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# FOREWORD

The nexus between population, food demand and ecological degradation is a matter of critical concern for the country. The Indian Council of agricultural Research (IC-AR) is keen to understand this phenomena and respond to it. It is often argued that by treating population as important resource, the twin objective of food security and providing clean environment could be accomplished simultaneously.

The national seminar on Food, population and environment strategies for sustainable Indian agriculture has debated the issues, several of which were ignored in the past. In particular, the issues of appropriate technology, socio economic constraints and policy interventions are identified as important determinants of this complex equation.

The proceeding presents the salient features of the outcome of the discussion, which is expected to generate further interest and research on the subject.

We hope the audience will find it useful. We solicit your comments.

December 1998 — Dayanatha Jha

New Delhi — Director, NCAP

# ACKNOWLEDGMENT

A brainstorming seminar was organised by the NCAP on the occasion of the ICAR's celebration of the 50th year of Independence of India. The moving force behind the seminar was Dr. R S Paroda, Director General, ICAR. We are extremely grateful to Dr. Paroda for his keen interest and constant encouragement to us for this event. Dr. Mruthyunjaya, Assistant Director General (ESM) took a very personal interest and continuously advised us on both organisatioal as well as professional matters. We are thankful to Dr. Mruthyunjaya.

Number of the participants from various part of the country attended the seminar and offered valuable contributions, which benefited us immensely. We are grateful to all of them.

Dr. Dayanatha Jha, Director, NCAP took great interest and continuously guiding us to make the event a success. Dr. Jha also made several rounds of comments and suggestions in the preparation of the proceedings of the seminar. I offer my sincere gratitude to Dr. Jha. I am thankful to Dr. S Selvarajan and Dr. Promod K Joshi, Principal Scientists, Mr. Ravi Shankar, Scientist, NCAP and several of my other colleagues for their kind help and suggestions at various stages of the seminar.

B C Barah
New Delhi 1998

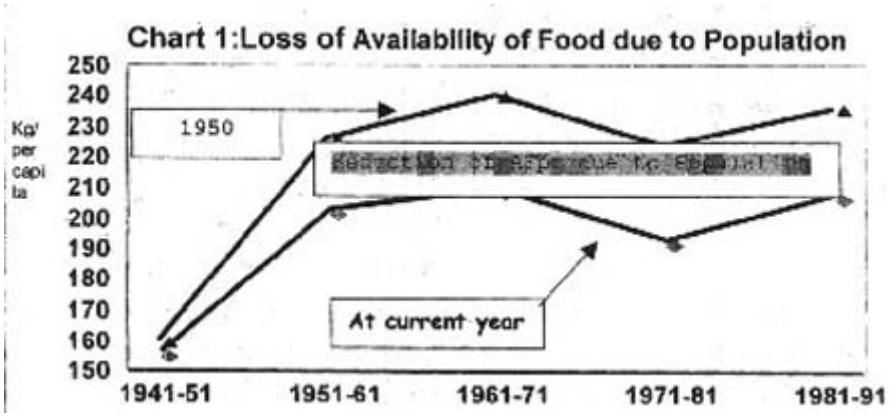
# ACTION PLAN

- Prioritize the research agenda of the ICAR with special focus on rainfed and bypassed areas and develop typology for socio economic characterization of rainfed eco-system. Importance of developing efficient backup support services for continuity of the technology needs to be emphasized.
- Increase investment on effective literacy program (particularly for household decision-makers), infrastructure building, conservation of natural resources and information dissemination.
- Encourage and enhance public-private partnership in agricultural research, extension and investment.
- Constitute a permanent working group for improved estimations and projections in agriculture and reporting short term agricultural outlook.
- Appropriate pricing policy to improve resource uses efficiency and to prevent their degradation. Revitalization of the public distribution system, fair price shops, employment guarantee schemes is necessary and there is need to revisit fertilizer, energy, land and water policies.
- Develop technology and knowledge-based mechanism for efficient use of pesticides and other chemicals in agriculture in order to reduce the risk of environmental pollution.
- Documentation of traditional practices and application

