

Report of the Task Group on Revamping and Refocusing of National Agricultural Research



**Government of India,
Planning Commission (Agriculture Division)
January 2005**

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Planning Commission
Government of India
(Agriculture Division)
Yojana Bhawan, New Delhi



Prof. M. S. Swaminathan
Chairman

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कृषि मंत्रालय
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GOVERNMENT OF INDIA
MINISTRY OF AGRICULTURE
NATIONAL COMMISSION ON FARMERS

February 12, 2005

My dear Dr. Ahluwalia,

I have pleasure in enclosing the Report of (he Task Group on Revamping and Refocussing of National Agricultural Research.

2 In my view, speedy and sincere action on our recommendations will help the country both to get the best out of the existing *R&D* infrastructure and to equip ourselves to fulfill the S&T needs of the 115 million farming families who safeguard our food, livelihood and ecological security systems.

3. The world of agriculture is changing fast, technologically, commercially, economically and ecologically Resisting change in institutional and management structures will be a formula for increasing farmers' distress No further time should be lost in restructuring and strengthening our NARS, so that it becomes the flagship of the movement for agrarian prosperity and freedom from hunger

4. I wish to acknowledge our indebtedness to Prof V.L. Chopra, Member, Planning Commission for his guidance and active participation in the work of the Task Group Our thanks also go to Dr. Vandana Dwivedi for her dedicated support.

With warm personal regards.

Yours sincerely,

(M.S. Swaminathan)

Dr. Montek Singh Ahluwalia,
Deputy Chairman,
Planning Commission,
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New Delhi

End: As above

II.	Methods of anticipatory research keeping in view the challenges of variation in monsoon behavior/climate for fostering crop-livestock-fish integrated farming systems and to enhance the productivity and profitability of rain-fed, semi-arid, desert, coastal and hill areas.	55
III.	Professionalising skill management and ways for weaning management from civil services bureaucracy.	58
IV.	Prevailing funding system of agricultural research and suggested changes (e.g. Competitive Block Grant, Project-based Funding etc) for improving the system.	64
V.	Steps for making agricultural research sensitive to emerging scenario of home and external trade (with particular reference to WTO Agreement on Agriculture).	67
VI.	The present system of scientist recruitment and human resource development and suggested measures to attract and retain good scientists.	85
VII.	Alternative modalities for integrating research and extension at state level.	92
VIII.	Report of the Sub-Committee of the Task Force on Revisiting Professionalization of Agricultural Research	98
IX.	Minutes of the meetings of the Task Group	103
X.	Constitution of the Task Group (Orders/Addendum)	126
X.	Appendix – Suggestions received in response to electronic consultation with stakeholders.	136

Preface

1. On the midnight of August 14-15, 1947, Jawaharlal Nehru referred to a new dawn in our history and our entering into a tryst with destiny. Being aware that widespread poverty in the country has its roots in agricultural stagnation, Nehru remarked, “**everything else can wait, but not agriculture**”. This led to several policy and programme initiatives such as enlarging the area under assured irrigation, producing the inputs needed by farmers such as seeds, fertilizer, pesticides, and farm implements, and above all, strengthening our infrastructure in the field of agricultural research and education. Thanks to these far-sighted steps, we have today a National Agricultural Research System of which we can be proud.
2. On the midnight of August 14-15, 1947, Shri. K. R. Narayanan, the then President of India, referred to two major achievements of the first 50 years of our Independence. These are: first, our democratic system of governance extending up to the village level leading to the recognition that India represents the World’s largest functioning democracy and secondly, the achievement of our farmers, scientists and policy makers in making the country self reliant in food production. In spite of striking agricultural progress and democratic decentralisation, poverty and poverty-induced under- and mal-nutrition are widespread. International and national media refer to this situation as the co-existence of “grain mountains and hungry millions”.
3. What should we regard as our major achievement when we commemorate the 60th anniversary of our independence on the midnight of 14-15 August 2007? Obviously, it should be the ending of the unnecessary and unenviable reputation of India being the home of the largest number of under-fed children, women and men. We can achieve this goal through a three-pronged strategy. First, we should introduce an open-ended **Food Guarantee Scheme** on 15 August 2007, combining the features of the Food for Work and Employment Guarantee Schemes. Second, we should help our farm and fisher families to enhance the productivity, profitability and sustainability of major farming systems through mutually reinforcing packages of pro-poor technologies, services and public policies. Third, we should enlarge opportunities for self-help groups, and other forms of group associations to take to market-driven non-farm enterprises, thereby accelerating livelihood opportunities in the rural non-farm sector.
4. All this will call for steps which can help us to mobilize concurrently scientific progress represented by the on-going digital, biotechnology, space and other technological revolutions and the social revolution represented by the 11th schedule of the Constitution 73rd Amendment Act relating to Panchayati Raj. This in turn will call

for new partnerships in technology development and dissemination and the revamping and refocussing of our vast National Agricultural Research System, comprising ICAR Institutions, State Agricultural Universities and Private Sector R&D Institutions. Fostering strategic partnerships with relevant advanced research institutes in India and abroad (e.g., CGIAR Institutions) should also become an integral part of 21st century agricultural research culture.

5. The Task Group set up by the Planning Commission at the instance of the Prime Minister of India went into the methods of harnessing farm science and technology to contribute to larger societal goals like eradication of poverty, hunger and unemployment. Our report offers recommendations for re-tooling and re-energizing our NARS to help the country to become not only a leader in science-based sustainable agriculture (ever-green revolution), but also in fostering job-led economic growth in rural areas through integrated attention to on-farm and non-farm livelihoods.
6. It has been a privilege for me to have been associated with Prof. V. L. Chopra and the other distinguished members of the Task Group in this important exercise. Our thanks go to Dr. Vandana Dwivedi and to other members of Prof. Chopra's Staff for their untiring efforts to assist the Task Group complete its assignment within the stipulated period. I am grateful to my Secretary Ms. Dilhara for her dedicated and competent assistance in the preparation of Part A of this report.



(M S Swaminathan)
Chairman
Task Group on Revamping and
Refocusing of National Agricultural Research

Executive Summary

Revamping and Refocusing Research and Fostering New Partnerships for Agricultural Progress in the 21st Century

1. India is fortunately endowed with a strong and well developed National Agricultural Research System (NARS) comprising ICAR Institutions, State Agricultural Universities and Private and NGO sector R&D Institutions. The NARS played a key role in initiating and supporting the green revolution. Today, our farm families, numbering over 110 million, most of whom are resource poor in terms of size of holding and capital assets, are facing serious problems of productivity stagnation or decline, shortages of irrigation water and farm power, soil degradation, inadequate support services, and markets which are not pro-producer or pro-poor. State Land Use Boards are not equipped to give proactive advice to farmers on land and water use based on meteorological and marketing forecasts. Science and technology, if supported by appropriate public policies, can help to enhance the productivity and profitability of small farms in an environmentally and economically sustainable manner. This report offers suggestions for revamping and refocusing our NARS to meet current ecological, economic, technological and social challenges and to equip our farm families to face with confidence emerging challenges in the areas of markets and climate. It further suggests ways of bringing about a paradigm shift from unskilled to skilled work and from routine on-farm to value-added off-farm livelihoods. The recommendations are arranged in the same order as the Terms of Reference.

2. Strengthening strategic, applied and anticipatory research

2.1. ICAR is providing and should continue to provide support and guidance to fostering excellence and relevance in agricultural research. There is however need for a coordinating body which can help to harness advances in basic sciences for

agricultural progress. For this purpose, a **National Board for Strategic Research in Agriculture (NBSRA)** may be set up under the Chairmanship of Member (Science) in the Union Planning Commission. NBSRA should include in its membership the Heads of all National Scientific organizations and the Chairpersons of the Scientific Advisory Council to the Prime Minister and the Scientific Advisory Committee to the Cabinet, in order to ensure that investments in science are in accordance with national priorities. A sum of Rs. 300 crores may be provided during 2005-06 for implementing the Mission-mode projects sponsored by NBSRA. A major aim of NBSRA should be to bring about convergence and synergy among the numerous ongoing efforts to enhance our agricultural efficiency and competitiveness and to create new opportunities for skilled and value-added job/ livelihood opportunities in rural India. Another important role of NBSRA is to help in filling gaps in critical areas where the core competence of the country is currently inadequate.

- 2.2. National institutions like IARI, IVRI, NDRI, CIFE of ICAR and CFTRI of CSIR should be declared as Institutes of National Importance by an Act of Parliament in order to provide them with the autonomy essential for them to become Global Centres of Excellence in research, education and capacity building. They should function like the Indian Institutes of Technology. For providing overall guidance to these centers, a **National Council for Global Leadership in Agricultural Sciences and Education** may be set up under the Chairmanship of the Union Minister for Food and Agriculture, with the Union Minister for Science and Technology serving as Vice-Chairman.
- 2.3. There is need for a few **National Participatory Research, Demonstration and Training Centres** to bring together in an integrated manner all the available scientific know-how in relation to the major agro-ecosystems of the country, such as arid, semi-arid, irrigated, coastal, hill and island ecosystems. They will bring together at one location all the scientific know how available in the country in the public and private sectors for improving the productivity of the specific ecosystem in an economically and environmentally sustainable manner. They should be inter-organisational centers, designed on the lines of the Polyclinics of CSIR and overseen by NBSRA.

- 2.4. The North East Region needs urgently greater S&T capability for addressing location-specific problems and for conserving and enriching the unique agricultural wealth and skills of the women and men farmers of the region. Large investments, as for example, in the areas of horticulture and **Jhum** management are not yielding the expected benefits owing to poor S&T backstopping. The creation of a **North East Cadre in the Agricultural Research Service (ARS)** of ICAR, with an initial cadre strength of 300, will help to create a critical mass of women and men scientists drawn from the region, as well as from the rest of India who can dedicate their entire professional career to launch and sustain an era of agricultural renaissance in this region well known for both the beauty of its culture and the bounty of nature.
- 2.5. Biotechnology including genetic modification has opened up uncommon opportunities for improvements in medicine, health, industry, agriculture and the environment. Recombinant DNA technology however involves potential risks to health and the environment. Hence, there is need to develop national regulatory policies and structures which can help to assess risks and benefits in an objective and transparent manner, based both on science and the paramount need to safeguard the environment and human health. IPR issues also have to be considered, so that the benefits of discoveries of value to food and health security are spread based on the principle of social inclusion. The priorities in agricultural research identified by the Swaminathan Task Force on Agricultural Biotechnology (June, 2004), need to be taken up with adequate financial and infrastructure support.
- 2.6. There is an urgent need for initiating **National Challenge Programmes** in areas of critical importance to our agricultural future such as the impact of WTO agreement in agriculture, potential change in climate, dry land farming, nutritious but under-utilized crops, bio-fuels, new vaccines, etc. The precise choice of topics and institutions can be made by NBSRA.
- 2.7. Although we are well endowed with institutions in a wide range of areas, there are gaps particularly relating to value-addition, non-farm employment and the technical empowerment of Panchayati Raj Institutions to discharge the responsibilities

assigned to them under Article 243(G) of the 11th schedule of Constitution amendment 73. New Initiatives, and institutions if necessary, are needed in these areas.

- 2.8. There is need for a **Code of Conduct** to foster ethical and symbiotic partnerships between the private and public sectors, so that the public good character of Not-for-Profit institutions is not compromised. The National Board for Strategic Research in Agriculture could help in setting up a **National Patents Bank for Rural and Agricultural Prosperity** to which individual scientists and institutions can assign commercially viable patents relevant to improving the work, income, nutrition and health security of the socially and economically under-privileged sections of the rural society. NBSRA in consultation with CII, FICCI, ASSOCHAM, Seed Associations and other appropriate private sector organizations may draw up both the Code of Conduct and the blueprint for the Patents Bank.

3. Professionalisation of R&D Management in Agriculture

In his address at the Indian Science Congress in Ahmedabad, the Prime Minister called for ending the “tyranny of bureaucracy” in scientific institutions. A beginning in this process can be taken by making the ICAR headquarters a compact, technical body engaged in the development of research strategies and programmes, monitoring and evaluation. A technically qualified Registrar may be appointed in the place of Secretary, ICAR and the research and administrative wings of the organization unified. The ICAR should internalize the power of its organizational structure which confers upon it concurrently autonomy in science administration and freedom from inelastic regulations, as well as Government authority through the Department of Agricultural Research and Education. Among the other steps that should be take immediately are:

- Developing and framing its own rules for governance and administration.
- Declaring IARI, IVRI, NDRI and CIFE as Institutions of National Importance.

- Autonomy in financial management to all institutions of ICAR, with control only in the processing of 5 years plans.
- Delegating authority for foreign deputations to Directors of Institutes in cases where no financial liability is involved.
- Engendering all personnel and HRD Policies.
- Reserving 10% of the budget of Institutions for human resource development and capacity building through life-long opportunities for re-tooling and re-training.
- Taking steps to achieve a proper match between scientific strength and the critical mass of inter-disciplinary effort needed to achieve the goals of projects in priority areas.
- Revitalisation of the National Academy of Agricultural Research Management (NAARM) at Hyderabad in order to make it a powerful instrument for instilling a collegiate and participatory work culture in ICAR and SAUs.
- Enhancing the capacity of NAARM to sensitize Directors of ICAR institutes and Vice-Chancellor of SAUs in issues relating to WTO, Global Conventions, Climate Change, etc.,
- Developing a **Creativity Index** to measure the spirit of invention and innovation prevailing among scientists in the organization.
- Establishing in NAARM a **National Virtual University for Science in Agriculture** in collaboration with IGNOU and MANAGE, in order to reach the unreached and voice the voiceless in issues relevant to sustainable agriculture and work, income and food security. The National Virtual University will particularly reach-out to Panchayati Raj Institutions.

3.1 The major part of the system (NARS) i.e. the ICAR has been the subject of reviews by a number of Committees in the recent past, which indicates that the system has not responded adequately in addressing the concerns that led to the repeated need for finding corrective measures to stem the perceived decline in its efficiency. **It is recommended that the System itself undertakes a thorough introspection, realizing that a major overhaul is needed to improve both its effectiveness and**

image. The recommendations of this Task Group should be seen as an input for an initiative that catalyses a participatory self – correcting process.

- 3.2 The System has grown too large, dispersed and unwieldy because of periodic additions without rationalization and clarity of mandates of the new units vis-a-vis the existing ones. An exercise of integration and consolidation is urgently called for.
- 3.3 It is important that the System operates on a project mode for its research programmes and funding. This will call for careful design of a project format that clearly enunciates the programme elements, the expected outputs and milestones, the timelines for achieving the outputs and the validation criteria that will be used for verifying the claim of achievements. The log frame options used in the CGIAR system for preparation of MTPs (Medium-Term Plans) provides an example of a working model. Such a system will offer an objective mechanism of monitoring and evaluation based on the scientists' own projections and thus allow implementation of accountability which is sadly missing at present.

4. Improving the Funding System

There is much scope for improving the fund management system with the help of modern technologies. An integrated system of block and competitive grants and project funding should be developed. The integrated management and project accounting system adopted by CSIR has some lessons for ICAR. The existing fund management system may be reviewed with the help of CSIR and the Tata Consultancy Services and revamped in a manner that links authority and accountability at every level.

The Research Councils of Institutions and SAUs should ensure that only projects for which there are funds adequate to generate a critical mass of effort should be undertaken. Institutes should be allowed to retain the funds they generate through consultancies for upgrading infrastructure. There should be no artificial distinction between Plan and Non-

Plan funds at the Institute level. The totality of the resources available should be used effectively for achieving the mission and mandate of the Institution.

There is need to ensure that the research proposals undertaken have a **sharp focus with well defined output indicators**. This will help to monitor progress and fix accountability.

5. Sensitizing Agricultural Research to the Emerging Global Trade Scenario

There is need for establishing or mandating a National Institute to deal with home and external trade issues. Imparting trade, quality and patent literacy among scientists and farmers is an urgent task. There should be no double standards in quality farm commodities intended for home and external consumption should both have the highest standards of quality from the point of view of food safety and human health. There is an urgent need for accelerated efforts in plant breeding for processing quality. An Indian Common Market should be fostered and a Digital Gateway for National and International Trade in Farm Commodities should be organized at the proposed National Virtual University in NAARM.

6. Improving Recruitment Procedures

A serious crisis is developing in agricultural research. Nearly 1000 scientific and technical posts have been abolished in recent years. The scientific strength is dwindling, with the result that a critical mass of scientific effort is lacking in many projects. This situation needs immediate remedial action.

There is need to restore to ASRB its original position equivalent to UPSC in the area of recruitment and evaluation of agricultural scientists. The aberrations in selection procedures that have crept in during the last two decades should be removed with the advice of the Chairman of UPSC. A special North East Cadre should be created in ARS to assist farmers in that region to overcome serious soil and plant health, alien invasive species, genetic erosion and other problems facing them. Multiple methods of recruitment

including a Quick Hire System may be followed particularly in the area of recruitment to positions requiring specialization in frontier areas of technology.

ARS was conceived as a scientist and **not** post-centred system. There is need to remove the distortions that have taken place in the ARS structure, which is leading to much frustration among younger scientists. This can be done with the help of the Director of the Lal Bahadur Shastri Academy of Administration. The 5-year assessment procedure should be carried out in the Institutes where the concerned scientists work and not at the ASRB headquarters in New Delhi.

About 50 positions of National Professors and 100 positions of National Fellows may be created in areas of frontier science as well as for the purpose of remedying regional imbalances in S&T capability. Also a new category of **Genius Awards** should be introduced, to nurture outstanding young talent.

7. Integrating Research and Extension

Agricultural extension should be holistic and regard farm women and men as partners in knowledge management. **Poverty and not ignorance is often responsible for resource poor farmers not taking to new technologies.** Credit and knowledge flow should be synchronized in time and space. Farm Schools in the farms of creative farm families should be established to foster farmer to farmer learning. Steps should be taken to remove the constraints women farmers face in access to Kisan Credit Cards, and farm graduates face in operating Agri-clinics and Agri-business centers. An area rather than a single farm approach is needed to spread eco-farming practices. This is where the implementation of the provisions under Article 243(G) of the 11th schedule of the Panchayati Raj Act will help.

All technical positions in agriculture both at the Centre and States like Directors of Agriculture, Animal Husbandry, Extension, etc., should be manned by technical persons with a proven track record in agricultural transformation. Also, the SAU-ICAR-KVK-

Farm School System of technological and skill upgradation needs continuous feed back and advice from farm men and women. In order to provide a structured opportunity for sustained scientist – farmer dialogue, a **National Council of Innovative Farmers** may be set up. **Professionally Qualified Farm Science Advisors** should be appointed in our Embassies in Rome, Washington and Tokyo in the place of the administrators now occupying such positions.

8. Promoting Strategic Partnerships

National and local level S&T Alliances for Rural Livelihood Security may be formed for providing technical backstopping to the Food for Work and Employment Guarantee Programmes. Such alliances will help to address the following 3 issues, the addition to extending help related to improving the productivity, profitability and sustainability of local farming systems.

- Agricultural wages: Paradigm shift from unskilled to skilled work.
- Output per agricultural worker: Enhanced factor productivity.
- SC/ST population: Education, health, nutrition, capacity building.

A National Institute for the Technological Empowerment of Women and Men Members of Panchayats may be established. The proposed National Board for Strategic Research in Agriculture will help to bring about convergence and synergy among the programmes of all national R&D agencies engaged in harnessing science for agricultural progress.

The proposed National Council for Global Leadership in Agricultural Sciences and Education should initiate steps for strengthening symbiotic linkages with CGIAR institutions and Advanced Research Institutes world wide in areas of national relevance.

9. Conclusion

The world of agriculture is changing fast, technologically, commercially, economically and ecologically. **Resisting change in institutional and management structures will be a formula for increasing farmers' distress, leading to more suicides.** No further time should be lost in restructuring and strengthening our NARS, so that it becomes the flagship of the movement for agrarian prosperity and freedom from hunger.

Government of India
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**Report of the Task Group on Revamping and Refocusing of
National Agricultural Research**

I. PREAMBLE

In pursuance of the direction given by the Prime Minister, a Task Group was constituted by the Planning Commission on 4th October 2004 to look into the issue of revamping and refocusing agricultural research (Annexure 1). The Planning Commission added two more Members to the Task Group on 2nd December 2004 (Annexure 2). The Task Group held 6 meetings, in addition to conducting widespread consultations through e-mail. The minutes of the different meetings and the inputs received from Members and other experts are contained in Part B of the Report. Part A contains a description of the backdrop to the deliberations of the Task Group, together with the recommendations of the Group in relation to its seven terms of reference. The recommendations are based on considerations of priority, actionability and affordability.

PART – A

II. INTRODUCTION

Agriculture, including crop and animal husbandry, inland and marine fisheries, forestry and agro-forestry has been India's living industry for several Millennia. Even now 70% of India's population live in villages, where farming is both a way of life and the principal means to livelihood. Agriculture is not only the backbone of our food and nutrition security system, but also of our livelihood and ecological security systems. Further, self-reliance in food production is basic to national sovereignty.

India's independence was born in the backdrop of the great Bengal famine. Famines were frequent in the colonial period. Most of the steps to improve agriculture were then taken on the basis of the reports of Famine Commissions. In response to the reports of the Famine Commissioners in 1878 and 1898, and the mission of Dr Voelcker in 1889-90, the Imperial Government of that time decided to focus on agricultural research and extension. The need was felt for a full-fledged research laboratory, in order to find ways of combating the famine situation. This need was fulfilled in 1905, when Lord Curzon, the then Viceroy of India, established the Imperial Agricultural Research Institute at Pusa, in Darbhanga district in Bihar, with the help of a donation of £ 30,000 made by Mr. Henry Phipps of the United States of America.

It will be worth quoting what Lord Curzon said in 1905 at the time of the inauguration of the Imperial Agricultural Research Institute, "I hope the setting up of this Institute will be the starting point of a policy of agricultural development henceforward to be systematically pursued in good years and bad ones by the Government of India so that a time may one day arrive when people will say that India is looking after **her greatest living industry** as well as she is now looking after her greatest inherited treasure, viz. her ancient monuments". In his opening speech, Lord Curzon further emphasized that it was not enough to study the agricultural problem, but to bring the results of research to the knowledge of the cultivators. In addition, he wanted that "rural schools should give children preliminary training which will make them intelligent cultivators, will train them

to be observers, thinkers and experimenters and **will protect them** in their business transactions with the landlords to whom they pay rent, and the grain dealers to whom they dispose of their crops”. Thus even in 1905, an integrated system of agricultural research, extension and education (including primary education) was envisaged. The name of the Imperial Agricultural Research Institute was changed to Indian Agricultural Research Institute (IARI) after independence in 1947. Also following a severe earthquake in Bihar, the headquarters of IARI was shifted in 1936 to New Delhi. IARI is commemorating its centenary this year, while the Indian Veterinary Research Institute (IVRI), originally established at Mukhteswar in Kumaon hills is even older. IVRI, IARI, the National Dairy Research Institute (NDRI) located at Karnal in Haryana and the Central Institute of Fisheries Education (CIFE), located in Mumbai, are today deemed universities and have been the main sources of trained faculty for our Agricultural, Veterinary and Fisheries Universities. Together with the Forest Research Institute in Dehra Dun, which functions under the Indian Council of Forestry Research and Education (ICFRE) and the Central Food Technological Research Institute (CFTRI) in Mysore, which is a constituent unit of the Council of Scientific and Industrial Research (CSIR), these national institutes constitute the principal scientific foundations of our agriculture. IARI has also been the flagship of the green revolution movement. This group of great national institutions was strengthened in 1958 with the establishment of the G.B. Pant University of Agriculture and Technology at Pant Nagar, U.P. (now in Uttaranchal). Since then, a large number of Agricultural, Veterinary and Animal Sciences, including Fisheries, Universities have come into existence in different States. Despite the gradual growth in R&D infrastructure, the average productivity of our crops and farm animals is low and our farm families by and large remain poor. Agriculture is also yet to attract educated youth in a significant manner.

We have started this report with this historical introduction, just to flag the fact that the living industry of India is yet to receive the attention it needs, as compared to the non-living industries of our country. Indira Gandhi, while releasing a stamp commemorating our Wheat Revolution in 1968 remarked that only synergy between science and public policy can ensure the health and progress of our agriculture. During

the nineties, we witnessed a fatigue of the green revolution, which was due to a combination of factors such as technology stagnation, damage to the ecological foundations essential for sustained advances in farm productivity, and above all, inadequate public policy support in the form of investment in irrigation and rural infrastructure as well as in the areas of credit and insurance. Research and educational institutions including State Agricultural Universities (SAUs) grew in number, but tended to decline in quality as well as in connectivity with the clients of farm research namely farm women and men. Education in rural schools continues to remain divorced from both nature and the needs of agriculture.

At the same time, the size of an average holding has been going down, biotic and abiotic stresses have been increasing and agriculture has started becoming not only a gamble in the monsoon but also in the market. The gap between potential and actual yields started growing as a result of the disconnect between research and extension, and policy and technology. The threats and opportunities associated with the World Trade Agreement in Agriculture have added new challenges to scientists, farmers and policy makers.

Our planning process over the past decades in the agricultural sector has been focused on increasing food grains. All strategies have been addressed to the crop sector and rightly so, because the focus was providing the food grains. But incidental to such planning process, the livestock sector got neglected and in its wake the land less and the marginal farmers, who constitute 58% of the rural population, never received due attention. Incidentally this resource poor population sustains itself through 481 million livestock and 410 million poultry which serve as the most critical components of our rural production system.

The crop sector programmes for farmers both in the central and State governments, were meant for people with land. There were no committed programme for animal sector or for landless and marginal farmers who live by livestock. There being much greater equity in livestock holdings any attempt to directly reach the animals and animal owners would have brought about faster rural transformation.

The lack of support for the inherent capacity of livestock sector, is now being recognized. Considering the overwhelming evidence that sustainability in agriculture is through livestock and that the issues of poverty alleviation, nutritional security, rural employment, women empowerment, particularly among the resource poor farmer can best be addressed through livestock, there should be a policy shift to greater financial, infrastructure and programme support to such sectors which in turn will directly reduce rural poverty.

Livestock is also emerging as a driving force in the growth of agricultural sector of India. Several factors underline this development. Contribution of livestock to Agricultural Gross Domestic Product (AGDP) has increased from 14% in 1980-81 to 26% in 2000-02 (post green revolution). Demands for livestock product is income elastic and sustained growth in per capita income of the population, rising urban population, change in food habit are going to fuel further growth. More than equity and balance, the rural livestock provides sustainability to the total agricultural operations. In spite of poor infrastructure, low investments and low priority shown to this sector, livestock has provided sustainability and stability to Agricultural Production. The greatest contribution from livestock in the current concept of global economy and the national agriculture resurgence is in terms of sustainability to the total rural development, which the livestock only can provide.

It is clear that the economic future of our agriculture would depend upon the ability of farm families to raise agricultural productivity in perpetuity in an environmentally sustainable manner, and enhance our global agricultural competitiveness through rapid progress in the areas of quality improvement, cost reduction, diversification of farming systems and value addition to primary products. Science is basic to sustainable intensification, diversification, value-addition and quality improvement. It is only science based and knowledge intensive agriculture that can help our farming families numbering 115 million (25% of the global farm population) to enhance productivity in perpetuity without associated ecological harm, a phenomenon now commonly referred as “ever-green revolution”. This report offers suggestions on methods of achieving a proper match

between scientific research and the knowledge and technological requirements essential for launching an ever-green revolution or sustainable agriculture movement. Even at the outset, it must be stressed that an annual growth rate of 4% in agriculture will need a 8% growth rate in horticulture and animal husbandry, thus emphasizing the need for a farming system rather than a commodity centered approach to research.

III. PROCESS

The National Agricultural Research System (NARS) has grown enormously since 1947, the Indian NARS being one of the largest of its kind in the world. It is also unique in the sense that the Indian Council of Agricultural Research (ICAR) has integrated responsibility for research, university education and extension education. Thus, it performs with reference to Agricultural Universities the same role as the University Grants Commission. Our NARS comprises a large number of ICAR institutes and National Research Centres, including IARI, IVRI, NDRI and CIFE several National Bureaus and Project Directorates, a large number of All-India Coordinated Projects, numerous Agricultural, Animal Science and Veterinary Universities and a growing number of private sector R&D institutions. The ultimate impact of the Indian NARS will depend on the one hand, upon the extent of synergy generated among all these institutions and on the other, upon the extent of symbiotic partnership developed with farm and fisher families. It should not be forgotten that the green revolution was the product of synergy between technology and public policy, symbiotic partnership between scientists and farm families through the National Demonstration Programme and above all, a symphony approach among all the stakeholders. **How can we again generate such synergy and symbiosis and reinvent an Agricultural Research and Development Symphony?**

The Task Group sought the advice and guidance of a wide range of scientists, farmers' groups, university scholars, scientific associations and science administrators on issues relating to its terms of reference. Advice was also sought from private sector R&D institutions and CGIAR institutions. The various suggestions received are given in Part B

of this Report. They contain valuable suggestions relating to research priorities, as for example in dryland farming, livestock improvement, pulses and oilseeds production, etc. A consultation was also held among the principal stakeholders. The Task Group feels that the process of preparation of such a report is as important as the product, since without the emotional and intellectual involvement of all the members of the National Agricultural Research Symphony, progress in the revamping and refocusing of our research institutions and strategies will be poor. **While formulating our recommendations, we have tried to identify catalytic points of action, which can help set in motion the process of change, so urgently needed now.** Shaping the future directions of our agricultural research strategies and priorities as well as management systems in a desirable direction can alone help us to shape our agricultural future in a manner that agrarian and rural prosperity is enhanced and our national food security assured.

IV. CURRENT SCENARIO

A. National

The size of farm holdings is decreasing. It has decreased from 2.69 ha in 1960-61 to 1.41 ha in 1995-96. It will be even smaller now. The per capita availability of arable land is now 0.15 ha and is likely to go down to 0.095 ha by 2020AD. The number of small and marginal farmers have increased from 30.78 million in 1960-61 to 92.82 million in 1995-96. A large proportion of farmers, particularly women, do not have access to the institutional credit system. The rural poor still borrow 84% of their credit needs from non-formal sources. In 1990s, term lending in rural areas decelerated. Women in agriculture have largely been by-passed by the credit and extension systems. Only less than 10% of Kisan Credit Cards have been issued to women. In the past, rural financial institutions tended to neglect rainfed agriculture, horticulture, post-harvest storage and processing. The volume of agricultural business has however increased tremendously. The use of purchased inputs by the farmers has multiplied 283 times during 1950-51 to 2000-01. The quantities of marketed surplus have multiplied to the tune of 10 times in the case of cereals, 4.6 times in oilseeds, 5.3 times in milk, 15.4 times in poultry products and

7.4 times in fish. Handling of such commodities emerging from over 115 million farms generates employment and income opportunities. The market orientation of farmers has increased as can be seen from marketed surplus-output ratio increasing from 33% in 1950-51 to 70% now. But the value addition to agricultural commodities is less than 10%. The gross marketing margin in agricultural commodities is estimated at Rs. 1009 billion, out of which nearly 70% is accounted by marketing cost. About 77% of marketing costs are estimated to be avoidable losses during handling, transport and storage. Market regulation programmes are still inadequate and ineffective. Private and corporate sector entry is still marginal. Although we are the second largest producers of fruits and vegetables in the world, less than 10 percent of the produce is processed. Due to inadequate availability of cold storage facilities, post-harvest spoilage is high in perishable commodities.

The supply of inputs like seed, planting material, fertilizers and implements is far from satisfactory, in respect of timeliness, quantity and quality. Despite a policy of Minimum Support Price (MSP), the farmers in several areas particularly in arid, semi-arid and hill areas are not realizing these prices due to ineffective implementation of price support policies as well as poor communication facilities. Quality, labeling and brands, taxes and subsidies, SPS issues, price volatility, and dumping etc. are becoming significant factors in marketing of farm produce. Consumers also expect the availability of goods round the year at reasonable prices and in good quality. While the volume of implicit and explicit farm input subsidies has gone up, the economic conditions of farmers, particularly small and marginal farmers and those living in dryland areas, as well as in mountain, coastal and tribal areas has not improved. At the same time, farmers are under tremendous pressure to reduce cost and enhance quality to remain globally competitive. Even the Government is still to be ready to address the issue of quality in terms of fixing standards, establishing quality testing laboratories, and spreading quality awareness among farmers, processors, traders etc. The much-publicized Training and Visit (T&V) system of extension initiated with loans from the World Bank is now regarded as a failure. Extension personnel are unable to meet the information and skill needs of emerging diversified agriculture. The State Land Use Boards are not equipped to give proactive

advice to farm families on land use planning, on the basis of meteorological and marketing forecasts. Farmers are left to themselves to decide on what crops to grow and how to allocate land and water. The infrastructure needed for agricultural diversification like rural roads, drying yards, storage structures, transportation facilities, packaging services and branding system is most inadequate. Much of the paddy is dried in public roads after harvest. There is a growing mismatch between production and post-harvest technologies, as a result of which higher production does not necessarily help either the producer or the consumer. Thus, the growing disconnect between research and extension and between production and post-harvest technologies coupled with monsoon abnormalities is resulting in acute farmers' distress in some parts of the country, leading occasionally to farmers' suicides.

It is an undisputed fact that investment in agricultural research has paid rich dividends in the past. Science based agriculture has led to the emergence of many agricultural "bright spots" in the country. However, considering global developments in farm technologies and trade, there is an urgent need to change the way we work and start responding quickly to new and emerging situations. In particular, the planning and implementation of research programmes need a thorough overhaul. The need of the hour is to integrate agronomy with economics so that the cost, risk and return structure of farming becomes favourable. This will call for much higher efficiency in the use of inputs particularly, water. **We have to reverse the present trend of declining factor productivity. Irrigation water will be the most important constraint in the coming years, and "more crop per drop" should become a reality and not remain just a slogan.**

B. International

The nineties witnessed the emergence of several global conventions, which will have a far-reaching impact on agricultural research. Mention may be made of the Global Biodiversity, Climate and Desertification conventions, the UN Law of the Sea convention, the FAO Treaty on Plant Genetic Resources for Food and Agriculture, and above all, the World Trade Agreement in Agriculture which was first entered into at

Marrekesh in 1994 and which is currently being renegotiated. National legislation responding to the obligations under such conventions, includes Protection of Plant Varieties and Farmers' Rights Act (2001), the Biodiversity Act (2002) and the ordinance relating to Patents (2004). India is the only country, which has enacted legislation to protect concurrently the rights of breeders and farmers. The WTO Agreement also calls for the strengthening of sanitary and phytosanitary measures and for the adoption of the **Codex alimentarius** standards of food safety. The coming to an end of the multi-fibre arrangement in Cotton on 31 December 2004, marks the beginning of a new era in global trade in textiles, characterised by both threats and opportunities. This has profound implications for India, since the cotton and textiles industry provides jobs for several crores of people.

C. Food Security

The Tenth Plan calls for a paradigm shift from the concept of macro-level food security at the National level (i.e., the per capita availability of food) to nutrition security at the level of each individual child, woman and man. Nutrition Security is best defined as "physical, economic, social and environmental access to balanced diet and clean drinking water". The major cause of food insecurity in our country is the lack of the minimum purchasing power essential for economic access to balanced diet. **The famine of jobs/livelihood opportunities leads to the famine of food at the household level, thus emphasizing the need for ensuring that our development strategies lead to job-led and not jobless economic growth.**

Farmers are also consumers and hence 70% of the consumers in India are also those who earn their livelihood in farming. The situation is very different in industrialised countries where hardly 2 to 5 percent of the population is engaged in the production phase of farming. Therefore under our conditions enhancing agricultural productivity per units of land, water and labour is the speediest way of ending poverty-induced chronic undernutrition. The smaller the farm, the greater is the need for marketable surplus, so that the family has adequate cash income.

It is clear that agricultural research has to be refocused in a manner that science not only helps to enhance productivity, but also income through farming system diversification and value addition. Value-added employment involves a paradigm shift from unskilled to skilled work and from routine on-farm to value-added off-farm livelihoods. Over a third of the rural population is assetless, i.e., they do not possess land or livestock or fish pond. Concurrent attention to skilled on-farm and non-farm employment is essential for alleviating poverty and chronic undernutrition. **Unfortunately, agricultural research institutions are yet to work in an integrated manner to achieve the triple goals of ‘more food, more income and more jobs’, all in an environmentally sustainable and socially equitable manner.** Consequently, food insecurity is widespread both in rural and urban India. Maternal and foetal undernutrition has particularly serious consequences to national development, since babies born with low birth weight suffer from malnutrition induced handicaps in brain development

V. NATIONAL AGRICULTURAL RESEARCH SYSTEM

India is endowed with a well-developed agricultural research system (NARS) in terms of scientific infrastructure and skills as well as its national reach. The NARS in India now comprises 189 institutes/ coordinated projects under ICAR, 100 private and voluntary R&D organizations, 37 agricultural and animal science universities, 23 general universities having agricultural faculties, several rural and womens’ universities, more than 105 scientific societies involved in agricultural research and one National Academy of Agricultural Sciences. ICAR Institutes and SAUs have remained at the centre stage in this evolution. Many studies have empirically shown impressive performance of the research done by the system with the average rates of return to investment in research ranging from 35 to 155%. Notwithstanding such an impressive economic performance, the research system along with others has not been able to address effectively the persisting problems of rural poverty, unemployment and natural resource degradation. The economic condition of small farm families has been deteriorating. Research and extension programmes are yet to be engendered in a systematic manner. The public

agricultural research system needs to be revamped and refocused to address these challenges in the coming years.

The NARS has been extensively reviewed by many expert bodies in the past. The recurrent reviews in recent years suggest that the system has not been able to implement the recommendations of earlier review committees in letter and spirit from time to time. This is particularly true with reference to the G. V. K. Rao Committee's report (1988) on "the existing organisational infrastructure, personnel policies and functional role in the ICAR". Perhaps the system is not adequately self critical and self-correcting. Also, ability and willingness to take a system-wide view and co-ordination is lacking. Complacency is permeating this system; as a result, young scientists are developing a sense of frustration and lack of missionary spirit. The nineteen sixties' spirit of **"we shall overcome"** seems to have vanished.

One of the main reasons for non-delivery or delayed delivery in several of the projects has been the rather casual way in which the planning is done and the less rigorous way of monitoring. There should be a sharp focus and quantifiable goals for monitoring not only the scientific aspects, but also the financial aspects, in which finance and administration can play a role. A micro system of weekly monitoring by the project leader, monthly monitoring by the Institution and six monthly monitoring or annual monitoring at the central level by the director with his colleagues and with external experts should be developed. Proper documentation perhaps through Quality Management System such as ISO 9001 may also be thought over on this process of documentation which may be so important in intellectual property and other important areas of the quality management. ICAR and SAUs will have to equity themselves to face this challenge of the 21 century. There should be a sharp focus in project objectives and a clear indication of measurable outputs.

Accelerated progress in enhancing agricultural productivity and profitability is essential for eliminating farmers' distress and for ensuring that no child, woman or man remains undernourished. Scientific agriculture is becoming knowledge-intensive. Ecologically

desirable farm practices like efficient water management and integrated pest management require group cooperation among small farm families in a village or watershed. **The social engineering aspects of generating group effort are as important as the technological aspects of modern agriculture.** This is where a new partnership between NARS and Panchayati Raj Institutions is urgently needed.

VI. RECOMMENDATIONS

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“To suggest methods of strengthening strategic research involving frontier science and technology and anticipatory research keeping in view the challenges of variation in monsoon behaviour / climate and to foster crop-livestock-fish integrated farming systems and to enhance the productivity and profitability of rain-fed, semi-arid, desert, coastal and hill areas.”

In addition to the triple needs of generating higher productivity based production, income and jobs/ livelihoods in the farm sector, there is need to address issues relating to global competitiveness in the context of the WTO agreement in agriculture and the prospects for adverse changes in precipitation, temperature, and sea level as a result of global warming. There is also need to take the benefits of frontier science and technology in areas such as space, nuclear, information, renewable energy and bio-technologies to resource poor farming families. At the same time, we should build our national capability in nano-biotechnology and in space applications for education and precision farming. There is need to marry frontier science with traditional ecological prudence and technologies, so that we are able to develop and disseminate ecotechnologies rooted in the principles of ecology, economics, gender and social equity and employment generation. This is particularly true of organic farming, where traditional wisdom will have to be integrated with new technologies relating to biofertilizers, bio-pesticides, vermiculture, bio-remediation agents and efficient microorganisms.

All this will call for a critical mass of inter-disciplinary research in the areas of strategic, applied, anticipatory and participatory research. This in turn will call for new patterns of research design and implementation characterised by a high degree of cooperative endeavour and accountability.

1. Strengthening strategic, applied, anticipatory and participatory research

The strategic research programmes emerge from solid scientific facts and when planned meticulously and executed with diligence, help in finding solutions to specific problems. If properly designed, strategic projects can be technically feasible and have a high probability of success in delivering solutions. The human and rice genome sequencing projects are examples of strategic research, involving numerous institutions and individual scientists. In fact, a majority of research projects are strategic in nature and are usually aimed at addressing pressing contemporary problems using the latest scientific tools.

In today's fast changing technological scenario, innovations in one country can have repercussions elsewhere. The consequences (favourable or unfavourable) could be different for different nations or sections of society. Therefore, it is imperative that a constant watch is kept on technology development in various fields related to agriculture and appropriate research initiatives are taken to keep abreast in a changing world. Anticipatory research is aimed at finding answers, in advance, to situations or problems that may arise in the future. Anticipatory research can also be of exploratory nature to advance frontiers of science that will eventually lead to the development of newer technologies. Anticipatory research also provides cushion against future adverse scenarios such as climate change and sea level rise. Formulation of anticipatory research needs foresight and bold initiatives.

It is an undisputed fact that investment in agricultural research has paid rich dividends in the past. However, considering global developments in farm-technologies and trade, there is an urgent need to respond quickly to new and emerging situations. In particular, our research programme planning and implementation needs a thorough overhaul. The following suggestions are made to revamp and refocus the system.

1.1 Set up of a National Board for Strategic Research in Agriculture

Presently there are several government agencies funding research in overlapping areas of plant and animal sciences. These agencies work independently and tend to have little symbiotic interaction with one another. As a result, there is both duplicity of efforts in some areas (eg. Biotechnology) as well as serious gaps (e.g. ecotechnology and post-harvest technology). Hence, there is need for a national level umbrella mechanism with necessary administrative and financial provisions to serve as an apex body for providing overall policy framework and priorities for promoting and supporting basic research, building strengths in emerging areas of S&T, and to coordinate various scientific departments/agencies for evolving a focused approach and avoiding overlapping areas of agricultural research and funding. **A National Board for Strategic Research in Agriculture (NBSRA)**, on the lines of the National Science Foundation of the USA, may be set up to fill this void and a budgetary provision of Rs. 200 crores made in the Annual Plan for 2005-2006.

The National Board for Strategic Research in Agriculture may be chaired by Member (Science) in the Planning Commission with the Director Generals of ICAR, CSIR, ICMR, DRDO and ICSSR, and Secretaries to Government in the Departments of Science and Technology, Biotechnology, Ocean Development and Non-Conventional Energy Sources as Members. The Chairmen of Atomic Energy and Space Commissions, the President of the National Academy of Agricultural Sciences, the Chairman of the Agricultural Universities Association, the Chairpersons of the Scientific Advisory Council to the Prime Minister and the Scientific Advisory Committee to the Cabinet, as well as a few eminent women and men Scientists from the private sector, may be invited to serve as Members. The NBSRA may be assisted by a Standing Advisory Committee consisting of the Directors of IARI, IVRI, NDRI, CIFE, CFTRI, two Vice Chancellor's of the SAUs and two Directors of Private Sector R&D Institutions. **ICAR should continue to provide leadership in the field of agricultural sciences, while NBSRA's role will be mobilizing science for agriculture.**

The functions of NBSRA may include:

- (a) Identifying and supporting inter-organisational strategic missions related to farming systems diversification, value addition, productivity and quality improvement, climate change and strengthening the ecological foundations of sustainable agriculture
- (b) Identifying institutions and individuals, on the basis of competitive bidding, to carry out specific pieces of strategic research
- (c) Developing strategies for human resource development in frontier areas of science
- (d) Standardizing indicators for developing a **Scientific Creativity Index** and for performing environmental and gender audits
- (e) Strengthening regulatory mechanisms in appropriate areas, such as biotechnology and nano-technology
- (f) Identifying areas for anticipatory research,
- (g) Developing a Code of Conduct for private-public sector partnerships, and
- (h) Promoting international partnerships in strategic areas of national importance

1.2 Developing Global Centres of Excellence

There is need for outstanding centres of global eminence in crop and animal husbandry, fisheries and post-harvest technology. Fortunately, these already exist in the form of IARI, IVRI, NDRI, CIFE under ICAR and CFTRI under CSIR. They constitute the mother institutions from where most of the faculty members of SAUs are drawn. Though IARI, IVRI, NDRI AND CIFE are deemed universities, their administrative autonomy is restricted due to the hierarchical nature of functioning by the ICAR unlike CFTRI of CSIR. They have therefore not been able to achieve the stature and efficiency of IITs. We therefore recommend that IARI, IVRI, NDRI, CIFE, and CFTRI (under CSIR only) may be declared as Institutions of National Importance by an Act of Parliament and vested with complete autonomy in administrative and financial matters, on the lines of IITs especially for IARI,IVRI,NDRI and CIFE as CFTRI under CSIR already has such

autonomy and can be a model role for other four organisations. They will then be able to realize their full potential and become global centres of excellence. In addition to fulfilling their national responsibility, they can equip themselves to become capacity building centres for fellow developing countries in Asia and Africa for synergising the agricultural research in the country by Networking.

As mentioned earlier, IVRI is more than 100 years old and IARI is commemorating its centenary during 2005. If they are to maintain sustained dynamism, they need a management structure which combines autonomy, authority and accountability in an effective manner. For example, CFTRI is already a major research and training centre of international repute on the areas of food processing and post-harvest technology. It would be useful to declare this institution also an institution of national importance under CSIR only so that it can play a pivotal role in the areas of agro-processing, value addition, quality literacy and maintenance of international standards in food safety. These five centres (four of ICAR and one of CSIR) have the potential to become world leaders in research and education relating to agriculture and agri-business and no further time should be lost in realizing that potential for cross ventilation between ICAR institutes and ICAR and CSIR. In order to maintain close linkages with the Union Ministry of Agriculture, the Cabinet Minister in charge of Agriculture may be ex-officio Chairman of **a National Council for Global Leadership in Agricultural Sciences and Education** which provides policy oversight to these four centers of ICAR, with the Minister for Science and Technology serving as Vice Chairman (for purpose of networking). DG's of ICAR, CSIR, ICMR and ICSSR should be ex-officio Members of the Governing Bodies of such institutions of national importance for bringing about networking. We recommend that suitable legislation may be enacted by Parliament during 2005 for this purpose especially keeping in view of the four institutes of ICAR as mentioned above as we revamp the ICAR in relation to its Research.

1.3 Inter-organisational Participatory Research, Demonstration and Training Centres

Jawaharlal Nehru, quoting Alice in the Looking Glass, often reminded us that “we have to run twice as fast to remain where we are”. With our population growing relentlessly, this statement is even more true today. Time is not in our favour and we must accelerate our progress in the technological transformation of agriculture. For this purpose, we suggest the setting up during 2005-06, the following National Participatory Research, Demonstration and Training Centres:

- Centre for Arid areas
- Centre for Semi-arid areas (dry land farming areas)
- Centre for Hill areas
- Centre for Irrigated areas
- Centre for Coastal areas
- Centre for Islands

These centres will be designed like CSIR Poly-clinics to bring together at one location all the new, socially and environmentally relevant technologies available with ICAR, SAUs, CSIR, ICMR, DST, DBT, Departments of Atomic Energy and Space, MNES, and private sector R&D institutions. The aim will be to undertake technology verification, incubation and demonstration in order to elevate and stabilise farm productivity and profitability on an environmentally and economically sustainable basis. They could help to train the staff of the new extension system titled ATMA (Agricultural Technology Management Association) being promoted by the Union Ministry of Agriculture.

Such Participatory Research, Demonstration and Training (RDT) Centres should be farmer-centric and should concentrate on demonstrating how to increase the output and income of farmers with small holdings and artesanal fishermen. Precision farming, hi-tech horticulture, monsoon management and mixed farming will be important components of the training programmes. The proposed National Board for Strategic Research in Agriculture can work out the modalities of establishing such centres at locations where the work done will have a large extrapolation domain. Priority may be given to dry farming, where the work done at CRIDA and ICRISAT has shown that

amelioration of micro-nutrient deficiencies in the soil can help to improve yield substantially. Also, we can initiate a revolution in pulses production by covering 100,000 ha under hybrid pigeon-pea (arhar) during 2005-06. The concerned State Governments could be requested to provide about 100 ha of land free of cost for establishing such RDT centres. The centres should be autonomous, and managed jointly by farm/ fisher families and scientists. Panchayati Raj Institutions should be associated with the design and management of RDT centres. These centres should be designed to serve as windows into the new world of agrarian prosperity that awaits rural India. They should have strong linkages with the relevant SAUs. We suggest that Rs. 100 crores may be provided in the budget for 2005-06 for this initiative.

1.4 Remedying regional imbalances in agricultural progress: Special ARS Cadre

A more harmonious development of our agriculture across the country would **require a more equitable distribution of scientific skills and experience**. Capacity building of researchers and extension workers in areas characterised by relative stagnation in farm progress is a national obligation. The Agricultural Research Service of ICAR (ARS) was established in 1974 to promote a **scientist-centred system** of recruitment and career advancement, in the place of the **post-centred** system prevailing earlier. The distortions which have minimised the impact of ARS are dealt with separately. What is however urgently needed is a **special sub-cadre** in ARS to deal with the needs of the North East region. Currently many ARS positions in the ICAR research complex in the North East region are vacant. The North East Horticulture Mission is also suffering due to lack of adequate technical expertise. There are increasing number of male and female graduates coming out of the Central Agricultural University, Imphal, NEHU, Manipur University and colleges in the North East region. The time is opportune for creating a **N.E Cadre under ARS**, to be filled up with qualified women and men from the States in that region (Arunachal Pradesh, Meghalaya, Manipur, Mizoram, Nagaland, Tripura and Sikkim) as well as those who commit themselves to work in that region. Without Scientists from the region itself, who have a long term stake in enhancing the agricultural prosperity of the region, it will be difficult to convert the vast untapped potential for agricultural progress and rural prosperity in the North East states into jobs and wealth. **We therefore suggest**

that ICAR may create a NE Cadre in its Agricultural Research Service, with an initial cadre strength of 300. ASRB in association with the North East Council could work out the modalities of recruitment for this special North East cadre of ARS. Scientists from the other parts of India should also be eligible to apply for joining the N.E. Cadre of ARS, but they should agree to devote their professional life to helping the region in relevant areas of research, education and capacity building. Greater attention to the special animals of the region like Mithun and Yak is needed.

1.5 Biotechnology and Shaping India's Agricultural Future

The Task Force in Agricultural Biotechnology chaired by Prof M S Swaminathan in its report presented to the Union Minister of Food and Agriculture in June 2004 has indicated priorities for harnessing the tools of molecular breeding in agriculture. The Task Force has stressed the need for establishing an autonomous and scientist-led Biotechnology Regulatory Commission for inspiring political and public confidence in methods of assessing risks and benefits. The Swaminathan Committee recommended that the National Biotechnology Regulatory Commission may have an eminent Scientist as a common chairperson and two Vice Chairmen, one dealing with medical and pharmaceutical biotechnology, and the other, with food and agricultural biotechnology. With the emergence of neutraceuticals and plant based vaccines, the linkages between crop and pharmaceutical biotechnology are growing. Molecular breeding enables plant breeders to achieve aims, which would be extremely difficult even with the most sophisticated technologies of Mendelian breeding. However, the new genetics should be used to help re-shape agriculture in a manner that environment is not merely conserved but enhanced, and food and nutrition security is safeguarded and improved. **We therefore urge the finalisation of a science-based biotechnology policy for the country as soon as possible.** We are aware that the Department of Biotechnology has initiated steps to formulate such a policy. This exercise may be completed soon. We should neither worship nor reject a scientific tool because either it is old or new. The onward march of science will continue and we should provide our hard working farm

women and men the best available technologies, subject to the stipulation that they are both environmentally and nutritionally safe and are economically viable.

1.6 National Challenge Programmes

The Tenth Plan Steering Committee for Agriculture, chaired by Prof M S Swaminathan, had recommended the initiation of a few National Challenge Programmes to address priority areas of research in a time-bound and effective manner. Such challenge programmes are also intended to harness the power of partnership among appropriate institutions and individual scientists. The leadership of the Challenge Programmes must be vested in Scientist-achievers. We endorse this recommendation and suggest its immediate implementation. Some of the priority areas for initiating National Challenge Programmes are the following (these are illustrative and not exhaustive):

- a. Implications of climate change for agriculture and food security
- b. WTO concerns in agriculture
- c. Gender Dimensions of Agriculture in hill areas characterised by a high degree of feminization of farming
- d. Enhancing the productivity, profitability and sustainability of organic farming
- e. Dryland farming, pulses and oilseeds
- f. Bio-fuels (like *Jatropha*)
- g. Energy plantations and biomass based power generation
- h. New sources of edible oils (like Paradise Tree- *Simaruba glauca*)
- i. Coastal farming systems, including sea water farming
- j. Medicinal plants and herbal biovalleys
- k. Abiotic stresses with particular reference to drought and salinity
- l. New animal and fish feeds
- m. New vaccines for establishing disease-free zones in Animals
- n. Genetic conservation and enhancement of local breeds of farm animals.

The proposed National Board for Strategic Research in Agriculture could select institutions and individual scientists to undertake research, on a mission mode, on such

topics of national importance. A competitive bidding procedure can also be introduced Rs. 200 crores may be provided in the budget for 2005-06 for this purpose.

1.7 New areas requiring focused research effort

We have a wide range of Research Institutes and coordinated projects, covering the entire spectrum of crop and animal husbandry, fisheries, forestry and agro-processing and agri-business both in the public and private sectors. The following seven areas however require much more intensive and inter-disciplinary attention and we recommend the setting up of new National Centres/ Institutes in these areas or mandate existing one to address these areas specifically.

- a) Implications of the WTO agreement in Agriculture (strategies for optimizing benefits and minimizing risks)
- b) Climate change and its implications for agriculture and food security (the proposed India-UK Centre on climate change at IARI can fulfill this purpose)
- c) Rural Non-farm employment
- d) Space Applications and Precision Farming
- e) Information Communications Technologies (ICT) and agrarian prosperity
- f) National Institute for Bio-fuels
- g) National Institute for the Technological Empowerment of Members of Panchayati Raj Institutions to enable them to implement the provisions of Article 243(G) of the 11th schedule of Constitution Amendment 73.

The above institutions could be set up in existing ICAR institutes or SAUs, but should be functionally and financially autonomous with their own governing Boards. The National Institute for Space Applications and Precision Farming could be set up jointly by ISRO and ICAR in the land available to ISRO at Hyderabad. The National Institute for WTO concerns in Agriculture could be set up jointly by ICAR, the Ministry of Commerce, APEDA and MPEDA. It should have wings for capacity building in IPR and SPS (sanitary and phytosanitary measures). The National Institute for Biofuels could be set up

by ICAR and MNES. The National Institute for the Technological empowerment of Members of Panchayati Raj Institutions and local bodies could be set up jointly ICAR and the Ministry of Panchayati Raj.

In our view, the above institutions should be built around outstanding scientists and research leaders of proven capability in these fields. Such committed research leaders should be first identified and involved in the project design process. This culture is referred to as “**the Homi Bhabha method**” of institution building, which stands in contrast to the normally adopted method of constructing huge buildings and then looking for scientists.

1.8 Strategic Research in Animal Sciences

For improvement of our 200 million cattle and buffaloes of indigenous origin there is no alternative but to have the availability of superior germplasm/gametes produced using the modern technological advances. At present germplasm available to the Artificial Insemination programme of the country have not matched the quality which will produce the significant effect upon productivity. There is an imperative need to have Central Authority of quality control for germplasm with a designated mandate for ensuring availability of quality semen (production, processing, distribution). As such a **Central Quality Control Board for animal genomics** needs to be established to ensure the best germplasm availability for animal improvement programme. **Low fertility rate in AI program and lack of quality assertion in frozen semen is a great impediment in breed improvement and animal reproduction program.** A large number of parameters for judging processed semen are available. Since ICAR Institutions have a rich resource of genetic material, such evaluation is mostly not up to the standard mark. **A Central referral laboratory for quality assurance of semen and embryos** therefore is essential with a designated authority for control of semen through a National Semen Grid.

Diseases Control

There are several diseases among livestock, which have very low mortality, but very high morbidity causing tremendous loss to productive economy from the animal. Diseases like Foot and Mouth alone, is reported to cost over 10,000 crore annually through economic loss. In order to minimize such loss there is an urgent need for **Disease Diagnostics and Monitoring Laboratory**, one for each state which should function in a coordinated manner gathering data and generating information for effective data generation vital for management of such diseases. With the best expertise available in each state at the veterinary colleges, these laboratories should serve the national disease monitoring labs for monitoring and surveillance.

1.9 Fostering Public-Private Sector Partnerships

In the industrialised world, the public sector represented by universities and Government funded research institutes are known for their pioneering efforts in advancing the frontiers of knowledge. Nobel Prizes usually go to scientists in such institutions. In contrast, private sector R&D institutions are known for their contributions to advancing production based on science-based technologies, thereby leading to the creation of economic wealth. “Not-for-profit” and “For-profit” institutions have learnt to work together in industrialised countries, thereby accelerating progress in converting basic science into economically viable and market-driven technologies.

Private sector R&D institutions are growing in India, particularly in the areas of biotechnology and crop breeding. It is high time we develop a **Code of Conduct** for public-private sector partnerships based on respect for each other’s obligations. Not-for-profit R&D institutions also exist in the NGO sector, such as BAIF and MSSRF. Such Not-for-Profit NGOs can also adopt the same Code of Conduct as public-funded institutions in their partnerships with the private sector, where IPR, breeders’ rights and other forms of proprietary control over technologies and products of commercial significance, are important. NBRSA should develop the code of conduct in consultation with CII, FICCI, ASSOCHAM, Seed Associations and other private sector organizations. Such a Code of Conduct can be used in the entire national scientific research system.

Public good and commercial profit need not always be antagonistic. Ways can be found to ensure that the principles of social inclusion and reaching the unreached remain sacred in public good institutions, while at the same time stimulating investment in private sector R&D, through methods of social recognition and economic reward. The proposed National Board for Strategic Research in Agriculture could also develop guidelines for establishing **a National Patents Bank for Rural and Agrarian Prosperity**. Individual scientists and institutes could assign their patents to such a Bank, which will then take steps to ensure that the findings covered by such patents benefit the economically and socially under-privileged sections of the community as well as the economically and ecologically handicapped parts of the country, such as tribal and semi-arid and arid regions and islands. The National Patents Bank could have a Governing Body in which all the major public and private sector R&D organisations could be represented. Patents will then not come in the way of the technological empowerment of resource poor farm and fisher families. This will be an important window of opportunity for scientists to contribute to job-led economic growth with gender and social equity.

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“In order to professionalize skill management, suggest ways for weaning management from civil service bureaucracy.”

Our Prime Minister rightly remarked at the Indian Science Congress held at Ahmedabad on 3 January 2005, that science can progress only if the “tyranny of bureaucracy” is removed from scientific organisations. Although, this fact is widely accepted, such tyranny is tending to increase and not disappear, with the result that the core values of science such as fact-based questioning and acknowledgement of uncertainty (a beautiful expression of this core value is embodied in the motto of the Royal Society of London – **nullius in verba**, (i.e. do not have blind faith in the printed word) have become rare in our scientific establishments. **The political and administrative tinkering with the staff selection process also leads to the growth of “subordinate” scientists, than**

scintillating ones. ICAR institutes had long grown in the culture of subordinate offices of the Ministry of Agriculture. It will be difficult to remove this culture overnight. However, if steps are not taken without further delay to permit scientists to work without their hands and feet tied by unnecessary and inelastic regulations, India will continue to lose its position in the world of farm science. The disconnect between scientists and farmers will also grow. China is a good example of how a country can leapfrog in science, given a clear vision and mandate and freedom to perform as well as an atmosphere, which promotes pride in performance and a high sense of accountability.

