C. Katyal
Deputy Director General (Education), Indian Council of Agricultural Research, New Delhi

Summary

♦ *India has developed a comprehensive Agricultural Education System.*

♦ *With rapid developments in technology and a fast changing farm scenario there is need to reorient agricultural education to meet the requirements of the stakeholders.*

Investment in education is among the major contributors for both poverty reduction and productivity enhancement in agriculture. During the past half century the country has developed a comprehensive system of higher education consisting of State Agricultural Universities, Central Universities, Central Agricultural University and a number of public and private funded agricultural colleges. Despite an annual turnout of some 21,000 agricultural graduates and postgraduates there is hardly any attempt to link trends of employment needs with the kind and number of available manpower.

Policy Recommendations:

- With the growth in processing industry there is need to modify course-curricula to suit the needs of the upcoming industry.
- Modern information and communication technologies should be used in teaching and learning during practical and practice sessions.
- There is need for establishing a regulatory authority within ICAR/DARE to sustain quality of agricultural education on the lines of UGC and AICTE.
- Any attempt to reorient Agricultural Education for employability must be preceded by a need assessment on the kind and number of manpower projected to serve upcoming sectors of economy and country's national commitments.
- There is need for introducing business management, trade, marketing, cooperatives, banking and credit related subjects in the existing syllabi.
- There is need to explore possibility of introducing open and distance learning (ODL) alongside traditional classroom mode of education particularly for training and retraining of faculty, graduate professionals and paraprofessionals.
- Besides courses in biotechnology, food processing and business management, one year practical training in factory, business enterprise or engineering workshop is also necessary.
- Gender sensitization should be integrated into the curriculum i.e., uniform subject code for boys and girls.

❑ NAAS (2004): Stakeholders' Perception on Employment Oriented Agricultural Education, [J. C. Katyal. Convenor]. Policy Paper # 25. National Academy of Agricultural Sciences, New Delhi. pp 16.

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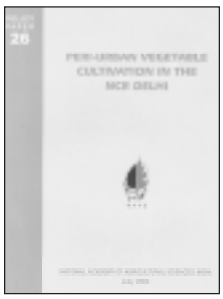
Policy Paper No. 26



Peri-Urban Vegetable Cultivation in the NCR Delhi *2004*

Convenor: Dr. S. Nagarajan
Director, Indian Agricultural Research Institute, New Delhi

Summary

- *Vegetable cultivation around large cities provides improved environment and fresh vegetables to consumers and a remunerative source of income to farmers.*
- *Institutions situated in the city could serve as feeding channels of useful information to farmers.*
- *Model farms with emphasis on organic farming could be developed.*

This paper highlights the potential of peri-urban vegetable cultivation around metro-cities of India, taking example of NCR Delhi. Delhi with its rail, road and air transport, cold storage, processing units, export houses and well established market network is unique for taking up vegetable cultivation in peri-urban areas. In NCR Delhi vegetable cultivation is on rise due to its being more remunerative. Up to 35% of land in some villages has gone under vegetable cultivation. Almost, all kinds (tropical, subtropical and temperate) of vegetables can be grown in Delhi.

Policy Recommendations:

- Horticulture advisory service and extension network of the NCR Delhi needs to be strengthened.
- Modern micro-irrigation systems (drip, sprinkler) including fertigation, arrangement of supplies for installation of systems on cost basis needs to be promoted to improve cost-benefit ratio in vegetable production.
- Protected crop and nursery production technology should be popularized.
- Export production farms particularly for vegetables should be established.
- Training of farmers and farm supervisors in the field of scientific cultivation of vegetable crops should be strengthened.
- System towards making available information on market out-look, consumers' preference should be developed.
- Model production farms with quality considerations for fresh vegetable export should be established.
- Government of NCR Delhi should establish viable linkages with the concerned Government Departments of the adjoining states of Haryana, U.P. and Rajasthan for implementation of the policy issues.

❑ NAAS (2004): Peri-urban Vegetable Cultivation in the NCR Delhi, [S. Nagarajan, Convenor]. Policy Paper # 26. National Academy of Agricultural Sciences, New Delhi. pp 8.