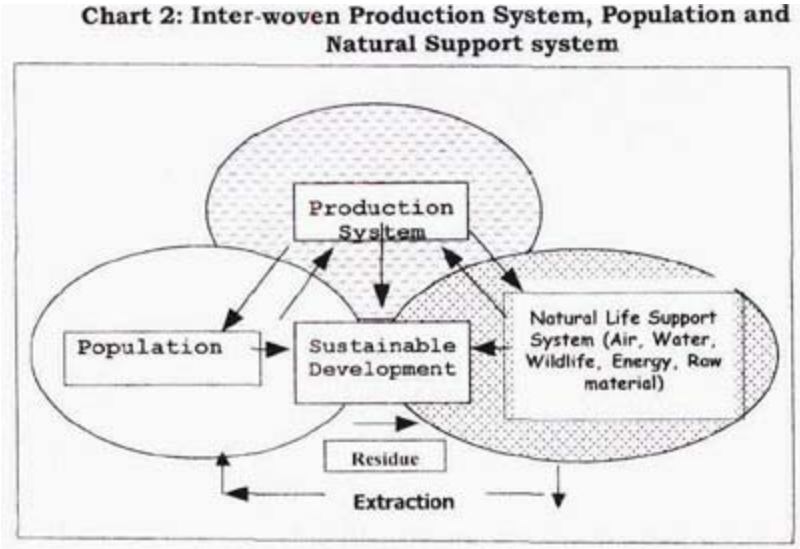
# CHAPTER I

## FOOD, POPULATION, ENVIRONMENT NEXUS

India's population of 938 million in 1996-97 has already exceeded the global population of 1798 A.D (a figure quoted by Thomas Malthus). By the year 2001, our population would be estimated 1012 millions. The projections imply that 5-6 million tonnes of foodgrains would be required additionally every year to meet the needs of the growing population [Table 1]. But, despite the productivity growth in agriculture, availability of food to the growing population has been far from being adequate (chart 1).




In addition, fast changing composition of food basket and increasing demand for non-foodgrains will' put greater pressure on the resource base in the years to come. These call for new strategies because past growth sources have led to non-sustainable production systems. Thus, the environmental degradation and population equation is a central challenge for agricultural planning (chart 2).




In order to understand the complex problem of food, population and environment, a brainstorming seminar was organised. The aim of the seminar was to discuss the emerging issues of food securities and environmental sustainability. To articulate alternative R&D and other policy options and strategies to meet the challenges in the next millenium were the other items on the agenda.

A number of policy makers, economists and other research scientists participated in the deliberations. Dr. R S Paroda, Director General, Indian Council of Agricultural Research, presided over the session. The subsequent sections summarize the essence of discussion and consensus in terms of various issues raised in the background note (annexure )

# CHAPTER II

## Technological Issues:

**1. What paradigm changes are required in agricultural research and development strategy to cope up with the new challenges?**

The discussion emphasized the need to shift from commodity/inputs based R&D approach to one centred on production systems mode. This thrust under the NATP (National Agricultural Technology Programme) initiative of the ICAR was strongly endorsed. It would necessitate a decentralized, location and client specific research agenda. A consensus was arrived to intensify research on rainfed and drought prone areas. It was argued that lack of effective technological research, inadequate economic and social infrastructure have resulted in poor performance of agriculture in these areas.

**2. How to harness science to ensure sustained income generation, social equity and ecological conservation in agricultural sector?**

The uncommon opportunities and challenges thrown open by the new liberalization regime need to be exploited gainfully. The role of indigenous knowledge (say Kudimaramat) and of modern information technology as vehicle for technology transfer was also recognized as crucial for sustainable natural resource management.

The subject of agricultural sustainability was actively debated. The most dominant viewpoint was on achieving higher level of production to meet the growing demand without harming the natural resource environment in the long run. There was consensus on shifting the emphasis from crop productivity based research to integrated land (resource) productivity based approach including the development of grassland, forestland and cropland, which not only ensures sustainability of natural resources but also generates higher income for the poor. This would require natural resources planning and instruments to enforce the policy effectively. The role of effective education and peoples' involvement was repeatedly underscored.