Chinese Formula for successful Agricultural Research and its downstream

reach to the farmers

- ❖ Focused attention to chosen high priority areas matched with appropriate investment. Rice genome project is a relevant example.
- ❖ Massive investment in HRD for training, including in leading laboratories abroad, of scientists to execute the selected missions.
- ❖ Scrupulously keeping the missions under the charge of technical people. In recent times, their ministers for agriculture and science & technology have invariably been technocrats.
- ❖ Complete freedom of operation within allocated budget.
- ❖ Building into the project, at design level itself, the route to extension for reaching the technologies to the users. To ensure smooth technology flow, all research institutes have associated companies as commercial arms.
- ❖ An operating Public-Private-Partnership in research realm is exemplified by Biocentury Transgenes (China) Limited which has three partners: The Biotechnology Research Institute (BRI), Beijing; Ministry of Science and Technology; and an entrepreneur investor (a builder from Shan Zhan). Transgenic Bt Cotton which is giving stiff competition to Monsanto has been developed and marketed by this joint venture. BRI developed the technology and Biocentury Transgenes sub-licensed it to cotton growing provinces of China and interested parties abroad including Nath Seeds in India. Project personnel of BRI get a share of profits made by Biocentury Transgenes.

A beginning in the reform process can be made by ICAR by taking the following steps:

2.1 Integrating technical and administrative responsibilities at the headquarters by making the Deputy Director Generals in charge of both science and administration for science. The parallel streams of administration and technical leadership now existing in ICAR can be removed by replacing the post of Secretary, ICAR with a professionally qualified Registrar. The number of positions of DDGs and ADGs should be revised in the context of the decentralisation suggested earlier. The purpose of creating the Department of Agricultural Research and Education (DARE) and making the DG of ICAR concurrently Secretary to Government in DARE, was to achieve the same fusion of Government authority and functional autonomy, as is enshrined in structures like the Space and Atomic Energy Commissions and Departments of Space and Atomic Energy. **ICAR is yet to internalize the strength of this organisational structure, which confers upon it concurrently autonomy in science administration and freedom from inelastic regulations, as well as Government authority.**

2.2 Develop IARI, IVRI, NDRI and CIFE into global centres of excellence by declaring them as Institutes of National Importance (like IITs) by an Act of Parliament. Such Institutes may have to approach the ICAR headquarters in financial matters only once in 5 years for the clearance of their plan proposals. They will function like IITs in relation to internal management. As in the case of IITs, there could be a Council of these institutions chaired by the Union Minister of Food and Agriculture and President, ICAR.

2.3 Other Institutes of ICAR

They should have full autonomy to utilize their sanctioned budget based on prescribed financial rules and auditing procedures. They should be corresponding with ICAR headquarters only in scientific and technical matters. They should also be empowered to utilize the amounts they earn through consultancies and sponsored research for

strengthening their research, education and out-reach infrastructure. This incentive will help them to continuously update their infrastructure and remain at the cutting edge of science, so that they are able to attract national and international consultancies.

2.4 Project Directorates, Coordinated Projects, National Research Centres

All these units of ICAR should be given complete financial and administrative autonomy so that they are able to utilize the sanctioned amounts efficiently for the purpose for which they are intended. Their correspondence with ICAR headquarters should be only in relation to scientific and technical matters.

2.5 Krishi Vigyan Kendras (KVK)

A large component of ICAR funds have been committed to rural development through technology transfer using “KVK” as the focus for programme implementation. A majority of these KVKs have produced little impact on the agriculture growth and rural poverty in the areas of their operation. There is an urgent need to correct implementation of KVK programmes through:

- a) Redefining the KVK programmes with qualitative and quantitative targets.
- b) Making release of funds dependent upon achievement of targets.
- c) Bringing in priority activity into focus on an eco-regional basis eg. Horticulture, livestock, fisheries, etc. and deployment of scientists in the KVKs on the basis of local trained manpower demand, rather than centrally determined uniform manpower set up.
- d) Major focus be shifted from only variety demonstration to activities like livestock, horticulture and marketing particularly in areas where we have large landless and marginal farmers.

- e) A National Monitoring and Evaluation system may be established through a KVK Board which has authority to regulate and oversee their working, and release of funds should be for targeted activity authorized through the Board.

There should be a strong representation of farm women and men in the Management Committees of KVKs. They should stick to the principle of **techniracy**, i.e., helping farmers to master the latest technical skills by the pedagogic methodology of **learning by doing**. A post-harvest technology wing should be added to existing KVKs so that they can become **Krishi and Udyog Vigyan Kendras**. Social inclusion should be the guiding philosophy in the functioning of KVKs, so that landless labour families are able to acquire new skills in the non-farm sectors of livelihoods. **The major aim of KVKs should be to assist in bringing about a paradigm shift from unskilled to skilled work.** KVKs could become locations for this establishment of the hubs of Rural Knowledge Centres under Mission 2007: Every Village a Knowledge Centre. KVKs could be linked with KVIC in the marketing area. They should play an important role in promoting market driven micro-enterprises supported by micro-credit.

2.6 Human Resource Development and General Principles for de-bureaucratization

Bureaucracy stifles human fulfillment as well as optimum human resource utilization. As the experience of NGOs shows, it not salary alone that helps to attract and retain creative scientists. An atmosphere of academic freedom and opportunities for professional growth through participation in national and international workshops, symposia and conferences are equally important. The Director of the Institute should have authority to approve foreign travel where no public expenditure is involved. In the case of the Directors, the approval of the Chairman of the Governing Body may be taken. Each Institute should earmark about 10% of its budget for human resource development. **As a single source of irritation and frustration, the present procedure for the approval of foreign travel is a significant one.** There should be a well-defined and transparent policy for deputing Scientists abroad at the expense of the Institute.

HRD policies should include continuous re-tooling, re-training and re-deployment. **Retraining and not retrenchment should be the general policy.** As in the case of defense services, every scientist - whether a Director or Vice Chancellor or a bench scientist - should have opportunities for recharging their batteries and revitalizing their creativity.

ICAR as well as most Agricultural Universities lack well-defined and transparent policies of Human Resource Development. Unless this void is attended to immediately a work culture, which enables every staff member to give, his or her best will be absent. Directors and Heads of Institutions should adopt a collegiate style of functioning, where everyone feels that his or her voice is heard and respected. **All personnel and HRD policies should be engendered, thereby tailoring such policies to match the needs of women scientists who, because of the multiple burden on their time, need special supportive policies.** Women scientists, who wish to proceed on leave for a few years for child bearing and upbringing, may be given a year's paid sabbatical leave on their rejoining duty, in order to help them to catch up with recent scientific progress including advances in techniques. In the case of married couple, who are both members of ARS, they should be posted at the same location, to the extent possible. Gender mainstreaming of personnel policies is a must, to enable women scientists to give their best. This is particularly important in the context of the growing feminization of agriculture at the field level and the large number of women scholars in SAUs.

Our scientific establishments and universities will continue to under-perform if the human resource is undervalued and natural resources like buildings and equipment are over-valued.

2.7 In the context of HRD, the role of the National Academy for Agricultural Research Management (NAARM) at Hyderabad is a crucial one. NAARM was created for instilling a new work culture among farm scientists. It has fine infrastructure and an important mandate. We regret that its role in HRD has been declining over the years.

NAARM need to be revitalized and re-tooled to enable it to perform the following functions.

a) **Foundation Course for ARS probationers:** This should consist of the following 3 segments.

- ***First 3 months - Know your Agriculture:*** During this period the ARS probationers should be introduced to the richness and diversity of India's living industry by leading experts, including Members in charge of Agriculture and Science in the Union Planning Commission
- ***Next 6 months - Know your Clients:*** During this period, the probationers should be attached to an appropriate civil society organisation in order to familiarize them with ground level realities. For example, if some of the probationers who have degrees in agronomy, economics, credit, marketing, etc., are posted with NGOs in "distress hot spots" with reference to farmers' distress resulting occasionally in suicides, they will become very sensitive to the needs of resource poor farming families in this scientific work. Similarly, spending 6 months in tribal and neglected areas will be very helpful in raising awareness of the need for remedying regional imbalances in agricultural progress.
- ***Last 3 months - Know your Institute:*** During this period, the probationers will familiarize themselves with the Institution where they will begin their scientific career.

b) **Refresher Courses:** These should be organised periodically for Senior Scientists, with emphasis on the emerging social, ecological, economic, demographic and technological challenges in agriculture.

c) **Senior level courses in Capacity Building in Management:** Such short term courses based on case studies are essential to increase the capacity of Directors of Institutes and the Director General and Senior Staff of ICAR and Vice-Chancellors of SAUs to manage their Institutions more effectively. CGIAR has developed a package for management training of Director Generals and Deputy Director Generals of

International Agricultural Research Centres like ICRISAT. NAARM and CGIAR could cooperate in developing such courses adapted to the Indian context.

- d) Special training programmes should be organized to re-tool and re-equip administrative and financial staff.
- e) NAARM should organize special programmes for building the capacity of Home Science graduates in areas such as food processing and value addition, diversification of the food basket by popularizing local foods and the organization of non-cereal cafeterias like, replacing rice or wheat with nutritious millets, legumes and tubers.
- f) **Indian Agriculture in an era of economic globalization and climate change:** NAARM will have to develop its own capacity to organise meaningful courses for senior policy-level research leaders, in collaboration with appropriate national and international organisations.
- g) **International Training Programmes:** NAARM should become a world leader in capacity building in the areas of sustainable agriculture and food security. Courses specially tailored to the needs of SAARC, ASEAN and African countries should be organised periodically in collaboration with the Ministry of External Affairs of the Government of India and the Union Planning Commission.
- h) **National Virtual University for Science in Agriculture:** NAARM should host a National Virtual University for reaching the unreached in technological empowerment through distance education. Such a Virtual University should cater specially to the needs of Panchayati Raj Institutions. It could collaborate with IGNOU and MANAGE in this endeavour.

TOR 3

“To examine the present funding system of agricultural research and suggest suitable changes (e.g. Competitive Block Grant, Project-based Funding etc).”

Elements that contribute to efficiency in CSIR system

- ❖ Has framed and uses its own rules and procedures.
- ❖ Has decentralized the five-year assessment procedure and conducts the assessment at the level of institutions.
- ❖ Has own HRD wing for forward planning, from recruiting through retiring so as to groom and train the scientists.
- ❖ Authority for foreign deputations is with Directors of the Institutes.
- ❖ Lateral entry is planned and encouraged at all levels to infuse for infusion of fresh blood in the system.
- ❖ Operates quick higher system for positions in frontier science and technology.
- ❖ Recognizes performance at all levels to encourage and enthuse human resource.
- ❖ Has computerized and projectised accounting system.
- ❖ Encourages innovative ideas and team approach.
- ❖ Reaches out to the outside world in terms of agri-business and encourages scientists, technologists and engineers to undertake consultancy.
- ❖ Creates incentive by royalty sharing through decentralized system of interaction with private sector and industry.

Thanks to modern computer technology, there has been a revolution in many public and private sector institutions in financial management. CSIR introduced over 10 years ago an integrated management and project accounting system. Management Information System (MIS) enables the Project Leader to continuously monitor both research output and financial expenditure. Project Leaders can now ensure that funds allotted for different purposes are effectively used at the right time, thereby avoiding a rush of “March purchases”.

Computerized accounting systems will enable the linking of authority and accountability at all levels. We recommend that ICAR should streamline the financial management procedures with the help of CSIR and a consultancy organization like the Tata Consultancy Services (TCS). This will help every member of the Management Team including the Director General to continuously monitor the state of receipts and expenditure in the entire NARS.

As mentioned earlier, the proposed National Board for Strategic Research in Agriculture should award grants on the basis of competitive bidding. The amount of Rs. 200 crores recommended for intensifying creative research in priority areas can be kept by ICAR in a special account, as in the case of cess funds. Block grants can be made for re-equipping laboratories and re-tooling scientists. Block grants, competitive grants, project based funding and co-financing by CSIR, ICMR, DBT, DST, DOD, etc in inter-organisational projects should all be used in a synergistic manner. Above all, in field projects the timely availability of funds is essential, since otherwise a whole crop season will be lost.

Prudent financial management also requires that projects should not be initiated unless there is adequate funding support for the minimum essential period. One of the reasons for the low practical impact of our research laboratories is the undertaking of a wide range of projects, all with sub-critical funding and staffing. This is where priority setting is important. The Research Councils of Institutes should ensure that only those projects are taken up which have adequate support in terms of technical personnel and funds for the minimum period essential for delivering results. Indicators for measuring impact and

output must be built into the project design. This will call for imparting a sharp focus in the goals of a project.

The other aspect of financial management is the allocation of adequate funds for maintaining the infrastructure, updating the equipment and upkeep of the laboratories. Many of these items fall under non-plan expenditure and hence do not get the needed support. **In fact, there should be no artificial distinction between plan and non-plan expenditure in scientific institutions.** The totality of the available resources should be used economically and effectively. Probably, a block grant approach could help to achieve this objective.

TOR 4

“To propose steps for making agricultural research sensitive to emerging scenario of home and external trade (with particular reference to WTO agreement on agriculture).”

As already emphasized, the WTO Agreement in Agriculture and the ending of the multi-fibre arrangement in Cotton provide both opportunities and threats to Indian farm families and agro-based industries. It will be prudent to enlarge our national capability in minimizing the threats and in capitalizing on the opportunities. We recommend the following measures in the field of science and technology as related to agriculture.

- a) Increase the investment in agricultural research, education and extension, **since under the WTO provisions, such investment is non-trade distorting.** Our investment in agriculture R&D is a fraction of what OECD countries are investing.
- b) Improve productivity and quality and enhance cost competitiveness through higher factor productivity and improved post-harvest technology
- c) Be sensitive to non-tariff barriers arising from sanitary and phytosanitary considerations and **codex alimentarius** standards of food safety. Ensure that all our marine and terrestrial food commodities are free of mycotoxins, **salmonella** infection, and all forms of aflatoxins. For achieving this, SAUs and KVKs should launch a

quality literacy movement. At the same time our infrastructure for strengthening sanitary and phytosanitary measures and for preventing the introduction of invasive alien species must be improved, on the lines recommended by the National Commission on Farmers in its first report titled “Serving Farmers and Saving Farming” (December 2004). This is a high priority task, if we are to avoid increasing rejection of our farm commodities due to pesticide residues and infection with organisms associated with the production of mycotoxins in food.

- d) Develop well-defined quality standards for Indian Organic products like organic tea, organic rice and millets and organic fruits, vegetables and species and herbal products including medicines.
- e) Strengthen research on speciality foods and crop varieties like medicinal rices (eg., **Navara** of Kerala and **Kalajeera** of Orissa) which can capture niche markets
- f) Improve quality control, standardisation and validation procedures for medicinal plants and herbal medicine, in order to ensure the purity of the products and the scientific integrity of the claims and attributes.
- g) Prepare Indian agricultural scientists and farmers for the IPR and patents regimes by imparting patent and trade literacy both to scientists and to farmers. Market access in affluent countries can be increased only through cost and quality competitiveness and reliability of supply.
- h) Suggest to Government from time to time non-trade distorting forms of “life saving support” to farm families in order to assist farm families with small holdings to become globally competitive with reference to the cost and quality of their products. Price and quality consciousness is an absolute must, if we are to retain existing markets and capture new ones.

Home Trade: Being a country of 1.1 billion persons, India has a large home market. We should proceed with developing a **dynamic Indian Common Market** on the lines of the European Common Market. The introduction of VAT with effect from 1st April 2005 is an important step in this direction. Inter-state barriers should be removed and e-commerce facilities installed in centres of surplus farm production, particularly of perishable commodities like fruits, vegetable, flowers and animal and fish products.

An urgent need is quality consciousness (i.e., freedom from pesticide and toxic residues, aflatoxins, salmonella etc.). **There should be no double standards in quality-one for the foreign consumer and one for the Indian consumer.** In fact, a majority of Indian consumers are poor, including landless labour and small and marginal farmer families. **Nutrition and health security at home must be the bottom line of all quality standards.** We will then have no difficulty in meeting the quality standards of importing countries.

WTO concerns like export subsidy, domestic support and market access should continue to be handled by the Ministries of Commerce and Finance. The proposed National Institute for WTO concerns in Agriculture could bring, from time to time, issues affecting farm families to the attention of these Ministries. At the same time, the National Institute for WTO concerns in Agriculture should bring to the attention of ICAR Research Institutes and SAUs the areas of research, which need added and accelerated attention. For example, most of the present varieties of vegetables and fruits available in the country have not been bred for processing qualities. **If horticultural production is increased based on many of the varieties currently under cultivation, losses due to spoilage will be greater, since they are not suitable for processing.** There is also need for research on socially relevant processing and marketing techniques. **The major market for processed foods is the home market.** We should increase home consumption and for this low cost packaging and delivery systems are needed. For example, bulk vending of fruit juices in the same way as milk (Mother Dairy), will help to improve the consumption of fruit juices.

On a suggestion made by the Kerala Commission on WTO Concerns in Agriculture chaired by Prof M S Swaminathan, the Kerala Government has established at the Kerala Agricultural University, **a Virtual University for Agricultural Trade.** The proposed National Virtual University for Science in Agriculture at NAARM could establish **a Digital Gateway for National and International Trade in Farm Commodities.** The information provided should be both dynamic and generic. Such information can also be

spread through the Jamsetji Tata National Virtual Academy for Rural Prosperity. Reaching the right information at the right time and place is a priority task. **The National Virtual University for Science in Agriculture to be located at NAARM and the State Virtual Universities in Agriculture could form a Consortium for the coordinated use of ICT in accelerating agricultural projects.** Many of the hubs of the National Virtual University could be placed in KVKs and SAUs. Home Science colleges should be included in the Virtual Network. Commercial intelligence, role of genetically modified organisms as well as social issues like child labour should be accorded priority.

TOR 5

“To examine the present system of scientist recruitment and human resource development policy and suggest measures to attract and retain good scientists taking into account the recommendations made by recent review committees. Because of distortions in personnel and incentive policies, the system has become highly rigid and opaque, and both central and state systems have restored to highly straight-jacketed recruitment, and omnibus time-scale approaches for advancement. Suggest ways of removing such distortions.”

With the approval of the Cabinet, ICAR established in 1974 an autonomous Agricultural Scientists Recruitment Board (ASRB), with the mandate that it should function like UPSC. ASRB was to perform the following functions.

- a) to recruit candidates to the Agricultural Research Service (ARS) through a competitive examination (in the first two years, such tests were also held in London, Washington and Moscow)
- b) To recruit candidates for higher level positions through direct advertisement and lateral entry
- c) To assess eligible candidates for promotion under the 5-year assessment rule.
- d) To undertake other responsibilities which may be entrusted to it from time to time by the President, ICAR.

The Chairman of ASRB, who has the rank of a Member, UPSC, reports directly to the President, ICAR.

The ASRB has on the whole fulfilled its mandate satisfactorily during the last 30 years. In particular, tribute should be paid to Dr M L Sahare, the first Chairman of ASRB (he later became Chairman of UPSC) for setting very high standards of professionalism, integrity and autonomy in the selection process.

From 1980, the undesirable practice of a certain number of selection committee members being appointed by the President, ICAR, was introduced. This undermined the confidence of candidates in the objectivity of the selection process. Similarly, the 5 year assessment procedures were not made transparent, leading to scientists expressing dissatisfaction with the assessment procedures. Since the 5 year assessment is a very important method of rewarding outstanding work, it is unfortunate that this powerful tool for providing recognition and reward to dedicated and distinguished scientists has become the centre of disaffection. Also, by making ill-considered changes in the ARS structure, ICAR has created an atmosphere of frustration among young researchers.

We suggest the following steps:

- a) Respect the Cabinet decision of 1974 that ASRB should function like UPSC and for this purpose request the Chairman of UPSC to kindly review the procedures of ASRB and suggest changes which can help to enhance ASRB's creditibility and operational autonomy
- b) Remove the distortions, which have taken place in the ARS system by restoring its original objectives and structure. By mixing up scales of pay and organisational structure, ICAR has damaged a carefully developed "scientist-centred" system of professional recruitment and advancement. We suggest that the Director of the Lal Bahadur Shastri Academy of Administration, Mussourie, may be requested to review the distortions which have taken place in the ARS system and suggest ways of restoring to it its original vision and mission.

- c) Decentralise the 5-year assessment procedure and organise the evaluation of all eligible scientists in their own institutions. The Evaluation Committee should visit the Institution for 1 to 2 days, depending upon the number of candidates, and evaluate them thoroughly in relation to their job assignments and responsibilities. Thus, an extension scientist will be evaluated differently from a scientist engaged in basic research. Publications in high impact scientific journals and number of hits in a citation Index will not be relevant criteria to evaluate the work of a scientist working in fields such as applied plant or animal breeding or field extension. A tamper-proof system of evaluation should be developed to measure outputs and accomplishments. Special evaluation procedures should be developed for those who are primarily engaged in teaching and capacity building.
- d) In order to encourage young scientists who have shown great creativity and a spirit of Innovation, ICAR may create a cadre of **Distinguished Fellows** on the pattern of the **Genius Awards** given in USA by MacArthur Foundation. The proposed National Board for Strategic Research in Agriculture could be requested to evolve guidelines for such awards, so that all scientific organisations like ICAR, CSIR, ICMR, etc., can follow a similar procedure in recognizing creative scientists and innovators.
- e) Introduce a system similar to that of the **Quick Hire System** of CSIR to attract eminent scientists from India and abroad to fill critical gaps in frontier science.
- f) Revitalize the scheme for the appointment of **National Professors and National Fellows** on the lines suggested by the National Commission on Agriculture and increase their numbers to 50 and 100 respectively. Priority may be given to the recruitment of National Professors and Fellows who are willing to work in neglected but important areas of science and help in remedying regional imbalances in S&T capacity. The age of retirement for National Professors may be raised to 70.
- g) The Prime Minister suggested in his address at the Indian Science Congress at Ahmedabad the development of a **Creativity Index**, to measure the spirit of invention and innovation. This is no doubt a complex task and needs to be tailored to each area of activity, such as basic and applied research, teaching and extension education. We suggest that the proposed National Board for Strategic Research in Agriculture may undertake the task of identifying quantifiable indicators for

developing a credible **Creativity Index**. It would be useful to seek in this task the help of the Lemelson Foundation in USA whose main mandate is to recognize and reward the innovative and creative spirit in scientists. The procedures adopted by the Institute by Management, Ahmedabad (Prof Anil Gupta) in recognizing innovations in indigenous knowledge may also have relevance in the development of the creativity Index for Scientific Institutions.

The recruitment procedures and personnel policies of SAUs also need urgent review and reform. The procedures of SAUs are usually conditioned by the provisions in the State Acts, which led to their creation. Nevertheless, **we suggest reforms, which will make young faculty members feel that professional contributions and not political connections that are important for career advancement**. Since the conditions prevailing in different SAUs vary widely, we suggest that the Agricultural Universities Association may initiate a well designed review of current recruitment and professional advancement procedures in consultation with the Chairmen of UPSC and ASRB and propose to their respective governing bodies appropriate reforms.

The Research Management System should recognize and introduce decentralization, prioritization and accountability with responsibility and structural changes with a mandate of performance in making the entire system, of not only the scientists and the middle level and top management, but also the administration and finance to be partners in striving for scientific excellence and social relevance. Most importantly, performers have to be encouraged and merit recognized which the present system is not doing to a large extent. The bench mark has to be scientific and technical competence for moving to higher positions. This demands a long term HR planning and professionalising skill management. This is the most important task today for ICAR and for its 46 institutes as well as for the 38 SAUs. At the same time, one should not get the idea that everything has to be revamped. Infact, cutting across the various discussions most of the people were of the view that nearly 70% or so of the existing systems have evolved over a period of time with distilled knowledge. Perhaps it is that 25–30% which needs radical improvement so that ICAR can be put into a higher orbit of performance. If these are looked at with a strict monitoring and evaluation process in place, perhaps a large amount of

professionalization would emerge, which is capable of extending the needed support for the scientists to deliver results of importance to our agriculture.

Scientists, rather than buildings, will shape the future of research and educational institutions. We therefore urge serious and immediate consideration of our recommendations. As stressed earlier, time is not in favour of our country, in view of the widespread occurrence of poverty, hunger, unemployment and environmental degradation. An agricultural and rural transformation led national economic development is the most effective and speedy method of erasing these chronic blots in our social and developmental history.

The technological empowerment of the poor is essential to bridge the economic divide. In this task our NARS has both a great opportunity and obligation. Personnel and human resource development policies hold the key to enabling the NARS to fulfill this obligation.

TOR 6

“To suggest alternative modalities for integrating research and extension at state level.”

Agricultural extension involves extending concurrently location specific and time specific information on farm practices, which can help to bridge the gap between potential and actual yields, and the inputs needed for applying the advice of extension personnel. **With the gradual impoverishment families with small and marginal holdings, the reasons for the non-adoption of scientific agricultural practices and new technologies are in many cases related to lack of economic access to inputs and not lack of access to knowledge.** Therefore, extension reform should deal not only with knowledge delivery, but also with linkages with credit and input supply systems. **Most research and extension agencies unfortunately do not recognize that poverty and not ignorance is the reason for the non-adoption of new technologies.** A holistic approach to access both to knowledge and inputs is the need of the hour.

During the past 20 years, many extension systems like the Training and Visit system (T&V) of the World Bank have been tried and later pronounced as failure. Recently, another World Bank loan supported system, termed “Agricultural Technology Management Association” (ATMA) is being introduced. ATMA takes into account the deficiencies of the T&V system and adopts a farming systems approach to extension. If implemented in a manner that **regards farm families as partners and innovators and not just beneficiaries**, ATMA will represent an improvement over the earlier approaches to extension. The mindset of extension personnel should change from patronage to genuine partnership (Lab to Land and Land to Lab).

Schemes have also been introduced in recent years to provide opportunities to farm graduates to take to a career of self-employment in agriculture by setting up Agri-clinics and Agri-business centres. **If there are parallel programmes in the public sector, the farm graduates will not be able to make a living by running Agri-clinics or Agri-business centres.** Hence a holistic view is needed. Public investment in agricultural extension and capacity building should be increased since the network of Agri clinics as Agri-business centers is likely to be confined to irrigated as well as endowed areas.

Ecologically-sound agriculture is knowledge intensive. **An area rather than a single farm approach** is needed to spread eco-technologies like Integrated Pest Management, Integrated Nutrient supply and Integrated Natural Resources (Soil, Water) Management. **Panchayati Raj Institutions should be involved in the social engineering aspects of group endeavour in eco-agriculture, since under Article 243(G) of the 11th schedule of the Constitution 73rd Amendment Act (1992), agriculture including agriculture extension has been listed as the very first responsibility of Panchayats.**

Presently, ICAR and SAUs have the following forms of linkages with farming communities.

- National Demonstrations

- Krishi Vigyan Kendras
- Lab to Land programmes
- Village adoption and other forms of whole village and watershed programmes

Education for agriculture should find a prominent place in school curriculum. Primary education with a rural orientation is urgently needed.

We have recommended earlier the development of KVKs into **Krishi and Udyog Vigyan Kendras** in order to give concurrent attention to on-farm and off-farm livelihoods. The National Commission on Farmers (NCF) has recommended the establishment of 50,000 Farm Schools in the fields of farmer-achievers in order to spread their impact through farmer to farmer learning. The fields of Krishi Pandits, Udyan Pandits, State Government Awardees, Karshaka Shrees (of Malayala Manorama), the outstanding farmer award winners of ASPEE and other non-governmental organisations can all serve as inspiring training centres. The economic credibility and viability of the technologies adopted by outstanding farmers will be a major advantage in the lateral transfer of technical know-how. Thus, Farm Schools can serve as the grassroot learning centres and they can lead to a learning revolution in farming.

Priority in the establishment of Farm Schools may be given to areas such as horticulture, green house cultivation, efficient systems of water conservation and use, organic farming, cultivation of GM Crops, cultivation of tissue culture propagated banana, spices and other crops, medicinal plants, plantation crops, dairy and goat farming, crop-livestock – fish integrated production system, aquaculture etc.

The Union Ministry of Agriculture and Departments of Agriculture, Horticulture, Animal Husbandry and Fisheries in State Governments are increasingly getting de-professionalised. The generalists who are occupying technical positions are capable and intelligent, but that alone is not enough to spearhead science-based farming. **Life long experience and commitment are essential to become transformational agents. Denying ourselves the leadership of technical persons in technical positions is a self-inflicted injury.** This is costing the country dearly. This is an important reason why China and many other developing nations have been able to overtake us in the pace of

agriculture progress. **Unless the political leadership wakes up to this sad situation and decides to entrust technical jobs to technical persons, we will continue to debate why our average yields are low and why our huge untapped production reservoir, even with technologies currently on the shelf, remains untapped.** Committees cannot help to change the situation. Only individual technical leaders, who have a life long commitment to their profession, can serve as change agents. **We therefore recommend that all technical positions in the field of agriculture in Central and State Governments be filled up with competent technical persons with a proven track record in agricultural transformation.** As a single step, this will make the maximum contribution to the integration of research and extension at the Central and State levels in a mutually reinforcing manner.

The SAUs/ ICAR Institute–KVK-Farm School system of technological and skill upgradation of farming needs continuous feed back and advice from farm men and women. In order to provide a structured opportunity for sustained scientist–farmer dialogue, it is suggested that a **National Council of Innovative Farmers** may be set up for providing on a continuing basis guidance on the technology and public policy requirements for achieving productivity, quality and value-addition revolutions in the 115 million operational holdings in our country. This Council may be serviced by ICAR, with DDG (Extension) serving as the Convenor. Members of the Council of Innovative Farmers may be appointed by the President of ICAR in consultation with the National Commission on Farmers. There is need for monitoring recent developments in agriculture in OECD countries. **The existing positions of Minister (Agriculture) in our Embassies in Rome, Washington and Tokyo are now occupied by administrators. It will be in the national interest to replace them with technically qualified Farm Science Advisors. We can then get a better return for the tax payers’ money spent on such positions.**

TOR 7

“To suggest methods of developing strategic partnership among ICAR, CSIR, DBT, ICMR, DST, DRDO, MNES and Private Sector R&D institutions, so that a dynamic National Agricultural Research system involving both public and private sector research emerges. Also suggest methods of involving Panchayati Raj Institutions in technology incubation and verification, participatory research and knowledge management.”

Seemingly impossible tasks can be achieved by harnessing the power of partnership. Our National Scientific Research System (NSRS) comprising ICAR, CSIR, ICMR, DBT, DST, DRDO, MNES, Department of Ocean Development and private sector R&D has formidable strength in the area of **science for agriculture**. While the NARS is concerned with agricultural sciences, NSRS contributes in the area of science for agriculture. There are many areas, such as animal diseases, which have an adverse impact on human health. The avian flu and mad cow disease are recent examples. Since agriculture is the largest living industry of the country, a beginning can be made to tap the strengths of NSRS for getting the best in frontier science and traditional wisdom to our farm, fisher and rural families by organising a National Board for Strategic Research in Agriculture, on the lines recommended by us. Member (Science) in Planning Commission, who is also in charge of agricultural research and the Principal Scientific Advisor to the Prime Minister will be able to bring to the attention of the inter-organisational Board the priorities of our nation in the areas of food and nutrition security, elimination of chronic under-nutrition and micro-nutrient deficiencies, employment and income generation, and natural resources conservation and enhancement. This will help in priority setting and judicious resource allocation. We urge the setting up of such a National Board as soon as possible.

While apex level cooperation and coordination at the cutting edge of science is important, we also need inter-organisational partnership at the grassroot level. A Consultation

convened by the Task Group has suggested the formation of a **National S&T Alliance for Rural Livelihood Security**. To begin with the National Alliance will provide scientific backstopping to the National Rural Employment Guarantee and Food for Work Programmes.

A. S&T Consortium involving public and private sector R&D institutions and Agricultural, Rural, and Womens' Universities as well IITs may be formed for each of the 150 districts chosen for the initial phase of the National Food for Work Programme. The District Level S&T Consortium will aim to bring about confluence and synergy among the efforts of private, public and academic sector institutions in human resource development and capacity building programmes. Sustainable SHGs based on poor-friendly technologies should be promoted. Priority areas of concern will be health, education, water, weather, nutrition and sustainable livelihoods/ employment opportunities.

The State Level S&T Consortium should in cooperation with the District Rural Development organisations (DRDOs) initiate the technological upgrading of work. The three parameters used by the Planning Commission for identifying priority districts for the Food for Work Programme are:

- Agricultural wages
- Output per agricultural worker
- SC/ST population of the district

The S&T Consortium should try to bring about a paradigm shift from unskilled to skilled work, thereby adding economic value to time and labour. Output per agricultural worker can be increased with better nutrition, health care and education. A special capacity building programme will have to be launched for the SC/ST population.

In all this work, Panchayati Raj Institutions will have to be actively involved. The Jamsetji Tata National Virtual Academy for Rural Prosperity plans to train atleast one

woman and one male member of Panchayats in managing computer-aided and internet connected Rural Knowledge Centres. Bridging the digital divide will help to bridge the rural-urban technological, economic and gender-divides.

A dynamic and socially sensitive NARS will emerge only when there is partnership with Panchayati Raj Institutions at the grassroot level, and with the National Science System and advanced research institutions in India and abroad at the apex level.

The State level S&T consortium can be hosted by an appropriate SAUs. The National level S&T Alliance can be hosted by the Planning Commission through the National Academy of Agricultural Sciences. We recommend the provision of Rs. 50 Crores in the budget for 2005-06 for organising this massive R&D support to the anti-poverty programmes. Employment Guarantee at minimum wages will help the individual to survive but will not help her/him to rise above the poverty level. Poverty eradication can happen only if there is asset building (including market-driven skills) and mobilisation of the power of group endeavour both at the production and post-production ends of an enterprise. The National S&T alliance for Rural Livelihood Security should have the eradication of poverty and deprivation as its primary goal. Technological, skill and knowledge empowerment and human resource development need to be coupled with programmes like Employment Guarantee and Food for Work, so that the immediate goal of hunger elimination and the medium term goal of poverty eradication can both be achieved.

Science recognizes no political frontiers and we should use the best in science, irrespective of the country of its origin. The proposed National Council for Global Leadership in Agricultural Sciences and Education should initiate steps for strengthening symbiotic linkages with CGIAR institutes and Advanced Research Institutes world wide in areas of national relevance.

VII. CONCLUSION

Our country is endowed with the essential institutional and human resource requirements for achieving rapid progress in enhancing small farm productivity and thereby the alleviation of poverty and hunger. If our recommendations are implemented speedily and honestly, we can convert ICAR, SAUs and other R&D organisations into 21st century institutions, which can effectively assist farming and rural communities to face successfully current and emerging challenges in enhancing the economic viability and ecological sustainability of agriculture. We can then ensure that our greatest living industry is in a state of good health.

The world of agriculture is changing fast, technologically, commercially, economically and ecologically. Resisting change in institutional and management structures will be a formula for increasing farmers' distress, leading to more suicides. No further time should be lost in restructuring and strengthening our NARS, so that it becomes the flagship of the movement for agrarian prosperity and freedom from hunger.

TOR 1(A)

Strengthening strategic and anticipatory research in the system (NARS)

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Technology empowers and enables development. Investments in science and technology are vital for sustained progress and well being of any nation. In India, agriculture provides sustenance and livelihood to a vast majority of population. Hence, development and deployment of new, innovative agri-technologies is necessary to ensure all round and balanced development.

The strategic research programmes emerge from solid scientific facts and when planned meticulously and executed with diligence help in finding solutions to specific problems. Strategic projects are technically feasible and have a high probability of success in delivering solutions. The genome sequencing projects are examples of strategic research. In fact a majority of research projects are strategic in nature and are usually aimed at addressing pressing contemporary problems.

In today's fast changing technological scenario, innovations in one country can have serious repercussions elsewhere. The consequences (favourable or unfavourable) could be different for different nations or sections of society. Therefore, it is imperative that a constant watch is kept on technology development in various fields related to agriculture and appropriate research initiatives are taken to keep abreast in a changing world. Anticipatory research is aimed at finding answers, in advance, to situations or problems that may arise in the future. Anticipatory research can also be of exploratory nature to advance frontiers of science that will eventually lead to development of newer technologies. Anticipatory research also provides cushion against future adverse scenarios. Formulation of anticipatory research needs foresight and bold initiatives.

It is an undisputed fact that investment in agricultural research has paid rich dividends in the past. However, considering global developments in agri-technologies and trade, there is an urgent need to change the way we work and start responding quickly to new and emerging situations. In particular, our research programme planning and implementation needs a thorough overhaul. The following suggestions are made to energize the system.

- **Assigning due recognition to basic and strategic research**
Basic and strategic research receives not only low priority in the prevailing dispensation but also fails to attract the deserved respect and recognition that is due to an important aspect of capability development for delivering solutions to complex problems. An impression is prevalent that any activity that does not

cater to immediate developmental needs is reveling in luxury. There is inadequate appreciation that basic research is the fountainhead that nourishes applied research and without its healthy development, adaptive solutions will elude us in the long run.

- **Setting up of a National Board for Basic Research**

Presently there are several government agencies funding research in overlapping areas of plant and animal sciences. These agencies work independently and have no close interaction with one another. As a result there is duplicity of efforts and sometimes unnecessary and wasteful expenditure on non-priority area. Hence, there is need for a National Level umbrella mechanism with necessary administrative and financial provisions to serve as an apex body for providing overall policy framework and priorities for promoting and supporting basic research, building strengths in chosen emerging areas of S&T and to coordinate various scientific departments/agencies for evolving a focused approach and avoiding overlapping areas of research and funding. A National Board for Basic Research may be set up on the lines of National Science Foundation of the USA and a budgetary provision of say Rs. 200 crores made in the forthcoming Annual Plan for 2005-2006.

- **Identification and nurturing of persons of caliber for leadership role**

Leader makes all the difference. A sincere and dedicated person at the top can inspire workers of all ranks and cadres and bring about major change in attitude of an organization. The system attracted eminent leaders in the past who could revolutionize India's agricultural fortunes. Of late, a feeling is gaining widespread currency that the system has little room and appreciation for talent. Consequently, persons of high scientific caliber are not coming forward to take leadership role. To get out of the present state of apathy, it is necessary to devise suitable modifications in the recruitment and promotion policy. Leaders at all levels must be identified from among persons who are highly committed, have high standing in science and have made outstanding contributions in their respective fields. They should also possess administrative acumen. Those carrying old baggage and those unable to rise above narrow specialization need to be urgently replaced. Appropriate training for leadership role will also be appropriate.

- **Project identification and priority setting**

A professional approach to project identification and prioritization is needed. At present there is no clear documentation that provides information on strategic and anticipatory projects being pursued in the system. Some exercise in this direction was initiated that resulted in the formulation of '2020 Vision Documents' but these (wish lists) are all-inclusive and vague. These documents are unacceptably

weak on the planning and resource side of the exercise. The inadequacy of anticipatory approach is typified by our system's experience with transgenics.

At individual Institute level also projects are equally fuzzy. Since identification of priority areas to be pursued and projects to be undertaken cannot be a one time and frozen exercise, specialist panels should be constituted to constantly monitor scientific developments relevant to Indian agriculture to suggest research initiatives. Proposals should also be solicited from individuals. All proposals should be subjected to scientific debate before they are short-listed for operation. Science Academies and Scientific Societies can play an important role in this context but for them to play this role effectively they also need radical transformation. Barring 'Current Science', no scientific journals in the country has provision for discussion on burning scientific issues.

- **Dismantle top heavy administration**

Today, there are far too many science administrators (e.g., ADGs, DDGs or their equivalents). If scientific programmes are well defined and their execution is entrusted to competent people, there is really no need for them. The CSIR system provides an alternative model that works. It should be recognized that administrative position and scientific excellence/expertise are not always synonymous. In the past, for example, even science advisors to the Prime Minister were picked up from working scientists who did not hold high official position. Today, it is made out as if all ideas can emanate only from the top whereas every question is passed downward for answer.

- **Project planning and implementation**

Attempts to plan research projects in a realistic manner have not had success largely because the action plans (technical programme) and resource (manpower and monetary) requirements were not matched. The system only looked at the technical programme and did not ensure matching provisions for supporting the programme. Where this requirement was met, the results have been rewarding e.g., disease resistance breeding in wheat, hybrid programme. Accountability can be expected only from a distortions free system.

Further, identification of persons to carry out various tasks also should be based on their competence. There is a tendency in the system to load numerous tasks to the same person or a group. This not only overburdens a few but also results in dilution of the research effort. In the present context, the system should consider such options as out sourcing, networking, participatory (private-public) etc. approaches to realize research goals. The potential of research students (Ph.D.) enrolled in SAUs and deemed universities (IARI, NDRI, IVRI) to carry out anticipatory research should be given serious consideration.

- **Scientific freedom**

Personal contacts and interactions are critical for scientific advance in modern world. In the system, bureaucratic hurdles prevent such interactions. Scientists find it very difficult to participate in international meetings and there is no easy way to invite foreign scientists to our labs. Similarly, in the day-to-day operation of projects, old-fashioned rules and regulations which are highly restrictive and non conducive impede rapid progress. Scientists should be released from these shackles. Instead of looking every financial transaction in pursuit of science with suspicion, administration should have faith in the integrity of scientists.

TOR II

Methods of anticipatory research keeping in view the challenges of variation in monsoon behaviour/climate and to foster crop-livestock-fish integrated farming systems and to enhance the productivity and profitability of rain-fed, semi-arid, desert, coastal and hill areas.

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Integrated farming offers unique opportunities for maintaining and extending biodiversity. The emphasis in such systems is on optimizing resource utilization rather than maximization of individual elements in the system. Local breeds of livestock and fish species, and local varieties of crops, are often better adapted to utilize such resources.

The main concept of integrated farming is that the farm consists of subsystems which all work together in a synergistic manner, one subsystem creating inputs to the others and eventually ending up in a more closed cycle with least external input. There is, therefore, a general improvement in the sustainability of the system, creating more wealth on a more equitable basis and on a more environmentally friendly basis. While a single definition of integrated farming may not be forthcoming, it may be broadly defined as follows:

- It involves the utilization of locally available resources. These resources may include feeds, wastes and other outputs from the subsystems within.
- There is a high degree of nutrient recycling and hence reducing energy requirement and cost.
- The total farming system is enhanced through reduction of waste; creating interdependence and overall economic efficiency.
- The system is made more sustainable ecologically, economically and socially.

The role played by livestock and fisheries in farming systems for poor farmers is multi-faceted and synergistic and must be seen not as a primary form of production, but rather in terms of their overall contribution to the total farming system and to the immediate needs of the family. These concepts have not been well-understood, as a result policy at all levels – in Ministry of Agriculture, at Universities and National Research Institutions – is still mainly on sectoral lines of scientific discipline rather than being focused on a holistic and multi-disciplinary approach. The solution to this problem is long-term and requires

changes in attitudes by decision makers and in curricula at institutions and the SAU. Agriculture must increasingly be taught from a biological standpoint, as regards theory; and from a systems approach as regards practical application.

The advantage of integrated farming systems is the opportunity of using residues, by products and wastes generated in the different activities which are the basis of the integrated approach. Selection of component sub-systems should be predicated on their suitability to maximize solar energy capture (example: multi-strata and associated crops), generate products with multiple uses and which are friendly to the environment. Crops, which produce products that can be consumed by the family or sold, and residues that can be fed to livestock and fisheries should have priority.

Bio-digesters play a pivotal role in integrated farming systems by facilitating control of pollution and at the same time adding value to livestock excreta through production of biogas and improved nutrient status of the effluent as fertilizers for fish ponds and crop land. There is need for on-farm research in different socio-ecological situations to evaluate management factors that influence digester performance and reliability.

Integrated farming can have a great impact on human development both in material and social terms. Because of the different systems involved there is substantial generation of knowledge and innovations. It can make farmers more self sufficient as well as self-reliant. Poor farmers or landless farmers can be assisted to create income and hence participate in the development process. External inputs to the system are very much reduced. Example : integration fo fish farming with livestock (pigs, poultry, ducks, cattle) reduces the requirements of fish feed considerably, which otherwise accounts for as much as 60 percents of the input costs.

Integrated farming has a great potential in reaching all levels of income. While the needs of the poor can be adequately addressed there is also the possibility of meeting the aspirations of the farmers with higher incomes. In areas where farmers are faced with problems of land fragmentation, integrated farming will go a long way to address this problem by giving more opportunities for productive activities. By appreciating the fact that women contribute far more to the household security, integrated farming can improve the welfare of women. It provides for better utilization and distribution of labour. Costs are generally reduced and productivity of labour is increased. The following suggestions were received from the consultation.

- 2.1 Integrated farming must facilitate the application of on farm studies to improve the productivity and sustainability of the land.
- 2.2 Research and extension efforts must address the needs of the poor farmer in a more holistic manner to promote integrated farming.
- 2.3 More research should take its origin in problems perceived by farmers. The farmers should be consulted on possible known, new and potential solutions at all stages. On-farm research is important, but farmers can also contribute to a realistic planning and evaluation of “on-station” research.

- 2.4 Training curricula for agriculture and development agencies should put more emphasis on the integrated farming perspective and farmer participation in research.
- 2.5 Attitudes of professionals (researchers, academicians and extension agents) should be re-oriented towards more collaborative working with farmers for mutual learning.
- 2.6 In order to retrain professionals to have more on-farm work with farmers, funding agencies should facilitate researchers and professionals to exchange information using the electronic mail system, which is a valuable tool for communication.
- 2.7 All development agencies should facilitate on-farm research work by providing financial and logistical support.

TOR III

“ Professionalising skill management and ways for weaning management from civil service bureaucracy.”

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1) Administrative

As at present, there has been a feeling among the R & D Section of staff that the existing bureaucracy, which is mostly drawn from the Civil Services, is, instead of providing the support services, to a considerable extent found to be a hindrance for the R & D activity.

Of late, the need for providing a better bureaucratic set up to provide administrative support to the R & D activities of the Council was felt, so that the R & D activities will progress without any hindrance from the bureaucracy set up.

The apprehension from the minds of R & D staff that they are not getting the support that is required from the administrative set up is required to be removed and a set up has to be established which will rather provide the services than finding fault with the research administration, and provide assistance in Research in planning, management and evaluation of the Research projects, to enable the Council to meet its mandate to the Government.

While the existing system requires modification in tune with the needs and requirements of the research planning, it cannot be said that the entire administration set up has to be done away with. For any organization, the administrative set up is required to be there for sustenance, maintenance and for providing administrative support services which are very much essential, like guard stones in a highway.

In the existing set up, with the passage of time, ICAR is not able to frame its own Rules & Regulations, Promotion Policies, Cadre & Recruitment Rules for different cadres, etc. It is, therefore, necessary to frame the Rules & Regulations entirely of its own, so that the administrative set up is provided with a tool to provide better administrative services to the research planning, management and evaluation. As of now, the Administration is depending mostly on Govt. of India Rules & Regulations, which are not suitable for R & D organizations of the type.

In this connection, ICAR can take a clue from CSIR (and similar other Autonomous Bodies) where CSIR has established/framed its own Rules & Regulations with regard to Recruitment, Promotion Policies, Materials Management, Stores Acquisition and Disposal, Financial matters etc. It has been proved in Autonomous Bodies including CSIR that framing independent Rules & Regulations to meet the need and requirements and updating these from time to time in tune with change of times and circumstances will definitely enable the Administrative Services to provide better administrative support services in the research planning, development and management.

In addition to the above, it is also very much required to develop in-built cadre in each cadre separately with provision for lateral level entry for inducting young blood rather than taking on deputation/hiring from Government from time to time so that the staff borne on the cadre are trained to meet the needs and requirements of the Council, as many a times, it is proved that the staff who come on deputation from Government failed to raise up to the expectation of the Council. They are rather insensitive to the needs and requirements of the Council, having been in pure Government services.

Therefore, there is an urgent and imminent need for restructuring the cadre of General Administration, Finance & Accounts and Materials Management separately and independently which is accountable/responsible for the Directors/Managers of R & D.

2) Finance

FINANCIAL MANAGEMENT IN THE CURRENT SET UP WITH A CLEAR MANDATE OF ACCOUNTABILITY AND RESPONSIBILITY

We are now in Information age. Financial Management relies on information processed by computers. Dusty old registers have yielded place to sleek, desktop & laptop computers, which at the click of a button put out enormous data in order fashion.

First of all, a well thought new set of procedures, rules & regulations, which are congenial both to Administrators and Scientists and Technocrats, are to be devised. Keeping in view of the ICAR requirements, computerization of accounts and project accounting needs to be designed and developed. The critical inputs like project planning in an organization and project accounting, based on realistic and authentic project data can be generated through introduction of computerization and project accounting.

The uniformity and transparency in accounting procedures are to be evolved to eliminate the probabilities of arbitrary and adhoc decisions on accounting procedures and practices. This will be extremely helpful to the staff working in planning, Administration, Purchase/Stores and other divisions of the organization. Computerization & projectisation of accounts can give different types of requisite data at any given point of time, so that the management/concerned co-coordinators can take appropriate financial decisions.

It is imperative, bureaucracy cannot be eliminated altogether, as it is part and parcel of the system, and however, less bureaucracy can increase efficiency and greater focus on core mission.

In order to achieve this phenomenon of easy transactions in finance without much of drudgery, CSIR introduced the impact in the accounts system in the year 1993 and has made a big dent in terms of impact (The Integrated Management and Project Accounting System). It has made a lot of difference in this phenomenon with a mandate of Rationalization of account heads, Classification codes, Laboratory Codes, Types of Voucher and Voucher codes, Reconciliation, Apportionment of expenditure, accounting of Provident Fund, Creation of Laboratory Reserve, Handling of Consultancy sponsored and Collaborative Research, Projectization and project accounting, Loans from International Agencies and handling of the same, Welfare funds, Foreign Exchange transactions, Cancellation of entries, Transfer of Outstanding advance balances, Output reports, to name a few. This has completely revolutionized digitalization of the accounting system in CSIR and perhaps ICAR must look at the possibility of implementing this in its own system as it has worked in a mega organization like CSIR for over 10 years.

3) Purchase

PURCHASE PROCEDURE, TO BE SCIENTIST FRIENDLY BUT STILL HAVE THE ACCOUNTABILITY AND AUDITABILITY BUILT INTO IT:

In order to achieve this, CSIR in its wisdom has set up a high level Committee of senior officers in the CSIR family and the draft was circulated to all the Laboratories and Institutions to elicit their comments and all the comments were taken into consideration.

The document has been designed to safeguard the interest of the decision makers in mind. If followed correctly, it would certainly mean a transparent manner of spending the Tax Payer's money with a high degree of accountability and at the same time, the freedom of the Scientists not being taken away to deliver the end results. A copy of the Purchase Procedure 2002 of CSIR is enclosed in Annexure – 1.

4) SEVERAL SUGGESTIONS WERE MADE BY A NUMBER OF PEOPLE IN THE ABOVE AREAS. THEY ARE:

- Technicality of Research Administration, Planning, Management and Evaluation & requirement of technical expertise for that Research Management Information System
- There is a need for production of triploids of grass carp to control the overgrowth of aquatic vegetation in ponds, tanks and reservoirs as it hampers productivity. Despite the technique being available, it has not been possible to produce these on a large scale as the skill required is

unavailable. This needs to be professionalized so that the hatcheries could supply certified seed.

- Skill management is necessary in every field and needs to be paid due attention and professionalizing, it is the best way.
- Exposure of R & D managers to regular state of the art management programmes which will help them to reduce their dependence on civil service bureaucracy.
- All technical departments must be headed by professionals who should have full administrative powers without being subservient to omnipotent bureaucrats.
- Identify skills required for research management at different levels from Heads of Divisions till DDGs and formulate programmes to be provided at selected levels in the career of the person
- Strengthen the NAARM in a professional way
- Provide exposure to Scientists in good management Institutions in the country as well as overseas
- Regular skill upgradation with changing times
- Re-look the policy on Research Management and Administration
- Functioning of all agencies/institutions may be made fully autonomous. Decentralization and empowerment may be done up to project level.
- The Scientists should be totally alienated from the Bureaucracy with respect to research and all aspects that are of concern to him
- Implement project based budgeting coupled with financial incentives to PI's from project funds. Success of this would depend on development of a comprehensive accountability mechanism
- There is a need to transform the ICAR into an organization that promotes: EQUAL OPPORTUNITY TO ALL TO GROW IN CAREER rather ALL OPPORTUNITY ONLY TO FEW INCOMPETENT INDIVIDUALS. ICAR administrative machinery is like hard clay in facilitating the timely flow of funds. Often, it is observed that the RMPs are no better than the civil servants. These people do not believe in building a team of particular subject matter or discipline rather they prefer to build themselves. There are hardly a set of uniform rules and regulations. It is not good in the interest of the organization. We have very poor quality people in the administration and finance stream. They have only negative mind set. It

is very difficult to reform them. Devise some mechanism to get rid of this problem.

- In order to professionalize skill management, it is suggested to dispense with bureaucracy in the system as far as possible. The project leaders should have the independence to create facilities, make expenditures and complete the tasks assigned in time targeted fashion, for which he/she will also be fully accountable as per norms and procedures.
- For management of agricultural research & development in India, a special cadres viz; *Agricultural Management Service (AMS)* may be created for which selections and training will be made by UPSC. The current process of selection of managerial cadres can be dispensed with. Thus, a Scientist will continue in the research stream till he superannuates, of course with career advancement and dignity. This facilitates cessation of longing of incompetent scientists for managerial positions with ulterior motives to the peril of the organizations and the nation.
- Technical, Administrative and Financial skill of the research manager should be professionalized through adopting newer management techniques.
- Civil Service bureaucracy has to be kept out of management of agricultural research. For this, there is a need to encourage professional skill management within the system by well directed efforts.
- The biggest bottleneck in delivering the research output for Scientists in the present set up is the impediments posed by the administration and audit procedures (bureaucratic set up). Unless the powers wrest with the researchers, the present frustration among the scientific community would continue which has reduced the efficiency of the workers drastically. Therefore, the institute should be functioning as a research-centric place with least red-tapism and administrative imbroglio.
- For smooth running of the research works, all the equipments and instruments must be in working condition. In many institutes, a good percentage of equipments are not functioning because of the technical faults in them and therefore, there should be a mechanism to have all the instruments serviced by the suppliers through the annual maintenance contract. Consumable as required by the researcher for the specific research work should be purchased as specified by the researcher and not as decided by the audit and finance managers of the institute as they will not be able to decide the quality of the chemicals or consumables. The system of necessarily selecting the lowest priced consumables and instruments should be dispensed with as surely this system surely operated

at the cost of compromising on the quality of the work. A rate contract could be signed with the firms of repute for the supply of consumables.

- Labour requirement and hiring procedures should be well thought out as at present, it appears to be a serious impediment for carrying out experiments.
- In order to professionalize skill management, there is a need to revamp the organizational structure of the DARE and at apex level technocrats should be posted instead of bureaucrats. System like DARE should be made effective in all the States. The awards of IAS may be conferred to the Scientists from NARS and other apex R & D bodies.
- The entire agricultural activity of the state (Research & Development) should be governed only by agricultural scientists (to avoid civil service bureaucracy without basic knowledge in agriculture) especially for research and development departments related to agriculture.
- De-bureaucratization of the system has been expressed by the PMO and Hon'ble Minister of Agriculture who has a deep insight and understanding of the agriculture on many occasions. ICAR like other departments of CSIR, SAUs are expected to have their own work culture for optimum delivery to the society. Pro-active, upstream and strategic research requires a different kind of management environment, purchase procedures, freedom of multiple partnerships both at the national and international level. The bureaucratic approach of civil servants who have vast experience of dealing with criminals, mafia, black marketers, defaulters, law and order problem in the country is not congenial for the scientific institutions. Decentralization to the project level managers, minimum office paper work and enabling procedures are very essential to get output of scientific manpower. Contrary to that multiple centers of power are becoming operative in the ICAR and especially DARE, which is supposed to be a very small component but has assumed all powers even of technical and scientific nature. Registrars in many Universities are being appointed among the Scientists, with the same analogy, it is suggested that Scientists of the NARS should only be eligible for the post of Secretary (ICAR) like that of DDG post.

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TOR IV

Prevailing funding system of agricultural research and suggest suitable changes (e.g. Competitive Block Grant, Project-based Funding etc.) for improving the system.

Dr M.L.Madan
Former VC, Dr PDKV, Akola , MS

Funding System

Financial Management is key to research programme implementation and progress. In the context of agricultural research, this would mean appropriate allocation to sectors, determination of the in-terse priority within sector and inter-sector allocation for activities and subsequent monitoring.

Present financial system is supposed to provide for prioritization and monitoring at various levels. However, the out come is far from satisfactory and in more specific terms, non-result oriented. The proformas and procedures are chiefly meant to satisfy the accounting of figures and miserably fall short of activity monitoring, result identification and outcome evaluation.

One of the major reasons for the failure of present day financial management is lack of linkages between physical targets, financial outlays and financial targets. The financial targets in terms of budget and allocation etc. are generally watched through routine appropriation and accounting procedures. This system of appropriation and accounting can and does not give a commentary of budget allocation and actual expenditure, but there is no correlation with physical progress or the targets.

At the planning stage, demand are received from Institutions and consolidated at the ICAR level and submitted to the Ministry as EFC documents, where sanctions/approvals are made on the basis of allocations made through the Planning Commission. If one looks to the EFC Memo projected figures of the ICAR, at no stage, is there any reference to the physical target activity maps or monitoring benchmark requirements. This results in serious allocation and accountability faults because;

- a) Institutional/ICAR EFC does not have any built-in physical target or achievement linked funding;
- b) The system of plan and non-plan budget, through meant to support the plan activities or an approved programme, in fact, represents the core funding to the Institutes since most of the plan activity over the years is converted into non plan activity and thereby isolating the plan funding from any monitorable 'end of the research program' scenario;
- c) There are no identified physical targets for basic or applied research to be achieved through responsibility linked to the performance of individual scientist;

- d) The scientific leadership with accountability to research output has been completely sub-ordinate to leadership in administration;
- e) The demands raised by the scientists/Institutions are highly exaggerated, inappropriate and often irrelevant to the targeted activity. There is a conscious effort to inflate the budget to compensate for the unimaginative financial cuts by financial wizards who have no application to the programme or the measurable research out put;
- f) Most of funding requests are for infrastructure, which in the annual planning process, is appropriated over several annual plan and hence not related to the associated urgency or need or desirability of having such a research support at a particular time span in the progress of the research programme;
- g) As the approved annual financial outlay is not linked to any annual progress or identified benchmarks for evaluation of financial expenditure, the exercise of formatting research reports at the end of 6 month of 12 months (6 monthly or annual report) is also in fructuous;
- h) With reference to the approved finances, the exercise of defining intra section priority and re-fixing the physical target is not taken up in the right earnest and as such the accounting only remains an exercise of matching figures. Hence there is urgent need to link financial progress and physical progress within the same year.

There is several research funding approaches for science like programme funding, zero-based budgeting, project funding etc. Each of them involves certain basic principals of financial implementation, monitoring and physical target evaluation. The critical aspect of financial auditing is:

- a) Linking financial expenditure to envisaged target;
- b) Linking the target to the end users;
- c) Giving the complete responsibility of financial management to the project manager/investigator who is to achieve the target and/or take them to a deliverable stage;
- d) Accounts establishments be mandated to support the scientific expenditure and not to monitor it with a constant approach of policing the expenditure with distrust and supposed mismandering of the accounts.

The critical aspect of any financial management, therefore, should be associating (total cost including salary) financial expenditure to the physical target identified in the project at the time of allocation. These physical targets be identified by the scientists himself

clearly, in the first instance at the start of funding, mentioning in a qualitative and quantitative manner how their progress of the project will be monitored over a specific time period and what will be the end of the programme scenario with respect to product, process or technology.

TOR V

Steps for making agricultural research sensitive to emerging scenario of home and external trade (with particular reference to WTO Agreement on agriculture).

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Background

NARS is mandated to provide trained human resource, location and situation specific agricultural technologies that increase production, productivity, income and employment to rural people, and extend these technologies at pilot scale assessing their field worthiness and introducing them, provide critical inputs emanating from research/academic institutions, and generate literature and software to disseminate such information. By Act agriculture is a state subject only research is on concurrent list. Taking improved technologies to the doorsteps of the farmers and providing inputs like seed, fertilizer, pesticides, irrigation water, credit and marketing facility to the farmers is mandated to state development departments. A synergy between the two is key to success in agriculture in India. India has very large domestic market for agricultural produce and products and inputs that go in them, an opportunity available to the Indian farmers to tap and acquire sound base for export.