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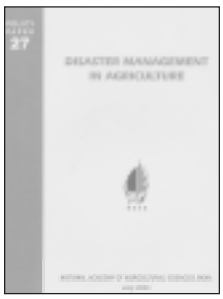
Policy Paper No. 27



Disaster Management in Agriculture *2004*

Convenor: Dr. Panjab Singh
Director, Centre for Extension Education, Indira Gandhi National Open University and Vice-President, National Academy of Agricultural Sciences, New Delhi

Summary

- *Our country is highly vulnerable to natural calamities.*
- *Different kinds of calamities require prompt, location specific and coordinated management systems involving various govt. and non-govt. agencies.*
- *Anticipated preparedness should be the focus of disaster management systems.*

The unique geo-climatic conditions of our country make this region vulnerable to natural disasters such as cyclones, floods and droughts which impact agriculture. These result in disruption of people's livelihood and add to the risk, damage and stress of disasters. Drought and floods are a perennial features of our country. Some of the lessons learnt from earlier disasters are: there should be a specific policy for specific situation and area, relief must be timely, proper crop planning/land use planning should be done, fodder banks should be created, occupational diversification should be made available. The unprecedented nature of the disasters calls for nationwide response mechanisms with clear-cut assignment of roles and functions by various institutions at the Central, State and District levels.

Policy Recommendations:

- Focus on anticipatory preparedness, prevention and rehabilitation is strongly recommended.
- Development of an effective and regular Pest Surveillance system is recommended to monitor pest activity through an exclusive network.
- Networking of International Agencies is very useful for channeling multi-faceted assistance ranging from pre-disaster, response, recovery and rehabilitation.
- Linkages for experience sharing, database transfers, action plans and strategies should be put in place.
- State Agricultural Universities should introduce a course on Disaster Management through multi-disciplinary approach.
- Basic infrastructure and transport facilities should be provided to the Panchayati Raj Institutions to help the residents in evacuation and providing relief and implementing disaster management programmes effectively.
- Database communication and information sharing is fundamental to the decision support system and its further strengthening through Geospatial Information System.

❑ NAAS (2004). Disaster Management in Agriculture. [Panjab Singh, Convenor]. Policy Paper # 27. National Academy of Agricultural Sciences, New Delhi. pp 7.

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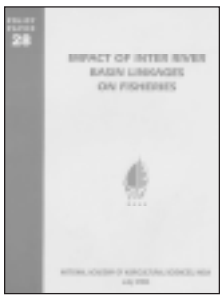
Policy Paper No. 28



Impact of Inter River-Basin Linkages on Fisheries *2004*

Convenor: Dr. S. Ayyappan
Deputy Director General (Fisheries), Indian Council of Agricultural Research and Secretary, National Academy of Agricultural Sciences, New Delhi

Summary

- *Our country is endowed with some of the richest fishing grounds in the world.*
- *For various reasons there is a move to expand water basin, by interlinking river basins, thus there is a need to study effects of such interlinking on the fisheries.*

India is endowed with a coastline of 8,118 km. It has some of the richest fishing grounds in the world. The present total fish production of 6.12 million metric tonnes. Both inland and marine fisheries directly or indirectly depend on the river systems. In order to expand spatial extent, it is suggested to interlink 'surplus' basins with the 'deficit' basins. The Himalayan Rivers component and the Peninsular Rivers component constitute the two parts of the river-linking project. With the creation of more water basins and canals, resource for fisheries and aquaculture is expected to increase, while on the other hand, there could be mixing of fish species between the river basins, loss of certain amount of biodiversity as also entry of some invasive fish species. However, massive projects of expanding water basins have been undertaken by Russia, China and Spain.

Policy Recommendations:

- There is an urgent need for data mining and analysis to gather baseline information on water quality, aquatic ecology, productivity and fish biodiversity for various river systems.
- Software-aided modeling studies are required to assess the impact of changes in river runoff on water chemistry, productivity, aquatic ecology, biodiversity and fish production.
- There is an urgent need to assess the minimum environmental flow in donor rivers and to work out a loss-gain statement on the possible impact of interlinking of river basins on fisheries.
- It is necessary to evaluate the usefulness of river ranching for enhancing the fish production in our river systems.
- Attention should be paid to study the impact of altered river flow due to river interlinking on biodiversity pattern of estuarine and coastal fauna.
- Before initiating large scale river basin linking at national level, it will be appropriate to conduct studies on linking adjacent river systems with similar ecosystem to assess and understand the environmental impacts of river linking on aquatic ecosystem.
- There is an urgent need to work out a loss-gain statement on the possible impact of interlinking of river basins on fisheries, using the available data.