**3. What interventions are necessary to make Indian agriculture more effective?**

The participants argued that lack of integration of socio economic considerations with agro-biological factors has been a critical factor constraining effective dissemination and adoption of technological innovations in agriculture. This also undermined efficient technology management. The group emphasized that along with agro-ecological factors, socio economic variables must also be integrated in R&D programmes. This will help in directing research towards both poverty and sustainability.

However, infrastructure and institutional investments in this context would play a major role in future. Institutional development was particularly important, and innovative ideas were needed in this regard. The role of NGOs, private sector and farmers' organizations need to be emphasized. The poverty considerations reinforce the need to strengthen agricultural research in eastern India, rainfed areas and on products and processes, which are critical for sustaining poor peoples' food and livelihood security.

**4. Should the agricultural development initiatives, including R&D, be eco-regionally oriented?**

The discussions strongly endorsed the natural advantages of eco-regional approach and appreciated ICAR's initiatives to adopt the concept to tailor research programmes under NARP and now NATP. The new R&D system become more focussed. The initiative also

provides more transparent evaluation and effective accountability. This also helps in the explicit consideration of region-specific ecological parameters in R&D and other developmental programmes. All these notwithstanding, it was recognized that political and administrative regions continue to be the basis of planning and there is very little analytical capability at lower levels. This then constrains effective articulation of local needs. The KVKs (Krishi Vigyan Kendra) and zonal research stations must play a pivotal role in association with Panchayati Raj institutions and NGOs.

## Socio-economic issues:

**1) How to obtain accurate projections of the demand for and supply of food, and to develop mechanism to update the projections periodically?**

Various estimates of demand for and supply of commodities in general, and foodgrains in particular, show wide variations. For example, demand projections for 2020 A.D, range from 250 million tons to approximately 400 million tons. On the supply side also estimates show considerable variations. This variation poses problems in planning. Underscoring the need for an authoritative study to be conducted by the I CAR, the group argued that as rapid changes are taking place on both demand and supply sides. The projections based exclusively on past trends were not satisfactory. It will be necessary to develop alternative scenarios based on technically informed assumptions about different parameters. Most demand projections, for example, simulate for income, income distributions and population growth, but not the changing consumption patterns. Likewise, supply projections must incorporate technical constraints and efficiency gains.

**2) What is the role of incentive structure?**

The participants recognized that efficient incentive structure-price and subsidy policies and farmer-friendly terms of trade, as critical determinants of production efficiency as well as environmental sustainability. The participants also stressed the role of safety standards and fixation of rational user-cost (e.g. taxation) policy to counter specific environmental problems. The view was articulated that an improved incentive framework for accelerated production growth and. combating negative environmental impacts could be possible side by side.

Concerns were also expressed regarding the potential backlash of new economic reforms, particularly on the poorer sections of the population. There were apprehensions whether the agricultural sector has the resilience to cope with world market volatility. The need to reconcile basic food security with open trade regime was emphasized.

**3) How to improve the role of human capital as an agent of developmental process?**

Investment in human capital is perhaps more crucial for greater efficiency and environmental sustainability than anything else. Historically, general education and other social sector extension activities have been emphasized, which neglected rural sector, weaker sections, women, tribals and resource-poor people. Thus, scientific temper of the people was ignored and remained untapped. This has affected the quality of our human resources and has constrained human productivity. A host of population-induced maladies can be attributed to this factor. In agriculture, the conventional agricultural extension system does not accommodate the needs of the people and innovative ideas based on involvement of groups. The group thus, expressed that the use of information technology in a farmer friendly manner could enhance the adoption of scientific and sustainable practices. It was suggested that there should be policy interventions to improve the quality of the population so that it becomes a valuable resource. The ICAR's pilot efforts in this area (KVK, IVLP) were favorably commented upon and it was suggested that mobilizing peoples' participation through cooperation with farmers and other groups, NGOs and panchayats would further enrich this effort.