Under WTO Agreement on Agriculture (AoA), agriculturally advanced countries consider India a potential market. India is obliged to open its market and have tariffs restricted as per agreement. Likewise signatory to WTO are obliged to open their markets to Indian traders/exporters, an opportunity that India must utilize to its economic advantage. Every WTO signatory country protects, promotes and subsidizes their agriculture in conformity with AoA. Advanced countries heavily subsidise their agriculture under Green and Blue Box category. India has to also protect and promote its agriculture and agricultural markets within its means which of course are limited. Under AoA agricultural technology is heavily protected under intellectual property rights (IPR). India too has come up with its Plant variety Protection Act (PVP Act) and Farmers User Rights. Provisions of these acts have to be understood at all levels and complied.

Globalization has opened floodgates of movement of agricultural produce and products through which unknown weeds, insect and pest can enter in India and become a menace unless strong quarantine procedures are put in place. Therefore, need for research and creation of non-tariff checks allowing only safe products coming to India. Open market also puts demand of quality of produce, packaging and handling that is competitive globally failing which multinational companies (MNCs) of advanced countries can capture our domestic market. Many Indian processors hanker for imported raw materials for unit cost and better product recoveries. In order to sell produce in export markets, Indian growers and traders have to meet out quality and safety standards laid out by importing nations i.e. market intelligence on global trade in different crops and

commodities, knowledge of Codex Alimentarius, HACCP and national standards of importing countries and their compliance at different levels. These are dynamic processes changing with market demand requiring shortest possible response time, indeed a challenging task.

Of late global market has been responsive to organic agricultural produce and products. For the same crop and commodities certified organic produce and products can fetch easily 15-20% additional net returns, export markets are even more receptive. Organics have demand in domestic market as well, a section of society who want organic foods for safety and is willing to pay for it. Either Indian growers meet this demand or others will capture this market to our economic detriment. Produce cannot be certified organic unless the inputs that go in its production and processing are organic. Codex Alimentarius lays out general guidelines conforming to which member countries can have their standards and certification procedures. APEDA is coordinating these efforts. For certification to be accepted in global market certifying agencies have to be globally recognized. A process has begun in India too but not adequate and very expensive. There are regions, crops and commodities where hardly any synthetic chemicals are used thus produce are for all practical purposes organic, targeting them makes sense.

Agriculture traditionally sustains about 2/3rd of the countries population who are facing livelihood challenges. Laws of inheritance and population explosion have resulted in steady decline in size of land holding on one hand and on the other advancements in material culture of the society have made the cost of living high as a result it has become too difficult for rural households to have two ends meet unless their income is supplemented. No possibility to give them more land. Agricultural research has focused on increasing productivity and reducing unit cost of production and has significant results too. However, laws of diminishing returns start applying beyond certain level of productivity. One possible way to supplement the income has been visualized is through appropriate post-harvest technologies, as applicable at rural threshold, that minimize post-harvest losses, meet out domestic needs of rural households at the least cost through on-farm processing and value addition and enable marketing of surpluses after value addition at least primary processing generating additional income and employment. Which means agriculture has to be transformed from seed to seed domain to production-cum-primary processing, at all levels. The processors want raw-materials that give high percentage of product recovery i.e., variety, agronomic and post-harvest handling practices that optimize processed product recovery. Entrepreneurship development, training, infrastructural support, finance and market assistance becomes a necessity to exploit this potential for which development departments have to equip themselves, NARS will have to train them.

Institutionally Indian NARS has worked, delivered results and recognized globally. However, since last decade or so its institutional autonomy has eroded. There are political and beaurocratic forces that have encroached on its decision making processes. NARS members, ICAR and SAUs, have been subjected to repeated reviews, for one reason or the other. Issue deserves a critical look. For institutional autonomy Dr. GVK Rao Committee emphasized on scientific organisation managed exclusively by scientists which was prevented. Some SAUs are being run by scientists, efficiently. The process of appointment of top management is vulnerable to political and interest group lobbying,

both ICAR/ASRB and SAUs. Ways need to be found to ensure functional autonomy. Punitive actions against errant have become hard to carry, at times even transfers.

Stake Holders and their Expectations:

It would be seen that stakeholders of agriculture are many. There are vast opportunities at the same time many restraining factors. Each stakeholder has expectations from the agricultural research and education at the state level from SAUs and their constituents and at the national level from ICAR and its constituents. However, there are widespread misconceptions, any thing wrong with agriculture and rural life is deemed to be failure of the agricultural research and education. Both ICAR and SAU are experiencing shrinking public funding. They are being asked to generate internal resources (IR) for which beginnings have been made through revolving funds, consultancies, patents etc., but IR demands reduction of free flow of inputs and services which may not be liked by some. Some possible expectations of stakeholders and responses of NARS are given in Table-1.

Steps to Enhance Responsiveness of NARS

While everything expected of the Indian NARS it can be said it is being addressed to. However, it is in finer aspects, in micro-scrutiny, that inadequacies become visible. Attempt has been made to identify these inadequacies (Table 1) and postulate steps that can remedy the situation and make Indian NARS more efficient and responsive.

(A) Farmers related

- (1) Too long a time involved in evolving a variety and making seed and planting materials available to the farmers.
 - Biotechnological support to conventional breeding such as marker gene assisted selection (MAS) and development of transgenic materials (GMOs).
 - Off-season nursery raising two or more experimental crops a year to expedite breeding processes.
 - Market trend analysis; relay breeding directed to predicted market trends to have promising lines / strains.
 - Variety release be made more decentralized that follow defined guidelines. The State Seed sub-Committees should play a more proactive role in release of varieties as majority of new varieties have zonal significance.
 - Partnership with private sector in development of hybrids.
 - SAUs are already empowered to multiply nucleus seeds into breeder seed, they may also be allowed and facilitated for production of foundation and certified seeds on own farm or adopted seed villages/seed producers supplementing seed availability in the state/region.
 - Awareness drive about released variety on institutional website and print and electronic media, minikits in farmers fair.

- Farmers exposure to new varieties through open house and minikits to accelerate the variety release process, time involved in minikits/AICRP trials be minimized.
- (2) Dearth of high yielding varieties that have globally competitive processed product recoveries required by the processors.
- Atleast 20% of breeding resources be diverted to developing varieties and hybrids that meet processors and green house farmers' needs.
 - Exchange and import of seed and plant types from leading countries to cut short breeding time through bilateral/promotion of multi-lateral MoUs or just commercial transaction.
 - Contractual farming for specialized seed products.
 - Mechanized environment controlled nurseries and their certification for released varieties for speedy multiplication.
- (3) Lack of information and supply of improved farm equipment
- R&D institution under NARS should prepare leaf lets, bulletins, audio-visuals on improved farm equipment, put them on their websites and portals for reference to enlightened farmers and extension workers, exhibit and demonstrate them in farmers fairs as well as lay demonstration/field trials on farmers fields.
 - Field worthy designs should be passed on to private sector through MOU or agreement. But till such time private sector takes over prototypes be multiplied in prototype production centres / public sector workshops.
 - Training with first hand experience in operation, adjustment and use of new equipment under the supervision of experts.
 - Extension agencies and promoters can place bulk order on quality manufacturer which will encourage the manufacturer to invest on required jigs and fixtures and specialized facility needed for quality product.

(B) Processors related

- (1) Non-availability of right quality rawmaterials for processing
- Supply of required type and quality of breeder and foundation seed / planting material and production of package at reasonable price to promoters and farmers.
 - Protection of contract farming and playing a catalyst in market oriented crop production.
- (2) Lack of indigenous processing plants that are competitive and of low cost.
- Pilot plant studies on new processing plants, processes and products for assessing and preparing realistic techno-economic feasibility reports which could be provided by NARS through a technology park.
 - Consultancy and advisement.
 - Turn key jobs.
- (3) Market intelligence and market prices

- Marketing, market price, and market intelligence should be thrust areas with agricultural economists under NARS and in partnership export and trade promoting agencies project it through print and electronic media for the benefit of entrepreneurs usually in the small scale sector.

(C) Traders related

- (1) Goods / products with high demand and good margin of profit.
 - Technology should be such that product has demand and traders get reasonable (10-15%) profit after deducting costs involved.
 - Product should be valued, have good shelf life, nicely packed, labeled and hygienic in order to attract the customers. If it is highly perishable required cold chain should be affordable.
 - Test marketing of new products, developing a market.
- (2) Produce and products that meet national and international standards
 - Production, processing, handling and packaging meeting prescribed norms of quality, purity and hygiene.
 - Sanitary and phytosanitary norms should be met, duly certified.
 - NARS establishing testing and certification facility that are internationally recognized.
 - Advisement and consultancy.
 - Test marketing of new products.

(D) Development department and extension related

- (1) Appropriate technologies and technological packages.
 - Only fieldworthy fully field tested technically superior, socially acceptable and economically viable technologies be released.
 - Technologies that increase productivity, reduce unit cost of production, generate additional income and employment.
 - Technologies compatible with natural resources, local needs and demands of accessible market.
 - Technologies be finalized in consultation with State extension services.
- (2) Breeder seeds and critical inputs and equipment
 - Production and supply of breeder seeds as per indents and other critical inputs.
 - Critical inputs production and marketing be privatized at least partially.
 - Pilot plants be created in NARS for bio-fertilizers, bio-control agents, prototypes etc. for pilot introduction.

- Seed processing and packaging facilities at SAUs need to be modernized. Pre-treatment, surface coating for precision planting, germination promoting treatments etc., have to be increasingly introduced.
 - Use of planters and transplanters to conserve seed and avoid wasteful methods.
 - Development of checkrow-planters to facilitate aerobic/organic methods.
- (3) Drought proofing and disaster management
- Assistance in contingent planning and supply of critical inputs.
 - Seed banks be created in NARS to keep seeds of drought resistant crops.
 - Assistance in cost effective rain water harvesting, application and composite mixed farming methods.
 - Promotion of conservation tillage technologies like zero-till drill, raised bed planting, mulching etc. need to be promoted to conserve water and achieve timeliness.
- (4) Training to trainers, extension personnel, farmers and entrepreneurs
- Training facilities with work experience be created in NARS for which adequate pilot plants, workshops, polyhouses, nurseries etc. be created on KVKs, institutes and colleges.
 - Trained persons be given preference in bank loans.
 - Bank lending be improved conducive to rural poor and landless.
- (5) Pest monitoring, surveillance and control
- Modeling and forecasting of pest epidemics ahead of incidence to give lead time for control.
 - IPM modules adequately demonstrated and extension staff trained.
 - Mobility of NARS scientists be improved for a quicker response.
 - Mobile clinics for livestock.
 - Transporters for sick animals to avoid mortality.
 - SAU animal clinics be strengthened.
 - Diagnostic Centres in SAUs for plants and animals.
 - Virus and nematodes study centres at SAUs for their use and control of pathogenic ones.
- (6) Referral testing of chemicals
- NARS as centres of excellence should establish referral labs.
 - NARS labs should take up sample testing on payment basis.

(E) Scientists related

- (1) Basic scientific research for advancement of agriculture and allied activities and to satisfy creative urges of the agricultural scientist.

- About 10% of research funds could be earmarked for basic researches which is essential for the advancement of agriculture.
 - NARS laboratories be well equipped where there are capacities for basic research.
 - NARS scientists should be encouraged to collaborate with basic scientist in other institutions of higher learning.
 - Basic researches that meet developmental goals will be desirable.
- (2) Better facilities to work and live
- For effective discharge of triple function of teaching, research and extension education in a resident mode the faculty scientists, staff, and students should live on campus. It is not a problem if NARS constituents are located in or adjacent to a big town/city where children education and health care facilities are available. Some SAUs do not have residential accommodation. Often locations are remote where accommodation / bussing / transport, health care, schools become a necessity failing which academics is getting compromised. Field oriented research and extension also suffers due to lack of transport.
- (3) Publications / patents / release of technologies
- Scientists be advised and encouraged to publish in refereed journal particularly of repute.
 - Increments and promotions be linked with publications/patents/released technologies.
 - Scientists credits be scored in numbers.
- (4) Training / visits / seminars / attachment / sabbaticals
- Scientist should have training / attachment / sabbatical opportunities to update and enhance their professional capabilities. They should be encouraged and facilitated to present papers and participate in professional conferences and seminars atleast once a year, funds be specifically earmarked for it. Full or partial sponsorship should be there for international events if they have a paper.
- (5) Recognitions
- Talent and contribution must be recognized both monetarily and in non-monetary terms.
 - Awards sometimes are misused, therefore need to be carefully awarded, procedures may have to be refined, endorsement by professional peers ensured.
 - Forwardal of award papers should pass through an in-house scrutiny through a committee.
- (6) Fast track promotions
- CAS is there which offers opportunity to be assessed and placed in next higher scale. It tends to have averaging effect.
 - Talented / high performers deserve incentives and fast track promotion. There should be institutional mechanism to meet such aspirations.

(F) Policy makers expectations

- (1) Indian agriculture globally competitive.
 - Productivity and unit cost of production be made globally competitive to protect domestic markets and have due share in exports.
 - Quality of produce and products be of international standards.
 - Varieties of crops with yield levels and product recovery globally competitive.
 - Bilateral cooperations be used to achieve these goals.
 - In certain cases we may have to purchase required material paying royalties which should not be ruled out.
- (2) Human Resource Development
 - Annual induction in academic programme deserves fine tuning reducing in disciplines where there are large number of surplus graduates and post-graduates and creating capacities in new emerging areas such as bio-technology, PHT, farm mechanization, information technology, agri-businesses etc.
 - Vacant positions be deployed to an extent needed in new emerging areas.
 - Opportunities be created to train HR in required areas.
- (3) Self-sufficiency in food, nutrition and industrial raw materials
 - Having achieved food self-sufficiency, NARS should focus on nutritional security and meeting industrial raw material needs to check undue imports.
 - Niche crop concept be put in place without jeopardizing food and nutritional security. Every member of NARS should emerge out as centre of excellence in its identified niche crops and commodities, fundings be channelized accordingly.
 - Crop development should be production till consumption in cooperation with intervening disciplines.
- (4) Due share in global export markets
 - India with limited land can prosper only with due share in agricultural export markets. NARS should scientifically and human resource wise backstop this need and aspiration.
 - Buildup of professional and technical expertise that helps in production, handling, packaging, and marketing of exportable goods and products.
- (5) Proper sustenance of rural masses
 - Situation as it is, inspite of developments in industrial and service sector, 2/3rd people have to live on land based sustenance which is very limited, their livelihood base has to be widened.
 - Rural India be mandated as producer-cum-primary processor.
 - On-farm PHT and Value Addition should be focused to minimize post-harvest losses and enable rural people undertaking value addition to meet own needs at

the least cost and market the surpluses after value addition and retain by-products for their livestock.

- The vision of Hon'ble President of India of cluster of agro-processing centred around production catchments net worked with major urban consumer centres be realized.

(6) Advisory and Consultancy

- NARS members are think-tanks of agriculture and rural life. Single window advisory through ATIC and consultancy cells be strengthened to meet the aspirations.
- Institutional websites should be updated and upgraded into portals.
- Technologies that can be made available for commercialization should be on website/portals along with their techno-economic reports.
- Consultancy to entrepreneurs in project formulation and establishment.
- Turn key jobs.

(G) Society Expectations

(1) Ecologically sustainable agriculture

- Impact of every agricultural technology on environment should be examined and reported upon, only ecologically sustainable ones promoted.
- NARS members should acquire expertise on environmental audit.
- Existing technologies that have excessive negative impacts be addressed and made sustainable.

(2) Rural economic prosperity

- Net returns to farmers be increased through increased productivity with reduced unit cost of production and proper PHT and value addition.
- Landless be assured minimum wages.
- Skilled rural people be assisted in self employment/entrepreneurship.
- Agri-clinic agri-business activities be developed and promoted as self employment to rural educated and service to farming community.
- Linkages with urban markets to rural entrepreneurs for proper marketing.

(3) Fair percentage of contribution of agriculture to national GDP

- Agricultural infrastructure development for intensive farming, 200% CI or higher.
- Minimization of loss to agricultural production in pre and post-harvest stages through proper infrastructure and on-farm technologies to hold and preserve the perishables to negotiate from the forces of market for optimized net returns.
- Unjustified outflow of rural wealth be minimized through appropriate technologies, rural entrepreneurship and farmers centric trade.

(4) NARS as powerhouse of agricultural and rural development

- Nurtured as autonomous institutions, in letter and spirit, dedicated to agricultural and rural development.
- Selection and working of top management of ICAR and SAUs be treated and respected apolitical, it should be based on merit and demonstrated management capacities.
- NARS members as scientific institutions be managed by scientists only.

Table- Some Stake Holders of Agricultural Research and Education and their expectations

Stake holder	Expectations	Response by NARS	Approximate response time	Level of satisfaction
1. <i>Farmers</i>	1. Seeds/planting materials of high yield varieties /improved livestock	NARS develops varieties, livestock management practices inputs required etc.. Seed multiplication, infrastructure and certification supply and distribution are in the hands of State Deptt. of Agric./Hort./Animal Husbandry/Fishery. NARS provides breeder seed after a variety is released by State Seed sub-Committee/National Variety Release Committee to development department for further multiplication and supply of certified seeds..	Approximate 4-6 years for food grain varieties, 5-10 years for fruit and vegetable crops, and 5-20 years for livestock. Relay R&D processes to meet expectations are usual strategy to meet the needs.	H - Food grains M-Fruits and vegetables M-Livestock L - Hybrids in F&V
	2. Improved tools and implements	NARS adapts or develop improved farm equipment and field worthy designs made available to farmers through commercial channels or their prototype production centres. FIM import is largely of R&D nature.	Variable	H - Indo-Gangetic Plain/pocket elsewhere. M - Central & coastal region L - Hill and mountain Region
	3. Demonstrations on farmers fields of varieties and improved agro-techniques/equipment	DE/KVK layout frontline demonstrations (FLDs) on new varieties/techniques in cooperation with by development departments or on their own.	One season, subject to availability of funds	M

	4.Information about new technologies	Radio, TV talks, extension articles, extension journals, leaflets, folder, website Kisan Call Centres.	Variable, situation specific	M
	5.Training in new techniques	DE, SMDs, KVKs organize such trainings of varied efficacy.	Variable, situation specific	M
	6.Improvement of livelihood	A number of technologies and trainings are organized by NARS that are directed to additional income and employment to farmers as well as rural landless. Makes impact when development departments launch such schemes.	Variable, largely dependent on state development departments	L
2.Processors	1.Raw materials of right quality and high product recovery.	So far most of the produce is table grade, suited to domestic markets,processed product recovery low.	Variable	L - M
	2.Availability of raw material at cheap price, year round.	Supply is seasonal though at cheap price but processors not satisfied. Scientists have created early, mid season and late season options. Off season productivity gets reduced but market price high.	Variable, situation specific	L - M
	3.Efficient process and processing plants that are competitive.	Many technologies have been commercialized but much more efforts are needed. Still turn key processing plants are being imported.	Relatively new activity, pace being accelerated	L
	4.Minimum waste and by-products, wealth from waste.	Reasonable degrees of success but still losses are high. Besides more research, extension efforts are needed on by-product and waste processing and	Variable	L

		utilization.		
	5. Market intelligence	Very few SAU and ICAR institutes have developed such capabilities. Possibly can't be handled by NARS alone. Indian Missions abroad should have agricultural attaches (an agric scientist).	-	L
	6. Referral testing and certification Laboratories.	Some capacities do exist in NARS but more efforts and investments are needed. HACCP and Codex Alimentarius capacities need to be expanded.	-	L
3. Traders	1. Goods/products with high margins of profit.	Crops, commodities and processed products are developed that have substantial margin of profit and economically viable.	No definite time frame	M
	2. Products that are unique have good shelf life and in great demand.	In commercialized products shelf life is kept in mind, monopoly may not last long in any commodity, demand factors of marketing forces.	No definite time frame	M
	3. Products that meet quality standards of export markets in demand, assured deliveries.	These aspects have drawn attention now. SAUs and ICAR institutes gearing up	-	L
	4. Market intelligence	APEDA, STC etc. have some mechanism but not NARS except a few. This activity needs to be strengthened.	-	L
4 Development Departments / Extension Workers	1. Technologies and technological packages that are field	Release of technologies is in the hands of development departments. Package of practices are developed in partnership	Frequently varieties and agro-techniques are released	H

<i>Workers</i>	worthy and critical input supports / incentives worked out	with development departments after minikit trials and field evaluation. At times they complain of half baked technologies, scalewise not suited.		
	2.Breeder seeds of varieties being promoted	SAU and ICAR institutes produce breeder seeds as per indent of state department of agriculture/horticulture, usually targets are met.	6-12 months (1-2 seasons)	H
	3.Drought / disaster management packages and critical inputs like seeds, bio-fertilizers, bio-pesticides etc.	SAU and ICAR institutes do work out contingent plans, however they do not maintain seed stocks for such emergent situation. NARS has technologies on bio-pesticides and bio-fertilizers but better supplied through private sector.	Prompt	L-M
	4.Training to trainers and extension workers	One of the regular activities of KVK, TTC and DE of SAU/DU as well as ICAR institutes.	Regular activity within 1-2 months of funding	H
	5.Technology and training in entrepreneurship in PHT & VA	Some is already being done but it needs to be strengthened.	-	L
	6.Pest monitoring and surveillance	SAUs and ICAR institutes participate in such missions. Some SAUs have developed prediction models	Such missions are very prompt	H
<i>5.Scientists</i>	1.Satisfaction of creative urges	ICAR institutes and SAUs give scientist liberty so long urge pertains to mandate. R&D in NARS is largely applied and adoptive. Some basic researches are done through PG, Ph.D. work.	-	M-H

	2. Good facilities and support to work and to live.	ICAR institutes reasonably equipped but SAUs constrained, one may have to wait at times. Adequate operational contingencies in ICAR institutes but scarce with SAUs.	Variable	L-H
	3. Good salary to fulfill family obligation.	Could be considered satisfactory but disparity widening between public and private sector salaries and perks. There are signs of exodus of talented both within the country and abroad.	Regulated by Pay Commission, 5-10 years	L-M
	4. Scientific papers and steady improvement of biodata	'Publish or perish' is now well understood, proper mechanisms in place to facilitate publishing, barring exceptions. But very few publications in international journals of repute.	Some SAUs release annual increment only on publication of 1 scientific paper	M
	5. Release of field worthy technologies and credit thereof	Technologies developed by scientists be it variety, agro-technique, process or machinery are being released, patented, consultancy mechanism in place (Johl Committee). Yet annual releases per scientists are low. Some may not release any and superannuate.	Variable	L-M
	6. Training and visit opportunities.	Ample opportunities nationally and some international too but TA funds often limiting, even those with scientific papers accepted cannot make it..	Variable 2-3 every five years	M
	7. National and international standing.	Many scientists have acquired such distinction but number is small. Work ethic need to be improved.	-	L-M Inbreeding /son-of the soil

				soil
	8.Recognitions	A number of awards have been instituted by ICAR as well as some SAUs.	Variable	M-H Competitive but some pass through the filter
	9.Quick promotions.	CAS in place but does not meet expectations of high performers. At times undeserving manage to rise up the ladder.	5-7 years	M
	10.Autonomy	NARS longs for full autonomy but it is eroded by centres of power and political interventions under some pretext.	-	L
<i>6.Policy Makers</i>	1.Indian agriculture globally competitive.	Green revolution and White, Blue and Yellow Revolutions. But productivity and quality lower than global leaders	No definite time frame	M
	2.Well trained agricultural graduates and post-graduates to man various programmes.	Adequate in terms of number and quality. Levels of skills need improvement. There is dearth of personnel in frontier areas.	4-5 year UG, 2 years PG, 3 years Ph.D.	H Shortage in new emerging areas
	3.Basket of crop varieties agro-techniques and inputs for favourable and drought conditions for use by development departments	Adequate options created by NARS. More are needed specially for processing and exports	Reasonably shot intervals	M-H
	4.Scientific advisement	Rendered as and when referred. But it is true the	Within a reasonable time it	M

		think tank is not used as it should be.	is referred	
	5. Self-sufficiency in food at regional, state and national level.	Self-sufficient on the whole but some don't have access, nutritional security yet to be assured. Not exclusive responsibility of NARS.	No definite time frame	H
	6. Agriculture sustaining rural masses	About 69% people draw sustenance, but needs to improve assuring minimum standards of living.	-	L
	7. High institutional discipline	Well laid out Acts and Statutes are in place. Model Act of ICAR is being followed by many SAUs.	-	M
<i>7. Society in General</i>	1. Food and nutritional security in a self-reliant mode and ecologically sustainable way.	Scientific, technological and HR provided to this effect, country can take pride in this respect. However, environmental issues are being addressed more intensively now as post Green Revolution issue.	-	H
	2. Employment and economic prosperity to rural people.	Though 69% draw sustenance from agric and allied activities but quality of life and gap between rural and urban not satisfactory. Intelligent rural youth in lookout for alternate vocation in urban areas.	-	L
	3. Globally competitive HR to man and service agriculture and allied activities.	A degree of self-sufficiency but shortages in cutting edge technologies.	-	M
	4. Fair percentage of	Share of agricultural GDP has declined over a	-	M

	contribution of agric to GDP	period of time, though NARS has adequately backstopped scientifically and technologically.		
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H = High, M = Medium, L = Low; DE = Directorate of Extension of SAU/DU;

NARS = National Agric. Res. System (ICAR+SAU+DU+CAU)

SMD = Subject Matter Division at SAU/ICAR Institutes, KVK = Krishi Vigyan Kendras

TOR VI

The Present System of Scientist Recruitment and Human Resource Development and Suggested Measures to Attract and Retain Good Scientist.

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What does a good scientist look for?

- An inspiring leadership
- Good working conditions where the management strives to provide and maintain at least the basic amenities
- An institution with its goals spelled out in unambiguous terms, an institution having a focused, rigorously debated program of work
- A system in place that seeks to pursue human resource development as one of its major missions and, thereby, provides working atmosphere and career advancement opportunities that bring out the best out of a researcher.

By and large, we have none of this today.

But why not?

First and foremost, that inspiring leadership is missing, and that, in most cases, is the root of the problem.

What ought to be done?

1.Revamp the leadership. Yes, revamp the leadership:

i) A leader must have the ability to lead by example, lead from the front. He must be seen as a person of great character, a person having a proven track record of accomplishments, in science and in application of that science to Indian agriculture. If such a leader in science and technology is offering his services to serve the system as a manager, ensure that he has that management aptitude required of a good manager in science. Ensure that he is not drifting to a management position merely out of blocked career advancement opportunities in his own area of specialisation, where he may be doing fairly well. Or, he is not seeking greener pastures as well as buying himself a promotion after having a mediocre career in Science. Let's also appreciate the fact that a scientist good at analysing DNA fingerprints or conducting agronomic trials need not necessarily be good at managing science. Management aptitude and scientific temperament are not known to be invariably

interlinked; so we need to carefully look for those where such linkage exists.

ii) Stop the practice of remote controlled science. Once a scientist offers his services for a management position and gets selected, debar him from doing laboratory/project science for as long he holds that management position. If he cannot do that, let him stay back and do his science. This practice of putting two feet in two boats has done substantial damage to the system. Invariably, this leads to a state of affairs where the person concerned does justice neither to his science nor to the management responsibility he has acquired. I know there are some good exceptions, but in majority of cases it has led to a state of affairs where the manager uses his muscle to garner greater support for his project at the expense of other projects and programs in that Department. Such practices from the leadership have immense demoralizing effects, especially among the younger scientists. Mediocre elements use such opportunities to manufacture gossip, gain prominence and inflict further damage. Indeed, the manager should be encouraged to do his own thinking and publish his considered views on matters of science policy and management.

iii) Ensure that prospective 'leaders' using caste, communal and political support to influence the process of judgment are firmly dealt with. During the recent times, this menace of political interference has grown to unprecedented proportions.

iv) Introduce a system of high quality and specially designed management training for managers at all levels of leadership. By no means should we undermine its importance. And this training should not be just a one-time ritual, but followed up every year with refresher courses on administration and management. In the Private sector, there are examples where such refresher courses are a mandatory requirement even for the Board of Directors.

v) Ensure that a really independent body carries out selection of top management positions. The present day ASRB leaves a lot to be desired. As we are aware, most, if not all, selections of senior management positions are highly influenced by caste, regional and political considerations.

One might say, all this is easier said than done, how do we put it in practice? Well, first of all, we must have the will to do it (Where there is a will, there is a way). If that will is missing, mere reviewing or refreshing recommendations from time to time, is just an exercise at window dressing and a waste of time.

Having said that, I am optimistic, having seen how admissions to the IARI PG School are conducted. The process of selection is so well designed that even now, it functions as a largely tamper-proof system. We do have some cases where a selected student does not appear to be the 'best of the best' but such cases are generally rare exceptions.

I recommend that we develop a comprehensive, carefully researched and structured, set of Performa for selection/evaluation at different levels of management (on similar lines, we need to do it for assessing scientists also). Having done that, let's ensure that we do not

authorize any person or persons to tamper with this Performa. Some minor modifications may become necessary, but let that be done only after proper authorization and due knowledge of all concerned. Transparency of this approach would enable even the prospective candidates to know, as to where they stand in terms of overall grades. This exercise may carry 70% or even 80% of the marks, leaving only 30% or 20% for the interview. For personal interview, majority of the experts must be from outside the ICAR/University system (as the case may be) and the overall panel should comprise of at least 7-8 members. We may not always follow a practice of selecting the one who gets the highest marks, if that highest falls short of the minimum level, say 70% or so.

2. If the management/leadership selection system is taken care of, especially the top brass, through a process that is and also appears to be seen as transparent, the rest becomes relatively simple. In turn, he commands greater respect and recognition of his competence. Down the line, the selection process generates greater confidence among the younger scientists and inspires them to excel. Surely, issues such as development of Institutional Research Programs and providing the needed support for efficient execution of individual projects, receives greater attention and support of the management. The manager (Director/Head Division etc), conscious of his selection through a competitive and fair assessment system, takes greater pride and strives to do well for the Organisation and strengthening of the system. Indeed, we have a few examples where, despite the existing limitations of recruitment and personal policies, a capable and dynamic leader (Vice Chancellor/Director) has led a team of researchers, teachers and technicians, such that they feel proud of their leader, the organization they serve and their own personal accomplishments.

3. After the leadership/management issue, the second most important area that merits serious attention is that of Personal Policies. This issue, viewed in the background of how it has been neglected for decades in the ICAR system, is such that causes considerable alarm in the minds of even the most committed young researchers/students who would otherwise enjoy and thrive in the area of agricultural research. For this reason mainly, numerous young scientists who get selected in the ARS, prefer to join Police or Bank or Excise or such other unrelated disciplines (if they get selected) rather than take the risk of joining a highly uncertain career in the ICAR. Many of those who join the ARS do so out of compulsion and are constantly looking for opportunities elsewhere or abroad. Some of them end up leading a nomadic life of post-doc fellows abroad. They prefer that rather than risk serving in the ICAR system.

What needs to be done?

i) Let's follow the five-yearly assessment system, religiously. In fact, let's even consider introducing a provision of three-yearly assessment for fast-track career advancement of any exceptionally brilliant achievers. And let's ensure that we do not use any excuse what so ever to postpone it for years together. In the ICAR, when assessments were taken up recently after a very long gap, almost everybody was promoted to the next higher grade! Such mistreatment of an extremely sensitive issue such as Career Advancement has caused immense damage to the credibility of the system. In turn, it has created an impression that

eventually almost everybody gets treated the same way, no matter what a person's contributions may be. So, the general impression is that just bide your time, be a part of some or the other project, when the time comes, you will automatically move up the next grade, just like everybody else.

ii) Allow a good capable scientist to excel in science and related technology development and application, be involved nationally and internationally in those areas of specialization, rather than be forced to look for some management positions as otherwise his career is blocked. De-link from the UGC system, if necessary. This is a very important area that merits serious consideration. Beyond the S3 level, let there be a more rigorous peer review, but let the scientist continue to flourish and enjoy career advancement opportunities, if he is capable to do so.

iii) In the absence of a better alternative, the five-yearly assessment system must be practiced with utmost seriousness rather than treated merely a ritual. As in the case of filling up positions of management, here also, carefully considered Performa must be developed that critically examines the merits of every single case. Rigorous perusal of this assessment system, with utmost seriousness, can contribute significantly towards human resource development, bringing in all round qualitative improvement. Indeed, the Performa must include a section that considers the obligations of the system in providing the basic amenities, infrastructure and administrative support during the period of assessment. Where institutional inadequacies exist and persist, due considerations must be given to representations from scientific staff for providing the necessary infrastructure facilities or his/her transfer out of that place. Such representations may be accepted directly from the scientist concerned and not necessarily routed through the proper channel. Several such centers have come into existence where some senior scientific staff seek transfers/higher positions, more for reasons of leading a comfortable life rather than for taking up some challenging assignment. And since promotions come to almost everybody at the same time, these people are at no loss, what so ever. For them, it is a win-win system. But for those unfortunate freshly recruited younger scientists who get transferred/ posted to such career-ruining institutions, it serves as a punishment posting. They either suffer no end, or just run away abroad or somewhere, or get converted to this growing clan of caste/region-oriented political recruits who specialize in exploiting the system for personal benefits.

4. That brings up the larger and intricate issue of accountability; accountability at all levels and of all kinds. Let me cite a few typical examples: I) Some programs are declared very important and may receive a lot of financial and administrative support but the same program may be dumped tomorrow and declared useless, without assigning a proper justification for why it was started in the first place and why it is being closed now. On the other hand, some activities may go on for decades despite the fact that they should have been closed down long back. ii) A young, well trained molecular biologist is posted to work in Lac Research Institute, where, at least for the present, there may be no need for initiating a molecular biology program, whereas, his services could be better utilized at another Institution. Iii) In the agriculture research system, there is this peculiar practice of change of national/regional/crop-specific priorities when a new Director

General/Director/Vice Chancellor takes charge!

So, there are many aspects of accountability which merit attention. Accountability is indeed the most important issue. While there are examples of good research programs suffering for want of funds and additional hands, we also have examples of sufficient funds and trained manpower but yet not showing the promised progress/results. Just one example: Despite having pumped in loads of grants from a variety of sources for more than a decade, we still don't have a Bt-cotton transgenic in the Public sector! Reason why? Is there any manner of accountability? Do we know why we haven't succeeded? And yet, we have a fresh Rs 40 crore project on transgenics, now including a lot many crops! Have we come to considered conclusions that we need transgenics for all these crops?

I believe a lot of this can be taken care of, if we have a capable and responsible leadership. That's why I have laid greater emphasis on selection of the top brass of management.

What needs to be done?

i) It's time to review the role of ICAR and the SAUs. Do they really have to do anything and everything concerning agriculture? Let this review team be comprised predominantly of renowned economists, extension specialists, environmentalists and water resource specialists, rather than be dominated by plant breeders and the like. Let me hasten to mention that I say this knowing so well the enormous contributions plant breeders have made and shall continue to make in the years to come. But having said that, it is high time we orient crop improvement programs in a systems approach of integrated resource management.

ii) Isn't it time to join hands with the industry, especially in the areas of definite mutual benefit? Indeed, its time to allow, and in fact promote, public-private collaborative programs. Wherever successful, allow sharing the monetary benefits even with the scientists of the project concerned. This step would go a long way in resource generation, provide the much needed boost to human resource development, and provide critical testing ground for a wide range of technologies and products that we keep making claims about. In the process, the real and the not so real shall stand identified. In China, some 20 years ago, one could see only bicycles in the prestigious Institute of Genetics, Beijing. Today, we see a line up of latest Toyota cars. The Institute has benefited, the Industry has benefited, the country has benefited and even the scientists have benefited. To my mind, this is the main reason that we have Chinese Bt-cotton giving stiff competition to Monsanto's Bt cotton in China. Perhaps more than some money he has made, Prof Sandui Guo, the principal scientist responsible for Chinese Bt-cotton, confesses that he would not have the immense satisfaction of witnessing widespread success of his technology and the product, had his Institute not forged a linkage with the industry.

iii) Stop the current practice of disbursing grants (hard earned public money) to ill-equipped, ill-concieved and sometimes even unwilling institutions, merely because we would like to claim that we are in tune with the fashion of the day, or merely because the grants are there. While a lot more investment is warranted in the area of biotechnology, that

doesn't mean it has to be hurriedly disbursed, without comprehensive planning, or, has to be done at the expense of the other crucial disciplines and without a thorough assessment of what precisely we are looking for. Rather rapidly, good plant breeders, taxonomists and pathologists are becoming an 'endangered species' due to this skewed attention to biotechnology.

Promote interdisciplinary programs. Make sure that grants given are indeed utilized for the intended purpose. Ensure that the programs are rigorously monitored, not only for the progress they are expected to make but also for any hurdles/impediments due to administrative/management inefficiencies. Wherever necessary, enforce the practice of terminating projects mid-way, and make sure the monitoring teams are comprised of personnel of the requisite background and integrity. Wherever appropriate, provide additional support to boost progress. Ensure that the team of scientists, the project personnel, is not handicapped due to inept administrative support, management indifference or interference.

iv) Stop the practice of 'I am directed to direct you' by the directors of institutes/projects/centers. If the Director of an institution has gone through a rigorous selection system, allow him to discharge the responsibility he has been chosen to undertake, himself. Of course, he has got to be aware of the limits of responsibility and the prescribed rules and provisions within the realms of which he has to function. Let him go through a one-month course of administration and management. But then, leave him alone. Interfere only if you must. How come so many directors of ICAR institutes are found hanging around the ICAR headquarter, whereas, CSIR headquarter is so quiet and peaceful? Every year, a team of eminent scientists must review the Institute's, including the Director's, functioning in a strict business-like manner. Critically analyse those glossy annual reports, most of which may contain only some previous work, sometimes many years old, or some mediocre, sometimes unrelated, stuff.

5. So far as the recruitment procedure is concerned, let's first recognize that at present, except for the senior management positions, almost everything is frozen. We have a serious situation in as much as some of the disciplines/divisions at IARI, for example, may have to be closed in a few years because the few scientists left would have also retired. We need to look at this very seriously.

We need to have in place a vibrant recruitment system that undertakes this sensitive assignment with very high level of responsibility, accountability and efficiency. We must consider all aspects of whatever it takes to put such a system in place. I think first and foremost, we need to ensure that such a body/board is free from all kinds of outside interference.

Having ensured that the system has been made tamper-proof, it must work efficiently so as to fill in a vacancy within a maximum period of three months. There may be some delay for the top-level management positions, but in most other cases, there should be no delay in

direct/lateral recruitment of scientists.

We could stay on with the ASRB system for initial (S1 scientist) recruitment as well as for lateral/direct recruitment, provided of course we ensure that it is free from all kinds of interference. As mentioned earlier, carefully developed Performa that considers all aspects of a scientist's competence and performance, must be used for comprehensive assessment.

Ensure that a scientist is given enough opportunities to show his/her competence/talents. Give him freedom to operate his project/sub-project, but of course while monitoring a younger scientist closely, provide him opportunities to gain additional knowledge and skills. Recognise genuine talent and provide liberal doses of moral and even material support, wherever warranted. Ensure that the encouragement is not guided by considerations of caste, colour, region or religion. "Despite your very busy schedule", the leadership must come down frequently to where the action is, personally visit as many research programs as possible and spend quality time to understand the complexities of what all is going on.

Allow freedom of expression; of course, not irresponsible expression. Let the scientists visit abroad, as many as 4-5 times a year. So long as he is invited and paid for by the inviting agency and he is attending a symposium/conference relating to his area of specialization, what is our problem? In fact such freedom will generate a competitive atmosphere and definitely improve the work culture. And why should his case for foreign travel go all the way to the President of ICAR for approval? How come a university teacher can attend any number of seminars/conferences abroad with just the approval of VC but an ICAR scientist has to suffer no end, every time he has to attend some meeting abroad? This must stop immediately. In turn, it will help attract a lot of good talent to the Council who otherwise dread entering a system that treats its human resource with so much of suspicion. What are we afraid of, that he might opt to stay back and work abroad? Let him. After the initial bond period is over, let's leave them alone to decide for themselves. We have abundance of Indian talent within the country and abroad. If we have in place a vibrant recruitment system, we can get the vacancy filled within a matter of three months, perhaps with a better person. I am absolutely clear that if we have a transparent, efficient and caring system in place that promotes talent and hard work, very few would still opt to run away abroad. A few may still do, join a center or an institution that has attained greater excellence in a certain area of specialization. Let them go. Why not? Some of them may like to come back tomorrow and serve the country with greater zeal and start a center of excellence of their own, why not?

TOR VII

Alternative modalities for integrating research and extension at state level.

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The major credit for the success of green revolution in India goes to the Agricultural Research Institutions who developed new varieties of different crops and introduced new technologies to enhance the crop production. It is because of the outstanding research outputs from agricultural scientists that the country is able to ensure food security for the citizens. In spite of such outstanding contribution of the research institutions to agricultural development, these institutions are often criticized for not addressing the needs of the farmers. This is because the technologies developed at these institutions have not benefited a majority of the small and marginal holders who represent about 70% of the farming families. It is believed that most of the small holders were not able to take advantage of the research for promoting green revolution, partly because of lack of communication between the research institutions, extension agencies and the grass root level farmers and partly because of their inability to take advantage of the technologies which needed good quality land, expensive inputs and access to information on processing and marketing. The research institutions are also criticised for the type of research projects undertaken, most of which are not directly relevant to the field conditions. This situation reflects on the communication gap between the agricultural research institutions, extension agencies and farmers.

While planning for agricultural development in the country way back in 60s, it was envisaged that the agricultural universities and research institutions will focus on the research and development of appropriate technologies, which can benefit the farmers while boosting the agricultural production. These institutions were expected to interact closely with the State Agriculture Departments, who are responsible for agricultural extension. Subsequently, the agriculture extension was initiated by the Agricultural Universities as well, on a small scale through pilot projects. The Indian Council of Agricultural Research (ICAR) also promoted agricultural extension through establishment of their field research stations and Krishi Vigyan Kendras. However, the major responsibility of taking the findings from the research institutions remained with the State Agriculture Departments.

Agricultural extension being a two way communication between the farmers and Agricultural Scientists through the network of extension agencies, it was also envisaged that the Field Extension Officers will be maintaining close interaction with the farmers. In this process they were expected to understand the problems of the local farmers and communicate to the research institutions to prioritise their research agenda and provide suitable answers.

Agricultural Extension by State Agriculture Departments

For promoting agriculture extension, the State Governments have established several departments such as Department of Agriculture, Department of Animal Husbandry, Department of Horticulture, Department of Soil and Water Conservation, etc. Among them, the Department of Agriculture being the oldest establishment, has developed a village level network for disseminating new technologies and provide critical services to farmers. The Agriculture Department has posted an Extension Officer at each block head quarters. Under this Officer, Village Level Workers (VLWs) have been appointed, each to cover a few Gram Panchayats. The VLW is the key functionary to provide various support services to farmers. The responsibilities of the VLW included the setting up of field demonstrations to popularise new crops and new technologies to boost agricultural production, apart from collection of field data, compilation of various reports for the district administration, disbursement of inputs and providing technical guidance to needy farmers.

The department has further tried to strengthen the agricultural extension programme by organising training courses for farmers and appointing subject matter specialists to support the technology promotion assigned to VLWs. The department had introduced a special programme known as “Training and Visit”, way back in 70’s, wherein selected farmers were trained on various technologies and subsequently the extension officers and the subject matter specialists visited the fields to provide technical guidance to these trained farmers. However, this programme did not make significant impact, particularly on small farmers, firstly because the VLWs were over-burdened with several administrative responsibilities. Hence, technical interaction with farmers became the last priority. Furthermore, as most of the VLWs with non-technical background, were incapable of addressing the problems of the farmers. The other reason for poor interaction was because most of the technologies promoted were to boost the crop yields through higher volume of inputs, which was beyond the capacity of the poor farmers. In the absence of appropriate technologies for the resource poor, the VLWs also did not interact with them regularly. Thus the resource poor farmers were out of the Research-Extension Network, even where the VLWs were efficient.

The Agricultural Extension Officers based at the Block Development Office also had several responsibilities. This did not leave adequate time or opportunity for them to interact with Agricultural Scientists and provide technical back-up to VLWs. Even at the State level, the Senior Officers of the Agriculture Department, who were supposed to interact with the Agricultural Research Institutions could not maintain effective communication and the Committees, which were created to serve as platform for sharing the scientific knowledge and receive feedback from the field turned to be mere rituals, without serving the purpose. Presently the Research Institutions and the Extension Departments work almost in isolation and deprived of the back up support from each other, which would have enabled them to excel in fulfilling their responsibilities.

Relevance of Agricultural Research

As the Agricultural Extension Agencies were not able to communicate effectively between the farmers and Agricultural Universities, there was a breakdown in the inflow of information on the current problems of the farmers to Agricultural Scientists. Deprived of the information on ground realities, the focus of the research studies undertaken by the Agricultural Research Institutions gradually started losing their focus on the field problems and the research studies laid out were often not relevant to the field conditions, particularly with respect to small and marginal farmers. In fact, even when the scientists interacted directly with farmers, they often met educated and enlightened farmers, who also had adequate resources to maximize the crop yields and profit. Thus most of the studies undertaken by these institutions were aimed at the enhancement of production and profit margins. Such research studies came up with recommendations to make good use of the agrochemicals, high yielding varieties, assured water supply, etc., which were the behind the reach of small farmers.

Problems of Small Farmers: In fact the small and marginal farmers, who most often own degraded lands, are also backward and illiterate. Such people seldom participate in the discussions with the scientists and officials to share their technical problems. Hence their problems are often unheard by the outsiders. Therefore it is necessary to understand the problems of the poor before finding suitable solutions to bring them in the mainstream of agricultural production.

The major problems of the poor farmers are:

- Small land holdings;
- Low productivity of land;
- Lack of irrigation and assured moisture supply;
- Inability to make to make high investments and mobilize finance;
- Unaware of the environmental safety standards and WTO threats;
- Semi-literate and literate;
- Poor linkage with market and information sources;
- Poor quality livestock which are a liability;
- Deprived of technology and superior quality inputs.

As poverty and food security are closely linked with the efficient use of their natural resources, the agricultural research should address these problems on priority. The problems of food security are more serious in arid regions of the western parts and the hilly terrains of northern and eastern regions of the country.

New Extension Initiatives by the Agricultural Universities and ICAR

Realising the inadequacy in interacting with the Agriculture Extension Agencies and farmers, the State Agricultural Universities have initiated several extension activities to interact directly with the farmers. These include Lab to Land Programme, Annual Field Days and Krishi Vigyan Kendras. However, as agricultural extension is not a direct mandate of the universities, these initiatives are restricted to small cluster of villages. The research institutions also have the limitations of financial and human resources to reach larger sections of the farming community.

Presently, there are about 260 Krishi Vigyan Kendras sponsored by the ICAR at one per district, with the mandate to study the local problems and provide suitable answers through field demonstrations and training. However, these institutions neither have answer for the small farmers nor these illiterate farmers can take advantage of the training facilities available by taking initiative to attend to the training courses conducted at the KVKs. Hence, the Agriculture Extension Programme is still largely dependent on the State Agriculture Department. However, like most of the other departments in the States, this department is also facing a major set-back to deliver the extension services, due to lack of financial resources and technical staff, apart from poor interaction with the research institutions. It is therefore necessary to re-establish a close communication network between the Agriculture Research Institutions, Extension Agencies and farmers, particularly the small holders who have not been successful so far in availing various technologies developed by these institutions.

While planning to establish a network to take technology to the poor farmers, it should be kept in mind that most of them have not been taking interest in adapting new technologies, due to many reasons. Probably they are neither aware of their needs nor the opportunities available to enhance their agricultural productivity. Hence the other partners in the network, namely the scientists and the extension specialists should evolve a system to assess their needs and develop suitable solutions. Hence addressing the needs of small farmers is the key issue. For achieving this, we need to spell out the modalities for flow of information from farmers to research institutions, transfer of technologies to the field and feed back on the impact of these technologies in the field.

Strategy to Revive the Linkage

To re-establish the linkage between the farmers, extension agencies and research institutions, we need to take a fresh look at the current situation and establish a network, which can be effective and informal. This can be done in the following ways:

1. Network of Scientists, Extension Officers and Farmers

Establishment of research Advisory Committees at the Research Institutions: Senior Extension specialists, scientists, representatives of Voluntary Organisations (NGOs) and Farmers' Organisations can be nominated as members, who can share their problems and suggestions for formulating the research studies. The committee should devote adequate time to identify the current problems of the farmers and to review the impact of the research studies and technologies disseminated in the recent past.

The State Agriculture Departments can set up Agricultural Development Council/ Committees represented by the farmers' organisations, voluntary organisations, marketing agencies, cooperatives, scientists and experts from different disciplines, at the district and state levels to identify the field problems, disseminate appropriate technologies and review the impacts of these technologies under field conditions. These committees will be helpful to identify the regional problems and help the scientists to design specific studies to tackle them.

Promotion of Farmers' Associations/ Organisations for different crops: With a view to organise common services for procurement of inputs, promotion of new technologies, post- production processing and marketing of the produce, Growers' organizations for important crops be promoted by the State Agriculture Departments. The Research Institutions and Agricultural Universities should have close communication with these organizations to understand their problems and find suitable solutions.

2. On-farm Research

The research institutions can take up on-farm research either directly or in collaboration with the State Agricultural Departments, Voluntary Organisations (NGOs) and Farmers' Organisations, on important topics, based on the problems encountered by the local farmers. The research institutions may also establish Field Research Stations and post their scientists to carry out on-farm research trails in collaboration with the local voluntary agencies and farmers. Such studies will also serve as field demonstrations and farmers can directly adopt these technologies on their fields, without any hesitation.

The Agricultural Extension Officers based in the block can also be involved in laying out on-farm research studies. This will sustain their interest in adapting modern technologies for wider replication. Joint Research studies can also be initiated by the research institutions by collaborating with the State Agricultural Department, KVKs, local voluntary organisations and Framers' Organisations.

With direct involvement of the scientists in on-farm research and interaction with the farming communities, the research institutions will be able to effectively identify the field problems and search suitable solutions.

3. Identification of Research Priorities

As the small farmers were not able to take full advantage of the agricultural research so far, it is necessary to identify their problems and solve them on priority. Some of the current problems of small farmers related to agricultural production are listed below:

- Agri-horti-forestry models for degraded lands in different regions;
- Economics of mixed farming with different species of livestock;
- Farming systems for arid and desert regions;
- Selection of suitable varieties of fruit and vegetable crops for processing;
- Economics of aromatics, medicinal and cash crops for wastelands and arid lands;
- Economics of low external input sustainable agriculture;
- Organic farming: Economics and impacts;
- Impact of bio-pesticides and bio-fertilisers;
- New varieties of food crops for stress conditions.
- Impact of WTO on Indian agriculture and strategy to overcome this threat.

The above list indicates the need for taking up multi-disciplinary research to address interdisciplinary problems. As the success of technology transfer is heavily dependent on the delivery system and motivation of the farmers, research should also be undertaken to strengthen these areas. This calls for collaboration between agricultural scientists, social

scientists and management professionals to develop suitable delivery mechanism and establish an efficient communication channel for free flow of information between farmers, extension officers and scientists. Identification the problems should be a continuous process and modalities need to be developed to ensure a free flow of inputs from farmers.

4. Dissemination of New Technologies and Communication with Farmers

The research findings of various studies carried out by the research institutions can be disseminated in the field through meetings with the Agriculture Department and Farmers' Organisations as well as by organising annual field days. User friendly documents should be published in local languages to popularise new technologies and innovations.

Mass communication media such as newspaper, radio, TV, etc. can be used effectively to disseminate the research findings from time to time. The Agricultural Universities and the Research Institutions should be given fixed time by the state owned radio and television stations / channels every day or few days in the week to disseminate the knowledge, relevant and useful for the current seasonal field operations. Presently the research institutions do have the direct responsibility to manage these programmes and hence their interest is limited to guest lectures. With the proposed assignment, these institutions will have to take the responsibility of identifying the current problems and find suitable solutions.

The research institutions should be encouraged to set up their website to display their technologies and to receive questions from extension officers and farmers. The small farmer may not have access to this facility in the initial stage, but gradually they will also follow the elite farmers, once they are convinced of the benefits.

Linkage with field level voluntary agencies can be established and their representatives can be invited to interact with the scientists of the research institutions periodically to share the problems and solutions.

The above suggestions can be implemented immediately without heavy financial burden, using the available human resources. This strategy can be reviewed periodically to improve the network stronger in due course.

Report of the Sub-Committee meeting of the Task Force on Revisiting Professionalization of Agricultural Research

The Sub-Committee meeting of the Task Force on revisiting Professionalization of Agricultural Research formed by Prof. M.S. Swaminathan the Planning Commission under the Chairmanship of Dr. V. Prakash with the members Dr. Bamji and Dr. Raina met at NAARM, Hyderabad to discuss the various points with the Heads of several agricultural institutions (as in Annexure - A) in and around Hyderabad alongwith the Director and Senior Staff of NAARM in addressing the issue of ***“Professionalizing skill management to provide administrative support to R&D and suggest ways for weaning management from Civil Services bureaucracy”*** as indicated in the TOR for the committee by the Planning Commission and Chairman of the Task Force.

Mr. Hegde could not attend the meeting due to pre-commitment.

The meeting opened with welcome remarks by Dr. Samanta, Acting Director of NAARM and the input regarding the various discussions he had alongwith his colleagues. The chairman requested each one of the Directors who were present there from the various institutions to briefly mention the points that committee could consider in putting forward its views to the main committee under the Chairmanship of Prof. M.S. Swaminathan about the subject matter. Many scientists felt that the existing systems, which have evolved over the years are by and large satisfactory but there is scope for improvement, for better functioning of ICAR.

Macro areas that emerged were that of recruitments, assessments, planning and monitoring of projects, administrative and financial aspects and training and retraining for the smooth functioning of the research projects and for timely reach out. The details are as given below:

1. Recruitments

- It was felt that the recruitment process till the level of Principal Scientist could be decentralized with the various institutions, atleast to begin with the 5 major research institutions under ICAR and combining wherever the case may be in case of other smaller R&D institutions in such a fashion as the strength not to exceed the allotted. For such decentralized system, a member of the ASRB can be present and the Director with appropriate approvals of his councils can have external members and the committee can select the candidates with a clear mandate of the candidate knowing fully well to which organization he belongs if he is selected obviously following the rules and regulations and other Government of India requirements within the charter of that institution such that the recruitment is done at a rapid rate.
- In the case of Directors, Zonal Directors, DDG's etc. this can be continued to be done at the level of ASRB but there must be also a provision of nomination for these posts which can be considered by the appropriate committees. Such

systems are in vogue in CSIR and other organizations. Only people of established credentials can nominate. This can be considered in the larger interest of the organization.

- ASRB itself must be reorganized, refurbished and made totally autonomous; free from the present 'guidance'/interface of the ICAR and the Ministry of Agriculture. Besides, the present easy-go system of recruitment must be revitalized so that the existing backlog of more than 1,000 vacant posts are speedily filled. In fact, the process of recruitment should start about six months ahead of the due date of a scientist's retirement and completed by the time the scientist relinquishes charge.
- In terms of lateral entries especially for people who are qualified and where newer areas have to be explored by ICAR, they should look at methodologies like Quick Hire System of CSIR where the Director of the laboratory in consultation with his council can offer the position of Quick Hire. The concerned person can start his work with a support of initial core budget of the respective research institutions and later on follow the procedures and can be hired into the system based on advertisement. However, due processes within the Institute must be developed so as to ensure that the provision is not misused. This way new blood gets incorporated rapidly in the system which will help in better augmenting the latest in R&D and cutting edge science across divisions, areas and newer concepts can flow through.
- Currently there are five National Professors in the ICAR system who are being appointed at different points of time. Considering the fact that there are nearly ~ 6200 scientists in the entire system, perhaps the number of National Professors (or even Senior National Fellows) can be increased to 25 – 30 keeping in view of the diversity of research and specializations and needs revisiting of the existing Policy on this. This would help to remove at least part of the stagnation at higher levels and also will pave way for promotional avenues for meritorious candidates in the system. More of such positions should be filled in by active researchers and experienced staff apart from only from the top management.

2. Assessments

One of the major points that emerged out of discussion was - the current rules and regulations for assessments do not permit distinction between the performers and the non-performers in the scientific arena. Most of the people in the committee felt that this tends to demotivate the performer if after some time. Therefore there must be recognizable and timely incentive for scientist who performs. It was also recognized that the additional salary per year that Principal Scientist draws in the scale of 16400 – 22400 is irrespective of his performance in the current scenario. It is automatic and there are no checks and balances for distinguishing once again the performer to the non-performer. This may be due to adopting the UGC pattern of these slabs. While the system may be very

comfortable for the non-performers, however, it is proving to be detrimental to the long-term and larger interests of the Council and the Nation.

Keeping this in view considerable discussion followed and it emerged that similar to the CSIR system of recognizing the threshold marks which is earmarked for publications, patents, Ph.Ds produced, processes, products, innovation in equipments, extension services, reach out to farmers and growers, societal missions undertaken etc. certain amount of quantifiable can be made available to the scientists to enable them to know if they will reach that threshold or not within the period of the first attempt of three years. If they don't reach that threshold, then they need to do so within the next year and then again to be considered for entry into assessment and the pressure of performance and pressure to recognize, both will mount. This way obviously the merit gets recognized from the non-merit or the non-performers and it will be self-motivation for the scientist to work and go through the system. In other words even to enter into the assessment arena, the thresholds have to be reached. This will reduce the number of candidates appearing for the assessments since those who do not reach the benchmark grade will automatically drop out. At the same time perhaps one can pick-up the meritorious out of the merit and that would give the right signal to the entire system. We should fulcrumize all these into a proper perspective. Perhaps the ICAR should form a mega committee to revisit the entire system of assessment based on the above principle so that the merit gets recognition and there is a clear distinction between the performer and the non-performer. However perhaps the present UGC system being tuned to the ICAR does not distinguish clearly the performer to the non-performer through benchmarking in a way overall there may be good acceptance but can be leveraged better by the above suggestions and even setting up short term efficiency indicators if at all this system has to stay on. Otherwise it requires a total revisiting.

3. Planning & Monitoring of Projects

Many of the problems are arising in implementation of projects after the money is received, because Finance or the Administration raises several queries, which the scientists or the project leader feels is an inhibitor to the performance of the project. Perhaps like in CSIR today, this can be solved if the entire project whether it is going to ICAR or to external agency for funding is discussed with the administration and finance, so that there is no communication gap and future queries. In fact administration and finance can provide friendly advice and guidance in terms of their areas of expertise while formulating the project and signatories of the administration and finance can become a part of the project as ex-officio members and are also committed for the various details that go into the project such as equipments, staff, hiring of personnel, other expenditures, consumables, travel etc. This is very important to prevent a fate accomplished and the stalemate later on. This procedure before the project goes for funds would prevent what is today termed as "bureaucratic delays" and also would make the administration and accounts equally responsible and committed for the deliverables of the project. This would include the stores personnel who in today's domain of ICAR fall in the general administration.

One of the main reasons for non-delivery or delayed delivery in several of the projects has been the rather casual way in which the planning is done and the less rigorous way of monitoring. There should be quantifiable goals for monitoring not only the scientific aspects, but also the financial aspects, in which finance and administration can play a role. A micro system of weekly monitoring by the project leader, monthly monitoring by the Institution and six monthly monitoring or annual monitoring at the central level by the director with his colleagues and with external experts should be developed. Proper documentation perhaps through Quality Management System such as ISO 9001 may also be thought over on this process of documentation, which may be so important in intellectual property and other important areas of the quality management.

4. Administrative and Financial Aspects

The Finance Officer and the Administrative Officer of NAARM were invited for the meeting and several generic issues were discussed. Some of the suggestions that emerged are as follows.

- ICAR must digitize the finance so that the Head Quarters has an access on an online basis of the financial expenditure and even extra budgetary resources almost on a day-to-day basis to be dynamic in the current trend and scenario of IT. This has given wonderful dividends in CSIR over the past ten years.
- Financial freedom to the institute is required in terms of a macro budget being allotted and the Institute Director alongwith his senior colleagues and councils must be able to decide what they want. Unless that dynamism is kept in the system, research cannot be planned couple of years ahead, as it is a dynamic process and that freedom is what is going to perhaps make the difference for tomorrow's ICAR.
- Each project must be having its own financial package whether the money comes from ICAR or other extra mural funding agency. It should integrate into the four major heads under which one operates. In other words, all funds should be operated in project mode. Also the entire team must be defined to be on value addition for the finance for retrieval and for accountability in terms of people working as well as the management to look at the expenditure profile on a projectization with online basis if it has to transcend at all levels for clarity of purpose. Of course the modus operandi has to be clearly defined in terms of passwords etc in the system. Today such a system is not existing for ICAR funds but it does partly exists for other funds such as World Bank, NATP in ICAR itself. Why can't this be done for ICAR funds also?