❑ NAAS (2004): Impact of Inter River Basin Linkages on Fisheries, [S. Ayyappan, Convenor]. Policy Paper # 28. National Academy of Agricultural Sciences, New Delhi. pp 7.

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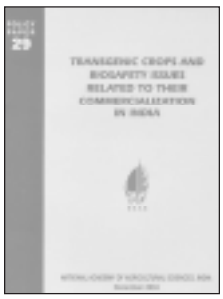
Policy Paper No. 29



Transgenic Crops and Biosafety Issues Related to Their Commercialization in India *2004*

Convenor: Dr. R. P. Sharma
Former Project Director, National Research Centre on Plant Biotechnology, Indian Agricultural Research Institute, and former Secretary, National Academy of Agricultural Sciences, New Delhi

Summary

- *Transgenic Crops provide new opportunities of achieving productivity goals in a sustainable manner.*
- *Biosafety issues relating to human health and environment need to be scientifically assessed on case by case basis.*

Products arising from modern biotechnology such as genetically modified (GM) or transgenic crops are providing new opportunities to achieve sustainable productivity gains in agriculture. The first, and as yet the only, GM crop permitted for commercial cultivation in India is the 'Bt-cotton'. Transgenic crop acreage in India is currently about 100,000 hectares. Commercialiation of transgenic crops has sparked off intensive debates worldwide on biosafety of the GM Crops. Therefore, the transgenic technology imposes tremendous responsibility on the scientific community and the regulatory authorities towards ensuring biosafety.

Policy Recommendations:

- The transgenic approach must be judiciously integrated into the crop breeding programmes based on specific needs, particularly in cases where conventional breeding is not feasible or effective.
- The public sector institutions must play a vital role with regard to knowledge generation so as to fill the critical gaps in relation to transgenic development.
- Information database regarding the biosafety of selectable markers should be upgraded to facilitate objective decisions by the regulatory authorities.
- A transgene that has already undergone extensive biosafety tests should not be treated as new even if it is a new transgenic event.
- The toxicity and allerginicity tests for the transgenics should be prescribed on a case-by-case basis. Scientific data coming from reputed national/ international institutions must be duly considered for testing toxicity and allerginicty.
- The Monitoring and Evaluation Committee (MEC) should be made more effective and relevant to the needs. Clear guidelines should be formulated regarding the parameters and methodology of monitoring and evaluation.
- Public and private sector may join for developing a transgenic product concept and together seek resources for undertaking the project with a clean value-sharing arrangement.

❑ NAAS (2004): Transgenic Crops and Biosafety Issues Related to Their Commercialization in India, [R. P. Sharma, Convenor]. Policy Paper # 29. National Academy of Agricultural Sciences, New Delhi. pp 7.

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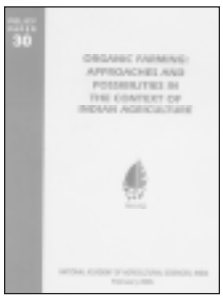
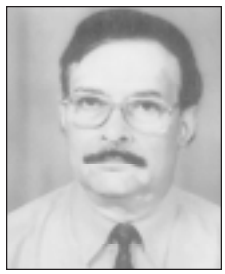


Organic Farming: Approaches and Possibilities in the Context of Indian Agriculture *2005*

Convenor: Dr. P. K. Chhonkar
Head, Division of Soil Science and Agricultural Chemistry,
Indian Agricultural Research Institute, New Delhi



Summary

- *Excessive use of chemical fertilizers, pesticides and irrigation has resulted in soil degradation and water pollution.*
- *In the Indian context, a judicious combination of chemical fertilizers and organic manures will be ideal.*

The era of Green Revolution saw introduction of high yielding varieties, extension of irrigated areas, use of high analysis NPK fertilizers and increased cropping intensity. Due to indiscriminate use of chemical fertilizers, pesticides and excessive irrigation the land water resources degraded. In the process use of organic manure has declined substantially. The ground water table has declined sharply and soils are developing salinity. Pesticide residues in food products and ground water contamination have increased. Occurrence of multi-nutrient deficiencies and an overall decline in the quality of the soil have been widely noted.