**4) What backup support services are essential to promote technology-led sustainable agricultural growth?**

The paramount need to reverse the traditional urban bias in investments in infrastructure, markets, supplies (social as well economic) and institutions was emphasized repeatedly. This has undermined the potential as well as encouraged non-sustainable agricultural practices and out-migration. Concentration of investments generates vicious cycle of poverty, under-investment and backwardness. An aggressive set of policies and programmes for promotion of non-farm activities including rural industrialization are necessary to boost the economic environment in the countryside. Such reorientation requires a catalytic role for the state and for local democratic institutions.

**5) What initiatives are needed to promote frontier technologies to address food and environmental problems?**

Apart from education and other social sector investments, information technology also offer enormous opportunities. Mass media and electronic communication networks must be made available at the panchayat level. Then professional rural-oriented programming to reach the rural communities should follow this up. In areas where bio-technological inputs (seeds, planting material, organisms, etc.) need an aggressive supply push involving private and public delivery systems.

**6) How to promote the involvement of the stakeholders as guardians of the environmental resources?**

People, being important stakeholders, their participation could play significant role in the environmental programmes. The natural resources management technologies depend critically on this initiative. Policies regarding effective decentralization, regulations governing exploitation of natural resources and de-bureaucratization of rural programmes along with the elements of good governance, are most critical.

# CHAPTER III

## An Address by Dr. R S Paroda, Chairman

Upholding the remarkable contributions of Indian agriculture in accomplishing self-sufficiency in food grain production during the post-independence era, the Chairman drew the attention of the participants towards the grave challenges in relation to sustainable food security. It was satisfying to note that the country has produced atleast four times more foodgrains and improved the per capita food availability, despite about three fold increase in population over the last fifty years. This was made possible, only due to a number of innovations in agricultural front and appropriate policy support by the government. While emphasizing the contributions of the agricultural research system, the Chairman felt that the country would not face the food shortage to the extent that it faced earlier. The Indian Council of Agricultural Research, which has to anticipate and initiate research in advance, recognises that more serious challenges lie ahead of us. Despite the favourable current food production scenario, the problems of poverty and shrinking resources loom large. Five to six million tonnes of additional foodgrains have to be produced every year to meet the projected demand, even if we were to consider moderate projections. This is a formidable task, but with vigorous R&D efforts and appropriate policy framework, the scientific community is confident of meeting the target. There is urgency in increasing research investment in agriculture, reorient and prioritise the research agenda. Initiating other policy interventions to increase production and conserve natural resources is also indispensable. The Chairman cautioned that though modern technology is production enhancing, it is also input intensive and hence likely to affect natural resources adversely. New initiatives in agricultural research such as public-private partnership, research in mission and system mode, focus on client participation and indigenous knowledge, sustainability and need-based prioritisation etc. were all targeted to tone up the capability and effectiveness of the national agricultural research system. Dr. Paroda stressed, at the same time, that it was also important to recognise that the overall socio economic framework as well as policies and programmes not only in agriculture but also in allied sectors determine the effectiveness of agricultural research. Agricultural research is one policy instrument of change; there are others, which are more effective in tackling some challenges facing the agricultural sector. An important outcome of the deliberations was that these linkages were brought to the fore. The chairman thanked all participants for their valuable contributions.

The recommendations and future action plans are indicated below.

**Table 1**
**Characteristics of food economy in India**

| | Demand (mt) | | | | Food Production (mt) | | | |
|---|---|---|---|---|---|---|---|---|
| | **1995** | **2000** | **2010** | **2020** | **1995** | **2000** | **2010** | **2020** |
| Rice | 76.8 | 85.4 | 103.7 | 122.4 | 78.1 | 85.4 | 103.6 | 122. 1 |
| Wheat | 62.3 | 69.8 | 86.8 | 104.8 | 60.8 | 69.4 | 85.0 | 102.8 |
| Pulses | 13.8 | 15.7 | 20.6 | 26.3 | 13.4 | 16.1 | 21.4 | 27.8 |
| Foodgrains | 180.6 | 200.9 | 245.7 | 293.4 | 181.9 | 200.8 | 245.7 | 293.7 |
| Milk | | | | | 60.5 | 75.3 | 103.7 | 142.7 |
| Source: | Kumar P (1998); Food demand & supply projections in India, IARI New Delhi | | | | | | | |
| **Population** | **1991** | **2000** | | **2010** | **2020** | | | |
| at CARG 2.13% | 846.9 | 1009.2 | | 1189. | 1370.03 | | | |