5. Training & Retraining

When it comes to Skill development for Management especially at the middle level, apart from the top management, a necessity was felt for continuous training not only what NAARM is giving today but also to ensure functional competency for management of middle level individuals for future leadership. This will ensure that scientists who go through assessment promotion on the basis of scientific merit are also ready with managerial skills.

In this connection, it was felt even the Directors of the Research Institutions as and when they are appointed must also under go management training because many a times this ends up as a lacuna in terms of their knowledge of administration, finance, purchase, GFR rules and many other protocols which the Head of the Institution must know. In today's scenario, he / she would learn it the hard way, on job, over a period of time and that incubation time can sometimes extend to 4-5 years. NAARM must also be focus to training top managers by cross ventilating faculty from various other scientific institutions such as CSIR, DAE, ICMR, IIT's and IIM's. At the same time focus should be on ICAR set of rules and regulations to remove shackles of do's and don'ts. There should be clear mandate of progressive alliance of inter-departmental networking and decision making process which must ensure the word "Quicker" and not "slower".

The Summary

This entire process should recognize and attempt decentralization, prioritization and accountability with responsibility and structural changes with a mandate of performance in making the entire system, of not only the scientists and the middle level and top management but also the administration and finance to be partners in the spiraling responsibility as the scientific and technical hierarchy as we look at these 46 ICAR institutions and 38 agricultural universities. Most importantly performers have to be encouraged and merit recognized which the present system is devoid of to a large extent. The benchmark has to be scientific and technical competence for moving to higher positions. This demands a long term HR planning. Professionalising skill management, therefore, is the most important issue today for ICAR. The committee also recognized the wonderful infrastructure and the fact that already many of the processes are in place and are working well. One should not get the idea that everything has to be revamped. Infact, cutting across the various discussions most of the people were of the opinion that nearly 70% or so of the existing systems have evolved over a period of time with distilled knowledge and perhaps it is that 25 -30 % incremental but radical improvement that would catalyze and put ICAR into higher orbit of performance. If these are looked at with a strict monitoring and evaluation process in place, perhaps a large amount of the professionalization would come into providing the needed support for the scientists for the delivery of the goals in the National projects for better reach out.

The meeting ended with vote of thanks by Dr. D.M. Hegde, Project Director, DEWAR to the Chair and Members of the committee and all those who participated.

Minutes of the First meeting of Task Group on Revamping and Refocusing of National Agricultural Research held on 21.10.04 at Yojana Bhavan under the chairmanship of Dr. V.L. Chopra, Member, Planning Commission.

The first meeting of the Task Group on Revamping and Refocusing of National Agricultural Research was convened on 21.10.2004 at Yojana Bhavan under the chairmanship of Dr. V.L. Chopra, Member, Planning Commission. The list of participants is annexed.

2. Dr. M.S. Swaminathan, Chairman of the Task Group could not participate in the meeting for some unavoidable preoccupations. Keeping in view the time frame given to the Task Group and the expectations of Government, he advised Prof. Chopra, Convener of the Task Group to call the first meeting to crystallise the ideas of the members on the terms of reference.

3. At the outset, Dr. Chopra welcomed the members and apprised them of the genesis of this Task Group, as also the significant role the task group has to play in revamping the agricultural research system of the country. Although the contribution of National Agricultural Research System (NARS) have been applauded for bringing several agro technological revolution in the past four decades, it is now felt that some kind of complacency has set in at various levels. In the current age, the demands on the agricultural research system are undoubtedly different to cater to such demands, there is a pressing need to make the NARS more focused and responsive.

4. Dr. Chopra informed that the scope of different terms of reference outlined for the Task Group is not confined to ICAR but the entire NARS. He also brought to the notice of the members that the final report of the Task Group has to be submitted by the end of December, 2004 instead of October 2004 as communicated earlier. Thereafter, he invited the views of members on various issues included in the terms of reference (TOR) and also sought their advise as to how to deal with the TOR in a systematic fashion.

5. Prof. Madan emphasized that agricultural research should be oriented towards development of resources keeping in mind the need for conservation and cost effective technologies. At present, depletion of natural resources has emerged as a serious threat for the entire agriculture sector. Increasing cost of inputs reduces the competitiveness of Indian farm produce in global markets. He expressed surprise that the recruitment and promotion of research staff is personal oriented rather than farmer or client oriented. This leads to waning of interest of research personnel to work with and for farmers.

6. Dr. Alam was of the view that the present Task Group should take into account the recommendations of earlier committees constituted for similar kind of job. There is need to identify major ailments of NARS, leading to its failure to deliver vis-à-vis expectations. Now the expectations of the society from

agriculture are not restricted to just raw food and allied products but post harvest processing and value addition has become equally important. One of the major concerns of the day is growing detachment of rural youth from farming, as they find it a less profitable profession. Therefore, profitability as well as round the year employment (both on farm and off farm) has to be ensured. He wanted hastening of decision-making process and identification of the threat perception, that interfere with decision making in different research organizations. For instance, undue political interference has become a major problem in functioning of state agricultural universities (SAUs). Another issue raised by him was related to a communication gap within agriculture sector; Departments/Ministries dealing with the agriculture, food, agro-chemicals etc., work in isolation as far as identification of researchable issues and implementation of programmes are concerned. He suggested that there should be a unified approach to agriculture sector.

7. Dr. Yadav found the Task Group very timely as it is constituted at the beginning of the century. He also stressed on improving the accountability of NARS and its capacity building, giving due cognizance to the recommendations of any previous committee/group. He wanted that the transparency of NARS need to be improved to enhance the accessibility of information to the public. There is also a need to strengthen linkages and cooperation at sub-regional/regional/international levels.

8. Dr. Chopra finally discussed with the members the modus operandi of the Task Group. In order to derive focused views and recommendations of the members, they were requested to accept responsibility of drafting reports/recommendations pertaining to each item/aspect of the TOR as indicated below :

- I. To suggest methods of strengthening strategic research involving frontier science and technology.
-Dr. V.L. Chopra
- II. To suggest methods of anticipatory research keeping in view the challenges of variation in monsoon behaviour/climate and to foster crop-livestock- fish integrated farming systems and to enhance the productivity and profitability of rain-fed, semi-arid, desert, coastal and hill areas. -
- Dr. Y. S. Yadav
- III. In order to professionalize skill management, suggest ways for weaning management from civil service bureaucracy.

-Dr. V. Prakash

- IV. To examine the present funding system of agricultural research and suggest suitable changes (e.g. Competitive Block Grant, Project-based Funding etc).
-Dr.M.L. Madan
- V. To propose steps for making agricultural research sensitive to emerging scenario of home and external trade (with particular reference to WTO agreement on agriculture).
-Dr. Anwar Alam
- VI. To examine the present system of scientist recruitment and human resource development policy and suggest measures to attract and retain good scientists taking into account the recommendations made by recent review committees. Because of distortions in personnel and incentive policies, the system has become rigid and opaque, and both central and state systems have resorted to highly straight-jacketed recruitment, and omnibus time-scale approaches for advancement. Suggest ways of removing such distortions.
-Dr. S.K. Raina
- VII. To suggest alternative modalities for integrating research and extension at state level.
-Dr. N.G. Hegde
- VIII. To suggest methods of developing strategic partnership among ICAR, CSIR, DBT, ICMR, DST, DRDO, MNES and Private Sector R&D institutions, so that a dynamic National Agricultural Research System involving both public and private sector research emerges. Also suggest methods of involving Panchayati Raj institutions in technology incubation and verification, participatory research and knowledge management.

-Dr.Maitreyi Krishnaraj

Dr. Chopra requested the members to submit a base paper on the aspect (TOR) allocated to them latest by 5.11.2004, so that the same could be placed for discussion before the group during the next meeting. He requested that the suggestions/recommendations must be clear and unambiguous and feasible for immediate implementation by the Government.

9. The group felt that suggestions of working researchers of NARS, fellows of NARS/INSA, farmers Organisations and Agricultural correspondents should also be invited on different aspects of the TOR through e-mail.

The meeting ended with a vote of thanks to the Chair.

Attendance sheet

Prof.V.L. Chopra, Member, Planning Commission In the chair

Task Group

1. Dr. Y. S. Yadav, Director, Bay of Bengal Programme, Chennai Member
2. Dr. Anwar Alam, Vice-Chancellor, SKUAT, Sri Nagar Member
1. Prof. M.L. Madan, formerly DDG, Animal Science) and Vice-Chancellor Dr. Punjab Rao Deshmukh Krishi Vidyapeeth, Akola Member

Planning Commission

2. Dr. Vandana Dwivedi, Jt. Adviser, (Agri.)
3. Sh. Vijay Kumar, Director, ,(Agri.)
4. Dr. N. Das, Dy. Adviser, (Ani. Husb.)
5. Dr. Hari Das, Dy. Adviser, (Fisheries)
6. Dr. Ramanand, R.O. (Agri. Moni.)

Minutes of the 2nd Meeting of Task Group on Revamping and Refocusing of National Agricultural Research held on 8.11.2004 at Yojana Bhavan under the Chairmanship of Dr. M.S. Swaminathan, Chairman of the Task Group.

The 2nd Meeting of the task Group on Revamping and Refocusing of National Agricultural Research was convened on 8.11.2004 at Yojana Bhavan under the Chairmanship of Dr. M.S. Swaminathan. The list of participants is annexed.

2. At the outset, Dr. Chopra welcomed Dr. M.S. Swaminathan, Chairman of the Task Group for holding the second meeting of the task group and apprised him about the outcome of the first meeting held on 21.10.2004. He informed that the members were given the responsibility of preparing a base paper on the items of terms of references assigned to them. The base paper would be then utilized for developing draft report of the Task Group. As per decision taken in the first meeting of the Task Group, specific suggestions were invited on different terms of references from organisations and personnel within NARS as well as outside the NARS. The purpose of this exercise was to have creative ideas for revamping and refocusing of National Agricultural Research, so as to help the Task Group arrive at logical recommendations. For this, more than 700 personnels having vast experience in research/development/farming, etc. were contacted through e-mail, out of which some 67 responses were received. The suggestions against different terms of references were compiled and circulated to the Members.

3. Dr. Chopra brought to the notice of the Chairman that Dr. Maitreyi Krishnaraj, Ex-Vice-Chancellor of SNDT, Mumbai could not be contacted. She might not be even aware of her nomination as a Member of the Task Group. Dr. M.S. Swaminathan, Chairman advised to opt Dr. Jayati Ghosh, Chairman Andhra Pradesh Agricultural Commission as a Member in place of Dr. Krishnaraj. Being a front line economist, she may contribute sizeably to the Task Group. Dr. Chopra suggested that Ms. Mehtab Bamji could also be opted as one of the Members, if she accepts the offer. He wanted that the terms of references and other relevant documents may be sent to both the co-opted Members.

4. The Chairman, suggested that some immediate action points may be finalized as an interim report by the middle of December, so that the same could be reflected under NCMP for the regular budget 2005-06. The final recommendations may include medium to long term policy initiatives on the re-structuring, personal policy of the scientists, transfer of technology to bridge the wide gap between researchers and farmers productivity, need for region-specific research, gender sensitivity in agriculture research, role of ICAR in maintenance of quality standards particularly in respect of seed, bio fertilizers, bio pesticides, fertilizers, etc. He emphasized the need for bringing in gender specificity in agriculture research as the women are increasingly shouldering the farming responsibilities, particularly in hilly and tribal areas. For this even a North East cadre (including Himalayan belt) under ARS system can be created to attract more and more local women and retain them in the region. He mentioned that Dr. Bhagel, Vice Chancellor of CAU, Imphal has informed that very capable young lady scientists were working in north-east region who should be retained in their particular locales.

5. The Chairman emphasized the need to build a cadre of creative Scientists/Professors in agriculture and allied sectors. He recommended to refer to MacArthur Foundation.

6. Dr. ML Madan, Member, Task Group suggested to identify the critical parameters so that strategic research would be undertaken in order to increase agricultural production, productivity, etc. with sustainable management of natural resources. He pointed out that the livestock development is not getting due attention, though it contributes substantially in farm economy. He suggested to emphasize on the issues of landless and marginal farmers, which constitute 58% of population. Arid zone and dry lands should also receive greater attention in agricultural research.

7. Dr. V Prakash, Director CFTRI Mysore suggested for (i) consolidation of work done so far, and digitization of information for easy accessibility; (ii) cutting edge technology from bottom to top approach so as to link end users from the beginning of strategic research; (iii) Identifying dynamic youngsters to assign short term and long term strategic research; (iv) strategic research for enhancing shelf life of produce through primary processing at the farm itself and (v) bringing in some kind of accountability in agriculture research.

8. Dr. YS Yadava, Member, Task Group stated that no attempt on anticipatory research in fisheries have been made so far, and stressed the need for strategic research in capture fisheries. He was also of the view that climatic changes have a great impact on fisheries as in the case of the effect of the phenomenon viz. El-nino on anchovies fisheries, the negative impact on fisheries in the Bay of Bengal region due to monsoon failure since major river systems flow into the region. He also suggested that the aqua culture hotspots should be attended and we should not allow it to remain stagnant. We are still depending on capture fisheries for brood stock from the wild for development of hatchery system, especially in coastal aqua culture. No major emphasis is made on domestication of brood stock, development of feed technology for successful aqua culture since the raw material like rice bran is not available easily. Although he technology for poly culture with six species has been developed, it is not practiced at farm level where the culture is oriented to best price species. A symbiotic approach involving ICAR institutes and state universities was also suggested on strategic and anticipatory research in fisheries. He pointed out that the post harvest losses in fisheries are estimated at 30% of the fish harvest due to lack of adequate processing and marketing infrastructure. To a query raised by Adviser (Agriculture) regarding further enhancement in fish production, he clarified that while the production from marine sector is to be maintained at sustainable level, the vast scope for fish production from reservoirs is yet to be exploited.

9. The Chairman emphasized the need for national perspective on strategic and anticipatory research in fisheries in the Universities, CSIR and private sector laboratory besides ICAR. On Dr. S K Raina's view on the inputs received from Members, the Chairman suggested to take cognizance of what has been done so far and also to

crystallize them for strategic research besides networking to find out the best ways to proceed. He also pointed out the budgetary implications of networking on bio-spheres, geo-sphere programme, etc.

10. Dr. Chopra, Convener Task Group opined that creative research would come out of individual thinking. A national fellowship programme besides, creating a school to provide a Center of Excellence to build up and maintain research ideas of magnitude should be put forth. A concerted effort among ICAR and SAUs was needed to take up eco system research as a priority area. He also suggested creation of apex system for basic and strategic research at national level, and clear cut distinction in mandate of central institutes and SAUs.

Summing up the discussions, the following action points were suggested :

- (i) Setting up a National Board for strategic research in agriculture and allied sector after anticipating the problems. The Board should contain four/five members with vast experience to render precise suggestions.
- (ii) Sending the list of 150 districts identified for employment generation in agriculture and allied sectors to the Members for suggesting suitable programmes for these areas.
- (iii) Certain amount of funds should be earmarked for O&M reforms and encourage retention of good scientists in this system.
- (iv) As one of the terms of reference of Task Group is to recommend, steps for making agricultural research sensitive to emerging scenario of home and external trade with particular reference to WTO agreement of agriculture, the Chairman suggested to refer WTO issues pertaining to agriculture. In this regard he also suggested to refer the reports of Government of Maharashtra as well Government. of Kerala on WTO issues with a state specific focus.
- (v) Circulate the recommendations of four earlier committees namely, (i) report of Tata Consultancy, (ii) KV Shastri Committee; (iii) GVK Rao Committee; and (iv) Prof. Anil Gupta Committee, who had examined some of the issues common to the ToR of the Task Group.

The meeting ended with Vote of Thanks to the Chair.

Attendance sheet

	<u>Task Group</u>	
1.	Dr. M.S. Swaminathan, Chairman	In the Chair
2.	Prof.V.L. Chopra, Member, Planning Commission	Convener
3.	Dr. Y. S. Yadav, Director, Bay of Bengal Programme, Chennai	Member
4.	Dr. S.K. Raina, Chief Adviser, Nath Seeds Ltd., Aurangabad, Maharashtra.	Member
5.	Prof. M.L. Madan, formerly DDG, Animal Science and Vice-Chancellor, Dr. Punjab Rao Deshmukh Krishi Vidyapeeth, Akola	Member
6.	Dr. V. Prakash, Director, CFTRI, Mysore, Karnataka	Member
	<u>Planning Commission</u>	
7.	Shri S.K. Roy, Adviser (Agri)	
8.	Dr. Vandana Dwivedi, Jt. Adviser,(Agri.)	
9.	Dr. N. Das, Dy. Adviser, (AH&D)	
10.	Dr. Hari Das, Dy. Adviser, (Fisheries)	

Minutes of the 3rd meeting of Task Group on Revamping and Refocussing of National Agricultural Research held on 24.11.04 at NYojana Bhawan under the Chairmanship of Dr.M.S.Swaminathan.

The 3rd Meeting of the Task Group on Revamping and Refocussing of National Agricultural Research was convened on 24.11.04 at Yojana Bhawan under the Chairmanship of Dr.M.S.Swaminathan. The list of participants is annexed.

The meeting was initially chaired by Dr.V.L.Chopra till Dr.M.S.Swaminathan, Chairman, Task Group joined in the afternoon. Various issues related to organizational structure, management, leadership, personal policies, accountability etc., of the NARS have been discussed at length. Following important suggestions emanated out of the discussions.

i) At present ICAR is a highly centralized system with very little scope for any decision making on crucial issues at institute level. This brings inefficiency and undesirable delays in organizing/executing projects because even trivial matters are dealt with at the Head Quarters (HQ). In such a centralized system, power centers and vested interests have evolved over time. Stripping-off of the power centres is possible only with decentralization. The vested interests discourage decentralization on one or the other pretext, despite strong recommendations of the Committees/Task Groups constituted from time to time.

ii) This Task Group, in line with the recommendations of earlier Committee's headed by Dr.G.V.K.Rao, Shri Hemendra Kumar, Shri K.V.Shastrri, should also recommend decentralization of powers and decision making in ICAR/DARE.

iii) The HQ of ICAR has become undesirably crowded with too many Senior Officers and staff. Once the jobs to be carried out at the institutes and HQ are redefined in a decentralized manner with more powers and accountability assigned to the institutes, there would not be any problem in managing the affairs at the apex level efficiently and that too with a lean and thin officer/staff strength.

iv) There is need to foster leadership at the institute level. The Research Management Positions (RMPs) like Heads, Project Coordinators, Directors should inculcate in themselves the capability to exploit the maximum potential of scientists to meet the mandate of the division/project/institute. For this, thoroughly sketched orientation programmes need to be designed for RMPs, and it may be made mandatory for all RMPs to undergo such courses on regular basis.

v) The recruitment and promotion procedures have to be made transparent. In promotions, the performing scientists have to be differentiated from the non performers, so as to retain their zeal to work. Otherwise the work culture and professionalism will continue to erode, taking the NARS to a point of no return.

vi) The role of RMPs should be to facilitate the research, and not sharing undue credit of the research out put of the scientists working under their administrative control.

The actual researchers must receive credit and recognition for their contribution and the system should not come in their way. This will infuse new thinking and creativity in the youngsters, and encourage the retention of good scientists in NARS.

vii) The researchers should be provided with some kind of financial powers and liberty so that the research does not suffer for want of financial sanctions etc., of even small amounts. They must however, receive short orientations and training in financial procedure so that they stick to extant financial rules in utilizing their powers to meet the exigencies of research work.

viii) At present, NARS lacks accountability, the researchers must be made accountable in terms of the achievement of targets set for them on yearly basis. The career advancement need to be strictly linked with performance for which criteria should be set in advance.

ix) The bureaucrats associated with NARS need to undergo appropriate reorientation programmes specially structured for them, so as to enhance their understanding about agricultural research/education/extension, and enable them take rational decisions. Selected scientists also should undergo managerial training, particularly in finance & O&M.

x) The system demands a constant vigil to prevent and curb all kinds of corruptions, be they in recruitment, promotion, works or stores. The internal vigilance mechanism need to be strengthened so that the acts of commission and omission are identified quickly and dealt with sternly.

xi) The network of ICAR institutions is expanded so much that the mandate of different institutes have become overlapping, leading to repetition of research. There is need to redefine the mandate of institutes and develop a computerized information network to avoid any duplication of research.

xii) National Academy of Agricultural Research and Management (NAARM) should be made a more dynamic forum to identify and synthesize changing research needs, and impart necessary training/refresher courses to the scientists.

xiii) The Chairman suggested to set up a small group consisting of Dr.V.Prakash, Director, CFTRI, Dr.N.G.Hegde, President, BAIF Development Research Foundation and Dr.S.K.Raina, Nath Seeds to go into the details of the present system of recruitment and consider to implement a system on the lines of the one prevalent in National Institute of Rural Development, Administrative Staff College and other renowned institutes which are imparting advanced training.

The group as mentioned above may meet at NAARM and discuss with the scientists there the kind of recruitment and assessment policies that may be required to attract and retain brilliant scientists in NARS and also encourage the scientists working abroad to return

back and work with NARS. The policies so evolved should make the system a vibrant one with high professional output.

Annexure

Attendance sheet

Task Group

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|-----------------------------------|--|--------------|
| 1. | Dr. M.S. Swaminathan, Chairman | In the Chair |
| 2. | Prof.V.L. Chopra, Member, Planning Commission | Convener |
| 3. | Dr. Anwar Alam, Vice-Chancellor, Sher-e-Kashmir University of Agricultural Sciences and Technology, Srinagar. | Member |
| 4. | Dr. S.K. Raina, Chief Adviser, Nath Seeds Ltd., Aurangabad, Maharashtra. | Member |
| 5. | Prof. M.L. Madan, formerly DDG, Animal Science and Vice-Chancellor, Dr. Punjab Rao Deshmukh Krishi Vidyapeeth, Akola | Member |
| 6. | Dr. V. Prakash, Director, CFTRI, Mysore, Karnataka | Member |
| <u>Planning Commission</u> | | |
| 7. | Shri S.K. Roy, Adviser (Agri) | |
| 8. | Dr. Vandana Dwivedi, Jt. Adviser,(Agri.) | |
| 9. | Dr. Hari Das, Dy. Adviser, (Fisheries) | |
| 10. | Dr.Ramanand, RO (AM) | |

Minutes of the Fourth Meeting of the Task Group on Revamping and Refocusing of National Agricultural Research and Special Meeting of the National Commission on Farmers held on 23rd December, 2004 at NAAS Conference Room, NASC Complex, New Delhi under the chairmanship of Dr. M.S. Swaminathan.

The Fourth Meeting of the Task Group on Revamping and Refocusing of National Agricultural Research was jointly convened with National Commission on Farmers on 23rd December, 2004 at NAAS Committee Room No. 1 NASC Complex, New Delhi under the chairmanship of Dr. M.S. Swaminathan. The focus of the meeting was to forge S&T consortia for a **Engendered Sustainable Livelihood Security Movement in Rural India**. Vice Chancellors and representatives from different Agricultural and Open Universities, institutions like BARC, CFTRI and ICRISAT, banking institutions – NABARD, SBI, NGOs like BAIF and private sector companies like Tata Steel and Microsoft were represented at the meeting. The list of participants is annexed.

At the outset Dr. M.S. Swaminathan, Chairman Task Group and Chairman, National Commission on Farmers, welcomed members and participants and explained the purpose for which the meeting had been convened. The aim of getting together a range of participants from across the country was to discuss and develop a framework for strategic partnerships for sustainable development and examine how the landed and the landless poor could be technologically empowered in the areas of value addition, production and post harvest technology. At the end of the day, it was hoped that it would be possible to form consortia for each of the 150 most backward districts identified by the Planning commission for the Employment Guarantee Programme in the initial phase. The participating organisation / institutions had been requested to present their views from that perspective. He drew attention to Panchayati Raj Institutions. He mentioned that Panchayati Raj Institutions should be involved in a social engineering aspects of group endeavor in eco-agriculture, since under article 243(G) of the 11th schedule of the constitution 73rd Amendment Act(1992), agriculture including agriculture extension has been listed as the very first responsibility of Panchayats.

He explained the indicators used for identification of the 150 economically and environmentally under-privileged districts for initiating the Employment Guarantee programme, in order to alleviate acute deprivation and distress. These districts fall in the States of Andhra Pradesh, Assam, Bihar, Chattisgarh, Gujarat, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal. This programme currently structured as a National Food for Work programme was initiated by the Prime Minister in Andhra Pradesh on 14 November 2004. This initiative is a significant contribution to achieving the goal of a hunger-free India by 15 August 2007, which represents the 60th anniversary of our independence.

It was expressed that if all R&D Institutions having know-how in the area of enhancing the productivity, profitability and sustainability of the major farming systems as well as in the area of value-addition and generation of non-farm livelihoods with particular reference to these districts would get together and form a Consortium for promoting an Engendered Sustainable Livelihood Movement in these districts, we can effectively

demonstrate the pathway to permanent poverty eradication and hunger elimination. Such a S&T consortia could assist in helping the rural families in the underprivileged districts in areas such as the:

- ❖ Improving the productivity of crops, livestock and fisheries
- ❖ Introducing quality and trade literacy
- ❖ Promotion of sustainable self-help groups for the production of value-added products through agro-processing, on the basis of buy-back arrangements
- ❖ Conservation and enhancement of Natural Resources, particularly soil and water
- ❖ Establishing knowledge connectivity through information and communication technologies
- ❖ Helping rural families to address issues in the areas of health, drinking water, education and nutrition
- ❖ Involving Panchayat Raj Institutions as lead partners in this endeavor.

Therefore, can constitute an overall National Consortium of public and private sector R&D agencies as well as financial institutions to provide overall policy guidance to the programme, as well as a specific Consortium for each of the 150 districts based on the expertise of the different partners of the Consortium with reference to the needs and opportunities of each district.

After detailed discussions on various issues related to the organization, structure and constitution of a National S&T Consortium for fostering an Engendered Sustainable Livelihood Security movement in rural India, the following important suggestions emanated out of the discussions:

It was decided to form a National Alliance of S and T institutions in the public and private sectors to provide technical backstopping to the National Rural Employment Guarantee and National Food for Work Programme, so that the work undertaken leads to an engendered and sustainable livelihood security system. The National S&T Alliance for Rural Livelihood security will bring together ICAR, CSIR, ICMR, ICSSR, Department of Atomic Energy, Science & Technology, Bio-technology & Ocean Development, UGC, Ministry of Non-Conventional Energy Sources and other Central Government institutions, Agriculture, Rural and Women's Universities as well as private sector and civil society R& D Institutions and banks and financial institutions for the purpose of initiating in the 150 districts identified by the Planning Commission for special attention an engendered sustainable livelihood security programme through knowledge, skill, information and market empowerment. The National S&T Alliance will be a virtual organization and will promote a multi-institutional and multi-disciplinary team effort to foster job-led economic growth in rural India. The areas of concern will include, besides technology support and skill building and the promotion of economically viable SHGs, attention to health, education and nutrition. The S&T Alliance will aim to bring about confluence and synergy among the efforts of private, public and academic sector institutions to undertake a massive human resource development and capacity building programme, to begin with in the 150 districts chosen for the National Food for Work Programme. Sustainable SHG programmes based on people-centric and eco-

friendly technologies will be developed. The National S&T Alliance Secretariat will be serviced by the National Academy of Agricultural Sciences.

2. The National S&T Alliance will promote the formation of all similar alliances at the State level. The State level S&T Consortium will be serviced by the appropriate State Agricultural University. At the district level, this programme will be linked to the DRDA. The District level S&T consortium will also give priority to the following activities:

- ❖ Assisting local farm and landless labour families access their entitlements
- ❖ Capacity building - building a cadre of Master Trainers
- ❖ Mentoring
- ❖ Establishing market linkages.

The formation of National and State level S&T Alliance for fostering economically sustainable and greater sensitive livelihood systems in villages will be an important step in mobilizing the power of partnership in ushering in an era of job and economic growth in rural India, based on a pro-poor, pro-women and pro-nature orientation to technology development and dissemination. Technology can then become an ally in the movement for gender and social equity.

The meeting ended with vote of thanks to the chair.

Annexure

Attendance sheet

Task Group

1.	Dr. M.S. Swaminathan, Chairman	In the Chair
2.	Prof.V.L. Chopra, Member, Planning Commission	Convener
3.	Dr. Anwar Alam, VC, Sher-e-Kashmir Univ. Srinagar.	Member
4.	Dr.Y.S.Yadav Bay of Bengal Programme (BOBP), Ch.	Member
5.	Prof. Mehtab S.Bamji, Em. Scientist, Dangoria Chari. Tt	Member
6.	Prof. Jayati Ghosh, Chairperson, AP Agri. Comn.	Member
7.	Dr. N.G. Hegde, President, BAIF Dev. Res. Foundation Dr. Manibhai Desai Nagar, Warje, Pune-411502	Member
8.	Dr. S.K.Raina, Nath Seeds, Aurangabad	Member
9.	Dr. M.L. Madan, Ex. DDG(AH) and Ex-VC, Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola	Member
10.	Dr. V. Prakash, Director, CFTRI, Mysore-570 020	Member
11.	Shri S.K. Roy, Adviser (Agri), Plg. Comn.	
12.	Dr. Vandana Dwivedi, Jt. Adviser,(Agri.), Plg. Comn.	

Other participants invited by NCF

13. Dr. R.K. Malik, HAU.,Hisar
14. Dr. D.P. Singh, VC, JNKVV, Jabalpur

15. Dr. M.B. Dilshad, Dir., Karnataka State Women's Univ.
16. Dr. D.P.S. Chauhan, Director (DAHD), Min. of Agri.
17. Dr. K.L. Chadha, President, Hort. Soc. of India
18. Dr. C. Bhasakaran, KAU
19. Dr. Geeta Kutty, Associate Professor, KAU, Kerala
20. Dr. Nagendra Sharma
21. Dr. Chanakya Choudhary, CRI, Delhi Tata Steel
22. Dr. Sukanaya Rath, Exe. Dir. NASSCOM Foundation
23. Dr. Nanda, For. Chairman of NABARD & Member, NCF
24. Sh. S.K. Mitra, Exe. Director, NABARD
25. Dr. C.R. Hazra, VC, IGKV, Raipur
26. Dr. Punjab Singh, Former DG-ICAR & Member, NCF
27. Dr. V. Balaji, ICRISAT, Hyderabad
28. Dr. R.P.S. Katwal, DG, ICFRI, Dehradun
29. Dr. Ramchandran, VC, Dr. Ambedkar Open Univ., Hyd.
30. Dr. P.L. Gautam, VC, PAUT, Pant Nagar
31. Dr. V. Dharmadhikari, Scientist, G&HOD
32. Dr. Nazeer Ahmed, Prof. & Head, SKUAST (K)
33. Dr. P.K. Mahapatra, Dean, OUAT, BBSR.
34. Dr. V. K. Mishra, Dean, Dr. Y.S. Parmar Univ. of Hort.
35. Dr. F.R. Sheriff, Dir. of Extn. TANUVS.
36. Dr. J.K. Jera, Sr. Scientist, CIFA, Bhubaneswar
37. Dr. A.K. Sen, Prof., AAU, Jorhat, Assam
38. Dr. A.M. Patnaik, Head, BARC, Mumbai.
39. Ms. Ankhi Das, Coop. Affairs Manager, Microsoft
40. Prof. L.L. Dhakar, Dir. of Extn. MPUAT, Udaipur
41. Dr. N. Raveen, Dir., CARDS, TNAU, Coimbatore
42. Dr. Ravi Shankar, Regional Dir., NDDB, Delhi
43. Shri A. S. Rawat, GM, APPETA, New Delhi.
44. Dr. A.I. Sherikar, VC, Mah. Ani. & Fish. Sci. Univ.
45. Dr. G.R. More, DOR, MAU, Parbhani
46. Dr. Buljit Singh, DGM, Agri. Business, SBI
47. Dr. S.K. Kaul, Proj. Coordinator, SFAC
48. Dr. A.S. Satyanarayan, Dir., Extn, ANGRAU, Hyd.

Minutes of the 5th meeting of Task Group on Revamping and Refocussing of National Agricultural Research held on 6.1.2005 at Yojana Bhawan under the Chairmanship of Dr. M.S. Swaminathan.

The 5th meeting of the Task Group (TG) on Revamping and Refocussing of National Agricultural Research was convened on 6.1.2005 at Yojana Bhawan under the Chairmanship of Dr. M.S. Swaminathan. The list of participants is annexed.

2. At the outset Dr. M.S. Swaminathan, Chairman, Task Group welcomed members and participants and drew their attention towards the suggestions made by the Hon'ble Prime Minister and Minister of Science and Technology during the 92nd Indian Science Congress held at Ahmedabad on 3rd January, 2005. The suggestions were articulated in view of their relevance to the report of the Task Group, which is to be finalized very soon. Dr. M.S. Swaminathan addressed some of the issues connected to the suggestions and flagged other issues and categorised them under various terms of references (TORs) of the Task Group.

3. The issue of development of a Creativity Index to measure innovations as suggested by the Prime Minister in his address to the Indian Science Congress at Ahmedabad, was specially emphasized and it was suggested that this item should be included as a recommendation in the Task Group report. The Chairman mentioned that Prof. Anil Kumar Gupta, IIM, Ahmedabad has done considerable work in this regard; therefore, his views may be obtained regarding the parameters that should be included as elements of a Creativity Index for the purpose of assessing contributions of scientists and institutions to agricultural research, education and extension.

4. The Chairman stressed the need for finalizing the TG report based on each of the TORs especially the one on strategic and anticipatory research, which may include recommendations on a series of National Challenge Programmes involving mini-networks of individuals and institutions. Some of the challenge programmes could be (a) mitigation and adaptation to climatic change (temperature and precipitation); (b) preparing coastal area agriculture to a potential rise in sea level and increased frequency of cyclones and coastal storms (c) value addition to primary farm products and (d) productive organic farming system. For promoting farming systems research there is need to establish horizontal linkages among All-India Coordinated Projects on crop, livestock, agro-forestry and fisheries sectors, so that the needed scientific backstopping can be provided to crop-livestock-fish production systems in an integrated fashion. National Challenge Programmes, which can help to enhance the productivity, profitability and sustainability of the major farming systems under different agro-ecosystems, particularly in rainfed, semi-arid, desert, coastal and hill areas, should be instituted.

5. As a part of revamping of ICAR set-up the Chairman opined that there should be total autonomy of all Institutes, Research Centers, etc. within the NARS and they should come to ICAR only for requisite funds; ICAR should devote itself primarily to monitoring, evaluation and trouble shooting for the approved projects. It was also

mentioned that similar recommendations have already been made by the G.V.K.Rao Committee in this regard.

6. At the ICAR headquarters, technical and administrative arrangements may be unified under the leadership of the respective DDGs. The post of Secretary, ICAR may be abolished and the post redesignated as Registrar. Besides, IARI, NDRI, IVRI and CIFE may be declared as Institutes of national importance by an Act of Parliament. They should function like IITs, in the area of management and administration. These institutes should function autonomously under the guidance of their respective governing bodies. Only for money/budget, they would come to ICAR.

7. There is need to re-organise the National Academy of Agricultural Research and Management (NAARM), Hyderabad. The curricula and senior level orientation programmes of NAARM need to be reviewed and revised. NAARM should have innovative training courses for different levels of personnel. NAARM should become an instrument for imparting sensitivity to both national and global challenges including issues like IPR, WTO, GMO and UN Millennium Development Goals.

8. There is need for going back to the original principles upon which ARS and ASRB were based. The 5 years assessment should be done at the Institute level, with the Review Committee spending at least 1 or 2 days in the Institute, going through carefully the work of the concerned candidates. The entire system of recruitment and career advancement needs restructuring on the principles of fairness, integrity and transparency. Human Resource Development needs urgent attention.

9. Research and extension linkages will have to be strengthened through participatory research and knowledge management with farm families. The following forms of linkages will have to be strengthened. (a) Farm School: Grassroot level training in the fields of farmer-achievers in crop and animal husbandry, fisheries and forestry (farmer to farmer learning); (b) Land to Land and Land to Lab: This programme will have to be revitalized based on both factor and system oriented research interventions; (c) Krishi and Udyog Vigyan Kendras: KVKs should be restructured, adding competence in post-harvest technology, agro-processing and agri-business; (d) Agri-clinics and Agri-business Centres: These need to be integrated in the overall farmer support strategy; (e) Whole village/watershed operational research projects: These should be designated to bring about convergence and synergy among all the components of a production system, designated to maximize income and output per units of water and land; (f) Farm University Extension Department: This should be a reference center, giving the most update information and scientifically credible advice.

10. Inter-organisational integration has to be achieved at two levels:

(a) Grass-root level: A beginning can be made in harnessing the power of partnership by organizing a **National Consortium of S&T institutions** which can provide the scientific backstopping essential to make the fund spent under the Employment Guarantee and Food for Work

Programmes yield lasting benefits in the form of creating more on-farm and non-farm livelihood opportunities. The S&T support can be organized at 3 levels:

National level: Senior level representative of ICAR, CSIR, ICMR, DBT, DST, DRDO, MNES, MOEF, Departments of Space and Atomic Energy, Universities and private sector R&D institutions could constitute the National Consortium of S&T institutions for suitable livelihoods. At the State level, a similar consortium can be organized with the appropriate Agricultural University as the Convener. At the District level, the S&T consortium should work with the respective DRDO.

(b) Apex level: A **National Board for Science in Agriculture** may be formed under the Chairmanship of Member (Science), Union Planning Commission with all the concerned DGs and Secretaries to Government as Members.

11. Dr. V.L. Chopra mentioned that since the Task Group has obtained extension for the second time for submitting its report, the report must be submitted by 31st January, 2005 positively. He also mentioned that the Task Group has obtained a large number of suggestions through consultation with the scientists within and outside the NARS; therefore, the recommendation of the Task Group should come from these suggestions. He informed the Chairman that the second draft report has been compiled based on terms of reference wise suggestions received from the scientists. He suggested that a set of implementable recommendations be compiled based on suggestions pertaining to each TOR. Dr. Chopra called upon the members to suggest necessary modifications/replacements in the second draft report and send their suggestions in the form of additions, deletions and modifications. He also requested that these suggestions should be specific and provide alternative in written form of what is desired to be modified. He also requested the members to use "Track Change" for electronic intervention or written revision of targeted alterations. He informed that the second draft report will be e-mailed to all members by 7th January 2005 and requested the members to ensure that the advice should reach to him by 14th January 2005 so that their valuable suggestions may be incorporated and final draft report may be prepared and circulated on 23rd January 2005 among members of Task Group.

12. The Chairman opined that the Task Group may submit its report to Deputy Chairman by end of January, 2005. He also mentioned that a presentation will be made before Deputy Chairman, Planning Commission during the last week of the January and Dr. Chopra may obtain suitable date and time from the Deputy Chariman.

13. Dr. Mahtab S. Bamji, endorsed the views made by the Chairman and Dr. Chopra as mentioned above. She also emphasized the need for a system of middle level polytechnic on the lines of ITI to attract farm youths in agriculture and also suggested for a surveillance system for nutrition as well as farming warning system. She also pointed out the need for value addition in order to compete with multi national products and for

non-farm employment generations especially for women through net working with DBT & DST programmes etc. On the need for nutritional security at village level suggested by Dr. Bamji, the Chairman pointed out that the PDS system that is prevalent in the country distributes only rice and wheat at present and suggested that the home science students should encourage the consumption of nutritional foods at village level and cited the example of ragi in Karnataka which has high nutritional value, but its consumption is coming down for want of awareness.

14. The Chairman referred to the findings of the Andhra Pradesh Agriculture Commission with regard to the recent calamities in agriculture sector in Andhra Pradesh including farmers suicides and suggested that some of these could be incorporated in the TG Report. Dr. Jayati Ghosh who is also the Chairperson of the Andhra Pradesh Agriculture Commission mentioned in this context the disconnectivity of the scientific research and end users in agriculture sector in Andhra Pradesh and also about the inadequacy and ineffectiveness of extension network. She also expressed concern at the neglect of dry land farming, lack of post harvest technology and a general lack of enthusiasm among scientists to pursue the need based research and to encourage the farmers to take up farming on scientific lines. The issues need to be addressed in the Report.

15. The chairman suggested that the Task Group should address the problems of two specific ecosystems, namely, coastal area farming including both agro and aqua culture as well as hill area farming with suitable integration of land and water. He desired Dr. Yadava to prepare a section on coastal area farming in consultation with Dr. Selvam. He also desired Dr. Alam to prepare a chapter on hill area agriculture including post harvest technology, animal husbandry, cold-water fisheries etc. in consultation with Himachal Pradesh Agricultural University.

16. The Chairman wanted Dr. Alam to look into the current ICAR structure and the National Agricultural Research System as a whole and discuss how the accountability factor can be built up in the system in case of decentralization.

17. Dr. Yadava mentioned about many committees functioning in the ICAR set up at present such as RAC, Quinquennial/Quarterly Review Committees etc. Most of these committees are not functioning in their true spirits; the Institutes are not able to institutionalize them effectively.

18. In the context of a comment of Adviser (Agri.) that there is no recognition of the fact that there is indeed a disconnect between field problems and research on the one hand and research and extension on the other, Dr. Alam pointed out that it is not the matter of disconnectivity but only of poor connectivity. Dr. Chopra emphasized the need for technology development, effective T&V system for suitable dissemination with greater dialogue between research and extension system. Adviser (Agriculture) quoted the example of ATMA, which has reportedly established an effective link between research and extension system. Dr. Yadava, mentioned about the aquaculture activities where the training and extension are done by private entrepreneurs who operate model

hatcheries and produce quality seeds for carrying out semi-intensive and intensive culture practices.

Annexure

Attendance sheet

Task Group

- | | | |
|----|---|--------------|
| 1. | Dr. M.S. Swaminathan, Chairman | In the Chair |
| 2. | Prof.V.L. Chopra, Member, Planning Commission | Convener |
| 3. | Dr. Anwar Alam, Vice-Chancellor, Sher-e-Kashmir University of Agricultural Sciences and Technology, Srinagar. | Member |
| 4. | Dr.Y.S.Yadav Bay of Bengal Programme (BOBP)
91, St.Mary's Road Abhirampuram, Chennai – 600
018 | Member |
| 5. | Prof. Mehtab S.Bamji, Emeritus Scientist, Dangoria Charitable Trust,1-7-1074, Musheerabad, Hyderabad-500 020. | Member |
| 6. | Prof.Jayati Ghosh, Chairperson, AP Agriculture Commission, Centre for Economic Studies and Planning School of Social Sciences, JNU, New Delhi – 110 067 | Member |

Planning Commission

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| 7. | Shri S.K. Roy, Adviser (Agri) | |
| 8. | Dr. Vandana Dwivedi, Jt. Adviser,(Agri.) | |
| 9. | Dr. Hari Das, Dy. Adviser, (Fisheries) | |
| 10. | Dr.Ramanand, RO (AM) | |

Minutes of the Sixth Meeting of Task Group on Revamping and Refocusing of National Agricultural Research held on 30.1.2005 at NAAS Committee Room No. 3, NASC Complex, and New Delhi, under the Chairmanship of Dr. M.S. Swaminathan.

The final meeting of the Task Group on Revamping and Refocusing of National Agricultural Research was held at NAAS Committee Room No. 3, NASC Complex, and New Delhi, under the Chairmanship of Dr. M.S. Swaminathan. List of participants is annexed.

2. Initiating the discussion, the Chairman described the structure of the Draft Report, which was circulated to all the members. The Part A of the report would consist recommendations whereas the details of the member's views and the report of the Sub-group would be available in Part B. The Chairman also mentioned the President's concern on the need of rural employment particularly in the non-farm sector and the importance of Panchayat Raj Institutions. The issue of ICAR role in checking the proliferation of State Agricultural Universities (SAU) in the country was also discussed. It was mentioned that ICAR was not a statutory body and thus had no control over the establishment of new SAUs in the States. It is the prerogative of the State Assembly to create new universities.

3. The proposal of National Board for Strategic Research in Agriculture on the line of the National Science Foundation of the USA was discussed in the meeting.. The proposed Board would take up the inter-organizational strategic missions related to farming system diversification, value additions, productivity and quality improvement, climate change and strengthening ecologically sustainable agriculture. Emphasis was also given for integration of livestock, fishery with agriculture. However, Member (Science) cautioned that mere establishment of a new institution would not help unless the establishment was empowered and operationalized with proper mandate and financial autonomy. The members also suggested the integration of the proposed Board/ICAR with the line departments like Department of agriculture and department of animal husbandry and dairying apart from involvement of other research organizations (like CSIR, BARC), inter-organizational cooperation. The Chairman suggested that we should look forward and a chance should be given to the proposed Board for initiating radical changes in the national agricultural system. After detailed discussion, it was recommended that a budgetary provision of Rs. 200 crore be made in the Annual Plan for 2005-06.

4. The members also agreed that there was need for outstanding centers of global eminence in the crop, animal husbandry, fishery and post-harvest technology. It was agreed that IARI, IVRI, NDRI, CIFF and CFTRI might be declared as Institutions of National Importance by an Act of Parliament and vested with complete autonomy in administrative and financial matters on the lines of IITs.

5. The Chairman referred to the importance of equitable distribution of scientific skills and experience in all the regions of the country. Due to non-availability of adequate

scientific manpower, the development programme in the Northeastern region (like technology Mission on Horticulture) is not progressing satisfactorily and as a result the vast untapped potential of agriculture could not be converted into jobs and wealth. It was suggested that ICAR might create a NE Cadre in its Agriculture Research Service, with an initial cadre strength of 300. Although it would be a special cadre for NE states, there would be no bar for the scientists from other region of the country to join in this specialized cadre.

6. The Chairman also mentioned that the Steering Committee for Agriculture (Tenth Plan) suggested to initiate National Challenge Programmes in the emerging areas like climate change, WTO related problems, gender issues, bio-fuel etc. After detailed discussion on this issue it was decided that ICAR would take up the National Challenge Programmes in the existing institutions. Unless it becomes essential, establishment of new institution should be avoided. If required the mandate of the existing institutions could be changed and they could be suitably strengthened to take up the challenge programmes. The members also agreed to recommend for establishment of National Patents Bank for Rural and Agricultural Prosperity.

7. Regarding the present state of agriculture extension, all the members expressed their concern and emphasized the need for immediate intervention. Dr. Jayati Ghosh mentioned that in some states governments were withdrawing extension service (like soil testing) on the pretext that these jobs were being looked after by private institutions like Agricultural Clinics. It was decided that the mandate of the existing KVKs would be changed so that they could help the farmers to acquire new skills in both farm and non-farm sectors. The KVKs could be renamed as Krishi and Udyog Kendras with the major aim to transform the unskilled workers into skilled workers. The Chairman also emphasized the need for establishment of a National virtual University for Science in Agriculture at NAARM, Hyderabad in collaboration with MANAGE.

8. The recommendations in respect of each of the Terms of Reference were discussed and the members agreed to the recommendation mentioned in the Draft Report with necessary modifications in the light of present discussion. It was decided that the Committee would make a presentation before the Deputy Chairman, Planning Commission before finalizing the report.

9. The meeting ended with a vote of thanks to the Chair.

Attendance sheet

Task Group

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|-----|--|--------------|
| 1. | Dr. M.S. Swaminathan, Chairman | In the Chair |
| 2. | Prof.V.L. Chopra, Member, Planning Commission | Convener |
| 3. | Dr. Anwar Alam, Vice-Chancellor, Sher-e-Kashmir University of Agricultural Sciences and Technology, Srinagar. | Member |
| 4. | Dr.Y.S.Yadav Bay of Bengal Programme (BOBP)
91, St.Mary's Road Abhiramapuram, Chennai – 600
018 | Member |
| 5. | Prof. Mehtab S.Bamji, Emeritus Scientist, Dangoria Charitable Trust,1-7-1074, Musheerabad, Hyderabad-500 020. | Member |
| 6. | Prof. Jayati Ghosh, Chairperson, AP Agriculture Commission, Centre for Economic Studies and Planning School of Social Sciences, JNU, New Delhi – 110 067 | Member |
| 7. | Dr. N.G. Hegde
President, BAIF Dev. Res. Foundation
Dr. Manibhai Desai Nagar, Warje, Pune-411502 | Member |
| 8. | Dr. S.K.Raina
Nath Seeds, Aurangabad | Member |
| 9. | Dr. M.L. Madan
Formerly DDG(Animal Science) and Ex-Vice-Chancellor. Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola. | Member |
| 10. | Dr. V. Prakash, Director, CFTRI, Mysore. | Member |

Planning Commission

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| 11. | Shri S.K. Roy, Adviser (Agri) |
| 12. | Dr. Vandana Dwivedi, Jt. Adviser,(Agri.) |
| 13. | Dr. N Das, Dy. Adviser, (AH&D) |

**No.Q-11050/18/2004-Agri
Government of India
Planning Commission
(Agriculture Division)**

**Yojana Bhavan, Sansad Marg,
New Delhi, the 4th October, 2004**

ORDER

Subject:- Setting up of a Task Group on Revamping and Refocusing of National Agricultural Research.

In pursuance of the direction given by the Prime Minister, a Task Group is constituted to look into the issue of revamping and refocusing agricultural research, including the issue of attracting and retaining good scientists in public research institutions.

2. The composition of the Task Group is as under:

- | | | |
|----|---|----------|
| 1. | Dr. M. S. Swaminathan
Chairman, M.S. Swaminathan Research Foundation
III Cross Road, Institutional Area
Taramani, Chennai- 600 013 | Chairman |
| 2. | Dr. Anwar Alam
Vice Chancellor
Sher-e-Kashmir University of Agricultural Sciences and
Technology, Srinagar- 191 001 | Member |
| 3. | Dr. N.G. Hegde
President, BAIF Dev. Res. Foundation
Dr. Manibhai Desai Nagar, Warje, Pune-411502 | Member |
| 4. | Dr. Y.S. Yadav
Bay of Bengal programme (BOBP)
91, St. Mary's Road, Abhiramapuram, Chennai-18 | Member |
| 5. | Dr. V. Prakash
Director, CFTRI, Mysore-570 020 | Member |
| 6. | Dr. M.L. Madan
Formerly DDG(Animal Science) and Ex-Vice-
Chancellor. Dr. Punjabrao Deshmukh Krishi
Vidyapeeth, Akola | Member |

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|-----|--|----------------------|
| 7. | Dr. Maitreyi Krishnaraj
SNDT University, Mumbai | Member |
| 8. | Dr. G.S. Khush
Formerly Chief Plant Breeder and Head, Plant
Breeding and Biochemistry of IRRI, Philippines | Member |
| 9. | Dr. S.K.Raina
Nath Seeds, Aurangabad | Member |
| 10. | Dr. V.L. Chopra
Member, Planning Commission | Member &
Convener |
3. The terms of reference of the Task Group will be:
- I. To suggest methods of strengthening strategic research involving frontier science and technology and anticipatory research keeping in view the challenges of variation in monsoon behaviour / climate and to foster crop-livestock- fish integrated farming systems and to enhance the productivity and profitability of rain-fed, semi-arid, desert, coastal and hill areas.
 - II. In order to professionalize skill management, suggest ways for weaning management from civil service bureaucracy.
 - III. To examine the present funding system of agricultural research and suggest suitable changes (e.g. Competitive Block Grant, Project-based Funding etc).
 - IV. To propose steps for making agricultural research sensitive to emerging scenario of home and external trade (with particular reference to WTO agreement on agriculture).
 - V. To examine the present system of scientist recruitment and human resource development policy and suggest measures to attract and retain good scientists taking into account the recommendations made by recent review committees. Because of distortions in personnel and incentive policies, the system has become highly rigid and opaque, and both central and state systems have resorted to highly straight-jacketed recruitment, and omnibus time-scale approaches for advancement. Suggest ways of removing such distortions.
 - VI. To suggest alternative modalities for integrating research and extension at state level.
 - VII. To suggest methods of developing strategic partnership among ICAR, CSIR, DBT, ICMR, DST, DRDO, MNES and Private Sector R&D institutions, so that a dynamic National Agricultural Research system involving both public and private

- sector research emerges. Also suggest methods of involving Panchayati Raj institutions in technology incubation and verification, participatory research and knowledge management.
4. The Task Group will have the powers to co-opt/associate professionals/domain experts into the Group.
 5. The expenditure of the Members on TA/DA in connection with the meetings of the Task Group will be borne by the Ministry/Department/State Government to which the Members belong. In case of non-officials, TA/DA will be borne by the Planning Commission as admissible to the Class I Officers of the Government of India.
 6. The Task Group will submit its report to the Planning Commission by 31.10.2004. The recommendation of the Task Group should be in such a form that they could be immediately operationalized.
 7. The Task Group will be serviced by the Planning Commission.

(K.K. Chhabra)
Under Secretary to the Govt. of India

To

The Chairman, Co-Chairman and all the Members of the Task Group

Copy to:-

1. Deputy Chairman, Planning Commission
2. Minister of State (Planning)
3. Members, Planning Commission
4. Cabinet Secretary
5. Secretary to the President of India
6. Pr. Secretary to Prime Minister
7. Secretary (DARE) and Director General, ICAR
8. Joint Secretary to Prime Minister (Shri R. Gopalakrishnan) with reference to his U.O.No.360/40/C/1/04-ES-II dated August, 2004
9. Addl. Secretary (DARE) & Secretary, ICAR
- 10r. Advisers/Advisers, Planning Commission

(K.K. Chhabra)
Under Secretary to the Govt. of India

No.Q-11050/18/2004-Agri
Planning Commission
Government of India
(Agriculture Division)

Yojana Bhawan, Parliament Street
New Delhi, dated the December 2, 2004

ADDENDUM

In continuation of Planning Commission's earlier Order of even number, dated 4th October, 2004 regarding setting up of a Task Group on Revamping and Refocussing of National Agricultural Research under the chairmanship of Dr.M.S.Swaminathan, it has been decided as an outcome of the Second meeting of the Task Group held on 8th November, 2004 to co-opt the following persons as Members of the Task Group.

- i) Prof.Jayati Ghosh
Chairman, AP Agriculture Commission
Centre for Economic Studies and Planning
School of Social Sciences
JNU, New Delhi – 110 067.
 - ii) Prof.Mehtab S.Bamji
Emeritus Scientist
Dangoria Charitable Trust
1-7-1074, Musheerabad
Hyderabad-500 020.
Andhra Pradesh.
2. It has also been decided in continuation of para 6 of the aforesaid order to extend the time limit for submission of report by the Task Group to 31.12.2004.
3. The Terms of Reference of the Task Group and other contents of the above-mentioned Order would remain unchanged. TA/DA to the above two Members shall also be regulated as per para 5 of the earlier order.

(K.K.Chhabra)

Under Secretary to the Government of India

To

- i) Chairman, Members & Convenor of the Task Group.
- ii) Prof.Jayati Ghosh
Chairman, AP Agriculture Commission
Centre for Economic Studies and Planning
School of Social Sciences

JNU, New Delhi – 110 067.

Along with a copy of the Original order dated 4.10.04 and other relevant papers.

iii) Prof.Mehtab S.Bamji
Emeritus Scientist
Dangoria Charitable Trust
1-7-1074, Musheerabad
Hyderabad-500 020.
Andhra Pradesh.

Copy to:

- 1) PS to Deputy Chairman, Planning Commission.
- 2) PS to Minister of State, Planning Commission.
- 3) PSs to Members, Planning Commission.
- 4) Cabinet Secretary, Rashtrapathi Bhawan, New Delhi.
- 5) Secretary to the President of India, Rashtrapathi Bhawan, New Delhi.
- 6) Principal Secretary to the Prime Minister.
- 7) Secretary, DARE & Director General, ICAR.
- 8) Joint Secretary to Prime Minister (Shri R.Gopalakrishnan)
With reference to his UO No.360/40/C/1/04-ES-II, dated August, 2004.
- 9) Addl.Secretary, DARE & Secretary, ICAR
- 10) All Principal Advisers/Advisers of the Planning Commission.

(K.K.Chhabra)
Under Secretary to the Government of India

F.No.Q-11050/18/2004-Agri
Planning Commission
Government of India
(Agriculture Division)

Yojana Bhawan, Parliament Street
New Delhi, the December 7th, 2004

ORDER

In continuation of Planning Commission's earlier Order of even number, dated December 7th, 2004 regarding setting up of a small sub-group with in the Task Group on Revamping and Refocusing of National Agricultural Research. it has been decided as an outcome of the Third meeting of the Task Group held on 24th November, 2004 to set up a small sub-group consisting of the following:

- | | | |
|------|---|-----------|
| i) | As Dr.V.Prakash, | -Chairman |
| ii) | Director, CFTRI,Mysore,Karnataka. | |
| ii) | Dr.N.G.Hegde
President, BAIF Dev.Res.Foundation
Dr.Manibhai Desai Nagar
Warje, Pune – 411 502. | - Member |
| iii) | Dr.S.K.Raina
Nath Seeds, 'Nath House'
Aurangabad – 431 005.
Maharashtra. | - Member |

2. Terms of Reference:

- i) To study the details of the present system of recruitment of scientists in the NARS and suggest an alternative system based on those being followed by National Institute of Rural Development, Administrative Staff College or any other renowned institutes which are imparting advanced training.
- ii) To meet at NAARM, Hyderabad and discuss with the scientists there the kind of assessment and promotion policies that may be required to attract and retain brilliant scientists in NARS and also encourage the Indian scientists working abroad to return to India and work with NARS. The policies so evolved may be recommended to make the system result oriented, with high professional output. .

3. The sub-group may submit its report to the chairman of the Task Group within two weeks time.

4. The expenditure of the Members on TA/DA shall be regulated as per para 5 of the earlier order of even no dated 4th October,2004.

(K.K.Chhabra)
Under Secretary to the Government of India

To

- i) Chairman & Members of the sub-group.
- ii) Director, National Academy of Agricultural Research and Management (NAARM), Hyderabad.
- iii) The Chairman, Convenor and all the Members of the Task Group.

Copy for information to:

- 1) PS to Deputy Chairman, Planning Commission, New Delhi.
- 2) PS to Minister of State, Planning Commission New Delhi.
- 3) PSs to Members, Planning Commission New Delhi.
- 4) Cabinet Secretary, Rashtrapathi Bhawan, New Delhi.
- 5) Secretary to the President of India, Rashtrapathi Bhawan, New Delhi.
- 6) Principal Secretary to the Prime Minister.
- 7) Secretary, DARE & Director General, ICAR.Krishi Bhavan New Delhi
- 8) Joint Secretary to Prime Minister (Shri R.Gopalakrishnan)
With reference to his UO No.360/40/C/1/04-ES-II, dated August, 2004.
- 9) Addl.Secretary, DARE & Secretary, ICAR, New Delhi.
- 10) All Principal Advisers/Advisers of the Planning Commission, New Delhi

(K.K.Chhabra)
Under Secretary to the Government of India

**No.Q-11050/18/2004-Agri
Government of India
Planning Commission
(Agriculture Division)**

**Yojana Bhavan, Sansad Marg,
New Delhi, the December 30, 2004**

ORDER

Reference Planning Commission's earlier Order of even number, dated 4th October, 2004 and the subsequent Addendum dated 2.12.2004 regarding the Task Group on Revamping and Refocussing of National Agricultural Research set up under the chairmanship of Dr.M.S.Swaminathan.