Policy Recommendations:

- India today needs a balanced and conjunctive use of organic and inorganic sources of plant nutrients for sustainable green agriculture.
- There is a need to develop hi-tech organic technology with strict quality controls meeting international quality standards.
- Technologies are needed for *in-situ* recycling/rapid composting of on-farm residues and wastes.
- Inclusion of legumes in intensive cereal-cereal production systems as short duration grain or forage crops, as substitute to one of the cereals or as break crops needs to be promoted.
- In Indian context, organic farming has to be practiced without synthetic pesticides, but complete exclusion of fertilizers may not be advisable under all situations.
- Entrepreneurial potential with respect to production of organic inputs, processing and marketing of organic food should be fully exploited.
- Certification of organic produce is an important issue that is central to organic production itself.
- Global market on organic produce has to be exploited, for which strict phyto-sanitary measures have to be followed.

❑ NAAS (2005): Organic Farming: Approaches and Possibilities in the Context of Indian Agriculture, [P. K. Chhonkar, Convenor]. Policy Paper # 30. National Academy of Agricultural Sciences, New Delhi. pp 8.

For details please visit Academy's web site: www.naas-india.org

Mega events organized by NAAS

Agricultural Science Congresses

The National Academy of Agricultural Sciences organizes an Agricultural Science Congress every alternate year in different parts of the Country on themes having special significance for the region. The following seven Congresses have been organized during the last ten years.

- **1992.** First Agricultural Science Congress. It was held at Indian Agricultural Research Institute, New Delhi on the themes: (i) Global Climate change, (ii) Rio Agenda 21 – Priorities for Agricultural Research, (iii) Capital Requirements for Modernization of Agriculture.

- **1995**. Second Agricultural Science Congress was held at the Andhra Pradesh Agricultural University, Hyderabad on the themes: (i) National Water Policy, (ii) Vector Biology, and (iii) Integrated on Farm and Off-farm Employment.

- **1997**. Third Agricultural Science Congress was held at the Panjab Agricultural University, Ludhiana, on the themes (i) Sustainable Management of Intensive Agriculture (ii) Implications of Biotechnology in Agriculture and (iii) Indian Agriculture in next 50 years: Role of Science and Technology.

- **1999**. Fourth Agricultural Science Congress was held at Jaipur, on the theme, Sustainable Agricultural Export.

- **2001**. Fifth Agricultural Science Congress was held at the Assam Agricultural University, Guwahati, on the theme, Sustainable Development of Mountain Agriculture.

- **2003**. Sixth Agricultural Science Congress was held at the Indian Institute of Soil Science, Bhopal, on the theme, Multienterprise Farming Systems for Viable Agriculture.

- **2005**. Seventh Agricultural Science Congress was organized by Mahatma Phule Krishi Vidyapeeth, Rahuri at the College of Agriculture, Pune, on the theme, Entrepreneurship Development in Agriculture.

The next i.e., the 8th Congress is scheduled to be organized at the Kerala Agricultural University, Thrissur in early 2007.

❑ For detailed information please visit Academy's web site: www.naas-india.org

88th Session of the Indian Science Congress,
New Delhi, 3-7 January 2001

Theme: Food, Nutrition and Environmental Security

This Congress was attended by about 3500 delegates from all over India and abroad. The programme of the Congress comprised of eight Plenary Sessions, four Public Fora and sixteen Concurrent Technical Sessions on different subjects. In these programmes, many eminent scientists and public figures, besides large number of young scientists participated and provided useful insights into the problems facing our country. The Congress also served as a forum for farmers to interact with the scientists. Another unique feature of the Congress was the participation of large number of school children. An exhibition giving exposition to the latest developments in science was also organized.