# Recommendations

1. About 5-6 millions tons of foodgrains has to be produced additionally every year over the next decade and beyond. This must happen without damaging or degrading the ecosystem. This challenge, induced by population growth, has to be met by science-led productivity growth in agriculture. Efficient management of agricultural technology is a crucial pre-requisite for the strategy to address this problem. Enhanced funding for public supported agricultural research is critical.
2. Equally important is the needed paradigm shift in R&D (Research and Development) from component (say input-based) to system focus in agriculture. There is also a need to underscore proper technology assessment, refinement, efficient transfers and to move from supply-driven to demand-driven mode by integrating market signals with client needs and constraints. This calls for changes in management and organization of agricultural research in the country.
3. Wide variation in estimates of future demand and supply of foodgrains makes it difficult to plan for increased agricultural production. A systematic study of various projections in agriculture is an urgent need and it was recommended that a task force be constituted for this purpose. The group should examine alternative estimates critically, attempt its own analysis, if necessary and submit its report as soon as possible. In fact, the short-term agricultural outlook reports should be attempted.
4. It was recommended to systematically examine all policy and institutional instruments, which have a bearing on food security and environment. While technology was a very important factor, other elements like population management, industrialization, social sector, decentralization, regulatory policies and programmes, were often necessary to make the system more effective.
5. The need for a whole new set of institutional arrangements, including legal and regulatory processes, was emphasized. These must be non-bureaucratic, democratic and most importantly, participatory. Public systems must be reoriented along these lines if the twin challenges of productivity growth and sustainable use of natural resources are to be effectively achieved. All productivity enhancing research must be integrated to manage natural-resources in order to achieve sustainable improvement of the performance of production system within the eco-system.
6. The new trade regime offers challenges and opportunities which need to be analyzed properly, particularly with regard to poverty, food security, natural resources management and IPR (Intellectual property rights). Unfortunately, even after a decade of GATT and WTO discussions, the debates still centre round populist arguments. In order to improve the global competitiveness of Indian agriculture, the ICAR needs to undertake careful study to guide its future strategy.
7. Problems of natural resources degradation and environmental hazards need specific targeting in R&D as well as developmental programmes transcending agriculture. Despite wide recognition of these problems, at present hardly a few systematic efforts or programmes are in place to monitor the indicators at the national level. Such information must now be routinely generated by the statistical reporting system. Need for data on soil and nutrient loss, erosion of bio-diversity, chemicalisation of soil, water and atmosphere, harmful residues, etc. are some of the examples in this case.
8. Stagnation or decline of total factor productivity of major foodgrains are signals of impending crisis that threatens food security even in the medium term. Apart from greater thrust on agricultural R&D, infrastructure development in areas hitherto neglected, has to be given higher priority. Human resource development programmes aimed at improving technical and entrepreneurial skills of farmers also play an important role in this context.
9. Agricultural policy must pay equal attention to food and nutritional security, environmental sustainability and improvement in quality of rural population. Past efforts have concentrated on the first, the other two have been largely peripheral. This must change and an inter-ministerial approach to agricultural development must replace the current departmental mode.

10. Such comprehensive policy framework must integrate productivity, resource conservation, poverty alleviation, employment and gender education. The strategies like R&D, rural education, infrastructure development, rural industrialisation and social sector initiatives etc. must enmesh with this framework.
11. Peoples' participation and traditional knowledge are to be accorded prominence in all agricultural development programmes. Effective involvement of stakeholders has to be ensured and this will need installation of new organization and implementation process. Reorientation of research and extension in partnership mode (with private sector, NGO, farmers' organizations and panchayats) must form an essential part of the aforesaid initiative.

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