2. It has further been decided to extend the time limit for submission of report by the Task Group to 31.1.2005.
3. The Terms of Reference of the Task Group and other contents of the above-mentioned Order remain unchanged

(K.K. Chhabra)
Under Secretary to the Govt. of India

To

The Chairman, Co-Chairman and all the Members of the Task Group

Copy to:-

1. Deputy Chairman, Planning Commission
2. Minister of State (Planning)
3. Members, Planning Commission
4. Cabinet Secretary
5. Secretary to the President of India
6. Pr. Secretary to Prime Minister
7. Secretary (DARE) and Director General, ICAR
8. Joint Secretary to Prime Minister (Shri R. Gopalakrishnan) with reference to his U.O.No.360/40/C/1/04-ES-II dated August, 2004
9. Addl. Secretary (DARE) & Secretary, ICAR
- 10r. Advisers/Advisers, Planning Commission

(K.K. Chhabra)
Under Secretary to the Govt. of India

No.Q-11050/18/2004-Agri
Planning Commission
Government of India
(Agriculture Division)

Yojana Bhawan, Parliament Street
New Delhi, the January 7, 2005

ADDENDUM

In continuation of Planning Commission's earlier order of even No. dated 7th December 2004 regarding Setting up of a sub-group under the Chairmanship of Dr. V. Prakash , Director, CFTRI, Mysore, it has been decided to co-opt Dr.(Ms) Mehtab S. Bamji, Emeritus Scientist, Dangoria Charitable Trust, Hyderabad as member of the Sub-group.

2. **The Sub-Group may submit its report to the Chairman of Task Group within a week's time.**
3. The terms and reference of the sub-group and other contents of the above-mentioned order would remain unchanged. TA/DA of the above co-opted member shall also be regulated as per Para 5 of earlier order of even No. dated 4th October, 2004.

(K.K.Chhabra)
Under Secretary to the Government of India

To

- iv) Chairman & Members of the sub-group.
- v) Director, National Academy of Agricultural Research and Management (NAARM), Hyderabad.
- vi) The Chairman, Convenor and all the Members of the Task Group.

Copy for information to:

- 1) PS to Deputy Chairman, Planning Commission, New Delhi.
- 10) PS to Minister of State, Planning Commission New Delhi.
- 11) PSs to Members, Planning Commission New Delhi.
- 12) Cabinet Secretary, Rashtrapathi Bhawan, New Delhi.
- 13) Secretary to the President of India, Rashtrapathi Bhawan, New Delhi.
- 14) Principal Secretary to the Prime Minister.
- 15) Secretary, DARE & Director General, ICAR.Krishi Bhavan New Delhi
- 16) Joint Secretary to Prime Minister (Shri R.Gopalakrishnan)
With reference to his UO No.360/40/C/1/04-ES-II, dated August, 2004.

17) Addl.Secretary, DARE & Secretary, ICAR, New Delhi.

10) All Principal Advisers/Advisers of the Planning Commission, New Delhi

(K.K.Chhabra)

Under Secretary to the Government of India

Appendix

I.To suggest methods of strengthening strategic research involving frontier science and technology and anticipatory research keeping in view the challenges of variation in monsoon behaviour/climate and to foster crop-livestock-fish integrated farming systems and to enhance the productivity and profitability of rain-fed, semi-arid, desert, coastal and hill areas.

S. No.	Suggestions
1.	<ul style="list-style-type: none"> • In spite of what has been achieved, the links between the farmer and the university are not as strong as they should be. And, in fact, the links between the farmer and the consumer are also not what they should be. Establishing these linkages, as it has been done in the case of dairy cooperatives, should be the priority. • The quality of research will respond to direct links with producer organisations, so too will the quality of extension. The experience from the dairy cooperatives suggests that if the salary of a veterinarian or fodder specialist is paid by farmers, the professional works with far greater diligence, dedication and commitment. His “boss” will accept no less than the best. Such a linkage should be developed in the case of agricultural research system. • “Privatisation” is the current buzz word when it comes to public sector enterprises. A similar path for privatisation of services should be attempted by the Government by seeking to contract the number of its personnel while expanding the quality of their role; by encouraging a transition where extension work is supported by Government research and information, but largely implemented by employees of farmer organisations and by commercial firms.
2.	<ul style="list-style-type: none"> • More focus on basic research should be there. But, nowadays in every single project - seniors are asking for the economic and commercial value even before starting the project, which forced the new scientists like me to abandon the novel ideas. • Visits to abroad for conference / training should be provided to all scientist once in three years (similar to the system in IITs) and the power to sanction foreign visit should be given to the DIRECTORS of respective institutes. Present system demands approval from ICAR which is a time consuming process. • Choice for the place of posting should be provided (based on merit) during the first appointments of scientists. • More focus should be towards research instead of testing and services. • Separate rules and regulations should be formulated for ICAR instead of following the central govt. rules as such. Power delegation should be there as similar to IITs or CSIR laboratories.
3.	<ul style="list-style-type: none"> • The green revolution emphasised on increased production. The evergreen

	<p>revolution should prioritise marketing with competitive pricing.</p> <ul style="list-style-type: none"> • Technologies which create rural employment and women empowerment are the need of the day. • Scientists should be accountable to the society. A monitoring mechanism should be inbuilt in the research proposal itself. • Piecemeal research proposals should be discouraged. • Centres of excellence should be identified in each existing Research Institutes/SAUs and funded fully. • Traditional knowledge and their validation need to be patented.
4.	<p>Research may be reoriented towards the development of low cost and eco-friendly technologies, especially to suit the marginal and poor farmers located in areas having agriculturally low potentiality such as rainfed, semi-arid, desert, coastal and hill areas.</p>
5.	<ul style="list-style-type: none"> • Re-introduce, popularise and improve the productivity of legumes, and millets, particularly some of the forgotten pulses and minor millets. The alarming shift from these dry land crops to water guzzling cereals and sugarcane needs to be arrested. This requires not only research in farming but also in post harvest technologies, development of ready to eat foods with these grains and shifts in procurement policies to make them attractive. The experiment of the Deccan Development Society in Zaheerabad, Medak dist of AP and of HESCO in Uttaranchal is noteworthy. • Facilities for analysis of local foods- food grains, vegetables and fruits, not only for their micronutrient content but also health giving photochemical. Such data are very essential. Bio-availability studies are also needed. • Development of low-cost equipment for small scale and cottage food processing industry. Also equipment like oil expellers which can be used for extracting oils like neem seed oil and oil from locally available oil seeds. Preferably equipment that can be used with electricity as well as other fuel sources. Most equipment manufacturers cater to the needs of large industries. • Evolve strategies for ready access to good quality certified seeds of not only food grains but also horticulture and flori culture, if not breeder seeds. We have to run from pillar to post trying to source such seeds. A directory of suppliers in each state/major cities/ towns for ready reference needs to be prepared, with price, phone numbers and e mail addresses. • Since the main objective of agriculture is nutrition security, do involve nutrition scientists in policy-making bodies.
6.	<p>My humble opinion is agriculture should move away from subsistence farming to income producing farm enterprise which will connect production agriculture to the market. By engaging in the income producing enterprises there is a chance that the Indian farmers may come out of the poverty. This may be done with appropriate infrastructure that covers the entire food chain and of course by policy interventions. I am speaking out of my convictions and observing where agriculture and the farming communities succeeded in different parts of the world. This is all for now.</p>
7.	<p>Inclusion of recycling and reuse of water in aquaculture, utilization of</p>

	problematic soils through aquaculture .
8.	<ul style="list-style-type: none"> • To propose steps for making agricultural research sensitive to emerging scenario of demographic changes in rural and urban areas (with particular reference to growth of mega cities and peri-urban agriculture) • To examine the present research and education system/approach to ensure food and nutrition security leading to zero hunger.
9.	<ul style="list-style-type: none"> • With a growing thrust on fresh and brackishwater aquaculture of fish and shellfish, the problems of disease and epidemics are being encountered in ever increasing proportions and if quality product is to be harvested from our waters, it is necessary to develop cell lines, diagnostic kits and vaccines. These are areas that need immediate attention AND WOULD REQUIRE A LARGE NUMBER OF TRAINED PERSONNEL WITH SOME HAVING ADVANCED TRAINING FROM ABROAD. • Despite good management, poor growth and low survival of fish and shellfish is a common occurrence. While the requirements of quality seed could be listed, how to determine the quality itself is not known? Methods and techniques to determine the same need to be investigated. A GROUP OF SCIENTISTS FROM DIFFERENT DISCIPLINES SUCH AS PATHOLOGISTS, GENETICISTS, NUTRITIONISTS, AQUACULTURISTS AND FISH BREEDERS WOULD NEED TO SIT TOGETHER. • Genetic engineering has not taken us very far in these three decades of indulgence. There is a growing opposition to the transgenics the world over. However, if the growth genes from the same fish are isolated, multiplied and incorporated to enhance growth it would certainly be most welcome especially so when fish production needs to be almost doubled. TRAINING AND LAB FACILITIES NEED TO BE STRENGTHENED AT KEY CENTRES. • Isolation and incorporation of cold and salt tolerant genes is another area that requires to be researched as it would be of immense gain to expand the aquaculture of certain select and preferred species and would be widely appreciated by fish farmers. ADVANCED TRAINING AND LAB FACILITIES WITH ADEQUATE FUNDS WILL NEED TO BE PROVIDED. • Improvement of feed quality and environment through use of probiotics. COLLABORATION WITH THE INDUSTRY AND ICAR SCIENTISTS IS NEEDED. • Organic aquaculture based on biofertilisation and bioremediation. This is a new craze the world over and our products would be preferred if these are organically produced but this would require a lot of work to mass produce the bio-fertilisers on an industrial scale. THIS NEEDS TO BE BROUGHT ABOUT IN CLOSE COLLABORATION WITH THE INDUSTRY.
10.	<ul style="list-style-type: none"> • The impact of agricultural research has not permeated to the core group of small and marginal farmers because our research and technology support is not tailored to their needs. Do we have technology support for a farmer scratching hardened fields with a wooden plough and a pair of dilapidated oxen? He needs a healthy pair of oxen or a small tractor, a good plough/tiller and a seed-cum-fertilizer drill to seed the crop well in time, without losing soil moisture and place fertilizer below the seed. Do this and he will usher another agricultural

	<p>revolution. We also need to take up farm/small scale water harvesting to provide for protective irrigation. This will also encourage adoption of other technologies.</p>
11.	<ul style="list-style-type: none"> • Strong Advisory bodies • High investments for identified areas of prospects, without staggered provision of funds, that often leads to infructuous expenditures and delays • Networking among national and international institutions in priority areas • Timely inputs in terms of material as well as capacity building of researchers • Critical Projects to be funded on priority basis, without the winding procedures of Plan documents, that often delays the projects and renders the outcome irrelevant.
12.	<p>Research may be conducted through well defined projects aimed at solving problems through a team of highly dedicated and motivated scientists and this team may be linked to the chain of extension central/ state to reach the farmers for validation of the findings at village level. Some of the priority areas could be:</p> <ul style="list-style-type: none"> • Strengthening/ development of international standard quarantine research facilities for study of crop/ pest / bioagent/ animal/ bird/ fish. • Establishing/strengthening centres of excellence in biotechnology to develop plants/animals resistant to pests/ diseases and for qualitative and quantitative traits. • Initiate/ strengthen biosystematics for qualification of biodiversity (plants, beneficial organism, insects, animals, birds, fishes, etc) for conservation and utilization. • Strengthening research to improve plant and soil health.
13.	<ul style="list-style-type: none"> • Formulating Network projects on problem areas, with greater emphasis on developing appropriate technologies to suit local / regional needs. • Allocation of more funds & manpower for strategic research as identified in the programmes.
14.	<p>Frontier science and technologies: applications of nanotechnologies in agriculture - nutrient management, pest management, biotechnology and others. This is an emerging but important area of research and India cannot afford to lag behind the developed countries for strategic reasons. It is also multidisciplinary and would require significant central initiative and investment to bring together institutions (ICAR, IITs, IISc, SAUs) and individuals. the specific nature of the initiative can be arrived at through a brainstorming session. A base paper can be prepared for the session and a workshop can be organized at NAARM, Hyderabad by the planning commission/NAAS. One can also learn from similar initiatives in USA by USDA. I can take the initiative on behalf of NAARM/NAAS for the preparation of the base paper and the brainstorming session at NAARM. Meanwhile it suggested that the planning commission provide a corpus of about Rs 100 crores for the nanotechnology initiative.</p>
15.	<ul style="list-style-type: none"> • Larger groups should work on most important prioritized projects with strong focus compared to smaller groups/individulals working in a weak way.
16.	<ul style="list-style-type: none"> • Research to develop varieties adapted to changed climate in the context of

	<p>global warming.</p> <ul style="list-style-type: none"> • Research on sea farming for food and pharmaceuticals. • Transfer of Technology related to crop production to Eastern States. • Strengthen basic research for defining the selection criteria for various abiotic stresses and their application in pre-breeding activities.
17.	<ul style="list-style-type: none"> • Majority of the members of the task force are the stalwarts from the discipline of Genetics, Plant breeding, Biotechnology and Plant Molecular Biology and they shall suggest ways and means to change the direction of the current research. Much has been talked on the crop improvements and a lot of funds have been allocated in the past to conduct research in these frontiers. But many believed that an expected outcome was not commensurate to the public spending. • It may be desired now that some serious thinking is done towards the research in the area of Land Improvement, Soil Pollution and Water Quality Monitoring research. Otherwise it will be too late. In the entire ICAR system, there is not a single lab that is equipped with the world-class facility to test 16 water quality parameters. Also, the institute may seriously consider to build a team of scientists whose present state of knowledge may be augmented by training them in the world class labs be it in India (Private sector) or in the developed part of the world. Well, this might require some public spending/ ICAR investments. Due to the lack of such facilities, we are not able to train our students, as per the future needs. Also, we never do the needful when a group of farmers or a farmer come with a water sample for answer. We do not have capacity to cater their needs of today. We simply confuse them. We do not want to do any more. • Water Technology Centre, IARI is well known by the contribution and leadership of Dr. A.M. Michael and late Dr. S.K. Sinha. The Task force may consider housing a world-class water quality lab in WTC, IARI, New Delhi with its connection in NRM division of ICAR. This center is the oldest one, which is carrying out research in the area of Water Science and Technology. (refer QRT recommendations) • There is need to amalgamate a group of divisions in to one node to solve the problems of Soil and Water quality. Water Resource management and Water Quality Management will be of great concern in future. • The academic standards in IARI, IVRI, NDRI and CIFE are deteriorating day by day. There is a need to recruit 30 to 40 young professors in core areas of very high standards in each Institute that has graduate teaching program. The selection could be from the existing scientists in want of cuts imposed by GOI. At the moment, the best talents are unfortunately not on the professorial chairs. • The merit should be the sole criteria for the recruitment. The doctoral students should never be allowed to do something other than the quality research work if they are drawing scholarship for PhD programme. One copy of the doctoral thesis must be sent abroad for the comments and evaluation. Such things may bring in some improvements in the academic standards in few years.
18.	<p>Ensure buffering mechanisms in the soil system, against the ill effects arising from excessive use of chemicals - one could possibly consider a whole range of</p>

	<p>pathways. The other is to see that 'traditional agricultural systems', which are largely confined to hill areas where traditional societies live(those living close to nature and natural resources live). These have not received much attention and where it has, it is based on a value system of text-book based agricultural scientists, and has not made much dent into those systems for obvious reasons. One need to have an appropriate blend of the 'traditional' and 'formal' knowledge systems, with a variety of pathways possible for 'redevelopment' of those systems.</p>
19.	<ul style="list-style-type: none"> • In the field of jute & allied crops, being essentially commercial commodities, a number of new areas are emerging keeping in view of their market potentialities to suggest a number of strategic and anticipatory research issues requiring application of frontier science in each of the related areas. These are essentially quality related issues for which varieties producing improved quality fibres have to be developed to suit the requirement for specific end uses. Attention is also required to develop varieties tolerant to biotic and abiotic stress conditions. It will be desirable to fit the crop into farming system mode. Special attention needs to be given to develop contingency plans in order to mitigate yield losses under aberrant weather conditions including drought, water-logging etc. For a systematic approach to address these issues in an interdisciplinary research mode, it would be necessary to complete two kinds of benchmark studies on location specific issues viz., (i) develop a series of production scenario through a appropriate survey of natural resources in different agro-climatic regions for interpretation of the data through GIS tools, (ii) socio-economic profile status of the farming community through PRA. • The following methods for effective implementation of the strategic and anticipatory research suggested: <ul style="list-style-type: none"> (i) Formulate inter-disciplinary research groups for conduct of research related to major thrust areas for strategic research (ii) Conduct benchmark survey to develop production scenario with special attention to various biotic and a biotic stress factors (iii)Conduct benchmark survey on the socio-economic status of the farming community through PRA (iv)Validate the research findings in farmers fields for location specific recommendations in a farming system mode.
20.	<ul style="list-style-type: none"> • A suitable and separate funding mechanism may be created for funding research of entirely new ideas, high technology areas, and frontier areas more or less on the line of CSIR funding for 'crazy ideas'. The area of work may be outside the mandate of the Institute in which the scientist is working. The main criterion of selecting such programme should be the novelty in idea. Even though the success rate of such programmes is less, but unpredicted break through is possible through this route. • The concept of network project involving multiple public and private agencies introduced recently in the ICAR system will go a long way in developing and transferring technology. However, funding limit should be raised to at least 2

	<p>corers, and should be decided depending on the number of agencies participating in the project.</p> <ul style="list-style-type: none"> • 30 to 40% of R & D work of an institute should be directed to research and linked to direct national requirement with immediate priority. The approach may be multidisciplinary as followed in case of coordinated projects presently conducted by ICAR, but with shorter duration and with specific and measurable outputs.
21.	<p>As of today, India lives in villages and the countries economy is agrarian. Needless to say that there should be <i>in-situ</i> employment generation to wean away from rural to urban migration. Although self reliance in food grain production was achieved through green revolution, primarily driven by HYVs and fertilizer coupled with irrigation, vast stretches of land remains rainfed even after 9 plan periods, proving the adage <i>gambling on monsoon</i> relevant even today. These less endowed areas need to be serviced through multi pronged strategy of R&D. The following observations /suggestions are made for consideration:</p> <ul style="list-style-type: none"> • In rainfed semi-arid areas, the peasants grow a variety of crops utilizing the available resources. There are many institutes of ICAR/SAU working on these crops resulting in duplication of work and wasting /thinly spreading resources which otherwise can be put to productive use. Such organizations can be amalgamated and scientists drawn from different disciplines can be made into <i>functional groups</i> to work on specific crops to avoid duplication. Also separate groups can be formed to address seed production problems and technology dissemination activities so as to reduce the time lag between technology generation and transfer to the farmers, including spread of varieties. • In coastal agro-eco-systems, farmers traditionally have the advantage of practicing integrated crop-animal-poultry-/fish/duck/pig farming systems. Futuristic research in these areas should address development of <i>model farms</i> for small, medium, and large farmers for adoption of technology, rather than working on single crops in isolation. Here too there is a need to reorganization of research institutes /centers forming functional research groups to address emerging problems on priority. • In hilly /tribal areas, although lot of efforts have gone into tribal development by ITDA and NGOs, their socio-economic status still remains static. It is akin to <i>running to remain where we are</i>. Research has to consider ethnical, botanical, social, cultural, habitat aspects as a prelude to formulating projects for tribal area development. In high altitudes crops like coffee, tea, cocoa, spices, medicinal plants, aromatic tobaccos, bio-diesel, sericulture (eri, muga, tassar, mulbary), apiary, etc. should receive attention and tribal development needs to be integrated into research domain through inter –face of forest/agriculture/KVIC/textiles/ministries. • In rainfed and arid zones, as the un certainty of rainfall is a norm, research needs to rope in animal component into the farming system, as it would provide a cushion for the farmers in times of crop failure.

22.	Participatory Farming System Research involving crop-livestock in rainfed ecosystem should be strengthened by making adequate provision of funds with ICAR/SAU.
23.	<ul style="list-style-type: none"> • There is need to identify and prioritize strategic research initiatives required in frontier science and technology and anticipatory research for each of the major agro-ecoregions. These can be of short-term (5 years) and long-term research initiatives. • There is lot of duplication of work being currently done in different organizations in the NARS. Any effective mechanism to weed out this duplication will be a most welcome step. Even in the Council, there is lot of duplication of work in some areas between Crop Science and NRM Divisions. • To make effective use of research in agriculture, there is also need to strengthen supporting services dealing with input supply (seeds, etc.) and marketing without which the benefits of agricultural technology cannot be fully harnessed.
24.	<ul style="list-style-type: none"> • The mandate of the institutes of ICAR should be revised and with respect to current situation. The mandates should be to build up the knowledge base of the institute. • All the research institutes having lab oriented research component must have an uninterrupted supply of power and water to ensure smooth conduct of the experiments. If normal power supply cannot be ensured, adequate alternate arrangements must be made to ensure continued supply of electricity. • Decentralization of research management in ICAR: At least four, one each in North, South, East and West zones, regional research management offices should be set up for tackling the region based problems so that the indigenous crops and problems afflicting them will get due recognition. • In all the institutes, basic research also should be given emphasis along with the applied and strategic research in a ratio of 20%, 50% and 30% allocation of allotted funds to the institute. Applied research should be problem oriented and need based. The problems to be addressed should those that are identified through PRA and any other feed back mechanism from the end user and clients. At present the problems as perceived by the scientists, which they choose based on their expertise and understanding, are being addressed and this is not helping the farming community at large.
25.	(i) Acceleration of dry land farming (ii) for food security, it is important to improve the distribution system because food does not reach the areas in time where it is most needed. (iii) The fisheries sector has not attained proper sustainability. It is still fluctuating widely from year to year because it is still dependent on harvesting the wild stocks. Therefore, it must change rapidly from capture to culture. (iv) Further innovations are needed to improve the harvest from aquaculture.
26.	Research conducted in newer emerging / areas like Biotechnology, information technology, Meteorology, Crop- Livestock- fish integrated farming systems require need based designed experiments. Various bottle – necks faced in implementation of these technologies are:

	<ul style="list-style-type: none"> • Under Human Resources Development (HRD), training of scientists in the frontier areas is inadequate. There is lack of scientific temper and aptitude; critical mass is missing in most programmes. There is no clarity of goals and leadership potential amongst the scientists is low. Infrastructure and funds are inadequate, structural organization and management is lacking. Effective and efficient monitoring system is inadequate. The programmes need to be self sufficient and monitored by a team of subject matter specialists. Mechanism of exchange of information from regions/ countries should be connected through Internet. Collaboration with international institutions of repute should be encouraged. • Funding should be collaborative between institutes/ SAV's and private industry.
27.	<p>India is endowed with one of the most advanced agricultural research systems among the developing countries in terms of scientific skills as well as its reach, even though a great deal of restructuring is needed for its efficient functioning. Indian farmers, despite low literacy levels, have responded exceptionally well to the opportunities opened up by new technologies. Also, frontier technologies like biotechnologies remain underexploited in the country. Therefore, the returns from investment in agricultural research and extension in the country can be expected to be very high, relatively quick, and assured.</p> <p>The existing public outlay on agricultural research and education stagnating around 0.5% of agricultural GDP in the country is too meager and needs to be stepped up substantially. At the same time, there is considerable potential for raising the effectiveness of these outlays by reordering the priorities in agricultural research and redefining the relative roles of public and private sectors in research and extension.</p> <p>There is a need for a shift away from individual crop-oriented research focused essentially on irrigated areas towards research on crops and cropping systems in the drylands, hills, tribal and other marginal areas. In view of high variability in agro-climatic conditions in such unfavourable areas, research has to become increasingly location-specific with greater participation or interaction with farmers. Greater attention to research on horticultural products that are land-saving as well as water-saving, animal husbandry and dairying integrated with crop production, and on small ruminants can benefit resource-poor farmers and women, besides being environmentally sustainable.</p> <p>Progress in post-harvest technology is essential to promote value addition through the growth of agro-processing industry. Economies of scale can be exploited through the food park concepts. Agricultural diversification necessitates subsidizing risk management, and private sector involvement in agro-processing opens up opportunities for sharing risk with the farmers through contract farming. However, steps have to be taken to ensure contractual obligations, for example, when market prices are higher than contractual prices.</p> <p>Private sector participation in agricultural research, extension and marketing is</p>

	<p>becoming increasingly important, especially with the advent of biotechnology and protection being accorded to intellectual property. However, private sector participation tends to be limited to profitable crops and enterprises undertaken by the resource-rich farmers in well-endowed areas. Public sector research has to increasingly address the problems facing the resource-poor farmers in the less-endowed regions. There is a need to avoid overlapping between the two sectors even as the complementarities between them are fully exploited, by restructuring the existing institutions for management of agricultural research. A high level body of scientists could be entrusted with the task of delineating the roles of public and private sectors.</p>
28.	<p>This requires fixing priorities, catalyzing focus and continued emphasis in specific areas, and in turn needs the following:</p> <ul style="list-style-type: none"> i) Availability of data to identify the critical areas, needs, opportunities and gaps, ii) Policy development, to ensure efficient implementation and sufficient investments. iii) Networking, to optimize efficient use of capabilities and infrastructure. <p>In order to make accelerated progress, additional Project Directorates or Divisions within ICAR or DARE or outside are desirable. These may be headed by younger persons as managers to introduce fresh ideas and state-of-art technologies. Heads of such Divisions should be selected on the basis of promise and potential and not by looking inwardly within the ICAR system. New Directorates or Divisions may be created to bring the following into focus</p> <p>A. Creation of a Database Division for continued analysis and forecasting of strengths and weaknesses of Indian agriculture versus global status in crops, livestock, seeds, natural resources etc. Some examples of the data to be developed for crops are given below:</p> <ul style="list-style-type: none"> a) Crop wise potential for becoming globally competitive in exports and problems therein. b) Year wise and crop wise disease and pest prevalence in different agro climatic zones. c) Losses due to a biotic stresses – climate behavior, soil conditions and farming systems. d) Crop wise gap areas and potential for enhancing yields due to genetic components. e) Yield and quality gains that have erstwhile been made crop wise through genetic enhancement vs agronomic management vs land coverage. f) Region wise potential of gains from improved agronomic management and farming systems. <p><u>Similar data on livestock, fisheries, soils, agri resources, seeds, market prices, climate change and personnel should become available. It should be used as the basis to fix correct priorities for mission mode projects and lay region related</u></p>

emphasis.

B. Creation of an Agricultural Missions Division for executing fully empowered knowledge based projects, cutting across hierarchical and institutional structures:

Based on the data, forecast, national needs and competitiveness, an extensive exercise needs to be undertaken to identify 30-40 missions for Indian agriculture. National academies, like NAAS can be requested to propose the first list through wide consultations. These missions can then be prioritized through area-wise expert committees and finalized by a Task Force Committee to be set up under the guidance of Planning Commission. Such projects should then be implemented through nation wide networks of virtual institutes. A representative example for implementation is given in Figure 1 for further discussions.

Wherever possible, the R&D projects are to be advertised in newspapers for expression of interest. Both, on the basis of expression of interest and identification of established groups, teams can be constituted through multi tier expert committees. The finalized projects should be executed through the 'virtual institutes' with a periodical system for self-evaluation and correction. These projects should truly be supported without financial constraints and run through fully empowered working team leaders who should themselves be pivotal to the projects as Principal Investigators. The projects should therefore be free of any hierarchical set ups, receive funds through an Agricultural Missions Division that may be established with the recommendation of Planning Commission. Networking among the most deserving should be ensured and function through empowerment, responsibility sharing, accountability and incentives. Monitoring should be done by 'outside' Monitoring Committees comprising of scientists of high repute, industry representatives and managers in agriculture. They should monitor such projects for mid-term modulation, reduced or enhanced financing, new partnerships and incentives. A substantial component of funds presently spent through ICAR, DBT etc. on agriculture can be spent in projects mode through such Agri-Missions Division.

29. In view of the impending seasonal variability following research areas should attain priorities:
1. Abiotic stress (high & low temperature/drought/salinity/alkalinity) tolerant plants and microbes by making use of:
 - a. Natural selection and development of abiotic stress tolerant plants (by making use of traditional well proven plant breeding methods) and microbes from our biodiversity resources
 - b. Need based development of new crops useful for our country. Work

	<p>should be properly regulated and focused on appropriate plants (e.g., sorghum, millet and beans for our poor farmers besides cotton, wheat and rice), particularly for genetically modified (GM) technology. The regulatory systems for GM crops need review and streamlining</p> <p>2. Short-term spatial and temporal diversification in cultivation and in crop varieties, required as adaptation for climate change impacts and strategies for localized agro-climatic zones of our nation's ecosystems has not yet been evaluated, e.g.,</p> <p>a. Delaying seeding time in response to delayed rains affected areas.</p> <p>b. Shifting cultivation of flowers, fruits and medicinal plants to hilly areas (colder climate) in case of delayed growing season in plains.</p> <p>3. Role of plants and microbes in agriculture and environmental management that support diverse agro ecosystems - agricultural, pastoral, forest and aquatic ecosystems to generate predictions for the ecological response to increased frequencies of changes in habitat structures, from genes to species to landscapes.</p> <p>4. Conservation and sustainable use of plant and soil biodiversity, i.e., proportion and spatial pattern of land that must remain relatively undisturbed, locally and regionally to sustain the delivery of essential ecosystem services.</p> <p>5. Identification of the level of microbial diversity, species composition and distribution to maintain resiliency and withstand stress. The importance of soil microbial diversity and its role in ecosystems needs to be realized to increase food productivity and enhance the quality of life for all.</p>
30.	<p>Methodology for strengthening strategic and anticipatory research should be based on long term projections on demand and supply of resources, rate of depletion of natural resources, shrinking size of holding and changing monsoon behaviour and climate change. Thus there is a need of strategic and alternative research at micro level to ameliorate variations of biotic and abiotic factors.</p>
31.	<p>1. Integrating the farming systems with food, fodder, fuel, timber, Commercial flowers, medicinal and aromatic plants.</p> <p>Animal component may play a major role to alleviate the poverty of small and marginal farmers. Wherever water can be stored for at least three months, commercial fish culture can be attempted. Planning can be made based on macro and micro water sheds.</p> <p>Research on evaluation of suitable kind and variety of crop and production technology for the specific micro climate has to be taken up for the crops listed below.</p> <p><u>Rain fed / Semi arid</u></p> <p>1. Food Crops</p> <p>a) Cereals & Millets: Paddy, Maize and small Millets</p>

- b) **Pulses:** Green gram, Black gram, red gram (including perennial) Cowpea and Soya bean.
- c) **Oil seeds:** Sun flower, Groundnut, Sesame and Castor
- d) **Fruit trees:** Mango, Sapota, Ber, Manila Tamarind, Tamarind, Wood apple.
- e) **Vegetables:** Chillies, Cluster beans, Bhendi, Coriander, Cucumber, Tapioca, Perennial Moringa, *Memordica tuberosa* Balsam Pear (*Memordica dioca*), Brinjal (rain fed), Tomato (rain fed).
2. **Fodder:** Soundal, Agathi *Sesbania grandiflora* *Cenchrus sp*, Dadop Thespesia, Desmanthes, stylosanthes, Alberzia, Acasia, Clitoria, Horse gram, Glyricidia
3. **Fuel:** **a. Biodiesel** Jatropha, Pungam, Mahua
- b. Fire wood** Prosopis, Acacia holocericae, Cassia siamea.
4. **Timber:** **Acasia auriculiformis**, Sisoo, Acha, Albezzia, Neem, Dalbergia latifolia(hills) Teak (foot hills), Red sanders, Silver oak, kadamba.
5. **Commercial Flowers:** Nerium, Marigold, Gomphrena, Celosia.
6. **Medicinal Crops :** Catharanthes, Senna, Neem, Bael, Woodapple, Saracca asoka, Amla (hills) Aloe.
7. **Aromatic Plants:** Lemon grass, Geranium (hills) Artimisia, Mints, Rosemary (hills)
- Semiarid:** (under protected irrigation) in addition to crops listed in rainfed / semiarid
- 1. Food Crops:** Rice, maize, Sorghum, Pearl millet, Finger millet, Fibre crop cotton, Agave, mulberry.
- a) **Cereals & millets**
- b) **Oilseeds:** Groundnut, castor, sunflower,
- c) **Fruits:** All tropical fruits including grapes Jack, Mango, Citrus, Papaya, Custard apple, Guava, West Indian cherry, Amla, Palmyrah.
- d) **Spices:** Turmeric
- e) **Vegetables:** All tropical vegetables.
2. **Medicinal:** Ocimum, Cassia auriculata Gymnema
3. **Aromatic plants:** Sandal, Mexican lavender,
4. **Commercial flowers:** Jasmine, Rose, Barlearia, Nerium,
- Tropical (Humid – Irrigated)**
1. **Food crops:** Coconut other crops as mentioned in rainfed / semiarid crops
- f) **Fruits:** Cashew nut (nuts), Banana, Palmyrah, Sapota, Guava, Mango (Except saline alkaline, saline) Jamun, Wood apple, and Cordia.
- g) **Vegetable:** Dmmstrick, chillies, Bittergourd,
2. **Fodder:** All crops grown in rainfed and semiarid area
3. **Bio fuel:** **Alexandrian Laurel, (Punnai)**
4. **Fire wood:** Casuarina, Prosopis
5. **Timber:** All timber crops mentioned in rainfed and semiarid areas.
- Hill areas (Warm temperate)**
1. **Food crops**
- a) **Cereals:** Wheat,
- b) **Fruits:** Plum, peach, strawberry, pear, persimmon,
- c) **Vegetables:** All Cole vegetables, Potato, French beans, Butter beans, peas.

	<p>2. Medicinal: Bacopa, Digitalis, Eucalyptus, Artemisia, Pyrethrum.</p> <p>3. Aromatic: Geranium, Rosemary, Lavender, Thyme, Mint</p> <p>4. Timber: Pines, Silver oak,</p> <p>5. Commercial Flowers: Gladiolus, Carnation, Gerbera, Lilies, Rose, Bird of Paradise.</p> <p>6. Pulp fibre: Eucalyptus</p> <p>Fuel: Wattle</p> <p>Beverages: Tea</p> <p>Subtropical:</p> <p>1. Food Crops :</p> <p>a) Cereal: Wheat</p> <p>b) Fruits: Hill banana, Pineapple, Jack, Rambutan, Litchi, mangosteen, Avocado, Mandarin, orange, acid lime, Lemons.</p> <p>c) Spices: Black Pepper, Cardamom, Cinnamon, Clove, nutmeg, Allspice, Malabar Tamarind, Garlic, Ginger</p> <p>d) Beverages: Coffee, Vanilla, Cocoa,</p> <p>e) Vegetables: Chow chow, Capsicum, Butter beans, Double beans,</p> <p>2. Medicinal Crops: Neem , Pongamia glabra, Albezia amara</p> <p>3. Herbals: Aswagandha, Ocimum, Cassia angustifolia</p> <p>4. Aromatic Crops: Sandal , Linoloo</p> <p>5. Dye Plants: Sappon, Red sandal , Wrightia</p> <p>Timber</p> <p>6. Fodder As furnished in the case of warm temperate regions</p> <p>7. Medicinal: Stevia, <i>chebulicmyrobalan</i>, white fraginscense, camphor tree,</p> <p>8. Aromatic: Patchouli, Lemon grass</p> <p>Commercial flowers: Carnation, Gerbera, Anthurium, Rose, <i>Alstromaria</i>, Dahlia, Orchids.</p>
32.	<p>Refocussing Agricultural Research :</p> <ul style="list-style-type: none"> • Both basic and applied research should receive adequate attention. Nevertheless, basic research should aim at ultimate goal to find workable solution to the practical problems in addition to scientific explanation for different processes and development of fundamental principles. • Harnessing the benefits of new scientific advances such as biotechnology, genetic engineering, cloning, remote sensing, GIS, information technology etc. • Sustainability issues related to the potential of soil, water, energy and environment under intensive, diversified and integrated farming systems. • Intensification of research to prevent land degradation, water and environment quality deterioration and to restore the productivity of degraded land and deteriorated water and environment through less costly and eco-friendly methods. • Development of precise quantifiable criteria for assessing different soil qualities and for monitoring periodic changes in soil health resulting from different land uses, human intervention, climatic adversities etc. in varying agro-ecological environments. • Eco-friendly methods to prevent as well as ameliorate pollution of soil, water

	<p>and environment and to recycle the varying marginal waters including waste waters.</p> <ul style="list-style-type: none"> • Establishment of a National Institute of Water Management Research with specific mandate to develop and transfer the improved technologies to conserve, save and improve use efficiency of water resources in both irrigated and rainfed areas. • Economic and efficient management of available huge quantities of organic wastes including crop residues, weeds, farm and home rejects, municipal and industrial wastes etc. such that these are converted into wealth through composting, recycling and value addition. • Well-planned anticipatory research for monitoring as well as mitigating the adverse effects of expected climatic change. • Quantitative assessment of the ill-effects of disasters like cyclones and earthquakes on soil-water-crop productivity, pest and disease incidence, biodiversity etc. and measures to combat these. • Detailed evaluation of the detrimental effects of developmental activities such as mining and brick-kilns, and cheaper scientific methods of rapid restoration of the damaged agricultural lands. • Greater emphasis on diversification of production systems, agroforestry and integrated farming with judicious management of soil, water, nutrients and energy in conformity with location-specific situations. • Priority attention on product quality and value addition. • Sustained productivity enhancement coupled with higher growth rate in the fragile ecosystems like coastal, rainfed and hill-mountain regions. • Efficient resource management practices including precision farming for high sustainable productivity. When the farmers in China with better management despite smaller size of holding can achieve much higher productivity of many commodities resulting in almost double foodgrain production from less cultivated land than India, it should be possible to attain such high productivity in our country as well. • Budgeting should be projectwise which should be time-bound. The tendency of continuing projects for indefinite or for too many years needs to be discouraged. • Certain research projects should be directed to develop technologies, outcome of which can help self-employment and high income generation. • Land use planning should also take into consideration the socio-economic conditions of the target farmers. • There should be a formal mechanism to collect and disseminate day-to-day data on market trends, price structure of agricultural products and related aspects to help the farmers in selecting suitable production systems. • Efforts to bridge regional disparities, gender inequities and rural-urban imbalances.
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33.	<ul style="list-style-type: none"> • While targeting to foster crop-livestock- fish integrated farming systems, research on use of equines in farming system particularly for transport of agricultural goods in hilly and mountainous terrain and area with non-motorable roads is required to be intensified at national level, with particular reference to states like Himachal Pradesh, Jammu and Kashmir, Uttaranchal, Arunachal Pradesh, Meghalya, Manipur and Rajasthan. Research on value addition of equine by-products like use of equine dung for mushroom cultivation, mare milk <i>for</i> harvesting lactoferrins (a protein having anti-microbial properties) and donkey hair for production of rough carpets to be emphasized. • Inputs from the end-users should be one of the major criteria for developing research projects. • Institutes should involve NGOs/ dedicated progressive willing farmers as collaborator for achieving the objectives. • Institutes should be prepared to undertake basic, anticipatory and adaptive research and should be more proactive to face the challenges emerged due to epidemics/natural disasters.
34.	<p>On the lines of National Innovation Foundation funded by DSIR, there is a need to develop a few autonomous bodies fully funded by ICAR / DARE to meet the challenges faced by irrigated, rain-fed, desert, coastal and hill areas, as under:</p> <ol style="list-style-type: none"> i) Crop-weather forecasting and disaster management; ii) Crop-livestock-fish integrated farming systems development; iii) Bio-diversity conservation and biotechnology exploitation; Commercialization of agriculture with effective utilization of local resources; iv) Agricultural information dissemination through ICT Kiosks in rural areas; <p>and Blending modern technologies with ITK, including gender issues.</p>
35.	<p>Open a fully autonomous, target oriented multidisciplinary strategic research center of international level to address this issue and work on time bound objectives. The work force should be drawn from national and international talent and financed by agro-industries, ICAR and FAO</p>
36.	<ul style="list-style-type: none"> • A very complex TOR requiring to address many issues in one go. In my assessment, the overall goal should be to enhance productivity and profitability of well endowed irrigated agro-ecosystems along with fragile agro-ecosystems representing rainfed, semiarid, desert, coastal and hill areas. Inclusion of irrigated agro-ecosystems is necessary, since food grain sufficiency and security, which is dependent on the productivity growth in these regions is on the decline. • When ecologies are fragile and their carrying capacity is constrained because of environmental limitations (land, water, vegetation and climate), the ideal approach to follow would be: (i) low intensity high value agricultural activities (if water is the dominant limiting factor) and (ii) high intensity agricultural activities depending on vertical and multiple use of natural resources (if water is

not limiting but terrain conditions are). Low intensity high value agricultural activities involve animal based farming systems and alternative land use practices (variants of agro-forestry systems; guided primarily by land capability class and moisture index i.e., ratio of precipitation to potential evapotranspiration) supported by native inputs (organic farming) and indigenous knowledge (medicinal and aromatic herbs and shrubs) and their integration with that what moderates risk, maximizes profitability and assures availability of even employment throughout the year (animal-based farming and arid horticulture). High intensity agricultural activities in well-endowed irrigated regions call for launching research on vertical and multiple exploitation of natural resources on the one hand and agricultural produce on the other. While doing that it will be of fundamental importance to maximize productivity and profitability and minimize environmental consequences by making efficient use of native and added resources. Simultaneously it will be inescapable to diversify production basket and value add to what is produced by conducting well planned market research to stay abreast with consumer demand at home and abroad.

- Over the years, a large volume of information has been gathered on the causes and solutions of developing sustainable agriculture in rainfed regions. Sectoral approaches of agricultural research are insufficient today when spread of land degradation continues due to inefficient use of natural resources and inability of farmers to make investments in restorer inputs. This happens despite the availability of knowledge on the ways by which rainfed agriculture is managed for sustainable development. This apprehension is justified since the available knowledge has not been and is not being applied in an effective manner.
- The agricultural research must address the issues of land management in an integrated format by following and encompassing ecological principles (say conservation tillage, biodiversity sustenance), integrated use of native and man-made resources (organic manures and microorganisms, fertilizers, bio-pesticides and their synthetic variants, native land races and improved plant types, irrigation and rainwater), climatic risks, developments in information and biotechnology, competence and capability of land users, institutional and market links, gainful use of farm household labor and cash constraints. In summation, a research project must begin with techniques of cultivation and end with consumption of produce in all their aspects not only for today but for tomorrow as well. Never a technology be approved until its after-adoption environmental consequences are studied, documented and certified safe.
- The total strategy of agricultural research must harmonize ecology, economics and environment. The key words of this strategy would be: production systems, farmers' future (poverty reduction), problem solving (technological and social), livelihoods security (competence, capacity and capability building), efficient and integrated natural resources management (native plus modern) for sustainable agricultural intensification (multiple and vertical uses of land, water

	<p>and biodiversity through resource conservation, appropriate genotypes, waste management and efficiency of external inputs), existing and emerging biotic and abiotic stresses (good agricultural practices in consonance with climatic variations and change, uncertainty analysis, biotechnology, information and communication), markets and trade (produce management and processing, quality and standards, commercialization, international trade and treaties).</p>
37.	<p>In the first Reference there are four items, three of them is understandable but how to join them with fostering of crop-livestock-fish integrated farming.</p> <p>(a) Strengthening strategic research involving frontier science and technology: Agriculture or plant science and industry is now at the interface where electronics have started to play a big role (precision agriculture, spinach lab-top, production of nano-plants, etc.). Conventionally three sciences may be considered as frontier ones, Biotechnology, Information Technology and Environmental science and technology. ICAR Institutes, SAUs, CSIR Institutes, General Universities and a few Corporate Bodies in India conduct research in Biotechnology. Each State may have a <i>Biotechnology Commission</i> to establish coordination between Biotechnological Research and to promote such research having proper linkage with the DBT. This Commission is to keep a Database of all Biotechnologists and their expertise in terms of work done by him- or herself including existing facilities that can be shared between the scientists of different Organizations (Domination of the Directors on the work done by the fellow scientists to be avoided). There should be an Apex Body in the Center to monitor that proper technical persons are there in the State-level Commissions. The Commission is to identify the strategic areas where research is to be strengthened in the existing agro-climatic zones giving emphasis on farmers' interest particularly with respect to production and productivity, propagation, diagnostics, new crops, regional gene bank, land use, improvement of beneficial microbes and bees, improvement of aquaculture, marine fisheries, livestock, birds and other allied subjects. Attempts are to be made to pick up indigenous biotechnology practiced by the farmers and to bring them to the proper laboratory for their refinement and transfer the technologies to the farmers.</p> <p>Research on Information Technology (IT) is conducted by the Institutes of the Department of Information Technology, Department of Space and ISRO and mostly by the Corporate Bodies. IT so far reached to the affluent communities though it can be a very useful technology to bring self reliance among the farmers' community at large. Launching of "Edusat" has enormously broadened the scope for taking knowledge at the door of the farmers and also to modernize technologies. Some Institutes have already started to modernize their technologies to bring precision, sensitivity, etc. on an interactive mode. Attempts have also been made to communicate the knowledge and information to the farmers. The MS Swaminathan Research Foundation has started a Movement on establishing Village Knowledge Centers for this purpose. Several NGOs, Central Marine Research Institute, National Institute of Agricultural Marketing, Ministry of</p>

Communication and Information Technology, ISRO (Agri-Infotech), NIC (Fruits and vegetable marketing), IFCO- Agrotech, Manufacturers' Association of Information Technology (Wi- Fi Technology), etc. have launched programs for the Farmers. But big farmers/landlords only are harvesting these opportunities and the small and marginal farmers do not have any access to these facilities. It is now necessary to organize IT sector both to facilitate research and to take the system to the grass-root farmers' community. Agriculture and IT are to undertake joint exercises to set the joint venture at order carefully guarding the interest of the poor farmers. There may be an Apex Body for this purpose involving ICAR, Department of Communication and Information Technology, ISRO and concerned Chamber of Commerce. This Body is to prepare the Road-maps to foster application of IT in research and establishment of Village Knowledge Centers in all the states involving the IT Institutes, SAUs, concerned Chamber of Commerce and NGOs.

Major drawback to use IT for Agriculture is that IT personnel do not have any knowledge in Agriculture and Agricultural scientists are not much conversant with IT. To integrate IT with Agriculture, IT scientists are to get training on agriculture in SAUs and Agricultural scientists to get training in IT Institutes. C-DAC may be made responsible to impart training to the Agricultural scientists, entrepreneurs and NGOs at the state level.

Following the pattern of Biotechnology, State level Commissions may be organized to promote, coordinate and monitor the scope activity on Environmental Science and Technology to guard biodiversity, bearing capacity and primary productivity of the land mass, environment, bio-resources and water use, etc.

(b). Anticipatory research keeping in view the variation in monsoon behavior/climate

Primary effect of Global warming appears in the form of climatic change and change in the monsoon behavior. Climatic change will bring changes in the flowering behavior of crops, their bio-mass and productivity. New cropping systems are to be developed with respect to the changed circumstances. ICAR may be entrusted to initiate a National Coordinated project to record the changes, recast the agro-climatic zones and suggest proper cropping systems in the changed climate.

Changes in the monsoon behavior are causing frequent occurrence of drought and flood. Several actions are to be needed to serve the farmers' interest in this respect:

(i) Development of suitable varieties adaptable to suddenly changed conditions (Extensive search for wild types having such properties, application of Biotechnology, etc.).

(ii) Alternative cropping systems

(iii) Extension of the protective umbrella of Crop insurance to the affected farmers.

(iv) Development of operational tactics and contingency plans

Item (i) is to come under the purview of the proposed Biotechnology Commission and items (ii-iv) are to be looked after by the ICAR, SAUs and concerned Government Departments constituting a Joint Action Committee for these purposes.

India Meteorology Department is to strengthen research to develop long range forecasting system and to make the forecast available to the Committee to plan their annual activity.

(C) To foster crop-livestock-fish farming system

It may be avoided as farmer oriented integrated farming system should not be restricted to crop-livestock-fish. It is to include poultry, duckery, bee-keeping, organic recycling, local bio-resource utilization so on and so forth.

In fact Agriculture may be looked from two different angles: (i) Improvement of Farmers condition by integrated farming system that eventually contribute to the improvement of the society but it may fail to produce exportable surpluses; (ii) Annual production oriented activity focusing only the yield. These subjects are debatable and need separate treatment.

(d). Productivity and Profitability of rain-fed, semi-arid, desert, coastal and hill areas Crops and technologies are different for different conditions referred. Rain-fed conditions may prevail in high rainfall areas and both in arid and semi-arid conditions. In high rainfall areas irrigation facilities are to be extended. In arid and semi-arid conditions proper cropping systems are to be developed with crops having low virtual water requirement along with efficient water use systems. Soil conditioners are to be developed. ICAR Institutes, SAUs, NGOs, etc are working in these fields. Desert and Coastal Farming are two emerging fields. Forestry is a component of both the fields. In coastal system, aquaculture, marine fisheries, horticulture are also to play a big role. Hill agriculture is completely different. Hill conditions differ in Eastern and North-Eastern Himalayas, Western, Northern and Southern Hills. Forestry, Geology and Horticulture are to play a big role in this situation. ICAR along with the concerned SAUs is to set up different Core Groups for developing Dry land farming, coastal farming and hill farming. These Groups are to prepare status reports at National level and develop farming policies in these specialized zones including cold deserts.

Focus Points : In view of the ground reality that availability of land for

	<p>cultivation and water resource will gradually decrease and we are committed to offer food and nutrition security to the farmers and also to assure sufficient income generation, the focus points will be:</p> <ul style="list-style-type: none"> • Productivity of nutritional value added appropriate crops • Application of appropriate technologies for reclaiming all types of waste lands with special reference to microbial and a-forestry technology • Intensive and extensive horticulture • Organic recycling • Development of proper organic manures and fertilizers to minimize the use of inorganic fertilizers • Development of botanical pesticides to reduce the use of hazardous pesticides • Mapping of agricultural bio-resources • Intensification of innovative research on the use of bio-resources and agri-horticultural wastes to develop plant based rural industries and agri-business • Crop diversification and multiple cropping and increasing cropping intensity and agro-forestry systems
38.	<p>This TOR seems to be too limiting. There may be also a need to detract from production in some areas given the fragility of the resource base and the benefits of the ecosystem services that the natural system might provide. Also, climate change should be squarely addressed, not just variation. These are issues of long-term strategic importance.</p>
39.	<p>The need to revamp the system has arisen because the system is not self critical and self-correcting. These concerns have been with us for quite sometime but the need for action has now been signaled by the highest functionary of the land.</p> <p>The question before us is how to go about? The task forces of the kind that has been set up have been set up earlier and a number of times. Our experience is that they have not yielded the desired results. I have no reasons to believe that this task force would lead to anything different.</p> <p>The reasons for my above observation are that a committee of this kind is generally viewed as something unwarranted since it tends to reflect on those who are currently responsible for delivering the goods from a downward spiraling system which they have inherited. Implementation of the recommendations of committees, where those who are supposed to implement are not involved in developing these recommendations are never taken seriously and after a few years yet another committee is set up.</p> <p>This being so, how do we go about? My view is that revamping any organization such as ICAR in one go is not feasible and should not even be attempted. What is needed and, I believe, doable is to consider how can the system be assisted by enabling it perform critical functions whose absence has allowed the system to go the way it has. This critical function in my view relates to ability to take a system-wide view, coordinated thinking and ability to see into the future by learning from the past with ability and capacity to steer the changes. This function is somewhat akin to what science council does in the CG system. Although the dimensions and variedness of the Indian NARS would make the task</p>

	<p>much more demanding. A key expectation would be to visualize, articulate, and develop a shared perception of the change agenda for agricultural research and education which will take the country into 21st century.</p> <p>Thus what I am saying is that those who have to implement the change agenda must be a part of the process which leads to a shared vision of the change agenda amongst the key stakeholders including research institutes , agricultural universities, even the state and central government departments. Facilitating building of a shared vision would be most critical.</p> <p>In view of above, it is very difficult to make suggestions with respect to individual terms of reference. The terms of reference as provided relate to elements of change that must be addressed. Some elements of change which have been flagged in the past discussions (e.g. NAAS sponsored workshops on Agricultural Policy-Redesigning R&D to achieve its objectives and ‘ Prioritization of Agricultural Research’ organized by CASA) include:</p> <ul style="list-style-type: none"> • Decentralized research prioritization • Regionally differentiated approaches to R&D • Building a systems perspective etc., <p>These and other elements of change will determine the nature of interventions that will bring about the desired change.</p>
40.	<ul style="list-style-type: none"> • Infrastructure development with state of art equipment for front ranking research in SAUs. • Adequate financial provision for strategic and anticipatory research on regional basis. • Establishment of referral laboratory regionally for quality testing. • Every University be supported for establishment of technology parks. For up scaling of technologies and skill development. • Emphasis on integrated farming systems approach.
41.	<p>(i)The ICAR institute should lay emphasis on basic, strategic and anticipatory research whereas the SAUs should devote more attention to applied research. Considering research in crop improvement as an example, the ICAR institutes should concentrate on development of breeding material, wide hybridization, identification and development of donors, development of transgenics and related protocols, whereas the SAUs should focus on their evaluation on research stations and farmers’ fields. In fact, the mandate of ICAR’s project Directorates and National Research Centres in various crops, is to undertake strategic and anticipatory research, but that has not happened.</p> <p>(ii) Reasonable issues in basic and strategic research should be identified and assigned to specific scientists/specific institute. To work on these, there should be inter-institutional efforts among ICAR, SAUs, Conventional Universities, CSIR etc. In case of research in cutting edge technologies, the scientists of</p>

	<p>ICAR, who are identified should be provided with facilities and support as in Institutes like Indian Institute of Technology, Indian Institute of Management, Indian Institute of Sciences, Tata Institute of Fundamental Research etc. Further, the scientists should be encouraged to publish in renowned journals. In certain institutes (SAUs), all emphasis is laid on the contribution to the package of practices.</p>
42.	<ul style="list-style-type: none"> • Sufficient number of scientists should be posted. • Potential irrigated system under going forced conversion to other ecosystem due to the failure of monsoon and non-availability of quality irrigation water and inter state water disputes. Consideration for the suitable policy enunciation and necessary research for inter state river water linkage and fund allocation to irrigation sector for development of water shed, rain water harvesting, rehabilitation of irrigation structures and economic and efficient use of water with water saving structures like inter-grid system for taking water to vast stretch of waste lands. • Impetus for rainfed farming - It is very much essential to strengthen our future research on rainfed farming particularly to enhance the production and productivity as well as profitability of major rainfed crops like millets, pulses, oilseeds, cotton, rainfed Horticultural crops etc. • Intensification of research on minor millets and less known pulses - The minor millets like samai, varagu, tenai, lesser known pulses like Horsegram, Naripaiyaru, needs intensification of research in the coming years including post harvest technology. These are drought tolerant and come up well in marginal and submarginal lands. • Intensification of research on modern irrigation & fertigation techniques using sprinkler, drip irrigation and other water saving agro- engineering techniques. • The Integrated Nutrient Management research should be intensified to develop balance nutrient management packages for major crops so as to reduce the wastage of plant nutrients and minimize the cost of fertilizer application. • Intensification of research on developing low cost IPM techniques for dryland agricultural ecosystem with emphasis on biological control. • Thrust on development of low cost farm implements/ labour saving machineries to reduce cost of production vis a vis situation. • Focused research on emerging challenges like waste water recycling, value addition, organic farming global warming, precision farming etc. should have to be carried out. • Identification and intensification of research in crop physiology, biotechnology, post harvest processing and viral and mycoplasma disease management. • Location specific and resource based integrated farming and cropping system to suite various agro climatic zones of the country (Crop zonation Vs IFS). • Emphasis on genetic engineering in crop plants to cope up with the changing scenario on biotic and a biotic stresses. • Indigenous knowledge / techniques – conservation, promotion, analysis, refinement and further building on such techniques • Focus on dry land horticulture and mass multiplication of dry land fruit crops

through tissue culture.

- To give special attention to identification of new bio-fuel yielding trees and standardization of agrotechniques for growing bio-fuel yielding trees and efficient extraction of oil from such crops.
- Agrl. prices are fluctuating widely resulting, at times losses to the farmers. Therefore, researches on agricultural prices behaviour and forecasting should be focused.
- Agricultural research on agro-exports and imports, emphasizing quality standards. So, there is need for evolving export oriented crop production technologies particularly for fruits and vegetables and medicinal plants. The research on 'oil palm' also needs reorientation.
- Intensification of research on salt affected soils and polluted problem soils.
- Waste land development assumes strategic importance and hence the research thrust may be on tree improvement, silvi-pasture, horti-pasture and the like.
- Participatory research and extension approaches with farmers and agri-businesses to facilitate the development of appropriate technologies and to reduce the time-lag involved in the diffusion of innovations, so as to improve the impact on agricultural production. The operations research may have its own renaissance.
- Addressing problems of under employment, unemployment and malnutrition in rural areas through diversification of agriculture and promotion of horticulture, fisheries, dairy, livestock, poultry, beekeeping, sericulture etc.,
- Addressing technology and input needs of farm women and other disadvantaged sections of rural society, with a view to remove the drudgery and burdens of their lives and augmenting their income.
- Team of scientist to be engaged to work continuously as "**Think Tank**" or "**Expert Cell**" both for formulation of innovative ideas for obtaining external funding and also to undertake anticipatory research on emerging issues.
- Much emphasis on basic research in agriculture.
- Line department personals of animals science, fisheries research to be integrated to take up long term mission mode interdisciplinary research.
- In line with pharmaceuticals all agricultural inputs dealer ship must be assigned to farm graduates for better and scientific use of Agricultural inputs.
- Engaging farm graduates in wasteland development to fullest extent.
- Cropping pattern policy for various agro ecosystem to ensure optimum use of land, water and other resources.
- Evolving National policy for contract farming of Commercial, Medicinal, Horticultural crops for export orientation as that of sugar cane, cotton etc.
- Strengthening warehouse including cold storage unit and regulated market system to ensure effective procurement, storage and marketing of agricultural produces.
- Facilitating crop insurance and sufficient credits for farmers for economic sale of farm produces.
- Challenges of variation in monsoon behaviour / climate : Strengthening regional scientific forecasting will help agricultural planner and farmers.