Prime Minister Shri Atal Behari Vajpai inaugurating the Congress

Eminent scientist Dr. G.S. Khush presenting a memento to Dr. (Mrs.) Manju Sharma

Some young participants

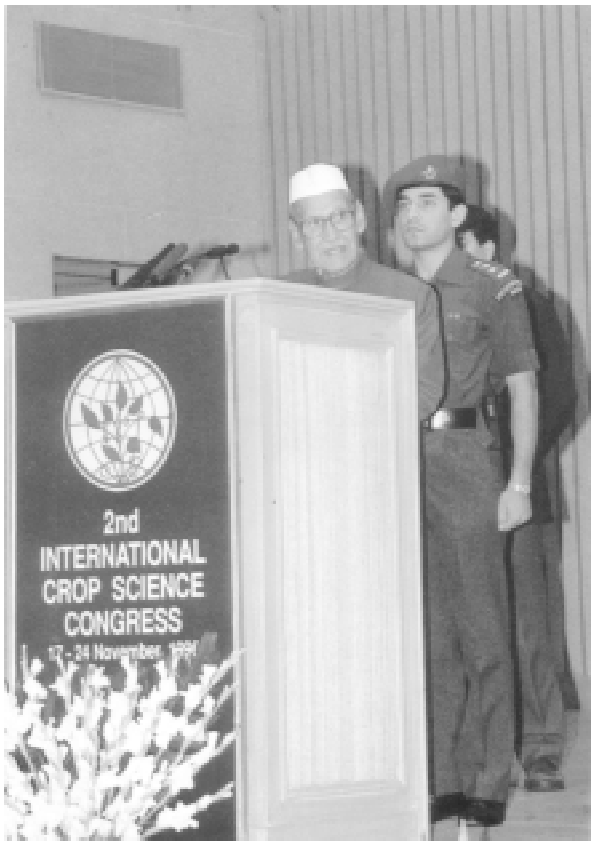
2nd International Crop Science Congress (2nd ICSC), New Delhi, 17-24, November 1996.

Theme: Crop Productivity and Sustainability - Shaping the Future.

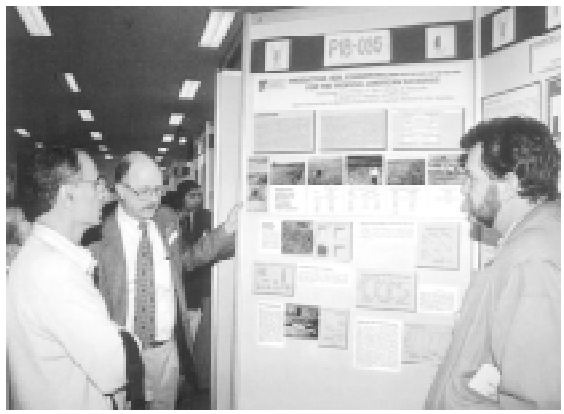
The Congress was attended by about 1300 delegates from 71 countries. The Congress took the dialogue further from the First ICSC, held at Ames, IOWA, USA in 1992, and focussed on the following issues:

- How to achieve comprehensive and sustainable food and nutrition security despite increasing population?
- How to ensure continuous increase in productivity on an ecologically sustainable basis?
- How to generate public understanding of technological innovations and their potential opportunities, particularly, in the field of biotechnology?
- How can scientists, policy makers, farmers and people come together and function in a partnership mode?

The Scientific Programme of the Congress comprised five Plenary Lectures, eleven Symposia, three Evening Lectures, six Working Groups, five Poster Sessions, one Commemorative Lecture and ten Satellite Meetings. The deliberations held were published as Proceedings.



The president of India, Dr. Shanker Dayal Sharma delivering the inaugural address at the 2nd International Crop Science Congress on November 17, 1996 at Vigyan Bhavan, New Delhi



Poster Sessions were a great success. The quality, presentation and display of posters were highly appreciated.

'Indian Agriculture - A Saga of Success and Challenges Ahead', an exhibition organised during the Congress was one of the major attractions. Dr. M.S. Swaminathan and Dr. R.S. Paroda are interacting with the delegates at the exhibition.

❑ Copies of the Proceedings of the Congresses are available with NAAS. Please contact the Executive Secretary, National Academy of Agricultural Sciences, New Delhi for obtaining a copy.

Credits

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