	<ul style="list-style-type: none"> • A researcher should have freedom and too many diversion of works should not be thrust. <p>Emphasis on timely seed supply :</p> <ul style="list-style-type: none"> • Separate wing involving Agricultural university, Agriculture Department, co-operate sector and quasi government organization to facilitate large scale seed production including green manures • Making existing Seed Act flexible to accommodate and encourage more seed growers to involve in the seed production so as to maintain seed chain by involving agrl. graduates • Identification and zonation of potential areas for seed production. • Campaigning for promotion of seed farming • Contract farming to meet seed demand <p>Bio- inputs in Agriculture:</p> <ul style="list-style-type: none"> • There is a sufficient awareness of using the bio-inputs in agriculture. However, under existing scenario there is a wide gap to bridge the supply and demand. Policy enunciation fund mobilization and channelizing agency (like SHG's) must be identified.Emphasis given for non conventional energy sources. (Emphasis for sustaining soil health in agriculture). <p>Thrust must be given for production and distribution of bio-inputs like Biofertilizers and Bio-control agents for use in the farm sector with due emphasis on quality control.</p>
43.	<p>1.For strengthening strategic research, we need to ensure inter-disciplinary and inter-institutional collaboration for required complementarity and efficiency. The model developed for strategic research under NATP, focusing on eco-regional approach, would possibly be the best alternative for addressing new challenges. Rice-wheat consortium is one of such good examples to address System's approach. We can not afford to have single institution or individual scientist oriented research efforts any more. Perhaps, a competitive grant system for funding inter-institutional projects, involving other stakeholders, such as CSOs and private sector, would be the best way to infuse competitive spirit and encourage performers in the system. Institutions can be funded for staff salary and capital expenditures, whereas scientists must complete for research grants to be provided through scientific panels of eminent scientists, using the competitive grant system, under overall umbrella of ICAR. Also, we could learn from the experience of the NATP and overcome deficiencies, if any, to make this a real success in future. Sectoral imbalances such as animal sciences and fishery, forestry research have also be corrected through these initiatives.</p> <p>2. Emphasis must be given on building of Centers of Excellence, and the initiation of well thought Mission Mode projects that are for a fixed time period (maximum of five years) and are better monitored externally for expected impact.</p>
44.	<p>We must strengthen research programs in molecular biology and biotechnology in agricultural universities and ICAR institutes. The level of research in these</p>

	<p>subjects in India is much lower than in developed countries and even in some of the developing countries such as China. Resources devoted to some of the routine subjects such as agronomy may be reduced and diverted to “new science”.</p>
45.	<p>Frontier and Anticipatory Research</p> <p>These are endearing terms of high relevance and sophistication, and very appropriate in context of the first decade of the Third Millennium. Alas, like most Indian gubernatorial attempts at outreaching, this will also fail unless there is change of antiquated mindsets, in-depth comprehension, but above all some little honesty and sincerity in the Science (this includes Agriculture – I hope!) establishments and more importantly in the ‘Science Managers/Babus’, who manipulate the Heuristics of Indian Science. Agriculture is admittedly regarded as lesser enterprise simply because it’s a little more mundane, but it is here that the grass roots can also be involved in the business of intellectual adventure. That’s what Science, and Research, especially Frontier and Anticipatory Research is.</p> <p>One Principal Frontier and Anticipatory research area for India, and indeed for the world, without smudging by demarcations of ‘areas and subjects’, is</p> <p><u>Genome Modification</u></p> <p>- Of microbes, higher plants and animals.</p> <p>The fallouts would be both theoretical and immediately unrealizable as well as practical and of high utility. They could even be life/planet saving.</p> <p>Cues can come from exobiology, and projections for future terra-forming of potentially habitable celestial bodies. This assumes relevance in time as short as a decade in view of the increasing ‘eyeing’ of the moon by many countries, including India, in the manner of the Antarctica.</p> <p>There are no exo-biologists in India. We have one lone astronomer who has postulated esoteric theories on the supposed Cosmic Origin of Life!. Agriculture would form an important part of any terraforming enterprise. What is to prevent the NAAS to at least start thinking on those lines. Make a beginning by allowing/encouraging relevant disciplines to explore, analyze, experiment...beginning with methanogens, going on to the extremophiles...the list is formidable now. They might even come in handy right here, in multiple situations in countries like India bursting at the seams with populations and pollutions, and all ‘natural’ bounties fast depleting, eroding.</p> <p><i>Exo-agriculture</i> is a new discipline which is suggested as a component of Terraformation since human cultures and civilizations on earth have been established and have flourished only on the introduction and advent of agriculture. So, lets have exo-agriculturists. Let India make a beginning by producing a few.</p>

	<p>They would be the first in the world!</p> <p>I may add that apart from microbes, Agriculture also encompasses insects (both useful and destructive-management aspect), fishes, mammals (livestock) and birds (poultry) as non-herbal protein/other significant nutrient/vitamin/medicinal sources.. Within the broad heading above, these must also be included.</p> <p>Any serious tinkering with genomes would necessarily entail both technical and ethical dilemmas, and both self-regulation and watchdog bodies would be essential to oversee the research. Only, care will have to be exercised that the overseeing not fall into the hands of interfering incompetents, as has been happening.</p>
46.	<p>Increased emphasis should be laid on participatory research with full involvement of farmers and extensionists in tackling specific problems constraining the productivity of agriculture of a certain agro-ecology or a community. This would be particularly important in issues that relate to management of natural resources for sustained production/productivity of agriculture.</p>
47.	<p>There are many issues in agriculture that are benefited by using Space data.</p> <ol style="list-style-type: none"> 1. Space data provides spatial and temporal information and the Knowledge Technology for the soil/crop relation which hasn't been given adequate attention. 2. Today information is available mainly at 1:250K scale. What we need is 1:50K and at 1:10K scale (using P6 satellite) for intensive agriculture. 3. For long term strategy, we need short term plans. We need macro level as well as micro level information. Integration of data from various sources/organizations is crucial for analysis and synthesis in any situation. 4. Horizontal growth in Agriculture can be provided using Remote Sensing inputs (ex: - waste lands can be reclaimed for agriculture or horticulture or for litter growth or for soil conservation or for water/watershed management, land use management etc). Space can also identified marginally unproductive areas for making them more productive. Vertical growth can be provided by better technological management for example in land use, we can improve production by identifying suitable areas using Remote Sensing. In Kalahandi district of Orissa, it is our personal observation that it is the poor management that is responsible for the low production of crops, though the soil is highly productive there, besides ground water. 5. Also nowadays, Technology management solutions are needed for the mega problems ex: - River linking. There should be a law to promulgamate water distribution (both Ground Water & Surface water) On this, I feel it is not lack of knowledge, but the lack of interest from Govt. side.
48.	<p>The terms of reference of the Task Group indicated the need for strengthening the strategic research in view of the challenges in various monsoon behaviour /</p>

	<p>climate, etc. It is certainly a very important matter that needs special attention. Modern molecular biology and genetic engineering have emerged as some of the fastest and most powerful techniques for manipulation of various traits in living organisms. It can therefore make a major difference in the agriculture sector. The various advancements / methodology that are available in genetic, genomic science can offer valuable inputs in engineering crops and live stocks suitable for the windbreak, salinity, draught, disease as well as to improve nutrition of food plants and thereby provide both food and nutritional security to the people. Fostering livestock – fish integrated farming systems and to enhance the productivity and profitability of rain-fed, semi-arid, desert, coastal and hill areas, etc. have to be given special focus in agro research. Intensive cultivation of land without conservation of soil fertility and soil structure have shown to degrade the land likewise irrigation without arrangement for drainage could result in soil become alkaline or saline. Indiscriminate use of pesticide, fungicide and herbicide could cause adverse changes in the biological balance as well as lead to various human diseases including cancer. Unscientific tapping of underground water, replacement of hybrid varieties for the locally adopted ones has shown the disastrous consequences. Therefore, our agricultural research also should develop strategy for such issues and build up a scientific strategy of agricultural practices for sustainability and prosperity.</p> <p>While the human population is increasing in geometric proportion the harnessable natural resources, particularly the land, water (which form the best for production of food, nutrition, fuel, fibre, medicine) are drastically shrinking in size as well as deteriorating in quality. In India it is not only the human population pressure, we also have the pressure of the animal / cattle population, which is seriously compete for the scarce resources. This change in scenario demand for a highly innovative and strategic research in agriculture focusing of sustainable increase in yield, productivity per unit land and per unit water in a sustainable manner. The scientific management of soil and water is the key to meet these challenges beside the population control.</p>
49.	<p>Top management leadership of the ICAR was generally steered by the top managers of Crop Science division mainly breeders which inbred crop , commodity and disciplinary bias with a highly restricted scope. I am certainly not against a disciplinary approach but the same should not exceeded beyond a point and is expected to converge on integrated resource management for providing sustainable services to the society. Climatic potential of the Indo-Gangetic plains is about 18 tons per hac per annum, we have been able to realize just 10 with a plethora of multiple nutrient disorders, input use inefficiencies, resource degradation, excessive exploitation of groundwater and energy. All crop improvement programs aimed at realizing higher photosynthetic efficiency with a total disregard to input and natural resource use efficiency. Even if there were a few attempts by the breeders they never made soil scientists, agronomists, etc. as a partner in the program. There is a program with IRRI on rainfed rice in fragile eco-system which others come to know only through the press and media instead of real involvement of the NRM scientists.</p>

	<p>Recently, about 200 trainings were slotted in the bio-technology and proposals made for similar training in the area of climate change, drought management, multiple use of water and integrated farming systems were totally ignored. This happened in a year when maximum suicides were committed by the farmers due to drought. In this way there is a total lopsided and highly restrictive or biased emphasis on the strategic research. Time has come to rotate top level manager of the ICAR among various disciplines to provide equity for all inclusive and harmonious research and development.</p> <p>Per capita land and water availability of 0.19 ha and 1,290 cubic metre water per persons is projected for the year 2050 and therefore, livelihood, employment and income generation opportunities are expected to be realized with most efficient resource management. The only way is to optimize integrated farming systems based on the principles of cycling and recycling of inputs with reduced environmental loading. However, Crop Science division with 50% of the manpower and other ICAR resources is totally non-committed to the sustainability. Crop based CG centres like CYMMYT has recently gone into massive restructuring and has mandated itself in systems perspective of sustainable resource use. ICAR is about 20 years behind in its thinking of what is going on at the international level. It is, however, reassuring that this task can now be accomplished under the stewardship of Prof. M.S. Swaminathan, Dr. G.S. Khush, Prof. V.L. Chopra and others as a New Year gift to the nation.</p>
50.	<p>The subject of natural resource management for sustainable agricultural production has not received the kind of attention that is due to it. This cuts across the boundaries of the commodity oriented research activities, and variedly, either no one claims responsibility towards the natural resources, or everybody claims to be an expert on these.</p> <p>Research involving the natural resource is to be planned with caution as these are not administered to the users by the researching group, there is a good amount of uncertainty in the temporal, spatial and quantitative occurrence of them and there is a general unawareness (or, "I don't care" attitude) of the sustainability issue, perhaps due to more emphasis on short-term gain. This causes adoption and application of research results to remain invisible, questionable and many a time infeasible .</p>
51.	<ul style="list-style-type: none"> • Strengthen data bank on climatic parameters agro-ecological region-wise and analyse them critically to understand the behaviour of climate change. • Plan research on farming systems taking into consideration the anticipated climatic change pattern. • Strengthen natural water resources and prioritize research to enhance water productivity. • Contingent crop planning for situations originating from weather aberrations etc. • Linkage between SAUs and industries for R&D purposes should be strengthened. <p>Strengthening of strategic research: More resources and research efforts need to</p>

	<p>be directed towards the development of varieties/genotypes and agronomic practices to manage abiotic stress namely drought, excess water and heat. Breeding for these traits is being hampered due to non-availability of practical procedures to screen large populations. Identification of molecular markers and cloning of stress related genes should be given priority so as to develop varieties/transgenic suitable for rain-fed, semi-arid, desert, coastal and hill areas.</p>
52.	<p>Strengthening of strategic research: More resources and research efforts need to be directed towards the development of varieties/genotypes and agronomic practices to manage abiotic stress namely drought, excess water and heat. Breeding for these traits is being hampered due to non-availability of practical procedures to screen large populations. Identification of molecular markers and cloning of stress related genes should be given priority so as to develop varieties/transgenic suitable for rain-fed, semi-arid, desert, coastal and hill areas.</p>
53.	<p>Economic Aspects of Recommended Practices: Indian agriculture has moved away from subsistence occupation to economic activity. Today, farming requires substantial financial investments. Many farmers taking up commercial agriculture, not having the required managerial expertise, get into “over investments” and “inappropriate investments”, leading to many cases of suicides. This is mainly for the reason that the mindset in agricultural research has not changed with the changing agriculture in the country. It is very essential that farm improvements recommended to farmers are also described in their economic aspects. This is not happening for the reason that agricultural research is not tuned to this output. It is high time that this matter is given due attention.</p> <p>Management of Natural Resource Farm Resources The natural resource base in Indian agriculture, particularly under semi arid conditions, has suffered enormous depletion due to want of managerial attention from the farmers. Papers presented by Dr. R.S. Paroda and Dr. Panjab Singh in the First International Agronomic Conference held at Delhi clearly bring out this realisation. Many survey efforts are necessary at 5-year or 10-year intervals to bring out status and reports on natural resources in farming, so that due attention is devoted to this matter in policy formulation, development programmes and support services.</p> <p>End users to be educated The fact is that the farmers are the end users of all the natural farm resources in this Country, along with the recommended technologies and production incentives made accessible to them. While farmers are repeatedly provided with technical information and production incentives, they are not properly sensitized to the depletion in the natural resource. Therefore, building the awareness of the farmers and empowering them to deal with those problems is essential. Any amount of discussion in the seminars and workshops at the state or national levels on these issues will not have the required impact unless the farming communities are made aware of the deteriorations that are occurring in the normal course or due to mismanagement. Improvement of crops and yields alone is not the goal in agriculture</p>

	development.
54.	<p>All researches involving frontier science and technology, need the following key components?</p> <ol style="list-style-type: none"> 1. Well trained and committed scientists 2. Well managed infrastructure 3. Enabling environment and scientific temper <p>All the above components need serious consideration.</p> <p>Well trained and committed scientists :The country followed a good model in the fifties and sixties of arranging training at leading scientific research centres and attracting the trained scientists to work in public institutions. The National Agricultural Research System (NARS) also benefited from this model as it attracted talented and meritorious scientists to man NARS. Somewhere in the mid seventies a retrogressive model based on the ‘sons-of-the soil’ policy and recruitment of scientists through competitive examination evolved. This led the downward slide in agricultural research. The euphoria of the fifties and the sixties of cutting edge research fuelled by cross fertilization of new ideas and creative thinking was lost. In-breeding in the agricultural universities and loss of interest of students in research, as they realized that the quality of research at M.Sc or Ph.D. levels is no more prerequisite for getting jobs in agricultural research at public institutions. Instead of research, the new breed of students started concentrating on competitive examinations. ARS was just one of them. The result, mundane agricultural research.</p> <p>We must reverse the trend to strengthen agricultural research, as the challenges facing agriculture are greater today than at any time in the past. The following steps are suggested</p> <ul style="list-style-type: none"> • Stop inbreeding in SAUs • Change ARS recruitment system; abolish competitive examination, and select scientists based on their research capabilities, merit, and quality of their research through well-structured interviews and peer review, as is done world over. • Attract high calibre scientists through lateral entry. • Implement the basic philosophy of ARS that a scientist should concentrate in his research work, which can take him/her to a position equivalent to the top-most position in the system, and he/she need not move to managerial or other positions. • Taking a leaf from the earlier Japanese and now Chinese models, send our young graduates and post-graduates in large numbers for doctoral research at leading world institutions and attract the best of them to come back by inculcating a feeling of belonging to the nation. Chinese also attract well-established scientists by providing them the same emoluments as they get abroad (the gap in emoluments is greater in China than in India), equivalent and better research facilities, and a mechanism to work part of the time in their labs

	<p>abroad.</p> <p>In short our system of recruitment of scientists needs complete reorientation.</p> <p>2. Well managed infrastructure: We have built, excellent buildings but buildings alone cannot lead to high quality research. We must ensure uninterrupted power supply, quality water supply, clean air and well-planned laboratories. Our laboratories are much better equipped today, but maintenance of equipment and availability of supplies, including expensive biochemicals are most non-professional. For competitive research in a globalized world we must provide adequate funds and hurdle-free and efficient management of our research and teaching institutions. In the recent years, there has been a dramatic improvement in fund availability, thanks to projects like NATP, but their disbursement and procedure of utilization have not been conducive for good research.</p> <p>Well-trained and dedicated technical support is also very important for any vibrant research institution. Most of the research labs in the developed world take pride in their dedicated force of technical support. Typical of our system, we have created “Technical Officers’ and not a cadre of expert technical personnel. It needs careful attention.</p> <p>3.Enabling atmosphere and scientific temper :This is the most important aspect to promote quality research. We must strive to create it.</p>
55.	<p>It is important that basic, strategic and applied research components of a project are properly conceived, planned and executed. The three types of research essential and form a continuum (not separate) from the basic to applied research. These researches depend on one another. The role of P.G. students and young scientists are of particular significance as they bring energy and focus to especially conduct basic, and strategic research so essential for removing roadblocks to applied research and development. Agricultural production activities should be in tune with soils, ecology and environment. For example, wetland rice is making a major contribution to rice supply and is an excellent example of sustainable fertility maintenance. However, in view of water shortages in some states, there is need to consider growing paddy rice under water management practices that are water-wise (not under submerged conditions). There should be a debate on the pros and cons, in terms of rice productivity and soil fertility maintenance, on practices of growing rice under submerged vs. alternate water management practices because this has long lasting implications for the long-term sustainability of the wetland rice systems. There is need to consider growing wetland rice in well targeted areas which get waterlogged or have high water table during the growing season. For dryland agriculture, there is need to integrate soil and water conservation practices with balanced nutrient management to increase the efficiency of rainwater.</p>

56.

National Agril. Research System in India during 21st century

In view of the decline in percapita availability of land from 0.50 Ha during 1950-51 to 0.15 Ha by the turn of the century and further decline to 0.095 Ha by 2020 AD, it is imperative on the part of National Agricultural Research System (NARS) to develop such strategy and agricultural technology to be able to generate adequate employment and income specially for the small and marginal farmers who constitute more than 75% of the farming community in India. In the past NARS has not addressed the socio-Economic constraints adequately at the micro level which is the real challenge in augmenting agril. Production.

1.Socio-Economic Constraints For Agril. Production Needs To Be Addressed.

The policy makers, administrators and the agricultural scientists must seriously consider the removal of socio-economic constraints confronting the agricultural production and productivity. These include:

- Incomplete/delayed consolidation of holdings both in rainfed/and irrigated areas in many states.
- Unfavourable land tenure systems in many parts of the country.
- Incomplete coverage of crop insurance for all the major crops taking Gram Panchayat as the unit.
- Distress sale of agricultural produce in many parts of the country.
- Restricted agricultural credit specially for small and marginal farmers.
- Non-synchronous delivery of Agril.credit input and technology delivery system.
- Non-existence of cold storage/warehousing facilities in most of the production centres.
- Near absence of effective agril. Extension systems.
- Complete absence or disjointed research-extension-farmer-market linkage.

2.Second Generation Problems Of Green Revolution Need To Be Resolved

Diminishing and deterioration of land and water resources.

- Increasing biotic and abiotic stresses.
- Decline in factor productivity.
- Threatened loss of biodiversity.
- Natural Resource degradation.
- Global climatic change.
- Issues relating to intellectual property right.
- Intensification of competition for quality and cost of international trade.
- Widening of economic inequality.
- Burgeoning population.

Most or all of these should constitute the research agenda of ICAR Research Institutes and State Agricultural Universities. For some of the above agenda items, national and international collaboration is needed for quick resolution of the problems.

Basic and fundamental research shall continue to be addressed adequately by the ICAR Institutes while the results of practical utility emanating from such results

	<p>should be undertaken by the all India coordinated Research Projects for multilocation testing under all the major agro-climatic zones and soil groups.</p> <p>3.Profitable And Sustainable Cropping Systems.</p> <p>Cropping systems of a region are decided by a number of soil and climatic parameters. Nevertheless potential productivity and monetary benefits act as guiding principles for adoption of a cropping system by the farmers. It has been estimated that there are more than 250 double cropping systems in the country. However based on the rationale of spread of crops, 30 important cropping systems have been identified. These are mostly, rice, sorghum, pearl millet, pulse, oilseed, cotton based in rainfed and irrigated systems.</p> <p>In irrigated areas cropping system approach of resource management has immense potential in enhancing resource use efficiency and affective management. Land degradation problems, in efficient land use, decline in factor productivity, imbalance in fertilizer use, build up of weeds, insect pests and diseases and environmental quality could be suitably handled through appropriate Cropping Systems approach.</p> <p>Crop diversification, increasing cropping intensity and intercropping in rainfed areas, rain water management for drought alleviation, prioritized land treatment in watersheds, integrated nutrient management, integrated pest management, management of excess rainwater, exploitation of waterlogged and deep water areas have tremendous potential. Location specific no risk technologies could be identified through “On Station” and “On farm” research.</p>
	<p>Integrated farming systems research (FSR)</p> <p>“Farming System” is a complex interrelated matrix of soils, plants, animals, implements, power, labour, capital and other inputs controlled in parts by farming families and influenced to varying degrees by political, economic, institutional and social forces at many levels. Farming systems Research can be undertaken “On station”, “On farm” and by modeling. The findings of TNAU on Rice Based Farming Systems are good examples of practical applicability.</p> <p>Crop – live stock – poultry – fish for <u>sustainability</u>.</p> <p>Rice – Cow – poultry – fish for <u>small farm holding</u>.</p> <p>Crop – live stock – agroforestry – flooded rice – poultry - fishery for <u>resource risk farmers</u>.</p> <p>Poultry , piggery – fishery – vermi compost – mushroom cultivation for <u>labour intensive farming systems</u>.</p> <p><u>OFAR and “On station” FSR .</u> Basic principles of FSR are :</p> <ul style="list-style-type: none"> • Make the farm household self sufficient, make the farm free from being vulnerable to external forces.

- Enterprise diversification to increase incomes, minimize and spread risks, enhance natural resources and the environment and improve the diet of the farm families.

The standard methodologies of FSR – “On farm adaptive research” (OFAR) and “On station FSR” have to be followed (Mahapatra and Behera, 2004) in order to get dependable results in various agro-climatic zones and Farming situations, fully described by NARP/NATP for the country in five identified agro-Ecosystems – viz Irrigated, Rainfed, Coastal, Hill and desert agriculture.

Mechanism of OFAR:

Zonal Research and Technology transfer stations, commodity research centres and KVKs already established through out the country representing all the agro-climatic zones and soil groups must be fully involved in conducting “OFAR” and “On station” FSR. Scientists of the relevant disciplines must take active part themselves with adequate operational costs and field and laboratory equipments and transport facilities. Such programmes will pay dividends.

FSR By Modelling:

Recent computer software development may provide the basis for a start in modelling of “whole farm systems” even with incomplete conceptual understanding and data sets.

Many models of a given system are possible. The choice between various models depends on the purpose behind simulation, the relative ease with which the simulation can be achieved and the circumstances surrounding the systems.

Utility Of FSR Models :

- To improve our understanding of farming systems.
- To analyse and explain behaviors of a complex systems.
- To examine the different scenarios resulting due to integration or mixing different components or modifying different components of the system.
- To identify the areas where the knowledge of the system is fundamentally lacking.
- Improvising systems for wider application in varying situations.
- Models are cheaper then real life farming systems experiments.
- End users of FSR models are farmers.

Integrated Farming systems models could be developed for small, marginal, medium and large farmers. The extension and development agencies should be furnished with this type of tool (models) in order to project a “whole farm scenario’ before the small farmers taking their needs, opportunities and constraints into consideration and accordingly providing model for farmers’ overall development. This type of information should flow to each and every farmer of the country through the extension functionaries/development agencies and farm scientists.

“ Farming System Research” approach to agricultural research and development efforts would accelerate agricultural growth of the country, thereby providing leverage for transforming poverty prone rural India into a prosperous India by strengthening rural economy. Certainly this will play a key role in agril.

	<u>Revolution in the 21st Century which is very much needed to make India a developed nation.</u>
57.	<p>Need to integrate multi-disciplinary knowledge base, develop a think-tank of experts on specific agro-ecosystems to enhance conservation and use of agricultural biodiversity.</p> <ul style="list-style-type: none"> • Agro-biodiversity / PGR has much to do with the needs to regenerate/sustain the natural resource base and to increase the long-term productivity of the resource sectors • Priorities to be assigned to specific situations on specific ecosystems; relative priority to rainfed areas, upland ecosystems, specialized ecological niches / habitats <p>The loss of agro-biodiversity has immediate costs to producers, social costs to communities and long-term effects on agricultural productivity as well as jeopardizing food security.</p> <ul style="list-style-type: none"> • Strengthen conservation measures to protect the 'Resource base' for food production – curb genetic erosion in native/threatened habitats/ providing rich reservoirs of genepools. • More emphasis on a participatory approach to mitigate loss of biodiversity / agrobiodiversity; protecting, regenerating threatened agro-eco sites, species / landraces, complementary conservation efforts integrating <i>in situ</i>, on-farm, <i>ex situ</i> approaches. • Involving rural communities / farmers / organizations is necessary in the defining, designing and decision making stages in all R&D programmes on agrobiodiversity / biodiversity development / management – right from the initiation of such programmes. It is not optional but essential.
58.	<p>India's progress on agricultural front is met with fresh challenges due to ever increasing population and the cascading effects of globalization. We need to ensure that the quality of produce is high while the cost of the production is low, yet maintaining ecological harmony towards sustainable agriculture. This essentially calls for a farming system that would duly account all the factors of crop production, an integrated perspective based on reliable data with a mechanism to provide security to the farmers. Evolving such a system is a major effort but needs to be achieved at the earliest. Developments occurring the contemporary technologies in the fields of genetic engineering & molecular biology, information technology, instrumentation, simulation and modeling and space technology should be enablers in this endeavour.</p> <p>Cross the Limits</p> <p>The need of the hour is to overcome the barriers of limits to growth, both in farm and non-farm sectors that are intricately linked. Detailed perspective plans need to be developed to bridge the gaps between the potential and actual utilization</p>

efficiencies of our valuable natural resources including the land. Importance of spatio-temporal knowledge for improved sustained agricultural production is well known. Satellite data from Indian and international Earth Observation platforms providing information of the natural resources, bio-diversity and disasters are capable of providing information at micro and macro-levels have immense potential for the benefit of mankind. To achieve this following action plans could be considered:

- Databases with regular updations at different scales should be taken upon a priority basis as it would strengthen the decision making process with the adequate impetus;
- Watershed programs should be made more people oriented, actively involving panchayats and decentralizing the financial and administrative powers; and
- Diffusion of appropriate locale specific technologies and develop the requisite infrastructure have to be implicit in the any process of technology development. This will enable to bridge the gap between the development in the research farms and farmers field.

Priorities

- Several thrust areas for agriculture documented have been identified in the X-FYP to meet the growing needs like, increasing the cropping intensity, diversification of high value crops, development of minor irrigation potential, rain water harvesting, reclamation of problem soils and wastelands, etc. could be more efficiently worked out by using RS & GIS technologies, that address the related issues from a spatio-temporal perspective;
 - Spatial information, in the form of images and maps, forms the basis for most planning and implementation of developmental activities, infrastructure development, disaster management, environmental monitoring and natural resources management, etc. Remote sensing technology enables to generate spatial information of soil types and salinity, hydro-geo-morphology, ground water prospects, wastelands, land use & land cover, wet lands at different scales ranging from 1:10000 up to 1: 1 Million scale,
 - The spatial distribution of various categories of land resource from satellite data has provided potential areas that could be cultivated, thereby contributing towards horizontal expansion of agricultural areas. Integrated Resource Management research strategies need to be developed for better land and water resource utilization plans along with the monitoring capability of the satellites for improvements in overall productivity;
 - Implementation of the research plans for the national priorities viz., infrastructure location, literacy and health campaigns, etc., can be more efficiently devised and implemented with geo-spatial and communication technologies; and

	<ul style="list-style-type: none"> • Diffusion of the knowledge should be supported by the state-of-art technologies such as tele-education. The village resource information kiosks planned by the ISRO/DOS would further facilitate the decision making processes of the agricultural clientele. The extension programmes covering the highly locale specific issues in a more interactive manner with highly user-friendly GUIs would certainly motivate the farmers to opt for the better farming practices. <p>Up / Down scaling of processes</p> <p>In the process of generation of information from satellite data, appropriate ground information and procedures to assimilate this input into the satellite data for up / down scaling of the processes are essentially required. A strong interface between the remote sensing community and the knowledge domain experts would converge towards the generation of the information sought after by the policy makers, administrators, industry, traders and the farming community.</p> <p>Technology Enablers</p> <p>Various organizations involved in the knowledge generation need to come together right from identifying the thrust areas vis-à-vis the societal requirements to prioritization. This will help in evolving evolve action plans through convergence and synergy. There is an instant need to cut across the borders of the areas of specialization, in real practice. <i>Discover-Develop-Disseminate key</i>, being put to practice by the international organizations, is a right step in this direction.</p>
59.	<p><u>Policy Issues</u></p> <p>Public support for agricultural R&D is essential; all policy statements endorse this. However, managers of public funds (finance, planning commission) remain unenthusiastic. The situation is worse t in states. Consequently, even the Eight Plan goals for R&D investments are far off. Failure to allocate adequate domestic financial resources has also led to deployment of scare external; borrowings for short-term operational expenditure as in NAEP, NATP etc. Ad hoc project-based approach must be replaced by a well-considered policy.</p> <p>Scientific manpower is given more critical research resource. Over the last 10 -5 years there has been little growth in the central system, and in erosion in scientific strength in the state system. On the other hand, the R&D agenda has expanded exponentially. Sub-optimal performance within this resource environment should not raise surprise.</p> <p>While there is a very strong case for more resources, there are avenues for readjustments within the existing structures. These also contribute to inefficiency. To illustrate, public institutions do not need to research on themes where private research hs comparative advantage. The SAU and ICAR systems are replete with</p>

	<p>duplication and redundancy. The time has come to ask these questions. The danger is that bureaucracy will view this as an opportunity for downsizing</p> <p>Productivity of upstream institutions cannot be optimized unless grassroots level RD institutions are upgraded and decentralized. The SAU charter must be revised to implement this with local self-government and non-government institutions. States do not have the capacity to execute this financially. Over the next 15-20 years, the center must provide core support for this. This implies that the scope of public R&D must be inclusive of outreach. We converted extension into a state bureaucracy and are now systematically demolishing it. The continuing need for an effective public extension system, as part of the upstream research/education institutions in the states cannot be over-emphasized. State departments have neither the competence nor the motivation to perform.</p>
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(II) In order to professionalize skill management, suggest ways for weaning management from civil service bureaucracy.

1.	Technicality of Research Administration, Planning, Management and Evaluation & requirement of technical expertise for that. Research Management Information System
2.	<ul style="list-style-type: none"> • There is a need for production of triploids of grass carp to control the overgrowth of aquatic vegetation in ponds, tanks and reservoirs as it hampers productivity. Despite the technique being available, it has not been possible to produce these on a large scale as the skill required is unavailable. This needs to be professionalized so that the hatcheries could supply certified seed. • Skill management is necessary in every field and needs to be paid due attention and professionalizing it is the best way.
3.	Exposure of R & D managers to regular state of the art management programmes which help them to reduce their dependence on civil service bureaucracy.
4.	All technical departments must be headed by professionals who should have full administrative powers without being subservient to omnipotent bureaucrats.
5.	<ul style="list-style-type: none"> • Identify skills required for research management at different levels from Heads of Divisions till DDGs and formulate programmes to be provided at selected levels in the career of the person. • Strengthen the NAARM in a professional way • Provide exposure to Scientists in good management Institutions in the country as well as overseas • Regular skill upgradation with changing times • Relook the policy on Research Management and Administration.
6	Functioning of all agencies/institutions may be made fully autonomous. Decentralization and empowerment may be done up to project level.
7.	The Scientist should be totally alienated from the Bureaucracy with respect to research and all aspects that are of concern to him.

8.	Implement project based budgeting coupled with financial incentives to PI's from project funds. Success of this would depend on development of a comprehensive accountability mechanism.
9.	There is a need to transform the ICAR into an organization that promotes: EQUAL OPPORTUNITY TO ALL TO GROW IN CAREER rather ALL OPPORTUNITY ONLY TO FEW INCOMPETENT INDIVIDUALS. ICAR administrative machinery is like hard clay in facilitating the timely flow of funds. Often it is observed that the RMPs are no better than the civil servants. These people do not believe in building a team of particular subject matter or discipline rather they prefer to build themselves. There are hardly a set of uniform rules and regulations. It is no good in the interest of the organization. We have very poor quality people in the administration and finance stream. They have only negative mind set. It is very difficult to reform them. Devise some mechanism to get rid of this problem.
10.	In order to professionalise skill management it is suggested to dispense with bureaucracy in the system as far as possible. The project leaders should have the independence to create facilities, make expenditures and complete the tasks assigned in time targeted fashion, for which he/she will also be fully accountable as per norms and procedures.
11.	For management of agricultural research & development in India, a special cadre viz; <i>Agricultural Management Service (AMS)</i> , may be created for which selections and training will be made by UPSC. The current process of selection of managerial cadres can be dispensed with. Thus a scientist will continue in the research stream till he super annuates., of course with career advancement and dignity. This facilitates cessation of longing of incompetent scientists for managerial positions with ulterior motives to the peril of the organizations and the nation.
12.	Technical, Administrative and Financial skill of the research manager should be professionalised through adopting newer management techniques.
13.	Civil service bureaucracy has to be kept out of management of agricultural research. For this, there is need to encourage professional skill management within the system by well directed efforts.
14.	<ul style="list-style-type: none"> • The biggest bottleneck in delivering the research output for scientists in the present set up is the impediments posed by the administration and audit procedures (bureaucratic set up). Unless the powers wrests with the researchers the present frustration among the scientific community would continue which has reduced the efficiency of the workers drastically. Therefore the institute should be functioning as a research-centric place with least red-tapism and administrative imbroglio • For smooth running of the research works, all the equipments and instruments must be in working condition. In many institutes, a good percentage of equipments are not functioning because of the technical faults in them and therefore, there should be a mechanism to have all the instruments serviced by the suppliers through the annual maintenance contract. Consumable as required by the researcher for their specific research work should be purchased as specified by the researcher and not as decided by the audit and finance managers of the institute as they will not be able to decide the quality of the chemicals or consumables. The system of necessarily selecting the lowest priced consumables and instruments should be

	<p>dispensed with as surely this system surely operated at the cost of compromising on the quality of the work. A rate contract could be signed with the firms of repute for the supply of consumables.</p> <ul style="list-style-type: none"> • Labour requirement and hiring procedures should be well thought out as at present it appears to be a serious impediment for carrying out experiments.
15.	<p>In order to professionalize skill management there is a need to revamp the organizational structure of the DARE and at apex level technocrats should be posted instead of bureaucrats. System like DARE should be made effective in all the States. The awards of IAS may be conferred to the scientists from NARS and other apex R&D bodies.</p>
16.	<p>The entire agricultural activity of the state (Research & Development) should be governed only by an agricultural scientist. (to avoid civil service bureaucracy without basic knowledge in agriculture) especially for research and development departments related to agriculture.</p>
17.	<p>Zero bureaucracy research administrative system where decisions are taken by a small group (3 to 5) top quality professionals is to be evolved. For this a pyramidal structure of Administrative set up may be suitable. (Consultancy to professional management Organizations may help).</p>
18.	<ul style="list-style-type: none"> • An accomplished scientist can cultivate and breed good science and thus attracts willing support of his colleague scientists. Then a scientist manager understands closely and appreciates in all earnestness the concerns of various stakeholders. He is more focused in timely management of men and material to create new knowledge and technologies for stakeholders' benefit and ecological sustenance. There is no doubt to professionalize management of science and scientists through appropriate training in the art and processes of modern management principles and practices. Simultaneously, it is essential to support science managers by professional managers whose role should be to compliment and not compete and control day to day management Institutes. Rightly so, ICAR management is built around scientists and civil servants. Over the years latter have virtually taken over the management of ICAR by occupying the driver's seat in decision making and imposing it in all its aspects. An analysis is presented to support this viewpoint. • At present, ICAR/DARE is provided with two Additional Secretary (both IAS) level positions (AS, DARE and FA, DARE). These positions are a shade higher in status compared to those of DDGs (Scientists, specialists in a subject domain) (pay scale AS- 24,500-26,000 vs DDG- 25,000 fixed). With the result there is always a tug of war on who rules whom. And as always, civil servants have upper hand on technocrats in the matters of decision-making, decision- acceptance and its imposition through DDGs. As it goes on, civil servants enjoy authority without any accountability. On the other hand, DDGs have no authority but all the responsibility and total accountability. There is need to bridge this authority-accountability gap. Solution lies in downgrading the position of both the Additional Secretaries to that of Joint Secretaries (JS). In fact, up to 2000 these positions were to the level of JS only.

	<ul style="list-style-type: none"> • Then the AS, DARE is also Secretary ICAR. This duality of function creates total complexity and confusion in working of ICAR. Example, DDGs are subject matter heads of their respective divisions with administrative and finance staff provided to support them. But the administrative control of that staff vests with Secretary ICAR. Apparently, any staff working with a DDG can be summarily removed or posted without any information, what to talk of prior consultation. In my considered opinion – perhaps shared by many – the post of Secretary ICAR should be separated and assigned to a Scientist. Experience tells that in SAUs where Scientists fill Registrar (similar to that of Secretary ICAR) position are better governed than those where Civil Servants occupy these positions. In fact, better-managed SAUs like PAU, TNAU etc. have Registrars among the scientists. With this suggestion AS (or JS), DARE would cease to function as Secretary, ICAR. • Although not part of this TOR but related to organization and structure of ICAR may be important to be considered by the Task Group. Often it is suggested that ICAR is top heavy and its headquarters need to be pruned to make its structure lean and thin. This perception arises when headquarter structure of other similarly placed scientific organizations is compared with ICAR. For making a balanced decision it is necessary to consider breadth and depth of functions, which ICAR subject matter divisions perform at the headquarters. ICAR primarily promotes, coordinates and funds agricultural research, education and extension. Constitutionally these functions fall within the preview of respective State Governments. Apparently, none of the other scientific organizations has that diversity of functions as ICAR has. Thus, there seems no justification to disturb/dilute ICAR structure and organization at the headquarters. This set up has been evolved over the years and has been functioning well over the years.
19.	As in the case of CSIR, appropriate administrative rules and procedures suitable for fully meeting the specialized needs of scientific organizations in the NARS need to be developed. In place of hierarchical structure, concerted efforts need to be made to switch over to matrix structure with decentralized decision-making as the major focus.
20.	This reference accepts that skill management is not being professionalized due to bureaucracy. It is difficult for me to accept this generalization. There are three keywords: (i) skill (ii) management by bureaucrats and (iii) management by technocrats. First of all, agri-skills developed so far need to be reviewed (a database may be prepared on this subject). How many of them are field demonstrable with confidence. Why the Entrepreneurship development programs failed to show proper visible impact. In the management, it is the person who is important no matter he or she is a bureaucrat or a technocrat. In most cases in this country proper man is not in proper position. Bureaucracy involved in the selection of the Manager is to be changed. Bureaucrats have the advantage to have wider vision whereas technocrats mostly remain confined to their own expertise. However the matter is debatable. It may be taken as a separate issue.

21.	<ul style="list-style-type: none"> • Liberalization of administrative set-up and increasing autonomy of Director/institute's head for various routine activities as well as in selection of his team for better output. • All policy matters in agricultural research and dissemination of knowledge and decision on the broad outlines of research should be guided only by competent experts in relevant field and not by bureaucrats. • In all boards/ committees concerning such policy matters, the technical input must be given independence of expression and it must be given due importance in deciding all policies, though a check on its impartiality must be there in place.
22.	<p>This would be a key to change. Experiments with Institutes being converted to Government owned (not run) Foundations, even for some of the Universities are starting to show some positive results in Germany. They should be able to manage more competitively and recruit more aggressively.</p>
23	<ul style="list-style-type: none"> • Management of all Institutions should be with professionals. There is no role for bureaucracy in Science. • Total decentralization of powers to functionary level so that scientists are able to work in an environment available in developed nations. • There is necessity to bring wholesome reforms in University governance to provide Administrative and financial autonomy down the line.
24.	<p>(i) There should be decentralization(accompanied by accountability) and administration should be left with the institutes. The Headquarters should focus on the development of research of strategies and coordination</p> <p>(ii) The scientists (at the level of Head of Division and above) should be given training in research administration (may be for 6 months)</p>
25.	<ul style="list-style-type: none"> • Establishment of Agricultural Council of India in the lines of Medical Council, Veterinary Council and AICTE. • Making / declaring agricultural education as a professional education in all States and UT in India. • Agricultural Graduates must head the agriculture and allied departments in all the States and UT. • At present powers bestowed with various officials of agricultural department is insufficient and they are facing considerable problem in implementing various government programmes. So it is essential to enhance the administrative and financial powers to the various district level functionaries. • All agriculture related works hitherto looked after by revenue department and other departments shall be vested with agriculture department officials. • Both at State level and national level, the Dept. of Agriculture should be headed by technocrats. • In the Scientific Institutes, management personnel should be a scientist. • Agricultural scientists must be given an intensive management training programme to strengthen their management skills. This training could be in top management schools like IIMs for a period of 3 to 6 months on various aspects of personnel and technological management. Those who went through the management training must be placed in administrative positions for effective management of the

	<p>agricultural science and technology organizations including the SAUs.</p> <ul style="list-style-type: none"> • The communication skills of agricultural scientists need to be improved as well. Regular communication skill improvement training could be given at various levels.
26.	<p>The policies evolved earlier for incentives and rewards for the scientists were quite well thought of and should have served real good purpose, but I understand bureaucracy is coming in the way to implement those policies thus killing the very initiatives of the scientists. For improved performance and resource generation, this issue needs to be resolved on priority for proper implementation.</p>
27.	<p>ICAR should once again attain its autonomous status and structure an agile headquarters with maximum 2 DDGs but NO ADGs. Only one Joint Secretary (Bureaucrat) and one Financial Adviser should be at headquarters. All other should be ICAR staff.</p>
28.	<p>In the context of research there should be a competitive set up in which both the private sector and public sector should be enabled to have adequate fund and Govt. of India should set apart a substantial fund for the same and the utilization of the fund by the concerned body should be monitored by a competent scientific body and the gainful result should be appropriately rewarded irrespective of public or private. In other words research programmes should be managed by scientists / researchers without the bureaucratic control and their financial management also be made flexible enough so that it is not hindered by any activism of account officers, CAG, etc. The secret by which we built up the atomic science in our country is a classical example for the non-involvement of auditing agency in the bureaucratic manner. Auditing of research institutes or researchers should be independent of CAG and the creation of a parallel outlet system of assessment auditing, which is free from bureaucratic interference and control.</p>
29.	<p>De-bureaucratization of the system has been expressed by the PMO and Hon'ble Minister of Agriculture who has a deep insight and understanding of the agriculture on many occasions. ICAR like other departments of CSIR, SAUs are expected to have their own work culture for optimum delivery to the society. Pro-active, upstream and strategic research requires a different kind of management environment, purchase procedures, freedom of multiple partnerships both at the national and international level. The bureaucratic approach of civil servants who have vast experience of dealing with criminals, mafia, black marketers, defaulters, law and order problem in the country is not congenial for the scientific institutions. Decentralisation to the project level managers, minimum office paper work and enabling procedures are very essential to get output of scientific manpower. Contrary to that multiple centres of power are becoming operative in the ICAR and especially DARE which is supposed to be a very small component but has assumed all powers even of technical and scientific nature. Registrars in many universities are being appointed among the scientists with the same analogy it is suggested that scientists of the NARS should only be eligible for the post of Secretary (ICAR) like that of DDG post. After all ICAR has opted for UGC scales. Participation of the civil servants should be restricted to DS level. Recently Secretary ICAR organized meetings with the institute administration parallel to that of the Director's</p>

	<p>Conference without the knowledge of DG. This has sent wrong signals to the administrative staff at the institute level and it is creating contradictions between the Director of the institute and its administrative staff. These tendencies need to be curbed before further damages, contradictions and conflicts from top to bottom of the research system.</p>
30.	<ul style="list-style-type: none"> • All Statutory positions (Vice- Chancellors/Deans/Directors /Registrars/ Comptrollers etc.) in the University should be manned by the faculty members and not by bureaucrats. • The University budget should be presented and passed directly in the Vidhan Sabha and the grant should come directly from the funding agency (rather than through any department) on atleast quarterly basis.
31.	<p>Professionalization of skill management: This can be possible if actual research workers and not the managers are given higher status in the NARS set up. Programme leaders should have all powers to utilize funds, recruit its staff, participate in conferences, interact with experts in his field in India and abroad, and all other activities required to achieve the project objectives. However, programme leadership should be provided after critical evaluation of the proposals and keeping in view the academic as well professional achievements of the scientist in the field of his specialization and not just based on seniority or managerial position one occupies. Screening of the proposal as well as the biodata of the scientists should be done by committees consisting of experts from renowned institutions in India and abroad.</p>
32.	<p>The status of bureaucrat's involvement in ICAR administration should be like what it was prior to 2000. One is enough as against many now. One bureaucrat as was there in ICAR prior to 2000 and one with agricultural background can understand the need of the farmers and NARS, and help to improve the out put efficiency. It is suggested for establishment of Indian Institute of Agricultural Management (MANAGE, NAARM can be thought of for bringing changes needed) to be managed on the model of IIT / IIM / IISc so that the Human resource with excellence in agriculture is produced to tackle the problem of emerging challenges in agriculture. Parallely, to deal with Natural resource management, the TOENRE, be strengthened in the universities where it is presently strong, to focus on postgraduate teaching and research in natural resource management.</p>
33.	<ul style="list-style-type: none"> • We must shed the shackles of bureaucracy for professional management of scientific institutions. It is difficult to achieve in NARS. Decentralization in spirit and not merely in words is the key. We do not have to look far for a suitable model. CSIR model could be a good start. The ICAR model is too top heavy and centralized. Why do we need 'nau-ratnas' (8 DDGs and 1 NATP Chief) and a large band of ADGs? In fact it has negative effect on quality research. • To achieve the objective of professional management and weaning bureaucracy, the following approach may be useful

	<ul style="list-style-type: none"> • Give full powers, authority, and freedom to operate to the Directors of research institutions within the framework of mandate and budget allocation. It is essential to build confidence and develop leadership, which is a serious casualty in the present system. At present the poor Directors <u>have to follow</u> instructions from the ADGs and DDGs, giving no chance for independent thinking. • Have one Research Management Committee, instead of two Committees of the present system, to help the Directors of the Institute in planning and monitoring of research projects. • Develop or adopt unambiguous administrative and financial rules, which should be realistic and aimed at promoting research. • Delegate the so-called powers to the scientists to operate his/her research projects. • Allow scientists to concentrate and devote 100%time for research, by not involving scientists in routine management activities. • Take competent administrative and financial managers on deputation from the central services. Scrape the present administrative and financial services of the ICAR, as (a) we get the persons to man these services mainly from amongst those not selected elsewhere, and (b) they form caucus having negative influence on research. • Project based funding is ideal, but it should be realistic. • The ICAR should revive Expert Scientific Panels for considering projects for grants on competitive basis. • The Committee may like to examine development of a model in which the institute may provide salary and infrastructure to scientists but for research he/she should raise funds through competitive grants.
34.	<p>Professionalism especially in science teaching, research and extension should be inculcated because it has become fashionable that anybody who is nobody can talk about agricultural development and research. For example, recent mushrooming of NGOs in various states is the point to consider. A number of NGOs, without sufficient background to do the job, are coming to the fore because there are monies to spend in implementing some tasks. At the end of the day or once the project (money is spent) is over, they are accountable to none. We need to have permanent mechanisms so that trained professionals are always available to help farmers (not just to spend monies). An excellent example, is Punjab where PAU is responsible for teaching, research and extension and farmers hold extension staff accountable. There are no NGOs there. There is an urgent need to correct and professionalize the extension rather than replacing it by a 'foreign' NGO.</p>
35.	<ul style="list-style-type: none"> • How best the science of PGR with focus on improved management of agrobiodiversity can further the cause of better livelihoods, food security, nutrition, and poverty reduction. How best PGR science can be integrated to strengthen the R&D programme on sustainable agriculture 'keeping diversity

	<p>alive' for current and future use.</p> <ul style="list-style-type: none"> • Research and development agenda to lay emphasis on: • Strengthen field-level participatory approach, through multi-disciplinary expertise, including scientists, extension workers, farmers and other local experts to document indigenous knowledge. • On-farm conservation and management / use of local biodiversity – improving farmers' landraces – diversity (for farming communities), generating incomes, food increase/production. Farmers participation on-farm ensures that existing diversity is being sustained, and also cultivation is based on heterogeneous and continuously evolving folk varieties. • Participatory / multi-disciplinary research to achieve above goals for socio-economic benefits; establishing community genebanks, community (home) gardens, seed multiplication and supply system, local practices/monitoring and management. • Looking for development options – A farm (er), friendly approach empowering local people/farming communities, women in particular, is essential to developmental changes.
36.	<p>A high powered professional group must be constituted to guide and assess all central R&D initiatives and advise on policy issues. The technical advisory committee(TAC) of the Consultative Group on International Agricultural Research is the appropriate model. The TAC should be chaired independently and have resources to commission independent studies. Its recommendations must carry more weight in the Governing Board than nothings from the bureaucracy. The TAC structure is necessary because neither the ICAR nor the DARE has the analytical capacity to undertake this task. Consequently, these tasks (planning, monitoring, evaluation) are systematically undermined, and cloaked in political and breacratc fuzz. A credible TAC will also add transparency. The states should also create similar body to replace their SRC and other policy making bodies</p> <p>All interfaces (center-state, DARE-DAC, public –private, education-research-extension R&D other institutions) have been treated cursorily and administratively in the past. This has become a major source of inefficiency. It is important to think through and institutionalize these processes to exploit complementarities.</p> <p>Relevance accountability and performance must be the acid test for all R&D. Lip service is [paid to these concepts but in the absence of objective criteria and analysis as well as lack of well –defined institutional mechanisms to ensure these has led to apathy and neglect of these cardinal concepts. This has resulted in bureaucratic discretion and biases all around.</p>

III. To examine the present funding system of agricultural research and suggest suitable changes (e.g. Competitive Block grant, Project-based Funding etc.)

1.	<p><u>The Financing of Agricultural Universities</u></p> <ul style="list-style-type: none"> • Our agricultural universities have been and will remain creatures of Government. The resources that finance agricultural universities are overwhelmingly those of Government. So long as this is the case, the quality of research will depend entirely on the ability, the talent and the commitment of individual faculty: those who choose to focus on research that is based on a careful assessment of our farmers’ needs and of the market. • A small core of Government support is important for all academic institutions, including our agricultural universities. However, public funds should be limited to what is absolutely essential. “He who pays the piper calls the tune”. • The first beneficiary of our agricultural universities is the student. The students, who receive the education, should pay a significant portion of the costs of that education. Financial aid must be provided to those students who have talent, commitment and intelligence, but who lack the wherewithal to finance their education, in part or in whole. But for those who are able to afford the cost of education, the state should not continue to foot the bill. • Alumni of our agricultural and other universities have an obligation, a debt that must be met, to keep their alma maters in good health so that she may serve others as she has served them. There are universities in the United States who have endowment funds measured in billions of dollars much of which has been contributed by grateful alumni. This can be done in India too by building a strong network of alumni who support their agricultural universities with their talents and with their financial contributions. • Next major beneficiaries of our agricultural universities are the commercial firms that rely on agricultural produce, that sell inputs for agriculture, and who employ your graduates. Today, in large measure, they simply take the bounty that is provided. The commercial firms should meet the major part of the cost of research in agricultural universities and ICAR Institutes. We should be moving in the direction of funding increasing portions of research and even establishment costs by grants from the organisations that benefit from that research and whose knowledge can also help to ensure that the research is practical and responsive to the needs of producers and consumers.
2.	<p>Project based budgeting should be implemented, project investigator should have the full power to proceed with the financial aspects of his project to avoid the delay in present system.</p>
3.	<p>Project based budgeting should be introduced. Scientists should be made more answerable and responsible so that results generated in the project will commensurate with the investment made in the projects.</p>

4.	Inclusion of methods and mechanism of project prioritization.
5.	<ul style="list-style-type: none"> • The number of research problems is growing and the scientists are taking more and more of such problems but are often ending with the argument that the work could not be completed on time as the funds were not available. Once a proposal is approved, the funds required for it must be provided and not diverted for some other purpose. • There are meetings, conferences, seminars, symposia, workshops, consultations, round tables a galore and much of the scientists' time and institutes' funds are spent on these activities. A thorough check is needed and funds saved for research from the allotted budget. • Publications have to be good and attractive but it is the content that matters more than the glazed paper and coloured photographs. Reports appear to be meant more for publicity rather than for information exchange. • There is a need to effect economy where it should be and not on training, equipment, chemicals and the like. It is also seen that a number of scientists and technical personnel are involved in a small problem. Simple problems should be assigned to students and beginners while difficult ones need to be taken up by experienced and senior scientists. <u>The budget for each project should be assigned to the Project Coordinator and he should be personally accountable for its proper use and delivery of the results.</u>
6.	Ensure continuity of philosophy of funded projects into the new projects, with required mid-term amendments, to ensure accountability.
7.	All India coordinated projects should be scaled down by undertaking topical research contracted to individual scientists or groups of proven merit. This will provide wider coverage within the same budget.
8.	<ul style="list-style-type: none"> • Actual access to funds by the Scientists and timely provisions of material inputs • Competitive block grants with due monitoring and guidance • Funds for Repairs and upgradation of structures and equipment at regular intervals.
9.	Project based budget may be allocated. The infrastructure of the organisation/institution may be maintained through core budget. Project leaders may be allowed to take all decisions relating to their projects.
10.	The project - based funding need to be encouraged and implemented in its true spirit. The adequate administrative and technical powers to be delegated to the Principal Investigation/ Project Leaders.
11.	The concept of Project based funding is the most important point. Once a project has been approved with a specific outlay, the PI should be totally independent with no other need for sanctions.
12.	The present funding system for agricultural research is not project based. Scientists should be granted project based fundings based on competitive assessment of the proposals submitted on thrust areas. As per the present system it is not possible to audit expenditures against the amount sanctioned project wise
13.	The current funding system in the NARS is skewed with the authorities exhibiting bias towards some disciplines at the cost of others . When once the team approach dawns, this trend will automatically cease, and there will be a sense of <i>team spirit</i>

	<i>and belonging</i> . Inter- disciplinary rivalries will vanish and goals can be achieved in a time frame with more efficiency /accountability. Project –based funding /project network approach can bring in fiscal discipline coupled with accountability into the system.
14.	Project based Funding should be strictly implemented along with Accountability of the Project leader.
15.	Project based funding must be implemented for all the research projects. An initiative in this regard was taken a few years back which was never pursued.
16.	The funding should be strictly project based as demanded by the requirement of the project. It should not be as per the existing norms, which are based on the pre-fixed amounts, based on number of scientists involved in the project.
17.	Scientist should be asked to submit project proposal in the mandated area of research (strategic area). The feasibility, importance/ sustainability, deliverables should be clearly stated. The project under the present global scenario should be assessed by a group of at least 5 competent subject matter specialists. The proposal should have requirements in terms of recurring/ nonrecurring contingencies management staff, highly trained PI/ CoPIs. A group of 5 scientists including the project leader be built in the proposal, so that it becomes functional and critical mass is built in from Day 1. Complete operational independence should be given to the leader of the group. In addition there should be a Central Instrumentation Facility available in the institute related to the mandated areas of the research. This should be functional and not a shown piece. The project report should be monitored on half yearly/ yearly basis by peer review committees who should be the scientists of excellence in the subject to assess the out put of research in the right direction as per the defined technical programme/ targets to be achieved. Such type of Centres of excellence is the need of the hour in the country.
18.	<p>Management Issues</p> <p>Research at all levels has been traditionally organized along disciplinary lines. This needs to be replaced by multi-disciplinary and programmed based flexible structures in which agricultural education is integrated. We have realized the need for system-based, multi-disciplinary research, but have not been able to make much headway essentially because of the dominance of disciplinary fraternities in well-entrenched departmental structures. This has been the pattern for nearly a hundred years and we have exploited this fully. We need an alternative organizational structure to which outreach has also to be integrated. This will need to be thought through but the present organizational structure has to be altered even at the highest level. From the bottom to top planning, monitoring and evaluation processes are defunct. Unless these are institutionalized and professionalised, objectivity, transparency, and accountability cannot be instilled. We promised project-based budgeting, PME mechanisms and other management reforms in NATP but no effective headway has not yet been made, nor is it</p>

	<p>expected. For everything we create committees, which do not have any authority. This is a very serious malady and perhaps owes its origins to a highly distorted reward structure, which places a premium on bureaucracy over scientific accomplishments.</p>
19.	<ul style="list-style-type: none"> • In our Nation's interest ICAR funding should be based upon National merit/competitiveness and open to all, not just restricted to ICAR and Agricultural universities. It has been our personal experience where our Project was not considered for evaluation being a non ICAR agency i.e., CSIR. • In the capacity of Member of Plant Sciences Committee-CSIR for the past 7 years, I may inform to you that our decision to approve the project is based on merit.
20.	<p>There is a need for change in grant release pattern of ICAR to SAUs. First installment of grant is generally released by ICAR by August-September every year and second installment by the end of the financial year. Delayed release puts SAUs in difficult situation to meet financial needs as well as its expenditure. It is therefore, suggested that the grant for the first half be released immediately just after the start of the financial year and the second half after receiving the utilization certificate. Allocation for agricultural R&D should be at least one per cent of total GDP or 2 per cent of Agricultural GDP. Government should also consider collecting a cess on all agricultural commodities for this purpose.</p>
21.	<p>There should be enhanced budget allotment exclusively for agricultural activities (to be delinked from rural development). Increasing the share of state governments towards agricultural research which is at a low ebb at present. Amount allotted towards research on under exploited and unexploited food crops should be increased. Timely release of funds should be ensured at the commencement of financial year itself.</p>
22.	<p>Greater Budget Allocation : Although agriculture sector contributes substantially towards Indian economy, a very small percentage of the total national income is allocated to agriculture. Considering the dominant contribution of agriculture in impacting the Indian economy, it is high time that the Government of India should provide much higher quantum of financial support to enable more intensified and quality research in agriculture comparable to first class world organizations.</p>
23.	<p>This would be a key to change. Experiments with Institutes being converted to Government owned (not run) Foundations, even for some of the Universities are starting to show some positive results in Germany. They should be able to manage more competitively and recruit more aggressively.</p>
24.	<p>Follow the American pattern. i.e. the ICAR should provide for basic infrastructure, office space land and other basic requirements and a theme to conduct research., but asks the individual scientist to raise his own funds to support his research endeavor.</p>
25.	<ul style="list-style-type: none"> • There is need to revamp the present funding system. Firstly, at the Planning

Commission level, then at the ICAR level. While Planning Commission provides funds in the form of a lump sum or block grant to ICAR for allocation to its constituent Institutes, All India Coordinated Research Projects, KVKs and for strengthening Agricultural Education and related activities. ICAR in turn allocates this grant for well-defined programmes and projects with justified funding needs for all the activities. In fact, a research activity of a sub-project, a sub-project of a project, a project of a programme and a programme in fulfillment of the assigned mandate of an Institute/Coordinated Research Project/KVK/Agricultural Education should be the procedure of funding. This bottom up scheme of funding of ICAR with activity as the unit of funding is the core of Project Based Budgeting. Since a scientist (sometimes a group of scientists) works on a research activity, he is required to give a work plan and underline the matching funding needs to take it to a logical conclusion within a pre-defined time frame. In this scheme a scientist gets authority to utilize the funds for the approved activity and becomes responsible and accountable for the outcome from it within the stipulated time. If combined with quantifiable indicators to measure the outcome, Project Based Budgeting becomes performance based budgeting of a scientific organization. I strongly recommend that ICAR should get block grant (with one EFC/CCEA), which represents aggregate needs of its various programmes/activities in fulfillment of organizational mandate and country's national commitments and international obligations.

- In order to fund specific research programmes in response to contemporary or anticipatory needs arising from internal pressures/developments and ongoing shifts in global economic order/developments, ICAR should catalogue a series of research objectives on which appropriate projects can be invited on competitive basis from interested scientists. Approved projects are funded based on the merit of work plan and the corresponding budget bids. AP Cess Fund should follow this procedure of competitive bidding for undertaking an identified area of research.
- So that planned and proposed research programmes harmonize ICAR mandate and backstop fulfillment of food and livelihood security goals sans adverse environmental consequences and country's economic growth and international commitments, business as usual approach and merry-go-round research must pave way for a new look research portfolio followed by regular monitoring and evaluation. In doing that it will be necessary to strengthen the institution of Research Advisory Committee and Institute Management Committee. Firstly, Research Advisory Committee should become Research Advisory Council. Secondly, it must have powers to regulate selection and implementation of approved research programmes. Currently, Research Advisory Committee as the name suggests is a recommendatory body having functions and no powers. Likewise, functions and powers of Institute Management Committee need to be enlarged in that ICAR delegates most of the powers to manage institute

	<p>environs and functions to the institute itself. Thirdly, whether Research Advisory Committee or Institute Management Committee, it will be necessary to redraft their constitution by inducting diverse discipline scientists to represent these bodies. This suggestion will ensure cultivation of system perspective for conducting agricultural research in a multi-institutional format and interdisciplinary design. Hence, net working of projects within and across institutes will be infused right at the time a research programme is conceived and approved for implementation.</p>
26.	<p>The entire process of AP Cess grants needs to be reengineered. ICAR may identify quantum of grants on broad subject areas and empower Institutes and Agricultural Universities as process centers. By delinking from the SMDs, the grants need to be operated through Chairpersons identified for each subject group with smaller Technical Experts Committees to oversee selection and monitoring. This will not only reduce the burden on the headquarters, but will also speed up the granting process. The final grants can be released by ICAR / DARE.</p> <p>The project leaders are to be empowered to plan, execute and generate useful research results through project based funding. This will not only provide them with operational freedom, but also will ensure their accountability. Common-pot approach has to give way for project based budgeting mode of funding.</p>
27.	<p>It is difficult to suggest steps within such a short time. Funding systems operating in advanced countries and this country as well need to be reviewed. In a general way there should be two ways of funding: block basis and project basis. Project targets are to fixed by the competent authority, competitive proposals are to be invited from all Institutes, Universities and NGOs having R&D facilities, proposals are to be short listed according to the merit and physical assessment is to be made on the competency of the Investigator, availability of equipment and supplies and nature of the flow of fund from the Administration to Investigator, operational methodology of the fund. The Investigator is also to present the proposal before a competent group of scientist. Block grant is to be limited to specific situation particularly for infrastructure development and innovative research.</p>
28.	<ul style="list-style-type: none"> • The Competitive Block Grant may also be made applicable to funding to various ICAR institutes and SAUs under its schemes like AP cess funding and others. • Project based budgeting within ICAR system with full financial power and accountability on its expenditure to Project Leader should be adopted. The Project Leader must be accountable to achieve the objectives like private sector.
29.	<p>The Indian agricultural research system has performed remarkably over the past quarter century. Yet, the system lacks the flexibility and agility for which its advanced private sector is known. Only radical rather than evolutionary changes</p>

	will turn this ship around. The system can afford to experiment with radical concepts.
30.	<ol style="list-style-type: none"> 1. Research support should be project based. 2. 30% Research support should be on competitive grant basis. Remaining should be on network mode considering national priorities. 3. No scientists should be allowed more than two projects. 4. Research support need be built around teams. Priority for projects with inter institutional collaboration.
31.	<p>The distinction of plan and non-plan funds should be abolished. The funding should project based ; and the scientists who get projects, should be given freedom as well as due recognition.</p> <p>Issue: The SAUs are facing very serious financial crunch in spite of major assistance by ICAR.</p> <p>Suggestion: The major assistance from ICAR is in the All India Coordinated Research Project wherein 75% of the pay contingency etc is met by the ICAR and 25% by the SAU/State Govt. The ICAR in consultation on the various SAUs should fix the upper limit of the number of scientists that a given SAU may have; and ICAR should provide recurring contingency for all the scientists (up to the limit) and the State should provide the pay and allowances. The expenses in the new mode may be as the assistance being given by the ICAR at present but will ensure the availability of the working contingency to all the scientists in SAUs. It will result in de-facto All India Coordinated Research Projects in all areas of activities.</p>
32.	<ul style="list-style-type: none"> • Allocation of more budgets for agricultural research • Central Government share on entire research in agricultural university is to be the extent of 75 per cent and should be directly given to the farm universities as lump sum for the block year or as annual grant. • Much emphasis on basic research in agriculture to be given to meet the emerging challenges. Funding to basic research to the extent of 50 per cent of the total allocation may be made. • Project based funding on research for priority areas besides the block grant for education. • Funding agencies should give the funds directly to the SAU's. • Collaborative researches with leading laboratories around the world will help to identify modern technologies for Indian conditions in shorter times than national efforts. Scientists should be encouraged to collaborate with international scientists. The funds for the research or testing for Indian conditions should come from an agency in India than looking for international agencies. International scientists will also be encouraged to collaborate with Indian Scientists. • Funds in the farm of grants should be made available only to those who can deliver goods. In this context, the institute and the individual (preferably youngsters based on their field of specialization) should be identified depending upon the expected output. Seniority should never be a criterion. Rockefeller Foundation's recent approach in identifying the problems, institute and the individual can be a good guideline. Agrl. economists should be entrusted with the

	<p>task of prioritizing the research goals.</p> <ul style="list-style-type: none"> • Because of financial commitments. funds available for agricultural research from different sources is dwindling. Hence, wherever possible the beneficiaries of research like seed firms, farmers associations may be encouraged to contribute funds for specific research programs. Ph.D. scholars may be encouraged to get fellowships such as ICAR/CSIR/UGC to take up research. • Preference may be given for project based funding under competitive grant system. Expediency and transparency are the key elements to be adhered to while project selection. • The financial responsibilities may completely be vested with the principal investigator. • Flexibility in operating the funds is needed for purchasing equipments needed for research in the ICAR funded schemes. • Besides separate maintenance grant, shall be provided for the infrastructures available like buildings and equipments. • Special one time grant for infrastructure development shall also be provided (buildings, roads, equipments). • Project funding shall also be continued for need based research projects. • Continuous programmes like research on varietal developmental reclamation of problem soils, etc., shall be provided with separate funds. • Agri based research funding shall be given only to SAU's and ICAR institutes, rather than giving to conventional Universities and other agencies like private KVKs.
33.	<p>The policies evolved earlier for incentives and rewards for the scientists were quite well thought of and should have served real good purpose, but I understand bureaucracy is coming in the way to implement those policies thus killing the very initiatives of the scientists. For improved performance and resource generation, this issue needs to be resolved on priority for proper implementation.</p>
34.	<p>Conscience efforts to provide 33% funding to joint project proposals between ICAR and BARC/CSIR/DRDO/ICMR/ISRO is necessary for Indian Agriculture to evolve. More efforts and emphasis need to be given to Technology Development and as a consequence industry will automatically be triggered. (i) Directors' of ICAR Institutes need more powers, (ii) There should be merger of Directorates and some Institutes for lower overheads in administration and (iii) SAUs need major restructuring nominal Cess Funds to be generated as : Local Agricultural Produce at Mandi's and Local Enterprises on Sales</p> <p>Representations from Farmers' Mandi Board and Enterprises to be present in Board and Governing of University. Agricultural Marketing and NABARD members to be on Boards of ICAR.</p>
35.	<p>Competitive research-grant system should be used for making part of the resources available to the researchers as this would encourage health competition and avoid use of resources on 'hobby horses'. For greater integration in tackling the new,</p>

	complex problems facing agriculture, because of new externalities, the award of the research grants should be made to the project proposals that are multi-disciplinary and multi-institutional.
36.	<p>It is high time that the agricultural research funding pattern at National / State levels be made only through outcome – oriented project based funding as well as Competitive Block Grants Schemes as practiced in many developed countries. All such projects need to be scrutinized and vetted by highly competent national / international peer reviewing committees. The entire funding system need thorough revamping and should be streamlined through transparent, accountable, and effective systems of planning, awarding, monitoring and execution.</p> <p>Now, that in the market economy set up the private sector is getting extremely important and therefore we have evolve policies so that private sector is added with power and opportunities to do advanced research and fund should be geared up for disbursement on a parity between private and public sector.</p>
37.	<p>Funding system may be reoriented to targeted projects based on competitive bidding, rewards, incentives and flexibility and proper utilization of manpower. For example, scientists say working in the coordinated projects on potato have a field work of only 3-4 months in a year. I do not know if they remain fully engaged for the whole year. Many coordinated projects have to be in cropping system or farming system mode to provide full justification of distributive work load throughout the year. Similarly, senior and junior research fellows provided under NATP project fulfilled demand of technical manpower and they really worked even in the remote and inaccessible areas. Therefore, competitive funding with the incentives of research fellows will be better option especially when there is a ban on filling up and creation of positions at all levels. There should be priority for multi-disciplinary project or farming systems research suited to various socio-economic and agro-ecological situations. It is easier to follow this approach for some of the divisions where different disciplines of crops, livestock, soil, agronomy, horticulture and others are provided in the institutes. Unfortunately, Crop Science Institutes having more than 50% of manpower and infrastructure shall have to be more pro-active and forthcoming in restructuring overall approach of the crop based institutes. The institutes of Crop Sciences and of late horticulture (onion, garlic, banana) multiplied so as to create a situation of no other growth under the Banyan trees.</p>
38.	<ul style="list-style-type: none"> • Every SAU should have a Corpus Research Fund for meeting out any contingent research information to be generated. • The Central Assistance to SAUs should have both the provisions i.e. Competitive Block Grant as well as Project based funding for undertaking priority-based long-term and short-term research projects, respectively.
39.	<p>It is very important. We must develop expertise in NARS through internal and external trainings, and develop expert cell in each institute to protect intellectual property and promote international trade in agriculture.</p>

40.	The funding should be based on projects (in the priority areas) and professional advancement and salary incentives should be based on performance (publications or technologies developed) and not just on the length of service.
41.	<p>Need to integrate PGR and local / traditional knowledge base / agricultural practices / folk selection for better use of native diversity, so as to meet the needs of the resource-poor farmers.</p> <p>The importance of farmers local knowledge, farming practices and experiences is advantageous in sustainable agriculture through participatory approach, results of diversified research are to be integrated (PRA, PPB, Ethnobotanical etc.), and utilized consistently in R&D programmes for improvement, enhancement, conservation and management of agrobiodiversity (wild/semi-domesticated/domesticated).</p>

(IV) To propose steps for making agricultural research sensitive to emerging scenario of home and external trade (with particular reference to WTO agreement on agriculture).

1.	Strategies for market support of processed foods prepared by small rural industries. Again I am speaking from personal experience. We have started linking agriculture/horticulture with food processing, but marketing is a problem. We cannot compete with large companies, though our products are good.
2.	Also mechanism to assume leadership role in agriculture research, education and extension internationally and in Africa
3.	If application of Codex Alimentarius could be added in item IV - within bracket.
4.	We have to be competitive through reduced cost of production, quality control, research on value addition with quality processing and packaging and promoting external as well as internal marketing of agricultural produce.
5.	<ul style="list-style-type: none"> • Education and awareness of researchers in emerging issues of WTO. • Strong cells at Institutions for monitoring and sensitising the researchers. • Projects to deal with global issues.
6.	In addition to our own strength we should not hesitate to introduce the best material from wherever it is available, its performance assessed under our conditions and based on the national and international standards the best selected.
7.	In order to instill Competitive spirit and improve quality and quantum of research, Scientist should be allowed to interact freely at National/International level. Administrative control and paper/ file work should be reduced. They should be encouraged to bring out quality publications (research papers, technical bulletins/ brochure & books), bring in contractual and consultancy projects and participate in the relevant National/International subject matter meetings /Symposia, etc.
8.	Make ICAR and Vice Chancellors responsible for formulating the policies and their implementation. Give full freedom to institutions for managing research,

	teaching & extension activities. Harness the expertise and infrastructure by developing inter-institutional and inter-organizational network projects in critical areas of national importance. If India has to be globally competitive conscious efforts have to be made towards structural and functional genomic research.
9.	Intellectual property protection is proliferating globally. A thicket of property claims now controls the transfer and use of patented biotechnologies, limiting the freedom to operate public and private agencies alike. As a condition for participating in the trade benefits of WTO, developing countries, in particular, must adopt intellectual property protections as delineated in the TRIPS agreement. To ensure plant variety protection by Plant Variety Protection Certificate (PVPC) special emphasis needs to be given on DUS markers for present and future breeding programmes.
10.	To withstand the impact of WTO, the farmers need to be empowered with knowledge and skills by application of modern information technology. He should be in a position to access latest information on cultivation practices, crop protection and other research information including marketing inputs etc., Internet based national level information system with facility of multilingual access, discussion forum (where one farmer can ask suggestions from other senior farmers), FAQ, interactive information system, and facility for secured connection for direct marketing of his product may be made available to him through village based/block based information Kiosk. Agricultural scientists should be encouraged to write research information in the form of popular article and also in hindi and regional languages. Presently thrust is given for publication in referred journal while considering a scientist's career advancement. Equal weightage is to be given while promoting a scientist, for publication of popular articles in Indian languages, radio/TV talks, posters, internet publication etc. for better transmission of information and knowledge from R & D centre to the users.
11.	As India is a part of WTO ,if it has to benefit from external trade ,there is a need to become competitive through productivity improvement ,reducing costs, scaling up technologies,/processes. This needs <i>crop planning</i> , identification of <i>crop efficient zones</i> , <i>market and trade intelligence</i> , trade diplomacy and liasioning at global level. Quality appraisal of exportable commodities should form a research priority in future to conform to global standards. <i>Market driven agro research</i> to be done by SAUs/ICAR rather than routine research . <i>Organic food</i> production zones can be delineated and practiced to cater to specific markets., both in-house and external.
12.	Potential areas may be identified to step up research on Organic Agriculture to enhance exports.
13.	To make agricultural research sensitive to emerging scenario of home and external trade, first of all, there is need to have full information on the unfolding scenario of home and external trade which must be available to researchers. Many times, there no such information is available readily at institute level. For this, there is need to constitute units to collect all such information on different groups of crops and

	commodities.
14.	For each crop and agricultural produce a clear zoning of place of demand and supply should be done. This should lead to a forward and backward linking among all the people involved in the chain of production - transport-marketing- demand (use). This should be done for domestic as well as international trade. Every crop based research institute should have clear links with all the marketing and industrial units involved in utilizing the produce directly or after value addition. The links should be strong between the institutes involved in crop improvement vis-a-vis the institutes involved in value addition for the product so that particular type of genotypes suitable to the industries or processing units could be developed.
15.	The present system of extension at the state level should be abolished. Technology providers should be encouraged to develop services and goods sector and underwrite technology which they are to sell.
16.	Growing knowledge divide and increasing restrictions on technology/national transferred in the wake of WTO necessitates creation of frontier institutions in major areas and initiation of strategic/basic research on carefully selected themes. These needs are recognized but the problem is that there is massive mismatch on the supply side, particularly of human resources. We would need young scientists well trained in top ranking world centers. This base must be prepared by foreign post-graduate training and seeking faculty outside the country. We must allocate foreign exchange/external assistance for post-graduate education and faculty recruitment outside on a priority basis. Our policies rule this out and we are pursuing short-term external training or creating new departments with sub-optimal faculty. This will not serve out long-term needs.
17.	<ul style="list-style-type: none"> • Creation of Agri Research and Business Networking Division is required to bring together academia and industry. This may function under CSIR or DBT, with an OSD as incharge. The projects identified by Planning Commission may be sanctioned under an EFC document for implementation. A representative model for execution of mission mode projects is given in Figure 1. Agricultural management in the country needs to shift from food security to globally competitive quality assurance. Since Indian agriculture industry has very little R&D infrastructure, knowledge base and finance, government needs to evolve mechanisms, policies and platforms to catalyze public – private partnerships. • A biotechnology-centred agri-business policy is required. Accelerating the commercialization of agri-biotechnology is not easy in a developing economy where farming has traditionally been practiced for subsistence rather than business. Technology-intensive agriculture needs to be promoted through policy, incentives, investments and networking. A managerial flow sheet, suggesting an operational network is outlined, (Figure 1) taking, agribiotech as a representative example. In agricultural biotechnology, a few cases need to be fully supported and brought to the stage of clearance by GEAC. Success of the first few missions will then catalyze investments by industry in technology intensive agriculture.

	<ul style="list-style-type: none"> • New models based on farmers co-operatives and public-private partnerships need to be implemented. Resource optimization and anticipatory decision-making can be implemented efficiently through such co-operatives and consortia. The Networking Division will make such region-based, crop-based, systems-based and need-based co-operatives for taking research to their logical applications. • Registration of cultivars and breeds and promotion of seed industry, including hybrid cultivars as a matter of national policy is desirable. State Seeds Corporations need to be rejuvenated to provide leadership to the private seed industry through networking with them and with SAUs and R&D institutes. Organized seed industry in India is less than 3% of the global market, explaining poor quality control and responsiveness to new emerging needs. A platform to promote desired partnerships is needed. Otherwise, it is possible that in future Indian seed industry and farming will be managed more remuneratively by foreign multinationals. • M.B.A. level courses in agribusiness management and entrepreneurship development in agriculture need to be promoted. • Decisions need to be taken with respect to intellectual property protection and strategic acquisitions for rapid promotion of intensive agriculture. This can be achieved efficiently by utilizing the capabilities developed in CSIR. Project - centred networks of the kind outlined in Figure 1 need to ensure that the IPR issues are handled proactively.
18.	<p>There is an urgent need for policy makers representing our country at WTO to understand that for India livelihood security is far more important than food security. Our citizens go hungry because they are poor and cannot afford food or because they do not have sufficient land on which to grow it or food can not be transported to them due to lack of resources at state level, our surplus food stocks and foreign exchange not withstanding. To be sensitive to our needs for our poor farmers while being globally competitive we must,</p> <ul style="list-style-type: none"> • Ensure livelihood security instead of food security for the rural population • Identify our strength to acquire competitiveness in agriculture commodity production and marketing to relate these prices and the production system to the international commodity markets, to meet global competition • Improve our procurement, transportation, storage and processing functions. • Networking the local markets into a National commodity grid for spot and futures trading. • Improve our trade and Intellectual Property Rights (IPRs) literacy • Improve market access for consumers who lack the necessary purchasing power as well as the producers conditioned by State monopoly over subsidy regimes.
19.	<p>To make the agriculture research sensitive to emerging scenario of home and external trade there is a need for strengthening research on quality aspects to</p>

	<p>meet the phytosanitary and sanitary norms as well as CODEX standards for agriculture products to explore the export market. There is also a need for strengthening research on organic farming and standardization of certification norms for organic products to meet the demand of export market. Looking to the changing demand pattern of the domestic market there is also a need for strengthening research on processed food products through partnership with food processing industry.</p>
20.	<ul style="list-style-type: none"> • Funds allotted for pre and post harvest technological research is not sufficient at present and post harvest loss is not less than 30%. Cost to protect /preserve is much lower than the cost to produce the same units. • Facilities for protection / preservation should be enormously increased especially for cold storages. Data base, net working, exchange of information, market intelligence etc should be improved and disseminated to growers. Encouraging growers to produce quality produce / products for domestic and external trade (FPO, Agmark, ISI, HACCP, Codex Alimentaris Commission standards).
21.	<p>(i) Agricultural research should shift its focus from production – orientation to profit – orientation through diversification and value addition by encouraging post-harvest technology, international trade and marketing.</p> <p>(ii) Scientists, including the policy planners and research managers, should be sensitized to the implication of WTA on Indian agriculture, particularly on the livelihood of vast majority of small and marginal farmers.</p> <p>(iii) Quality consciousness to be inculcated in the minds of farmers to make them globally competitive</p>
22.	<p>So far the scope of agricultural trade is largely under rated. To raise to these issues, a core group be constituted to assess and integrate production, storage, stock movement, internal and external trade with special emphasis on food processing and quality control. This would in turn make commodity wise recommendations that would be addressed and attended to at national level.</p>
23.	<ul style="list-style-type: none"> • Suggested to launch an international trade and treaty and national food and feed literacy drive to educate scientists and science managers on various obligatory clauses enlisting standard and safety elements and norms before raw agricultural produce and processed product are marketed. Consumers at home will not accept agricultural produce if it contains harmful elements more than prescribed limits. In the international markets exported produce will not only be weighed against maximum permissible limits of hazardous constituents but also be scrutinized against corresponding processes of producing it. Agricultural research, therefore, must innovate techniques and technologies that conform to international norms of producing it and the final product fulfills laid out codex standards. Apart from meeting these quality requirements, it will be necessary to remain competitive price-wise. Particularly with reference to World Trade Agreement on agriculture, there

	<p>will be no escape to develop most efficient agricultural practices and invent after-harvest processes to value add what is produced. It is the efficient agriculture, which is economically favorable and environmentally benign.</p> <ul style="list-style-type: none"> • Since the farms are small and farmers are many, it is imperative to: (i) harness regional advantage built over the years for high value agricultural produce (say henna or white musli in Rajasthan) having value in the local markets or potential for exports (ii) federate farmers to create a corporate effect and (iii) prepare them for protected agriculture. In either case, it will be necessary to build farmers' knowledge and skills on new developments on the one hand and link them with market chains and export houses on the other. In order to respond to these demands, NARS should initiate: (i) comprehensive research on improvement of quality and productivity of region-specific high value crops (ii) non-formal education and training programmes for the life-long learning of farmers, (iii) activities on inventing affordable poly-houses and practices on protected agriculture and (iv) build data base by strengthening research in the area of artificial intelligence for forecasting consumer preferences and trade trends and to intertwine this information to guide agriculture as to what it should produce and of what quality. In my considered opinion, export oriented agriculture offers a most viable platform for organic farming, precision and high-tech agriculture. • Apart from quality produce, value addition through processing is the other option that will propel agriculture more into international trade than the direct export of conventional raw produce. Currently, India adds merely 7% value to its agricultural produce compared to 25% in China and 165% in UK. Primary processing (leading to that produce which is clean, fresh looking, graded, labeled and packed) is the first step to value add to agricultural produce. This should be done at the farmers' level. Well-established industrial units should preferably do secondary processing leading to conversion of primary produce to a new product. It is here where small farmers need to federate into corporate bodies or enter into contract farming arrangements to remain market appropriate. Agricultural education should add more courses on post-harvest handling, processing and value addition. How to pack, label and write cautions/precautions, and standards should be the integral syllabus of such a course. Food technology research needs to be strengthened to develop value addition steps and techniques that support small-scale industry or link farming with factory.
24.	<p>1. Market oriented production system. 2. High productivity and production. 3. Quality improvement. 4. IPM. 5. Avoidance of pesticides residues and other toxic additives and to keep them below the internationally acceptable limits. 6. Fulfillment of SPS requirements. 7. Post harvest technology (post harvest treatments, transport at optimum conditions, sorting, grading, value addition/processing, packaging, etc. as IT based automated systems).</p> <p>2. New crops according to the market demand</p> <p>3. While making the external trade of commodities/products only low virtual water</p>

	<p>containing items are to be considered. Trading of water is now a concern to the developing countries.</p> <p>4. Market intelligence</p>
25.	<ul style="list-style-type: none"> • Focus on application of modern technologies and reorientation of the research plans considering the SPS/WTO agreements on agriculture in present day scenario. • Development of market intelligence for assessing the real demands of agricultural commodities and generation of a database. • In order to achieve above objectives, Scientists in NARS must have to understand that only generation and patenting of technologies will not be rewarding rather their national/international acceptability and marketability will be considered as achievement and remunerative.
26.	<p>India has been in the forefront of this debate and should indeed prepare to reap some benefits once (and if) some of the promises are implemented.</p>
27.	<ol style="list-style-type: none"> 1. Stake holders (farmers, industry) involvement in research agenda development should be the hallmark. 2. Emphasis in curriculum about international agriculture, new opportunities and challenges and management strategies to meet these challenges. 3. ICAR and SAUs should develop sound international marketing intelligence. 4. Major focus on awareness on new opportunities in International agriculture through training.
28.	<p>There should be market intelligence cell and scientists should be encouraged to have up-to-date knowledge of international developments including conventions, treaties etc. Accordingly, research should be redirected and undertaken as mentioned under (1)</p>
29.	<ul style="list-style-type: none"> • State level export policy to ensure formation and promotion of region wise expert zone/ processing units . Rich human resource (unemployed farm graduates) available in the region may be utilized for the purpose. • Backward and forward linkages to produce and export agricultural products. • Inclusion of more number of agricultural commodities under APEDA . • Creation of infrastructures for meeting the quality parameter needs of the international market. • Establishment of location specific post harvest processing industries. District wise ‘export zones’ to meet export needs vis a vis WTO criteria. • Intensification of research on organic pest management and bio-intensive IPM to reduce the pesticide residues especially in high value, export oriented crops. • Establishment of quality control laboratory in the university for undertaking research on pesticide residues and certification. • Entrepreneurship development in the mass production of quality biocontrol agents. • Patenting procedure should be simplified for agricultural innovations and extensive training is to be imparted towards patenting

	<ul style="list-style-type: none"> • Identifying cropping zones exclusively for export purpose and for this rural infrastructure including roads and irrigation have to be developed. Importance should be given for Post harvest and value addition for which rural godowns and market development are to be created. • Strengthening and establishing quality control labs at Zonal levels and this might be managed by SAU's to ensure quality of products.
30.	The scientists recruitment system need to be de-centralized especially at the higher levels of recruitment but with required transparency. Initial recruitment of scientists for ARS through ASRB is serving good purpose and could continue, including the selection of junior and senior research fellows for MSc and Ph.D programs and for the assessment of scientists at all levels, being an independent body.
31.	ICAR is largely reacting to CGIAR objectives and is less focused on local priorities and feasibilities. ICAR has provided greater access to interactions abroad and in a restricted domain than interactions within the country on a wider basis.
32.	<p>Challenges Ahead :</p> <ul style="list-style-type: none"> • Exploitative agriculture in urge for short term gains at the cost of long term sustainability is causing unprecedented degradation and pollution of natural resources like soil, water and environment at unacceptable level. • Production (response) efficiency of per unit of inputs like fertilizers, and water as well as total factor productivity are declining at a rapid rate. • Practically no hope of horizontal expansion of the cultivated area which is stagnating around 140-140 Mha during the last three decades. • Population graph is soaring, while land : man ratio and average size of operational holding are shrinking with passage of time. • Compound annual growth rate in yield of all principal crops declined in 1990's as compared to 1980's and the productivity in India is much lower as against many other countries. • In the wake of recent globalization of marketing and liberalization of economy, agricultural production at less cost but of competitive quality is essential. • The problems of resource-poor and risk-prone marginal and small farmers (constituting about 80% of farming community) despite being major producers of foodgrains, fruits and vegetables etc. are not addressed adequately and hence, they are victim of poverty and poor living. • Expected climate change in the 21st century will have far-reaching negative consequences because of increased snow-melting, floods, droughts, land degradation etc. • Owing to faulty water management, irrigated agriculture is unsustainable, irrigation efficiency is hardly 30-40% and yield levels are very low. The

	<p>share of agriculture for water is likely to be curtailed in view of competitive demands from industry, power and domestic sectors. Shortage and scarcity of water will have negative impact on agricultural production.</p> <ul style="list-style-type: none"> • Because of weak extension services the improved technologies are reaching only to few farmers and as such, full benefit of research findings are not reaped by bulk of the farming community.
33.	<p>Refocus Agriculture Research for food, health and nutritional securities: -</p> <p>India has accomplished highly commendable progress in the agricultural sector after independence, particularly we became self reliant in the food sector. We have been witnessing planned development since the introduction of Five Year Plan Programmes in 1951 by Govt. of India. It has certainly resulted in many achievements, but most of the achievements of this planning process are moreover like an iceberg. The visible part is only one-tenth of the whole and the main junk i.e. nine-tenth, which constitute the rural sector could not get the benefits in the desired manner. In spite of the commendable achievements in the food production sector, the nutritional security of our country, particularly of the rural people is still not that satisfactory. We are mainly an agricultural country and the success of our agriculture and allied agro industrial development is possible only when the rural farmers / people are healthy, intelligent and productive. The rural Indians in the past (75 to 100 years back) used to be very healthy, innovative, and intelligent and led a sustainable and contented life. But the modernization and adoption of western agricultural methods and practices have all undermined it. According to a recent WHO report, only 10-15% of the people of the Third World countries have above average IQ. India is also among this unfortunate group. More particularly in U.P State of India, only 10-12% of its people have above average IQ. It means that only 10-15 million people out of the over 1 billion population of India are productive and creative and play effective role of building the nation. It is reported that China has about 60% people having above average IQ. This is perhaps one of the reasons of the fast development and progress that is currently taking place in China. It is well known that India in the past had perhaps over 70% of her people with high IQ. In ancient India, every village was self-reliant and contributing to the prosperity and welfare of the country. This was later systematically eroded and corroded with foreign occupation and even after independence the situation was not appreciably improved. One of the main reasons for poor performance of the people is loss of our traditional agricultural practices, balanced food and nutritional intake and primary health care, etc. We therefore need to focus our research in this sector to ensure: -</p> <ol style="list-style-type: none"> 1. Environmental securities by way of pollution free environment, green technologies, green fuel, organic cultivation, green environment, clean water. 2. Energy securities by way of cultivating biofuel, facilitation of rural electrification, solar technologies, generating enough and good vegetable oil (from oil seeds), biomass production for conversion to energy etc. 3. Food security by way of selecting elites, application of microbial bio-fertilizers that enhance yield, decrease disease incidence, reduce aflatoxins; nutrient rich species and cultivars with agro techniques that can be translated

	<p>to villages.</p> <ol style="list-style-type: none"> 4. Soil securities by way of application of neem (and other bioresources) based biopesticides and biofertilizers, microbial fertilizers, nutrient economizing techniques for cultivation and harvesting, biomass cultivation on sustainable way, non traditional crops, soil amelioration, phyto remediation of degraded soil, dump sites, abandoned sites, mined off sites, salt affected sites, fly ash dumps, etc. 5. Awareness among the villagers with a special focus on women folk to empower them with the right knowledge on best food, nutrition personal & civic hygiene, primary healthcare and organic farming. 6. Motivation of the villagers in setting up backyard kitchen garden or community gardens with diverse location-specific and seasonal local vegetables, fruits and medicinal plants (on common land jointly by 10-15 family as per the local strength) to supplement the diet for food, nutritional security as well as to manage efficiently the primary health care using common medicinal plants for disease preventive health promotive as well as in treating common self limiting ailments like common cold, simple diarrhea, cuts and wounds, etc.
34.	<p>Agriculture research has to be sensitized on two important emerging scenarios. The common minimum program of the present policies promised employment guarantee of 100 days per family per year to provide distributive livelihoods, equity and social justice especially in the poverty ridden agro-ecologies. The major problem is in the eastern India with high potential of growth due to abundance of groundwater, deep/fertile soils and high rainfall. There is large scale out-migration of the manpower and import of foodgrains, fish, eggs and meat from the other regions of the country. This area being virgin should straight way be considered for promoting integrated farming system approach which we missed in the past due to over emphasis on rice, wheat and a few commodities. We have to think on alternative institutions, policies, organization and sharing system of managing open access, common properties and wastelands for mitigating poverty of the socially and economically backward families.</p> <p>The second scenario is linked with liberalization of international trade and agriculture under WTO agreements. Here we have to be cost competitive by enhancing input use efficiencies to meet challenges of higher productivity in the other regions of the world. Area approach or agro-ecological zonation for organic farming, cultivation of spices, aromatic plants, cash crops like cotton, etc. may be evolved with a transparent, input supply and buy back system. Diversification of upland rainfed rice into horticulture or agro-forestry and tube well irrigated rice into pigeon pea, soybean, dairying, vegetable production and other cash crops should be given very high priority to meet emerging challenges. Livestock production based diversification has ample opportunity to multiply livelihood, employment generation and income earning with sustainable management of natural resources. Multiple use of water at a basin level by optimizing tree</p>

	<p>biomass, horticulture, grasses, livestock production and fish culture in the upper catchments and farming system including livestock/fishery in the downstream is called upon to harness complementarities of the resource use in a cascading manner. Basin, watershed and agro-ecologically based approaches are essential to harmonize management of natural resources, R&D within hydro geologically defined natural units of landscape.</p>
35.	<ul style="list-style-type: none"> • Emphasis should be given to generate technology for quality production at competitive cost. • Research priorities should base on site-specific, niche-based farm products. • Value addition to improve quality and acceptability of farm produce.
36.	<p>Making agricultural research sensitive to emerging scenario: Privatisation of the research activities is required so that funds are provided by the companies for the projects aimed at solving the problems of trade requirements. The output from such projects can be the property of the company funding the project and should have the right to sell it to other organisations/individuals.</p>
37.	<ul style="list-style-type: none"> • The ARS selection system must change if we want to recruit the best scientists. • Various S1 scientific positions should be advertised separately for each institute as is done for senior positions. • Select scientists on merit and research capabilities through well-structured selection committees. • Remove the clause of transfer from ARS rules, to minimize political influence! • Restructure AARs of scientists, which should reflect scientific achievement. Good models are available.
38.	<p>There should be mechanism(s) in place to ensure that farming remains/becomes a profitable business and farmers do not lose out due to lack of proper policy support. Subsidy should be used indirectly to ensure that farming remains profitable on a sustainable basis.</p>
39.	<p><u>Economics and Markets:</u></p> <ul style="list-style-type: none"> • More resources should be allocated to collect and disseminate data on yields, profits, labour requirements, human health hazards threats to water quality and other environmental hazards of conventional and alternative farming practices within a given region. These data will help policymakers and farmers make more informed choices. • Research should be undertaken to predict the long-term impacts of various levels of adoption of alternative farming practices on the total production and prices of various agricultural commodities use and prices of various farm inputs, international trade, employment, economic development, and incomes of various categories of farmers and the overall structure of agriculture and

	<p>viability of rural communities.</p> <ul style="list-style-type: none"> • Research should be expanded on consumer attitudes towards paying slightly higher prices for foods with lower or no pesticide residues, even though such foods may not meet contemporary standards for appearance.
40.	<p>Need to diversify the food basket, diversification of crops and improvement of underutilized crops suited to local farming systems for better livelihoods, and their sustainability to fit-in diverse agricultural systems/agro-ecologies. Decline in the variety of foods adversely affects nutrition.</p>

V.To examine the present system of scientist recruitment and human resource development policy and suggest measures to attract and retain good scientists taking into account the recommendations made by recent review committees. Because of distortions in personnel and incentive policies, the system has become highly rigid and opaque, and both central and state systems have resorted to highly straight-jacketed recruitment, and omnibus time-scale approaches for advancement. Suggest ways of removing such distortions.

1.	<ul style="list-style-type: none"> • Where is recruitment? Several posts are vacant! Posts of Directors and Heads of Departments are vacant for years when it should not be so even for a single day. Even when requisitions are sent, it takes months to recruit a person. Could it not be that for “retirees” a scientist could be selected in advance and kept as an understudy for smooth take over. • In many an institute, a scientist is working either as an Administrative Officer, Accounts Officer or a Stores Officer. How do we expect him to be doing justice to any of these positions and also his own? And then on the top of it blame and charge him for all kinds of irregularities! • A person recruited for a particular position or a particular work in a particular discipline should not be allowed to move, exchange or indulge in another area unless he or she is selected for that. Transfers on alibis such as ‘my home state’, ‘compassionate grounds’, ‘retiring in two years’, ‘marriage of my sons/daughters’, ‘construction of a house’ etc take away many of those who should be contributing. Many scientists have moved to cosy positions with no work to do as the facilities for the type of work they were doing are not available at the new stations where they have sought transfers and have been shifted on these personal grounds. • Why should the Council not consider seriously changing its recruitment system and adopt the system followed by another important organization in the country, the CSIR? • As regards HRD policy, performers must be identified at an early stage and sent abroad for higher and advanced training, may be within 2-3 years of their recruitment, as a period of 5 years is too long to wait and take advantage of the zeal with which these young men are fired. • A person must be got trained in advance for working on any new
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	<p>area/problem for which the expertise is not available in the institute or a person should be directly recruited and the kind of essential qualifications such as “5 years of experience as Scientist or as Senior or Principal Scientist” should not be there for scientists working abroad who have the expertise and capacity but not this kind of “experience.”</p> <ul style="list-style-type: none"> • Now that the retirement age has been increased to 62 years, the scientists should be allowed to go for training and exposure visits up to an age of 55 years as they would still have 7 years to contribute. This would also keep them interested in their work otherwise they would become stale at 50 years of age and spend over a decade brooding and grudging the young and also cursing the authorities. • It should also be seen that it is not the same scientist who is deputed again and again, others in the Division should also be given an opportunity for exposure. It doesn't matter even if they are juniors, they could be suitably trained and briefed, if necessary.
2.	<ul style="list-style-type: none"> • Within the overall umbrella of ARS, the recruitment system needs to be decentralized. We need to go back to delegating the powers to the Institutes to recruit keeping in view the specialization required and changing scenario. • Emphasis needs to be placed on enhancing the 'basic components in agricultural education and research". Best wishes. Yash Abrol
3.	<ul style="list-style-type: none"> • A majority of present-day agricultural scientists have studied and trained locally, often in the same university that they subsequently join and even retire from. This kind of inbreeding should stop. During the 1950s and 60s many scientists were trained abroad because foreign universities had resources to offer research, teaching assistantships, fellowships etc. The situation changed and such funding has almost dried out. Planning Commission should earmark funds for sponsoring promising scientists to work with reputed scientists abroad. I recall writing such a letter to the Planning Commission around 1990. • Personal promotion scheme has been miscarried and so has been internal assessment. Aspirants for the post of professor/principal scientist must pass a very rigorous test. Accountability and strict test regimen will inculcate work culture, which is sadly missing.
4.	<ul style="list-style-type: none"> • Merit promotion scheme with five-yearly assessment for Scientists • Weightage for research as well as good teaching and extension in evaluation • Provide promotion possibilities through the entire career (eg. Director level scientists in CSIR) and make research-for-life as attractive as the Research Management Positions • Lateral entry and direct entry of researchers from the open market to be made more flexible to identify and bring in talents to the system • Regular recruitment of Scientist at the initial level • Selection of personnel for RMPs through Search Committees

	<ul style="list-style-type: none"> Free movement of researches between ICAR institutions, SAUs as well as the industry
5.	It is fact that none of the earlier review committee reports were fully accepted, even on some of the reports no action was taken. Selection of best available talent for each project through the improvised system of lateral induction of scientists may be the solution.
6.	A desired level of technical assistance should be provided to each Scientist. Developing a system of Research fellows in various projects at the Institute will be desirable.
7.	It is absolutely necessary to have hire and fire. Only the fittest individuals should survive. If this is not possible, at least the system of reward should be there for encouraging merit and inventions. This is very much lacking in the ICAR system. The concept of seniority should be lessened to the extent possible
9.	Make ASRB responsible for short listing qualified candidates at the entry level and leave final selection with respective institutions
10.	<ul style="list-style-type: none"> Permit me to consider a very general example before making my suggestion with regards to the functioning of ASRB: Let X and Y be the two scientific personnel. X is 5 years senior to Y. They are on par in their academic qualification and research accomplishments. They have guided same no. of M.Sc. and Ph. D. students in their career. Both have got similar fame at national and international fora through their quality publications. Now they appear for a position of Director in some ICAR institute. ASRB selects Y for the reasons best known to board. Note the selected one is 5 years junior to his/her rival. A very bad message is sent down the line by the board. These events are common in ICAR only. Such example can never be found in any other organizations of GOI. This is highly humiliating and demoralizing to the senior incumbents. Such examples are good to destroy the organization. One can tolerate if X and Y are from same batch and Y has good connection and gets selected. The board members must be able to take enough care to respect seniority and experience while recommending a particular name for a position. My argument is not in favour of those who are seniors in age or length of service it is for those who are meritorious and are not at all connected with big people viz. DDGs, DG, Ministers and /or other influential people. Now the ARS service is 30 years old. ICAR may think to give opportunity to those scientists to rise that are from the system. The logic is simple that ICAR recruits the best available talents through competitive exams. This policy will enthruse to work hard and grow as much as possible. Let us select only the meritorious ones by two stages screening like first round formal presentation of a seminar before a jury and best three may be called for interview. Let the results of best 3 from presentation stage be declared same day. REVAMP THE PROCEDURE OF CHOOSING VARIOUS EXPERTS IN SELECTION BOARD

- The members of the task force are very well aware of the things that I am going to point out here. Example: If the chairman of ASRB is former VC of a particular University, then the majority of the best experts would be born overnight from that very Univ. irrespective of the disciplines. Very very bad practice it is.
- It is suggested that the list of past NAAS fellows would be able to supply much better experts to ASRB. The influential officials have changed the weighted of marks to the articles published in the quality Journals up side down. The classical examples is that: A journal that has listing in ISI and has impact factor more than 1 will attract lesser mark than a journal which has nil impact factor and of course no listing in IST. This is how the manipulation is done and the cause of merit is compromised.

Anomalous Situation in Personnel Policies

There may be several anomalies in ICAR but we wish to draw the kind attention of the Task Force towards the two important ones that are very interesting.

No.-1 The Principal Scientist (PS), Zonal Coordinators, Project Coordinators (PC), Project Director, Asstt. Director General (ADG) and Directors of ICAR are in the Pay scale of Rs. 16400-450-20900-500-22400 w.e.f. 1-1-1996 or pre-revised (rs. 4500-7300) w.e.f. 1-1-1986.

- Now, let us consider a hypothetical example say Dr. ‘X’ is PS w.e.f. 1-1-90. He appears an interview for PC (same pay scale of what he was earlier) and on the recommendation of ASRB, ICAR appoints him PC w.e.f. 1-1-93. He completes 5 years on 31-12-97. Again, he appears for the post of ADG (same pay scale) in 1998 and ICAR appoints him on ADG w.e.f. 2-4-1998 and he completes his term of 5 yrs. Successfully on 1-4-2003. Again, the ambitious RMP (gentleman) sees an opportunity for the position of Director (in the same pay scale) and this time ASRB did not find him suitable for the post of the same pay scale. How this situation will be explained ?
- The point that we would like to emphasize is that ICAR may an exceptional organization that has a policy of recruiting a person first 3 times for the same pay scale with (Open compt) and rejecting him 4th time for the equivalent post of the same pay scale. There is a serious inconsistency in the policy. Such a practice is in vogue for the last several years. Why ? no one thought about this anomaly so far. Why to spend so much public money in the recruitment process and in the end to award the personnel with humiliation. This negativism must go.
- **Solution Suggested:** Either upgrade the positions as per the hierarchical needs or simply adjust those senior incumbents appropriately by an administrative order. Otherwise, it becomes a joke.

No.-2: Promotion of Senior Scientist to Principal Scientist

	<ul style="list-style-type: none"> • The policy that was implemented after 1986, envisaged a residency period of 13 years (with Ph.D. degree) and 16 years (without Ph.D.) to become Senior Scientist from the entry level of scientist grade. The residency period was brought down to 9 and 11 yrs, respectively for PhD holders and non Ph.D holders by GOI in the new policy that was notified w.e.f. 27.7.1998. when this was done, the policy makers made a suitable para in the document/provision to take care of the extra years that were spent by the entrants of batches of 1981 through 1986. But, unfortunately none of the administrators except the present DG, ICAR understood the matter in the past few years. The reason is simple that no one wants to read that particular para. If this anomaly is rectified this will help improve the career of more than 1000 scientist and future of ICAR. Because these group of scientists are in the age group of 42- 50. • Permit me to apprise that this particular anomaly has been rectified in most of the agricultural University. • Solution: This rectification will enable the senior scientists to submit their paper to ASRB for their assessment after 17 years of their service. This case is pending in the ICAR personnel section. The necessary order will do the job to the satisfaction of all.
11.	<p>Adoption of UGC package in Assessment/Promotion should be dispensed with. Rigorous merit based assessment with 70-80% emphasis on originality/publication at each level must be adopted. It should be different from the present one in that the present system appears to have failed to inculcate the spirit of competitiveness among scientists in general. To infuse competitiveness, one way could be to restrict promotion among scientists by introducing a distribution quota among the cadres say, Principal Scientist, Senior Scientist, Senior Scientist (SS), Scientists = 1:2:3:4. However, this may be decided after a thorough debate on this issue. This will also ensure that the intra-cadre distribution of scientists becomes bottom heavy and not top heavy as it is at present.</p> <p>It is further proposed :</p> <ul style="list-style-type: none"> (i) limits of number of years a scientist is expected to serve to be eligible for higher promotion should be lifted completely (ii) step-wise promotion may also be lifted. This will encourage young exceptionally talented scientist to apply for post of two or three steps higher (iii) scientists from related other disciplines / ICAR institutes may also be allowed to compete through assessment / interview for vertical promotion <p>All these will ensure more competitiveness and improve work culture within the existing framework of ARS system with some modification.</p>
12.	<ul style="list-style-type: none"> • Initially a scientist may be recruited on a contractual basis for four to five years. Upon satisfactory performance based on his assessment, he should be absorbed against a permanent vacancy with higher scale of pay. If the performance is not satisfactory during the contractual period, he may be asked to continue on contract basis or search for other jobs. This suggestion is based

on the line of selection of lecturers as followed by the IITs.

- The present emphasis on selection of the head of a research division in an ICAR Institute mainly based on whether the incumbent is in the principal scientist's grade or he has completed 8 years of service in the senior scientist grade or not, with less or no regard to see whether his qualification, expertise and experience is suitable and indeed, going to help in furthering the research quality and output of the said division, must be stopped. The qualification and experience for the post of a Head of a research division in an Institute must be fixed based on the type of work being carried out by the division or to be carried out in future based on the perspective plan and mandate of the institutes. It should be made tamperproof so that it can not be altered at will to favour someone by making it a selection from multiple choices, e.g. Qualification A/Qualification B/ Qualification C/ etc. The primary criteria must be the educational qualifications, expertise and experiences relevant to the need of the research division. The concept that any scientist can go to any area and carry out R & D work or even become the head of the division is improper. With the advancement of science and technology, the expected level of R & D to be pursued in any field of research is very high. Only specialized competent personnel with relevant educational qualification and experiences can deliver the required results and goods. Just because a scientist is having a Ph.D. degree in any odd discipline and holding a principal scientist grade, should not make him eligible for head's post. A head of a division is supposed to plan, guide and supervise the work of a research division where other senior and better experienced colleagues are also working. Without the proper qualification and experience how can he command attention/respect from fellow colleagues and even professionals and practitioners from outside? This is one of the major reasons why many good and capable scientists are opting for VRS and searching alternate career options.
- Alternately, head of division post in an Institute be filled in by rotation of 3 years term among the principal and senior scientists working in the division following the IIT pattern. In such a case, a second term should only be considered in case no eligible candidates working in the division are found. This will save a great amount of money in hiring a person from outside the system and avoid unnecessary ego clash.
- In the recent scientist promotion policy, newly joined scientist with Ph.D. degree have been provided with a package of promotion to the principal scientist grade after completion of a minimum of 17 years of service. However, those who have joined relatively earlier and already in senior scientist grade have denied the same benefit. For them, minimum of 21 years of service is needed to be eligible for Principal Scientist post. This has created some sort of discrimination. A section of relatively more experienced scientists have been deprived of the benefits given to the members who are junior to them in service. Here, a section of scientists have been denied promotion not because of poor performance but because they happened to join the ARS service a little earlier. This denial of promotion is not at all merit based. Thus, these scientists have been punished because of no fault

	<p>committed by them. This has affected the self-esteem, work efficiency and initiative amongst a good no of experienced scientists. Such short of discriminations which are not at all based on merit must be corrected by providing equal opportunity to those scientists who have joined earlier in the service.</p> <ul style="list-style-type: none"> • Every senior and principal scientist by default must be given the opportunity to present a scientific paper in international conferences held outside the country after each 5 years of continuous service. They should be allowed to couple the visit along with conference for visiting a nearby related research institute outside the country for better exchange of ideas.
13.	<p>Agriculture is a state subject .SAUs are funded by ICAR. Although there is coordination at research level, but at the recruitment level there is no uniform policy .The <i>sons of the soil</i> theory is very much in operation .To make the system more efficient :</p> <p><i>Zonal system</i> of management which entails decentralization may be introduced for effective monitoring in lieu of the centralized system. All SAUs may recruit on 60:40ratio of state: out of state scientists. This facilitates better interaction between various SAUs and quality can be improved .A common syllabus at UG /PG level also facilitates <i>cross mobility</i> of scientists from SAUs to ICAR and vice-versa on deputation .</p>
14.	<p>Promotions beyond Principal Scientist/Professor may be introduced by creating either Senior or Principal Scientist/Professor to encourage continuity in research /Specialisation.</p>
15.	<p>There is lot of improvement needed in recruitment and promotion policies. Unfortunately, a feeling is being felt that the promotion is time bound irrespective of the work done. In many instances we find that both performer and non-performer are at the same pedestal as far as promotions are concerned. The performers must be encouraged and non-performers must be punished. There is also need for greater transparency in recruitment at all levels specially at research management levels.</p>
16.	<ul style="list-style-type: none"> • Filling up of all the vacancies in every research institute should be filled in on top-priority basis. The recruitment of the scientists could be tenured. • Human Resource Development: If any proposal for training, either within or outside the country, is within the mandate of the institute, then the institute should have powers to depute the concerned scientist for the training. • Promotions must be merit-based with due weightage to the working conditions available to the scientist. At this point due weightage should be given for all the jobs assigned to the scientist at the institute. • Ensure best working environment for research, which could meet all the demands of the scientist and should pose least problems in terms of physical facilities and consumables for the researcher so that he wouldnot be wasting

	<p>his time in running around to get the things for doing research work. This environment will motivate the workers to put in their best efforts to do research.</p>
17.	<p>The present system of governance has to be changed to contractual service mode. The five year assessment system though DPC for scientist recruitment should be abolished. There should be country wide circulation of all level positions e.g. Scientist / Admin./ Technical. Applications of Scientist from abroad in frontier areas of research should be invited. The appointments should be for five years only. Further five year term to be extended after peer review by competent subject matter specialists. Scientists should be permitted to get research projects from national/ international funding agencies under a defined MOU. The research out put should be jointly published. No germplasm should be brought in / or out from the countries without the permission of respective governments of both the countries. There should be no binding on to and fro visits for trainings, consultations whenever need arise. The work should be in a partnership mode.</p>
18.	<p><u>Personal Policies and Evaluation Criteria</u></p> <p>With shift from ARS policy to UGC scale majority of the scientists, who become Principal Scientists do not foresee much incentive in future service career and hence lose initiative for original, innovative and path-breaking research, thereby carrying out repetitive and routine research. Almost all positions of Heads of Divisions, Coordination's, Project Directors. ADGs and Directors (excepting Directors of four Deemed-to-be Universities namely IARI, NDRI, IVRI and CIFEC, and NAARM) are in the same scale of pay as that of Principal Scientist, regardless of vast difference in the magnitude of the responsibilities. This situation has very adversely affected the work culture, attitude, aptitude and urge for excellence in research achievement. My well-considered suggestion is to reverse the policy. Perhaps, the feasible way to implement it lies in developing appropriate alternative personal policy like ARS which after approval of the Govt., should be mandatory for adoption in case of new recruits, while the existing scientists may be given opportunity to opt either for new policy or for continuing in the present UGC pay scales. Such procedure was followed in ICAR when ARS was introduced.</p> <p>The evaluation/judging criteria are tilting focus towards more number of publications and not so much towards quality. This is prompting young scientists to have craze for more number of research papers based on routine work for earning earthy rewards/promotions, and therefore, is not conducive to produce brilliant scientists with talent as well as ambition for achieving excellence in creative research contributions.</p> <p>Leadership Waning : Competent and committed leadership having attributes of great vision for identifying priority thrust areas, developing requisite facilities,</p>

	<p>inculcating team spirit, motivating your colleague scientists for superior research work, creating enabling environment and ensuring good governance is of vital important. There are numerous examples in support of the fact that academic institutions/universities/research institutes have attained shining heights within short period under able leadership or have doomed under poor leadership. Consequent to the shift in the personal policies and evaluation criteria etc. as detailed under Item 1.1 and 1.2 above, the leadership is waning fast and is becoming glory of the past. It is, therefore, considered essential to assign due weightage to leadership qualities while selecting/recruiting scientists to Research Management Positions.</p> <p>Accountability Lacking : In order to ensure both quality and quantum of research of desired degree, accountability is of utmost significance. Accountability of the non-managerial scientists for research achievements against the pre-fixed atargets is practically very marginal and is not enough to foster the necessary sense of responsibility/commitment, as a result of which the good performers and non-performers are almost at part. It is suggested that accountability should be enforced through modification of rules (if required) such that there is adequate incentive for superior performers and disincentive for poor performers.</p>
19.	<p>To encourage good science and workers, advancement to senior positions after certain level of experience e.g., 15 years of service, promotion should be based on performance as demonstrated through clearly demarcated scientific parameters like grants obtained from external agencies, publications in impact factor journals, patents, recognition in area of expertise, technologies developed, and commercialized, instead of time-scale promotions.</p>
20.	<ul style="list-style-type: none"> • Our higher agricultural education be made internationally competitive. Within departments there should be specialized sub-sections and staff should be recruited accordingly. This is proposed keeping in view the international trend of super specialization in the subject. For human resource development the training and exposure on socio-economic and environmental issues, intellectual property rights, legal issues and quality control aspects need to be given top priority as these issues will dominate future. <p>The subject of Agriculture/Veterinary/ Agri. Engineering may not be taken as one subject for the qualifying of main examination conducted by UPSC for administrative cadre, but the individual faculty as referred above may further be splitted into masters' degree subjects to increase the probability of selection of professionals from these streams to occupy administrative responsibility.</p>
21.	<p>Continuous recruitment, skill scaling, competitive remunerations when compared to other trades should be provided to agricultural scientist and agriculture officers/ horticultural commencing compulsory education in agriculture related fields from school level itself and appointing technical person to train them.</p>

22	<ul style="list-style-type: none"> • Increasing competitiveness among the staff through psychological testing and motivation. The psychological testing may also be incorporated during the selection process as a selection criterion. • In order to infuse first-rate researchers in NARS, availability of first rate students for higher education should be ensured. • This can be achieved by providing competitive salary in the research and education system to avoid efflux of first-rated students to other sectors. • Identification and adoption of first-rated students by NARS right at the graduation level for higher education and induction in agricultural research and education system. • All scientific faculties be made aware of modern tools of collecting information and these must be made available to them for better output. • For upgrading competence of human resources in research demand oriented refresher/training courses to scientists in their field of specialization may be given priority. • Additional benefits to be granted to those who have acquired latest knowledge in their relevant fields through resources and displayed the excellence in his field of specialization. • Limiting number of research projects in an institute based on cadre/location/actual requirement based on field problems. • As far as possible like IAS, IPS avoidance of appointment of Scientist in home state will uplift output from scientists.
23.	<p>Recruitment may be automatically changed if the constitutional arrangements of research institutes are changed. Mobility of scientists has to be encouraged to foster centers of excellence. One of the issues that Prof Randhawa pointed out to me many years ago was the fact that mobility of scientists among universities or between universities and research institutions etc. was hampered by uncertainties of retirement benefits. I wonder if this is still the case.</p>
24.	<p>Human resources for R&D is emerging as a major constraint though the bureaucracy remnants complacent about its quantitative dimensions. There has been erosion in scientific strength in public systems. There is concern about quality across the board. Career advancement processes have become linked more to seniority and time-based mechanism rather than quality/excellence in research. We have already referred to deficiencies in frontier areas. We are spending more on infrastructure (institutes, universities, labs and equipment) but pursuing sub-optimal human resource strategies. In areas like bi-technology, informatics,</p>

	<p>environment), business management, trade, etc. the NARS is using expertise from related disciplines rather than specialists. What is worse, such faculty are employed in educational programmes also. We need to think about our human resources objectively and apolitically if we are serious about out long-term needs and goals.</p> <p>Modern efficiency-oriented management must replace the ‘sarkari’ culture currently in vogue. This has several implications, the most important being professionalisation, decentralization, transparency, effective. PME processes, and performance/ quality orientation at all levels. These will require massive changes at all levels. The institutions have not shown the willingness for structural, functional, or operation changes in the past. There will have to be externally imposed and will need support in the highest level.</p>
25.	<p>Follow the CGIAR (ICRISAT / IRRI/ CIMMIT) pattern of selection, recruitment and management of scientific personnel. All scientific recruitments should be on <i>quasi permanent</i> basis (extended year wise / in two to three year installments) and only for doctorates.</p> <p>Results get extension of term and quality in achievements lead to promotions.</p> <p>NO TIME SCALE PROMOTIONS any more.</p> <p>Post graduates should compulsorily work for 2 years as research assistants before they get into Ph.D. to develop research aptitude. Ph.D. programmes should only SELECTIVELY (25%) supported by scholarship (not totally as is followed now).</p>
26.	<ul style="list-style-type: none"> • Like TOR I, this TOR again is very complex since in one breath it seeks answers to many questions, which themselves qualify to become an independent TOR. For the sake of ease in comprehension, I subdivide this TOR into several individual references. These references could be: recruitment of scientists, human resources development policy, measures to retain and attract good scientists, personnel and incentive policies, opaque and straight-jacketed recruitment procedures and omnibus time scale. • Recruitment of scientists: In NARS, cadre-wise scientists are distinguished by the status and kind of duties they perform. As far status, scientists are classified as scientists/assistant professors, senior scientists/associate professors and principal scientists/professors. Any of these cadres are engaged in teaching, research or extension and differentiated by disparity in pay scales. Then there are other positions, which are filled to manage laboratories/projects/institutes/country-wide programmes. Apparently, academic merit at the entry point and merit-cum professional accomplishments as the position rises in status should be the criteria to recruit scientists. Selection of scientists by ASRB should, therefore, be based upon a fair mix of merit, scientific performance and interview. In order to remain transparent, there is need to assign a relative numerical weight to each of the traits (academic merit, experience, research publications, professional attainments, grades in annual

assessment reports, ability to present for and against arguments in response to an issue raised during personal interview etc.), which describe the suitability of a candidate to fill a specific position. At the entry level, weightage to merit (performance in competitive exam) should dominate with interview having no more than 15% consideration. Corresponding to this and depending upon the job profile, selection of Senior Scientists and Principal Scientists should be guided both by academic merit and scientific attainments. For filling these positions, interview need to still have low importance (25% of the total weightage).

- Beginning 2004, ASRB is following a scorecard system for making selections to fill various scientific positions. The basic problem with the existing scorecard is that gives uniform weightage to various traits irrespective of the status of the scientific position being filled. With appropriate amendments, particularly in terms of assigning marks to each of the identified traits against expected duties and functions to be performed, a new scorecard can be developed and adopted. Principally, as the positions rise in status, specifically when the jobs demand management of divisions/projects/institutes (typically, **Research Management Positions**), weightage to academic attainments should decrease in proportion and that of quality and relevance of scientific performance (number and quality of publications made in journal of impact, technologies developed, processes innovated, products invented, patents obtained, revenue generated including that through externally funded projects, ability to work in and build teams) should rise. In order to assess a candidate's worth in professional, management and leadership traits interview becomes a necessity. Accordingly, marks assigned for interview in the scorecard should also rise progressively with rise in the position. This distortion in the currently followed scorecard needs urgent revision while making selections to fill research management positions starting with Heads of Divisions up to the level of DDGs.
- The present structure of NARS provides that scientists fill the top positions like that of Director General ICAR, Chairman ASRB and Vice Chancellor of an SAU. There is need to revisit the selection procedure to fill these positions also. I would consider these selections and the manner in which these are made to be the most crucial in sustaining the organizational vibrancy, efficiency, performance and output effectivity. **Selection of DG ICAR and Chairman ASRB** should be entrusted to an independent body like UPSC. Currently, these positions are filled under the control of President ICAR (i.e., AM). Analysis of the past and ongoing selections clearly indicate that there is need to remove this control so that cast and region are pushed to back seat and merit occupies driver's seat in the matter of appointments to these top positions. There already exists precedence. Selection of DG ICAR, at least once to my knowledge, was made by UPSC. Likewise appointments of Vice Chancellors are made by a well-defined Committee and not by university boards of management, a practice that is followed in some premier universities of the country.
- Human resource development policy: In the present day system of knowledge

dominance in making time, trade and society appropriate S&T innovations and inventions, well performing organizations make more investments in continuously upgrading the competence and capability of their human resources through training than in brick and mortar structures. Contrary to this accepted approach in organizational management, NARS, currently, do not have a definite human resources development policy. Undoubtedly, some in- and out-country opportunities do exist for training of scientists and administrative staff. Except the foundation course training at NAARM for the entry-level scientists, other trainings are adhoc and are planned without any need assessment. Generally, scientists are attracted more by foreign training opportunities compared to those available in the local Institutes/Academies. In the era of dwindling support to fill even the approved positions, training becomes a very crucial instrument to respond to emerging problems and challenges. For instance, country has a crop of soil scientists who lack expertise to forecast the impending degradation and depletion of natural resources and climate change in response to intensive management practices and prescribe matching resource use plans and restorer inputs to counter their surfacing. In my opinion, training and retraining is an opportunity to make best use of declining number of scientific positions to re-deploy in those areas, which are frontier and upcoming. A comprehensive policy on HRD and distinct budget line to support its implementation are necessary. ICAR already has a proposal made by M. L. Mehta Committee Report in its shelves. With appropriate amendments this instrument can be revived, revisited, refined and adopted for implementation.

- Measures to retain and attract good scientists: Merit and deadwood, at least in science and technology, can neither be equated nor can be compromised. Strangely, in NARS as a whole there is hardly any mechanism in place to distinguish and sift out merit when it comes to appointments and filling of scientific positions. Selections are made only among those who apply in response to advertisements on vacant positions and are present on the day of interview. Many meritorious candidates do not apply because of fear of not being selected because of prevalent dominance of considerations and manipulations other than merit in selection process. Since merit does not come without premium, there is need to scout for the best in each subject domain and have supporting procedures to pay for it. Apparently, once identified, such scientists are appointed with minimum procedural wrangles and are offered monetary benefits in the form of higher scale or advance increments than what is advertised. In fact, the today's premier SAUs in the country, immediately after being incepted, searched for the most meritorious candidates, irrespective of their regional backgrounds, cast affiliations or place of working. Appointment letters to such distinguished candidates were offered without formal applications and with additional monetary benefits. In my considered opinion, this alternative channel of attracting merit need to be revived for building and sustaining scientific excellence for high quality output and contribution. This becomes all the more important when number of available positions is dwindling and need for highly outstanding candidates to manage the science and environs of NARS

	<p>becomes more and more crucial.</p> <ul style="list-style-type: none"> ▪ In order to retain best talent, it is necessary to have a fast track career advancement scheme for meritorious scientists. Also there is need to promote super-scales for those who excel in contribution in terms of application, relevance and worth of their innovations and inventions. Likewise, at the top there is need to consider supernumerary position of an additional DG to manage a specific subject domain of contemporary rising and necessity. As far super-scales are concerned, UGC pay pattern includes this provision. However, this recommendation remains unimplemented by the NARS. Then there exists precedence when ICAR had an Additional DG with specific responsibility to manage Oil Seed Mission. • My comments on personnel and incentive policies, opaque and straight-jacketed recruitment procedures and omnibus time scale are covered in the point on attracting and retaining the best talent. One important development that has taken place over the years is the loss of national character of the ICAR institutes. Currently, majority of the scientists (>80%) working across ICAR Institutes are from the place/state in which that Institute is located. I can say with reasonable degree of confidence that rampant inbreeding has seriously vitiated the working environs and adversely affected even the routine output what to talk of quality of research findings. There is need to stem this rot by bringing out an instrument of policy. ICAR may learn from civil services where the candidates from outside the state fill 50% of the positions.
27.	<ul style="list-style-type: none"> • Scientific manpower planning in agriculture to meet the emerging needs is to be undertaken immediately. • Based on actual needs in different areas, scientists need to be recruited purely on merit and not on other considerations. More transparent and quantitative measures to be adopted in the recruitment process. • The selected scientists need to be properly nurtured through proper incentives and reward systems. Performers need to be rewarded with out-of-turn promotion and advance increments; • The non-performers should be provided with every opportunity for improvement and be appropriately reprimanded in case of continuous failure. Suitable modification in the rules needs to be attempted. • Performance assessment system should be made more transparent with in-built mechanism for immediate feedback. • Capacity building through appropriately designed HRD strategies on a continuing basis should be the hallmark of manpower development.
28.	<p>A complete analysis of the existing systems in different states and in advanced countries is necessary before taking a National course of action. Analysis is also necessary for the differential success of scientists in different Institutes and Universities in different states. One is to be very rigorous with the recruitment at</p>

	<p>the baseline. Merit alone does not work. One is to have devotion, sincerity, imagination and analytical mind. Several approaches may be made for this purpose. There are still workers in different Institute and Universities who work for the work's sake without caring for monetary return following the tradition of "School Concept". Unfortunately these workers do not get proper recognition because of their humble nature. A system is necessary to get such workers and to look after their benefits. Posts are to be made successful individual oriented. Work of the scientists is to be made target oriented. Once target is achieved he/she is to get proper incentive.</p> <p>Basic issues are to obtain a balance between system and individual on the one hand and security and efficiency on the other.</p> <p>A task force may be created to analyze all operative processes and develop a model system acceptable to all states.</p>
29.	<p>Recruitment may be automatically changed if the constitutional arrangements of research institutes are changed. Mobility of scientists has to be encouraged to foster centers of excellence. One of the issues that Prof Randhawa pointed out to me many years ago was the fact that mobility of scientists among universities or between universities and research institutions etc. was hampered by uncertainties of retirement benefits. I wonder if this is still the case.</p>
30.	<p>Recognizing the importance of agriculture in accelerating economy, Government of India laid great emphasis on development of agricultural education. With the establishment of first Agricultural University in 1960 at Pantnagar, now the country has 35 SAUs. However, overtime these institutions have undergone sea change. World over Institutions are recognized based on the competence of faculty. Unfortunately during last over two decades there has been total deterioration in the standard of recruitment and the institutions have undergone severe strain because of many causes. The principal reasons have been regionalism, non-confirmation of Career Advance Scheme for quality promotion and extensive in breeding in institutions. Financial crunch in Universities has also contributed in large measure towards deterioration in academic excellence. The first and foremost constraint today in national agriculture system is the inability of the system to attract nurture and retain quality personnel. In order to attract and retain talented faculty, the following measures are suggested:</p> <ol style="list-style-type: none"> 1. Total decentralization of powers to faculty. 2. Recruitment of faculty based on national merit which could be ensured by the following: <ol style="list-style-type: none"> a) No recruitment of any person in SAU who has obtained all three degrees from same University. b) Recruitment of at least 25% of the faculty in each University from outside the state. c) Appointment of atleast 25% of the students from outside the state in every

	<p>programme.</p> <p>d) Annual increment should be linked to the professional achievement of the faculty. In fact provision need to be made in rules that those who have outstanding performance, get additional increment or some monetary incentive.</p> <p>e) In assessment of faculty, the student's feed back should form a major consideration.</p> <p>f) All faculty need to be assessed based on quality of teaching imparted in the University system.</p> <p>g) The appointment of Dean/Vice-Chancellors be made only on the basis of their proven competence in teaching and research.</p> <p>h) Consideration of candidates for initial recruitment to the University should be based on NET eligibility in all subjects including those who have Ph.D.</p> <p>i) Vice-Chancellor in SAUs and Director General in ICAR system should have power to recruit 10 per cent of the faculty based on talent scouting nationally or internationally and such people should be recruited on 5 yearly contract basis initially and if found suitable be absorbed.</p> <p>j) Clear bench mark criteria which is transparent need to be worked out for promotion. Career Advancement Scheme has suffered mainly because of lack of faculty assessment policy and appeasement of mediocrity which is in majority.</p> <p>k) The recruited scientists should be provided adequate contingency grant to carry out research.</p> <p>l) With every appointment, an establishment grant be provided.</p> <p>m) The selection criteria and the bench mark should be more and more regress as one move up on professional ladder. A person should only be promoted if he/she meets international criteria of scholarship.</p> <p>n) Gradually the system should work on contractual basis. There should be provision for removing unproductive, non-performing faculty in the system. The Head of the institution should have a power based on exceptional performance of faculty to provide additional increment and also have power to stop the increment for non performance.</p> <p>o) In order to improve the competence of the faculty, career advancement plan should include training at national level every 5th year and internationally every 7th year.</p> <p>p) Freedom of the scientists to attend international symposium/training in case the expenditure is met by any outer agency and Dean/Director (Research) be empowered to permit.</p> <p>q) Build support for 4% of the faculty for short to long term training from 3 months to one year. There should also be 10% exchange of faculty from various institutions. For this ICAR should extend full support. This could be patterned on sabbatical leave.</p> <p>r) Transfer policy in the ICAR system need to be scrapped. Scientists should be allotted or recruited for the institute.</p>
31.	<p>Issue: There is something basically missing in our personnel policies. The recruitments/promotions must be merit based and timely if we want to develop dedicated human resources. We must search our soul why our scientists generally become outstanding once they leave IGI Airport for a foreign destination.</p>

Agricultural Scientists Recruitment Board: ASRB is an autonomous body for the recruitment of the scientists but its autonomy has been eroded. There is a need for urgent corrective measures in this regard.

Suggestions:

- (i) The selection of Chairman, ASRB should be non-political and may be done by UPSC.
- (ii) The committees for selection/promotion of scientists including those which awards marks on the basis of CV should include only scientists.
- (iii) The present system of having representative of the Hon'ble Minister of Agriculture in certain committees should be discontinued. The Hon'ble Minister is already represented through Secretary, DARE or his representative. Moreover the Hon'ble Minister, being the President of Society, is the final authority.
- (iv) The recommendation of the ASRB should be directly submitted to the President of the Society and should not be routed through ICAR.

Issue: Pay Commissions: The system of constitution of Pay Commissions and implementation of the recommendation is also flawed. There are mergers and splitting of cadres and uneven pay raise for indifferent cadres that give rise to anomalies, and consequently to rumour mongering (wastage of time), heart burning and frustration. The scientists were quite happy with the cadres and their pay-scales before implementation of Kothari Commission in 1970; and thereafter all these issues arose.

Suggestion: General suggestion is that the cadres should be decided and we should try to stick to them. The pay revision may be in terms of percentage increase for all the cadres. There are also anomalies with respect to the implementation of the recommendations of 5th Pay Commission which are creating frustration, and need to be addressed to. A serious anomaly affecting a large number of young scientists is mentioned in Annexure I (Promotion to Principal Scientist – Number of Years Required to Qualify)

Issue: ICAR, UGC and CSIR: Unfortunately, the ICAR has got itself linked with UGC. The ICAR looks towards UGC for implementation of the scheme regarding selection and promotion of the scientists that results in delay and resentments.

Suggestion: ICAR is an autonomous body. It should develop its own personnel policy. The recommendations of the various Commissions should be expeditiously implemented without seeking guidance from UGC or others. If at all linkage is to be developed, it should be with CSIR.

Issue: Attracting the Scientists from SAUs: Strong interaction between ICAR and SAUs is of paramount importance for the development of NARS; and this

interaction should cover research, teaching as well as extension. There are large numbers of tenurial positions in ICAR which are filled through open advertisement. A number of scientists from SAUs used to apply and join these positions for a tenure of 5 years. Depending upon their performance, they used to get 2nd term and were ultimately absorbed by ICAR. In recent years, there have been many alterations in the system and number of cases of pick and choose. The treatment that non-ICAR scientists are getting will ultimately totally stop the movement of scientists from non-ICAR Institutes to ICAR. Some scientists may come at the fag end of their career or due to some non-academic reasons

Suggestion: The earlier system is better than the system now being followed on Adhoc basis. The earlier system needs to be followed in letter and spirit. The corrective measures are must, if we want to attract the talent from SAUs.

Issue: Selection and promotion of the scientists: Score-card system

Earlier, the selection of the scientists was based on solely on interview. During 2003, after long deliberations at different levels including specific committees, ICAR implemented a score card system. As per score card system 75% marks allotted to CV and 25% to interview. This system was working well. But unfortunately, all the interviews have been stopped due to reason best known to the Authorities and that has resulted in many adhoc arrangements.

The apparent impression about personnel promotion is that we have become very liberal. This is only partially correct as the first batch of promotees included scientists with 13-18 years experience. I feel that a scientist in ICAR deserves promotion after such a long time particularly when viewed in comparison with sister institutions. Nonetheless, some guidelines need to be developed so that the scientist's contribution is recognized.

Suggestions:

- (i) There should be transparent, objective and merit based promotion/selection. For this, score-card system should continue. For direct selection, the marks allotted to the performance in interview should be reduced from 25 to 15%.
- (ii) For promotion the score card should be flexible so as to be in tune with the mandate of various institutes. Many scientists work in Bureaux, seed production, data management or have other such important supportive but academically less attractive duties. There are some points which need reconsideration such as the allotment of marks to PI/Co-PI (generally nominated) and to externally funded projects.
- (iii) The score card should be widely circulated among the scientists.
- (iv) For career advancement, it would be appropriate to develop some guideline regarding percentage of scientists to be promoted once they complete required number of years ($N_1\%$ of scientists may be promoted), plus one year ($N_2\%$), plus two years ($N_3\%$), and so on; provided that the same is implemented unbiasedly.

*THE MOST IMPORTANT POINT IS THE FAITHFUL
IMPLEMENTATION OF THE CRITERIA BY THOSE IN POWER*

Issue: Foreign Deputation and Visits of Scientists: Recently, ICAR has turned down

the cases of deputation of scientists in India or abroad. This trend should be stopped. If a scientist moves to foreign organization he/she brings new ideas and work culture and moreover, develops self confidence. Stopping this movement will result in stunted professional growth, and frustration among scientists who are capable of growing.

At present all foreign visits (participation in trainings, symposia, congresses) of the scientists are cleared by the President of the Society. The long channel results in delay, and clearance generally is given at the eleventh hour. This causes a lot of anxiety and uncertainty, and scientists rather than working on their presentation get busy in pursuing the papers at Headquarters. This is one serious sour point.

Further, whenever a foreign visit of an ICAR'S scientist is sponsored by the organizers of the Conference/Symposia (at no financial cost to ICAR), the ICAR asks the scientist to take leave for that period, while if the money is paid by ICAR, the scientist is considered on tour/deputation. Interestingly, the ICAR rather than feeling proud of the recognition to the contributions of its scientist thinks otherwise!

Suggestions

- (i) As in the case of CSIR, the Directors of the institutes should be empowered to permit scientists to present papers in foreign countries for work done in the institutes, particularly in cases where either the organizers are providing funds or the same are being met from the sanctioned budget of the institute, Foreign visits of Directors, ADGs and DDGs should be cleared by the DG, and that of DG, by the President of the Society.
- (ii) The decision regarding the participation in the meetings on policy matters should be taken by ICAR headquarters. Efforts should be made that same person(s) continues to participate so that country is represented in best possible and continued manner. The policy of pick and choose should be discontinued.

32.

- Adopting efficiency based transparent recruitment policy.
- For promotion purpose contribution as well as efficiency of the scientist is to be appropriately considered.
- Encouraging scientist with awards for their contributions like research findings, patent, owning external funding projects etc.
- As that of Western Universities/Institution for efficiency in research, employing

	<p>scientist on contract basis can also be encouraged.</p> <ul style="list-style-type: none"> • Making the pay scale attractive (since best brains move out for executive positions which provides attractive salary and perks) increasing job opportunities, performance based promotions and incentives • Recruitment policy – centralized recruitment based on an All India Competitive examination to SAUs • Development of Human resource by training the scientists in foreign countries where the expertise are better than us. • Lateral entry in research organizations should be permitted. This will attract scientists of Indian origin working abroad to consider a career in Indian laboratories. • Proper incentive must be given for quality work. This can be promotion based. A suitable evaluation system should be devised for promotion based on quality and work. • The transfer of scientists from one laboratory to other often reduces their interest in establishing a life long research goal. Perhaps scientists can be recruited for a particular location for a particular specialists and should be left in there life long for developing a strong research base. • A scientists continually working in a particular area must be encouraged to continue and perfect the technology in his specific research areas. For this, a position like Research Chair or National Professor on particular discipline could be created. This will encourage the scientists for pursuing value based research in one particular area during their service. • Time bound elevation system is to be dropped. Capability and merit should be the bases for recruitment and performance should be the key for promotion and elevation. • Insisting minimum cadre service in each category for promotion to higher posts. <p>Higher scale than UGC scale for agricultural scientists since they do more research and extension in addition to teaching.</p>
33.	<p>There should be no ban on filling of scientific positions, in view of fixed cadre strength. I am given to understand that more than 1000 positions of scientists (out of around 5000) have been surrendered recently and institutions are struggling for additional staff despite many of them being new. Some NRCs even do not have more than 2 – 3 scientists. How can such a system deliver required results? There should be a fixed discipline-wise annual quota for required entry of young scientists, as is the case for IAS/IFS. I understand even lateral entry from universities and institutes is now being discouraged which is not healthy for the growth of national agricultural research system. The exchange between ICAR and SAUs should be encouraged and promoted further.</p>
34.	<p>At present the Agricultural Research Systems comprises of Agricultural Universities and ICAR Institutes, and AICRP. These have got into a competitive mode rather than a complementary mode. As such, ICAR gives priority to sustaining its Institutes and AICRP and not to strengthening of Agricultural Research of Universities. In a way we have made our Agricultural Universities redundant due to following reasons:</p>

	<p>(i) Rigid structures and fixed course curricula (ii) Parallel competition from ICAR Institutes</p> <p>As regard rigid structure, the problem lies at two fronts. A. Manpower: Only a B.Sc. (Agri.) can be an Agriculture Scientist – whereas the world has transcended with diffused boundaries. B. Subject compartmentalization –agronomy/Plant Breeding/Soils, We do not give scope for cross-functional expertise.</p> <p>Hence a re-look at course curricula and restructuring is important. Cross Functional Management roles also need to be evolved.</p>
35.	<ul style="list-style-type: none"> • All agricultural universities should start degree programs similar to MBA to train entrepreneurs who may start agro-industries. State governments should be encouraged to provide soft loans for starting agro-industries. • Mechanisms should be set up to attract young and mid career Indian Scientists settled abroad to return to the country to spend sabbatical leaves. • The promotion system in Agricultural Universities and ICAR institutes should be streamlined. It seems promotions are based on the seniority and longevity of service rather than merit. • National government should set up a funding organization for supporting agricultural research similar to NSF in USA to award research grants on competitive basis to promote cutting edge science. China has already established Natural National Science Foundation for such purpose.
36.	<p>1.To enhance the scientific quality of staff in the research institutions/universities it is absolutely essential that the 'inbreeding' of staff is avoided. There is an increasing tendency for the appointment of teaching and research staff members in the same university where from they have graduated. The selection process should be transparent and should operate with out any external political or other pressures. While appointing staff due attention should be given to the language and information technology expertise of the candidate that would enable the candidate to become a fully-participating member of the global fraternity of peers.</p> <p>2. The automatic promotion of staff based on the length of service should be replaced by a performance-based merit reward/promotion. The process of performance measurement should be objective, clear and transparent. It should be based on the task-planning and identification of milestones to be achieved by each scientist each year under direct supervision of the immediate supervisor.</p> <p>3. Duplication of research efforts in the national system should be avoided by creating Centers of excellence, in appropriate research institutions, for conducting cutting-edge research. These Centers should be fully resourced in terms of trained human resource and research facilities and infrastructure. The tools and techniques developed by such Centers should then be shared with others for more adaptive</p>

	<p>and applied research. Incentive should be provided for high quality research as assessed by international peer-review.</p> <p>4. Enrollment for higher degree training should be based on competitive examinations and number of persons enrolled should be commensurate with the needs, as assessed by some kind of 'marketing survey' undertaken periodically. The salary structure for researchers in agriculture should be comparable to that for other organizations so that the training in agriculture attracts same kind of talent as is attracted for other disciplines/administrative services.</p> <p>5. The whole system of 'All India Coordinated Projects' should be reviewed to see how it could be made more efficient by clearly linking these projects to the National Agricultural Research Centers and ensuring appropriate leadership.</p> <p>6. A strategy should be developed to optimize the linkage of Country scientists with the International Agricultural Research Centers to ensure that Country fully benefits from the research being undertaken with the International Agricultural Research Centers</p>
37.	<p>With regard to giving incentive to Agricultural Scientists in their career, the right person should be given promotion. Freedom and challenge to be provided to the Scientists. Spotting talent and rewarding for performing well on challenging tasks.</p> <p>Scientists at all level should not be controlled by bureaucracy - to be implemented as an experimental measures since this a difficult task.</p> <p>Sensitivity on the above issue is increasing and hence to be curbed.</p> <p>Creativity and (Integrated) SYSTEMS thinking should be imbibed in every working scientist. This could be done by special lectures.</p> <p>Also, methodology should be created for turning the creative recourse into well-tempered set of tools, so that more innovative and creative thoughts may be applied for agricultural excellence.</p>
38.	<p>To revamp the R&D system and recruitment of scientists from School and College talent tests should be undertaken and special coaching system should be established to those who are qualified, so as to attract them to research by offering attractive norms and conditions. We must attract the finest brains for research career. At such selection level no narrow regard for consideration of caste, creed or religion or region should never be allowed to influence or interface. While evolving the syllabus, the focus should be on science and scientific development of human personality, which is free of Chauvanic consideration. Chauvinism should be replaced with humanism. Models of such selection procedure that it purely based on merit and aptitude can be seen in the system followed in developed</p>

	<p>countries.</p> <p>In spite of the commendable progress that the country has achieved agriculture sector, it has still not improved the quality of life of rural India or rural farmers. Hon'ble Prime minister Dr. Manmohan Singh has announced the top priority in rural reconstruction and development. It is certainly the most appropriate and right decision and approach. Agricultural research is the most important and critical component in rural reconstruction.</p>
39.	<p>Like a man behind the machine, it is the scientist behind science which is important to compete with the knowledge based agriculture. Merit, excellence, output, delivery and justice should be the cordial principles in matters of selection, promotions and assessment. There should be no place of regionalism, groupism, castism, racism, favouritism and political alignments in the matters of recruitments and promotions. Performance, delivery, merit, contributions, incentives and rewards may be the driving force of the personnel policies. Selection and appointment of DG,ICAR and Secretary, DARE and Chairman, ASRB may be done by an independent body like UPSC without any political patronage because all other problems of the system flow from there only ASRB should not act as a subordinate office to the DG,ICAR and Secretary, DARE and should be at par with UPSC. Of course, there has to be a mechanism to ensure fairness and justice in the performance of the board also. At present there is no distinction between the Board and it just depends upon the persons holding these positions for calling the shots. Promotions should be based on performance rather than timer scale. Since the past two years for the first time Secretary, Department of Agriculture & Cooperation has become a permanent representative in ASRB selections through this bureaucrat. This distortion need to be corrected.</p>
40.	<p>Direct recruitment for core faculty.</p> <p>In order to facilitate movement of faculty members from one SAU to another, the service conditions should be made conducive by retaining the benefits of past service.</p>
41.	<p>Scientist recruitment and human resource development: The system of permanent positions should be abolished. Project based employment for specific periods should be followed. Emoluments provided should be high enough to attract the talent. NARS institutions should be only the working places for the adhoc projects with personnel employed for specific periods.</p>
42.	<p>This is a very very important aspect. This too is covered in the preamble. More than the systems of recruitment, it is the way they are implemented that matters. For instance, the Shastry committee recommendation was good. But the way it was implemented was not correct and the very purpose was defeated. Instead of transparency, it was adopted in a highly rigid and opaque manner! Hence it is important that the way that is to be implemented needs to be well defined. Omnibus time-scale approach and for advancement is a very serious matter and it is experimented enough. It is high time to think of a more rational approach.</p>

	Assured carrier advancement has made the scientists/ teachers lethargic and pay only casual attention to their legitimate work. It has been disincentive to the sincere
44.	<p>Increased public awareness more focused on rural sector, particularly farming communities.</p> <p>A bottom-up approach to produced change in mind-set for knowledge growth and technology adoption. On-job orientation structure using local studies / examples with more practical approach. Educating farmers and extension/village level workers/functionaries is necessary for inducing change in mind-set for gaining recent knowledge and adopting better practices for caring their genetic wealth.</p> <p>Generating community-level PA materials for farmers' use, local schools, etc in local language, multi-media communication emphasis, audio-videos aids using local names of species / threatened diversity; concerns on conservation and sustainable use.</p>
45.	<p>) We all know how we have been squandering our natural resources. A plethora of reasons, excuses, explanations abound, the most gratuitous being our burgeoning population and supposed material poverty. Of course, every one knows that the more real and devastating poverty which erodes us today is of ideas, intellect, and morals. The utter waste and decimation of our indigenous 'real' scientific talent cannot be excused on any grounds. Not only recruitment, but the incentive/promotion-all other HRD strategies have been total failures since they are riddled with nauseating dishonesty (sometimes even outright corruption) and/or total lack of imagination, proverbial indifference and inefficiency.</p> <p>) Today, the average Scientist working in a government establishment of whatever denomination, is getting a fair, indeed sumptuous salary. I am appalled, however that more than 90 percent of these contribute NOTHING, and are not even nominally penalized, if at all their sterility is noticed. Indeed, some of these are given promotions on positions tailored finely to their supposed 'capabilities'. The ones who do have the capacity to 'give' are treated at par with the nincompoops, or worse, targeted for harassment and continually passed over for any career advancement by incompetent and scheming superiors. This is happening in ALL Indian Government organizations, irrespective of their names, affiliations and areas, and I am sure everyone in Indian Science knows it.</p> <p>) We have a glut of 'Eminent Scientists' warming numerous 'Chairs' all over the country, or Emeritus Scientists adding a few measly years of ostensible 'activity' to their 'illustrious' careers in various institutions, courtesy essentially their being on the right side of the right fences. The ones which could possibly make some meaningful contributions, however, do not figure, and if they do add something to the sum of human knowledge, they mostly do it outside India, on</p>

foreign platforms. It's a pity that only a few 'retired' (at sixty!) scientists can hope to get post retirement 'work stations' in this country. These are platforms for high intellectual activity. The latter in the context relates more to Thought, and little if at all to continuing active bench work. Unfortunately, some foolish Science Managers have recently propounded active bench work as a sine qua non for the emeritus 'awards', barring pure intellectual enterprise such as Writing, and made this a Policy for Indian Science! What is needed instead is a greater accommodation of the still highly intellectually active but 'retired' scientists for continuing utilization and tapping of their rich knowledge and experience by a) giving them complete freedom of work and b) inculcating a culture of acceptance and veneration of these by the working force. Most regrettably, and contrary to our oft touted lofty sentiments of respect for age and especially the 'gurus', the ground reality in India in this respect is the total reverse of the situation in more enlightened societies : the retirees of even the late sixties and seventies are revered by their managers and colleagues there. Here they are shunned, if not dishonored overtly or covertly. The loss is more of the society, the country and the working scientists and science establishments.

Once again, without any reservation, I hold the Science Babus of this country responsible for these various lethal maladies in our system. They are the crux of the problem. I am afraid, given our hypocritical systems of appeasement, indeed, encouragement and rewarding of the most incompetent, there seems to be no way out of this nightmare. Even if some did manage to gather courage to bite, the teeth will have to be protected. We do not even have a Witness Protection program in place in our criminal justice system. How can we protect the Whistle Blowers in the arena of Indian Science who may dare to take on the system and its protectors who hide their inabilities by perpetuating it?

Perhaps a beginning can be made by trying to inject, cultivate, encourage and tangibly reward talent, diligence, simple human sincerity, propriety and basic professional ethics wherever these seem to glimmer through the mass of lies and deceit which are characterizing our 'intellectuals' today. It's a sad commentary on us that more than 50 years after independence, we have still to think of merely starting to make this kind of a beginning. Maybe, we can do it now. Surely we must be having a few honest men and women somewhere in the labyrinths of our Science (I include Agriculture in the term) organizations and establishments. Who will identify them, and how, should be the first priority now. What kind of teeth, and freedom from inanities of our unique curses of Babus and Netas, can be given to them to function effectively, would be the next task.

. Of Strait Jackets

Finally, you have used the term 'strait jacketing'. I use it in a different context here. We have heard about physicists taking up cell biology, chemists tinkering in computer nanotechnology; ornithologists becoming expert astronomers...But

	<p>all this can happen anywhere except in India. Why? If someone somewhere wants to, and is able to develop expertise and introduce novel ideas in a different field other than his own ‘designated’ one to which he was appointed umpteen years ago, can he do it in any Indian Science (/Agriculture) establishment/institution? The answer is a resounding NO. First and last, and the most formidable, the mighty babus, including the Science Babus will object. The very idea is inconceivable. The solution for this and most ills is again the same : remove this yoke of Babus of both varieties from Indian Science, and the strait jackets of all kinds will also vanish.</p> <p>Introduction of flexibility and pragmatism, with at least minimal doses of ethics, objectivity, decency and honesty in treatment/assessments of the great human resources with which our Sciences abound, will reduce if not altogether prevent their large scale unpardonably criminal and horrifying waste, which no society can afford. We need a similar approach to our policy formulations and actual work/research orientation. Only then can the potential be fully realized, and talent and genius flourish and surge ahead.</p> <p>I have done some plain speaking from the horizontal plane, on which >99% of our Sci-tech work force subsists. The remaining <1% of the Managerial cadres mostly seem to be looking down their noses from dizzying vertices. Except that only those down below know that from up there what emanates is a blinkered vision and skewered focus.</p> <p>The call now should be to at least start leveling the Playing Fields.</p>
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(VI) To suggest alternative modalities for integrating research and extension at state level.

1.	<p>Provision for frequent interface meetings between research organizations and state development departments to streamline the transfer of technology from lab to land. The technologies generated in research institutions need to be transferred effectively so that the farmers adopt them and the potentiality of the technologies is realized at the farmer’s level. The success of Vietnam in enhancing the productivity in different crops in the recent years is mainly due to the effective adoption of the technologies by the farmers. It is imperative to strengthen Agril. Extension Division in all ICAR institutes and State Agril. Universities (SAUs). Better liaison between ICAR institutes, SAUs and Development Departments is required in order to achieve effective Transfer of Technology. Further, ICAR may think of establishing a policy making body for Agril. Extension.</p>
2.	<p>Also to evolve suitable mechanism for NGOs involvement.</p>
3.	<ul style="list-style-type: none"> • Unlike agriculture, where there is much closer coordination between the Council and the State Departments and the Agricultural Universities, there is much more that needs to be done and seen in the fisheries sector. This has, in some rare

	<p>cases, depended on good personal relationship between the Directors, Deputy Directors and officers at other levels between the two organisations. <i>It is necessary that it is institutionalized.</i> The IAS Directors or Secretaries in the States somehow feel that the Fisheries Institutes of the ICAR have not been doing anything for them despite the tremendous effort that these institutes have taken to involve the state department. It is very unfortunate and the time is now ripe that this is set in order. The States do not depute their officers for training in the technologies that are developed but always expect the institutes to do the States' job of extension which is what has been the problem between the two organizations.</p> <ul style="list-style-type: none"> • It needs to be made clear to the States that the institutes could train their officers or even farmers but cannot do so every time and in each district of the state.
4.	<p>The agricultural universities and state departments of agriculture should jointly run a adaptive research station at each district/division headquarter. Its administrative head can be a deputy director of agriculture and scientific head could be a university scientist. This station should issue technology package after purposeful demonstrations. This kind of model can be tested at few centers.</p>
5.	<ul style="list-style-type: none"> • Strengthen extension mechanisms at the State level • Strong linkages between Research and Development Departments, through mutual formal representations on committees and working group • Flexibility in interactions and access for researchers for secondment to different agencies for greater field work • Private participation in extension
6.	<ul style="list-style-type: none"> • There should be a chain of not only University – state department – village level system but central research / development should also form part of this chain. The role and strength of each of systems may be identified and individuals working on similar projects may formulate joint projects, the concept of contractual research may also be considered. Maintenance of a constant dialogue with the end user is necessary. • Finally there is a need to strengthen and streamline project-monitoring system.
7.	<p>Involve Panchayat system in transfer of technology through on-field demonstrations and evaluation.</p>
8.	<ul style="list-style-type: none"> • Extension programmes is at present viewed as a separate subject handled by specific group of workers to operate at the farmers level on technologies developed by a separate group of workers based on on-station/lab research. The present system allows a distinct gap between the workers developing a project and those implementing it at farmers level for validation. This may not be a correct approach as validation of results at farmers field should essentially be in continuation to research generated. Team should be formed drawing core persons from the technology generation group while the expertise from extension

	<p>personnel should also be utilized in the same group to help implementation of the programme for their assessment/ refinement. This is one modality for research/extension related linkages in institute level.</p> <ul style="list-style-type: none"> The other modality, which would take place at a much bigger scale, should be through research-extension linkage with the SAU and state extension departments. Here again, core groups may be identified drawing personnel from the technology generation group of ICAR institutes and SAU's on specific thrust areas while the extension personnel from state departments should join them for implementation of the programmes for technology assessment/refinement.
9.	To integrate research and extension at state level ,research scientists should switch over to <i>on-farm research</i> mode at least for 2 years to have relevance, and for ready acceptance of a variety/,technology/process. Such integration also aids in fast spread of HYVs through <i>seed village concept</i> .,specially in cross pollinated crops.
10.	Research and Extension personnel should work together to transfer the technology and assessing the need of the clientele.
11.	Close linkage and regular interaction between research and extension functionaries must be established to keep pace with the developments in technologies so that they could be disseminated to the end users effectively.
12.	The present system of extension at the state level should be abolished. Technology providers should be encouraged to develop services and goods sector and underwrite technology which they are to sell.
13.	<p>Creation of an Agricultural Extension and Surveillance Division is desirable.</p> <ul style="list-style-type: none"> The Department of Information Technology (DIT) needs to set up e-Panchayats to the level of each village. Internet based web services to be provided. The village office to be headed by an elected member of the farmers. He may report to Adhyaksha at the level of Zilla Panchayat. All agricultural advise to be given electronically on weekly basis or earlier by a nodal officer at SAU. Well co-ordinated extension services need to network among ICAR, SAUs, State Agriculture Department, BDOs, agro-industry, Panchayats and farmers. The network should involve representatives nominated by farmers or Panchayats. The product and service related functions should be performed by outsourcing to private sector, like arranging credits, agronomical advise, market prices, services like soil testing, tractors, harvesters, chemicals etc.. Village level co-operatives and private franchise need to be placed in network to provide services to farmers competitively on cost sharing basis. Thus, a substantial component of extension work needs to be executed through competitive outsourcing though it may be co-ordinated by ICAR through

	SAUs. In national interests, these networks may have to be initially established through investments from the government. Recovering costs in interest of sustainability will become possible automatically, once a successfully functioning model becomes visible.
14.	<ul style="list-style-type: none"> • Well proven technologies should be passed on to Agriculture Department at the State level for its further dissemination to the respective state farmers. • We have successfully transferred our bioinoculant technology to U. P. for its commercial production in Department of Agriculture, U. P. Government's biofertilizer & biopesticide manufacturing units and provide technical know-how, R & D support and quality control during its Xth five year plan (2002-2007). Based on our technology, 13 biofertilizer and 9 biopesticide producing laboratories of U. P. are producing quality biofertilizer and biopesticides for the farmers of U. P.
15.	At state level there is a need for proper linkages between field extension workers and researchers to receive the undistorted feed back from the farmers for revalidation and refinement of available production technology and generation of new need based technology. For getting proper feed back KVKs can play a crucial role by linking them to state agriculture extension system so that the extension approach can be changed from "technology driven extension" to "farmers driven extension". For this there is need of strengthening our KVKs by providing model units for effective transfer of research emitted technologies and listening to the farmers problem for participatory technological interventions that are most suited to the local condition.
16.	SAUs should depute scientists for manning positions as subject matter specialists to facilitate and plan the development activities at district level. There should be continuous recruitment of technical persons in SAUs and development departments related to agriculture including rural banks.
17.	<p>Focus should be attracted on application of modern technologies. Facilities and appropriate training would lead to adoption of these technologies.</p> <p>The demand of research should also come from the extension workers and their input based on the actual field problems faced by the farmer/end-user will facilitate to achieve the objectives.</p> <p>Alternatively, the projects should also be undertaken on behest of the private sector with demand and funding from them. The scope of its application in the field must be clearly delineated in the project proposal.</p>
18.	State level integration of research and extension can be realized if both are brought under one umbrella. Right type of mindset, by valuing each other's contribution for the overall development of agriculture, is a must for bringing about effective

	integration of research and extension.
19.	Extension should be directly through university run TV channels and on farm demonstrations. (The American pattern is the best in this regard).
20.	<ul style="list-style-type: none"> • Integration of research and extension is possible when researchers conceptualize research objectives with input from extension personnel. Likewise extension workers involve researchers when findings of research are translated into package of practices in consultation with farmers. In other words researchers and extension workers draw strategic research-extension plans jointly by incorporating farmers' needs and aspirations. In this strategy research-extension interface begins much before than what is in general practice. Also the framework ensures farmers' participation before the research plans are implemented. • Prior consultation with development departments with participation of farmers becomes imperative when ecologies are fragile, benefits of technologies not so assured and require community-endorsement and knowledge capital of humans is poor and dependent population of man and his animal support system exceeds the native carrying capacity of natural resources. Rainfed arid and semiarid lands and mountainous and coastal tracts represent these regions. Along with environmental constraints these are the areas, which are starved of infrastructure and enterprising capability of farmers. What it all means that besides appropriate technologies, it is the pro-farmer input of resources (education and training, credit and infrastructure) that matters more in development of these regions. Whether it is providing credit, building human capital or infrastructure, role of development department (extension) dominates technological interventions. Apparently, integration of research and extension is need of the hour and can be achieved by interfacing their activities not only in content but in intent from all angles of team working.
21.	State level integration of research and extension can be realized if both are brought under one umbrella. Right type of mindset, by valuing each other's contribution for the overall development of agriculture, is a must for bringing about effective integration of research and extension.

22.	<p>There will be two levels of integration. At the base level a mandatory demonstration is to be made by a scientist in any growing area along with the extension workers after developing/standardizing a technology.</p> <p>To integrate research, extension and agri-/ Horti/ Rural development each state is to constitute a Committee including ICAR Institutes and SAUs, and Government Departments of that state for the interest of the farmers.. This Committee is to have necessary infrastructures and man-power to prepare proper databases on scientists, extension workers, knowledge and information generated throughout the state, country and abroad on agriculture allied subjects. It is to be hyperlinked with “Edusat” and equipped to have satellite and internet/wireless and multi-media based communication systems operating between the experts, extension workers and farmers through Community knowledge and information centers at Panchayet level where audio-visual and interactive programs will also be operated.</p>
23.	<ul style="list-style-type: none"> • The demand of research should also come from the extension workers and their input based on the actual field problems faced by the farmer/end-user will facilitate to achieve the objectives. • Alternatively, the projects should also be undertaken on behest of the private sector with demand and funding from them. The scope of its application in the field must be clearly delineated in the project proposal.
24.	<ol style="list-style-type: none"> 1. During State Plan discussion with planning commission; State Agricultural Universities should also be invited as was the practice upto VI plan. This will promote synergy between research institutions and state agencies. 2. Constitution of a state level Agricultural Technology Committee with representatives from SAUs, State Government Officials and ICAR Institutes in the region and this committee should meet quarterly at least. 3. Training of State Agriculture extension personnel upto grass root level be carried out in SAU regularly and every person should undergo training/refresher course annually.
25.	<p>Issue: Strengthening Linkages of Research and Extension Education: The ICAR institutes as well as SAUs are undertaking similar activity in extension education, which infact should be taken by the State Departments of Agriculture. Further, SAUs have KVK, Farm Advisory Service Scheme and other projects in extension education.</p> <p>Suggestion: All extension activities including KVKs should be transferred to SAUs as the SAUs have stronger linkages with the farmers in the given region. The ICAR institutes located in that particular region, however, should be very closely associated with extension activities of the Universities.</p> <p>General Issues : Director General</p> <p>Suggestions:</p> <ol style="list-style-type: none"> (i) The selection of the DG should be made non-political. For doing so, an appropriate system needs to be developed. Meanwhile, UPSC (with adequate representation of the Ministry of Agriculture) may be entrusted with this

	<p>responsibility with the proviso that DG has to be an eminent agriculture scientist.</p> <p>(ii) The DG, ICAR should have atleast the same powers as that of the Vice-Chancellor.</p> <p>(iii) No files should go to the President of the ICAR by bye-passing the DG.</p> <p>Issue: ICAR Headquarters: The ICAR has become top heavy with a large number of scientists and other staff at headquarters. They, irrespective of their stream (scientific, administrative, financial or any other) generally feel that they are the monitors.</p> <p>Suggestions:</p> <p>(i) The administrative staff including bureaucrats at the ICAR headquarters needs to be drastically reduced in terms the rank of the officers and their number.</p> <p>(ii) The administrative staff at the ICAR headquarters should be rotated and posted in institutes as is being done in case of the staff working in the institutes. At present most of the administrative staff at headquarters is working there since long.</p> <p>(iii) The institutes should be given autonomy (along with accountability) and administration should be left to the Directors. The ICAR headquarters should concentrate on coordination of research activities of various institutes so as to synergize the same and avoid duplication. In fact, in comparison to CSIR, the coordination activities of ICAR headquarters have to be much stronger because of a large number of institutes involved in any activity. For example; many ICAR institutes and SAUs are working on wheat breeding. Above all there is emergent need that those working at Headquarter should change their bureaucratic and autocratic outlook and work culture.</p> <p>Issues:</p> <p>Reporting by Institutes to Headquarters: There are many reports such as Annual DARE Report, Annual Assessment Report, Monthly Cabinet Report, Monthly ICAR Report, Mid-term Reviews, Annual Plan etc. In addition to all, there is six monthly report on the activities of each and every scientist. It is not clear if someone at headquarter can usefully go through the report on each scientist (there are about 5000 scientists and each report should need about 2-3 minutes) to assess.</p> <p>Suggestion: There should be monthly report for the Cabinet and monthly report to ICAR on only financial progress. The regular monitoring of the scientists should be left to the institute through mandatory SRCs at the end of the crop season. The performance of the institute on the whole may be reviewed at the ICAR level; and the scientist's performance, through the AARs annually.</p>
26.	<ul style="list-style-type: none"> • Creation of 'village knowledge centers' involving unemployed farm graduates. • Knowledge revolution through use of information and satellite technology. • As that of Vegetable sandy and cattle sandy, seeds sandy maybe established at different villages in different season. • Periodical refresher course may be offered for the extension workers and field functionaries

	<ul style="list-style-type: none"> • Involving scientists in the extension activities both at district and state level • Video conferencing, online training programmes to improve the extension activities. • Strengthening of extension wing for popularization of existing IPM technologies to the farmers for adoption. • Revamping of pest surveillance program for short term and long term forecasting of pest incidence. • Integration of research and extension will be possible through establishing Block level observatory net-works co-ordinated and managed by the State Agricultural Universities and State Agricultural Extension Department. • All SAUs should be linked to village via computer terminals and the online extension activities should be entrusted with a suitable private entrepreneurs who employ agric. graduates for this purpose. • Providing internet link with all centres of Agricultural Universities and all District Extension Heads, Extension Officers and Village Kiosks which will definitely play a major role in transfer of technology to the farmers. • Establishment more number of Government controlled KVK's at micro-level and providing extensive training to farmers • The existing system of funding for private KVK's can be dispensed with and such Institute to be established under the purview of farm universities for better and sustainable functioning. • Creation of co-operative units at Panchayat level for marketing, transfer of technologies etc., • Developing Human Resource at Institutions level and farmers level. • Effective utilization of the technical human resource available in the field of agriculture and allied sciences and promote technology transfer by strengthening agriclinics and agribusiness and the Government of India should come forward in a big way in this regard. • Strengthening university extension department with extension staff and SMS for various disciplines like agronomy, breeding, soil science, entomology, pathology and horticulture. • A separate co-ordination committee consisting of JDA's, Head of Research Stations shall be formed to monitor the needs of farmers field problems and TOT at divisional level in each district
27.	<p>For integration of research and extension, I suggest that new initiatives under NATP such as Institution - Village - Linkage - Program (IVLP) and ATIC be further supported. The institutions must ensure at least 25 – 30% of scientists' time for participatory research and technology dissemination. The KVK model be revamped to ensure integration of various rural development projects at the district level. The monitoring and evaluation system of KVKs requires critical review and further support, especially for contingency funds for effective program implementation, including possible role of KVKs to also implement IVLP and ATIC functions.</p>
28.	<p>At present the Agricultural Research Systems comprises of Agricultural Universities and ICAR Institutes, and AICRP. These have got into a competitive</p>

	<p>mode rather than a complementary mode. As such, ICAR gives priority to sustaining its Institutes and AICRP and not to strengthening of Agricultural Research of Universities. In a way we have made our Agricultural Universities redundant due to following reasons:</p> <p>(i) Rigid structures and fixed course curricula (ii) Parallel competition from ICAR Institutes</p> <p>As regard rigid structure, the problem lies at two fronts. (a)Manpower: Only a B.Sc. (Agri.) can be an Agriculture Scientist – whereas the world has transcended with diffused boundaries. (b) Subject compartmentalization – Agronomy/Plant Breeding/Soils, We do not give scope for cross functional expertise.</p> <p>Hence a re-look at course curricula and restructuring is important. Cross Functional Management roles also need to be evolved.</p>
29.	<p>Farmer friendly policy should be chalked out making every farmer as a catalytic agent in implementing national programmes with appropriate financial support. Such measures should be routed through the various commodity boards. While food crop may be the major concern of State, the cash crops should be by and large on the joint concern of the Centre as well as of the State Governments. Local bodies have found themselves governed and managed by the demagogic and windbags type of people whose stake in national developments is virtually zero. Therefore, precautionary measures in the context of financial support to the farmers are necessary concomitant without much bureaucratic techniques of delay or denials.</p> <p>Bureaucratic control is overcharged with willful denial on the one side and protraction of delays on the other. It will be ideal to have the local MLA / MP empowered to monitor and oversee the fast and smooth implementation of projects and schemes.</p>
30.	<p>Extension which is primarily a responsibility of the Ministry of Agriculture at the Centre and the State agencies at the state level is being pushed to ICAR. Managing an ultimate number of 500-600KVKs by the ICAR with more than 50% of its budget will be a Herculean task for any DDG. ICAR should confine itself with research and innovate ways of extension like information technologies, particularly management of extension etc. Since we are opting for the integrated farming system, the extension strategy has to be designed accordingly. At present, there is hardly any extension mechanism for the livestock, fish and agroforestry based activities. It is also not desirable to provide a separate extension system for crops, livestock, fish and horticulture production because of exorbitant transaction costs. All these functions are combined into our farming families.</p> <p>Extension services at the state level have diminished drastically due to several reasons. In the sugarcane cooperatives, inputs, seed and advisory services are generally provided by the sugarcane industry. The manufactures and dealers of</p>

	<p>inputs, seed, machinery, credit, procurement agencies for crop, livestock, horticulture and other products should own these responsibilities. Fertilizers, chemicals, seed and machinery manufacturers should deliver in a consortium approach. All inputs, machinery and testing services should be provided by KVKs and agri-clinics in a single window or under one roof principles. Even electricity should be marketed by such consortia. State departments of agriculture, horticulture, dairy, animal husbandry, etc. should act as regulatory authorities like in our telecommunication department. Wherever this cannot be organized ATIC model of NATP may be considered.</p>
31.	<ul style="list-style-type: none"> • There should be more KVKs even in the district as per size of the district. • Constitution of Coordination Committee consisting of the Director of Research, Director of Extension Education of SAU and Director of Agriculture of State Govt. • The SAUs and State Departments should work hand-in-hand while fixing research priorities, technology development and dissemination among the farming community. The State Department should give a precise feed-back highlighting the site-specific agriculture related problems in the State, which should serve as the basis of fixing research priorities in SAUs.
32.	<p>Extension activity: For this one tier system should be there and only the village/base level worker should be given this activity. Unemployed youths can be trained at the institutes specialized for specific research work and given time bound employment for spreading the technology developed by such institutes. Monitoring of their work and impact an analysis of the technology developed should be done by some other independent body.</p>
33.	<p>The SAUs and ICAR institutes should come closer. They are now working almost in isolation. When we take NARS as whole, there is enormous wastage of human resource as well as infrastructure facilities. The DRs of SAUs should be on the RACs of the ICAR institutes and vice versa. In order to make research findings transfer to the farmers most effectively, it is better that needs of the farmers is reflected in the designed research programmes and simultaneously research findings are demonstrated in the farmers field in association with line departments for each of the technology developed by the scientists. Further, it is better to have research programmes as well as demonstrations are developed with farmer's participation on the partnership mode.</p>
34.	<p>Partnership amongst the public sector institutions, and between public and private sector are the need of the day. Greater autonomy to research institutions and freedom to operate for the directors' will catalyze emergence of partnerships. The present ICAR environment is not conducive for partnership mode of development. It would be good to encourage private sector to fund contractual research in public sector institutions.</p>
35.	<p>As mentioned under II, the SAUs must take responsibilities for teaching, research</p>

	and extension in a state in collaboration with the state agriculture department and other departments. The important point is not just to integrate research and extension but to bring in permanent, invigorated extension service (NGOs are at best a temporary and inadequate substitute) that responds to farmers' problems in need or when needed on a regular (not on a project basis) basis (see point II for details).
36.	<p>Research – Extension – farmer – market linkage has deteriorated over the decades. The knowledge and skill of SMS and Extension Officers need to be updated through intensive training programs specially on Integrated Farming Systems involving crop husbandry, dairy, goatary, piggery, duckery, poultry, fishery, horticulture, agroforestry, mushroom cultivation etc. They should be well equipped with the latest knowledge of natural resource management efficiently to be able to give appropriate advice for generating additional employment and income for the farming families in rainfed, irrigated, coastal, hill and desert agril. Ecosystems.</p> <p><u>Responsive Agricultural Extension Systems:</u> Of late the village level workers have been assigned with additional duties not directly connected with agriculture. These village level functionaries must be multipurpose extension agents with working knowledge on land based enterprises. There must be a single line of command with agril. Department being the nodel department. The VLWs', AEOs, DAOs, etc must be given specific target to augment the agril. Productivity through adoption of modern technology. Many but mini single factor demonstrations, must be laid out on farmer's field. They must be responsible for conducting OFAR to assess and refine the technology in collaboration with Zonal Research and Transfer of Technology Centers and KVKs wherever possible.</p>
37.	<ul style="list-style-type: none"> • Profitable use of PGR through institutional networking / coordination; create – identify centres of excellence, partnership involved – public, private institutes, NGO organizations • Develop information dissemination and data base for PGR / Agro-biodiversity; directory of institutes involved, kind of expertise available • Sharing of inter-institutional responsibilities – across different ministries – ICAR/NBPGR, other institutes; Ministry of Environment and Forests, BSI, FRI; CSIR/CIMAP, NBRI; ICMR; DBT, DST; involving NGOs and other stakeholders • MSSRF materials / reports will provide a base; also NATP reports (ICAR agro-biodiversity and related projects).
38.	Education, research and extension must be administratively and organically merged at the SAU level. In addition, adaptive, on-farm research must become an integrated part of all applied research. Traditionally, it has been completely ignored or reluctantly undertaken at lower-rung ZRS or KVKs, or relegated to a separate extension arm, which interprets it not as research but as demonstration. Research budgets have online entry for this activity and researchers rarely attempt technology assessment at farmers' fields. The NATP tried this half-heartedly; this

needs to be made mandatory, written up in research proposals, and provided for. This will help in making research more relevant, participatory and accountable.

The earlier extension model has become irrelevant. The SAU should take over outreach from the state department, make it IT-intensive and multi-disciplinary. Scientists have long argued that low technology off-take is due to poor extension. This model will put all knowledge inputs together.

The role of the center in agricultural R&D must be holistically considered. The R&D challenges we face cannot be addressed if central and state institutions are not truly collaborating. The national R&D plan must be a joint exercise and the ICAR must lead this initiative. The centre should fund all operational needs of the state R&D system. Its research role (through ICAR) must be focused on upstream and strategic areas. Its institutes should not seek short-term field impacts. All applied research these do (including coordinated research) should move to the state system.

Decentralization has become a critical issue. Most of R&D efforts should be localized but there is an overwhelming tendency to the contrary. For 40 years we have argued about weak local systems and strengthened central infrastructure not only in research but also in education and outreach. This must change.

Decentralization is relevant in several dimensions – research at central, state and zonal levels, on farm assessment as the final part of all applied research, scientific leadership at operative rather than bureaucratic level, financial and administrative authority at project level, on-farm assessment as the final part of all applied research, scientific leadership at operative rather than bureaucratic level, financial and administrative authority at project level; participatory rather than position-based decision processes, are examples. Unless these are explicitly factored in, other interventions will not be effective.

VII. To suggest methods of developing strategic partnership among ICAR, CSIR, DBT, ICMR, DST, DRDO, MNES and Private Sector R&D institutions, so that a dynamic National Agricultural Research System involving both public and private sector research emerges. Also suggest methods of involving Panchayati Raj institutions in technology incubation and verification, participatory research and knowledge management.

1.	<p>The Restructuring of ICAR System</p> <ul style="list-style-type: none"> • ICAR’s mission statement should include words to the effect that ‘ ICAR shall strive to make its research capabilities in agricultural, science and technology highly responsive, much more productive and serve a larger purpose, viz., facilitate the rapid development of India’s citizens, most of whom live in rural areas and many of whom are still struggling to get above the poverty line.’ • ICAR must pursue the path of being sensitive to the needs of its clientele. In other words, its research activities must be customer driven. • It would follow that once ICAR delivers what its customers need, they would gladly pay a fair price for its services. Of course this is not to deny ICAR the privilege of receiving government support in the form of a corpus or grant to meet the expenses for some of its research activities. However, the key focus of ICAR must be to generate revenue streams from sources other than government. • ICAR’s Governing Board must have members who are both accomplished and posses the requisite skills to guide the destiny of the organisations. It should be a Board that has a balanced mix of leading scientists, eminent academicians, professionals, distinguished persons and at best one or two civil servants. And, most importantly, the Chairman of the ICAR Board must be a professional or scientist of high repute who has the vision and wisdom to chart ICAR on a totally new course. • ICAR’s research must be put at the service of the majority of our people who live in our rural areas. To do so, ICAR’s research will have to replicate its successes in the laboratory in daunting field conditions, in a large-scale manner and through methods that are practical and feasible. This then must be the challenge that ICAR must seize and overcome.
2.	If ISRO could be added in item VII
3.	<ul style="list-style-type: none"> • Perhaps, it would be of great advantage to have such collaboration in at least two areas, viz. the feed mills and the pharmaceutical industries. The former have some good researchers as well as facilities and it would be nice to have

	<p>an MOU on specific aspects of work through collaborative projects so that reliable and certified formulated feeds for various stages of growth of fish and shellfish are available to the farmers at an economical cost.</p> <ul style="list-style-type: none"> • Similarly, various drugs are being developed by the pharmaceutical companies to control the diseases that are occurring from time to time in both fresh and brackishwater farms and also to provide a good environment for the fish and prawns to grow. It would be nice to collaborate with them. While the institutes have a sufficiently good expertise in disease diagnostics as such, our expertise in drug formulation is almost nil. This should help us develop necessary expertise in this area too that should be further strengthened by recruiting scientists in this discipline that has opened as yet and has remained totally blocked thus far. • Another suggestion is to allot some of our M.F.Sc and Ph.D. students to a few of these well established R & D organizations in the private sector for working on research problems facing the aquaculture industry as is done by IIMs and IITs. The problems agreeable to both the parties must be decided and an MOU signed in each case with full details as to facilities, funding, guides/co-guides etc that should be worked out in advance. <u>This would also help us develop an expertise in the country with an industrial outlook and help commercialization of our technologies in due course.</u>
4.	<ul style="list-style-type: none"> • Sharing of vision and funding between the S&T agencies in projects of strategic importance • Building strength in grassroot level institutions for absorption of technologies • Utilise the mechanism of KVKs for effective dissemination of technologies, by enhancing their scientific capabilities and IT access.
5.	There should be an effective liaison between the Institute and Sugar Industry, DBT and DST for more effective utilization of the sugarcane production technologies developed.
6.	Strategic partnership with different specialized organizations and private sector R&D's is required to be developed for which specific research agenda should be identified requiring professional and technological help in a complementarity mode. In terms of transfer of technology, help from Panchayati Raj institutions may be availed for a wider public base. It is important here to make a note that this country has witnessed private sector enterprises in a very limited scale coming forward to help foster agricultural research promotion. As of now hardly 5% of R&D from private sector is in the field of agricultural biotechnology research. Almost equally important is the role of public sector organizations to develop ties with government research units. It should be left with the research organizations to identify specific areas of mutual interest for both private and public sector institutions which should be commercially viable in medium or long term perspective.
7.	<ul style="list-style-type: none"> • Through Network projects amongst the various R & D institutions. The projects should be identified by planning commission itself through a panel of experts.

	<ul style="list-style-type: none"> • MOU on sharing each others resources. For the purpose, zones can be formed, in which an R & D institute will belong. Procurement of multiple costly equipment, instruments etc. should be avoided as far as possible. They should be shared amongst various R & D institutes available in a zone.
8.	<ul style="list-style-type: none"> • Farmers participatory research concept instills more confidence in research results for quick adoption . Involving panchayatraj institutions can go a long way in bridging the research <i>gap</i> and reducing the time lag for adoption ,especially of varieties /hybrids. • Currently for spread of HYVs of crops the public sector has no proper mechanism in place ,resulting in poor seed replacement ratio (SRR) .Through public –private partnership ,the seeds can reach farmers via existing private sector market network. The issue of payment of royalty to the concerned SAU/institute for the variety/hybrid can be settled through policy . Alternatively ,the SAU/institute can consider selling the parents of hybrids to private sector for multiplication and <i>reaching the unreached</i> farmers . Lest the current static situation will continue depriving the farmers of improved genotypes of crops. • Henceforth , there should be more focus on outreach activities so that there is constant interaction of technocrats with farmers to find solutions to pressing problems under real farm situations.
9.	Public and Private Institution Partnership is needed to strengthen the Research and Development. This can be done through Monitoring teams involving both Public and Private organization.
10.	<ul style="list-style-type: none"> • RAC and QRT members must be active research workers and should be drawn from diverse fields cutting across different sections like end users, processing industries, sister organizations like CSIR institutes, different ministries, etc. • There must be a way to evaluate the performance of the recommended technologies at the grass root level. This would ensure that the local extension bodies will be well aware of the nuances of the technologies.
11.	All these organizations have their mandates. To some extent there is interaction within these organizations. The common interest / interactive areas under the National Common Minimum Program (NCMP) for the country should be identified and MOUs under taken between these organizations to develop dynamic National Agricultural Research System.
12.	There should be an effective liaison between the Institute and Sugar Industry, DBT and DST for more effective utilization of the sugarcane production technologies developed.
13.	Confidence building measures among various Institutions followed by identification of level of expertise/well proven technologies and developing partnerships and alliances to leverage their existing skills that bring desirable results which could be offered to Industry for commercial manufacturing of these products keeping in view local needs and National/International market potential

	and/or Panchayati Raj institutions for societal benefits.
14.	The strategic partnership among ICAR, CSIR, DBT, ICMR, DST, DRDU, MNES and private sector R&D institution can be developed through collaborative research and co-sponsored projects to avoid duplication and utilization of R&D funds efficiently. The private sector be tapped for research on all aspects of crop improvements and NRM. For initiating distant education in specialized fields like fisheries, horticulture, mushroom cultivation etc. effective linkages between SAUs, SU, ICAR, IGNOU and other organizations are needed.
15.	The position of technical personnel in Panchayatraj systems should be restored as was in vogue in the early years.
16.	Research institutions are to be empowered to enter into strategic partnership with other scientific organizations, both public and private, in the country by removing the existing bureaucratic hurdles. Only when they are given the necessary power and authority for entering into such partnership, they can be made accountable for the outcome. Such freedom, except in cases involving sensitive matters, should also be encouraged to enter into effective partnership with international institutions.
17.	Promote a national debate (1 year time) by the partners to evolve commonalities and to identify areas needing inter-institutional collaboration. Develop working groups to undertake R& D projects that benefit partner institutions. Draw private funding in key areas
18.	<ul style="list-style-type: none"> • Before I give my comments on this TOR, it is necessary to give a new definition to NARS to broaden its scope and spread. As at present, all it means is ICAR institutes and State Agricultural Universities. Even other public funded institutions are at time excluded from its scope. For example, there are reservations on including even institutions like NIRD and MANAGE in its scope. In my opinion, NARS should include all R&D institutions, which produce results both for general public good and commercialization but not profit as the primary motive. With this definition, private sector, which develops goods and services primarily for profit stands excluded. It does not mean that public sector institutions are barred from working with private sector. The need is to develop appropriate modalities and MOUs. For instance if public and private sector work together, the goods or services developed as a joint venture are available for transfer by either with or without profit. • In my view, strategic partnerships except those created by social compulsions and physical/physiological needs are built around fulfillment of certain requisites and conditions. These are: (i) willingness to work together, (ii) pursuance of common goal to reach an end, (iii) recognition of strength complementarity of each other, (iv) clear understanding on credit and responsibility of each partner and (v) common but assured source of funding. If these fundamentals of establishing partnerships remain unattended, it may be difficult to forge partnerships in the first place. Ignoring these basic requirements, if partnerships are made, these may be aborted well before the

	<p>maturity without tangible outcome. I would strongly recommend that while value of inter-organizational alliances should receive top priority, its welding together should be finalized after comprehensive discussions and development of well thought of work plans.</p> <ul style="list-style-type: none"> • Pnachayati Raj institutions should be involved in all activities and projects, which involve development infrastructure for rural development in all its aspects. NWDPRRA is a typical example in which involvement of PR institution is considered necessary, since watershed development programme is a community activity. Making PR responsible for development by providing funds for watershed related activities assures sustenance of permanent structures beyond the project period.
19.	<p>Research institutions are to be empowered to enter into strategic partnership with other scientific organizations, both public and private, in the country by removing the existing bureaucratic hurdles. Only when they are given the necessary power and authority for entering into such partnership, they can be made accountable for the outcome. Such freedom, except in cases involving sensitive matters, should also be encouraged to enter into effective partnership with international institutions.</p>
20.	<ul style="list-style-type: none"> • Investigative work is necessary to prepare the road map. There should be some statutory obligations of all the public and private sector organization for this purpose. • All scientists and Extension Specialists are to undertake training in the Panchayati Raj Institutions (Zilla Parishad, Panchayet Samity, Gram Panchayet) for a period of one month to get acquainted with the operation of these Institutions and their dealings with the agricultural and allied problems.2. It is to be made mandatory to all scientists that their technologies are to be demonstrated in agro-climatologically suitable representative GPs on a participatory mode with proper impact analysis. 3. One center for knowledge and information dissemination in an interactive mode is to be established in each GP in collaboration with a suitable IT organization and jointly operated by the GP. 4. There should be an official linkage between the Panchayati Raj Institutions and the Research Institutes and SAUs.
21.	<ul style="list-style-type: none"> • Centralized linkages and collaboration of ICAR with reputed national and international labs and agencies for HRD. • Strong linkages are required with the bodies pertaining to commercial and monetary regulating bodies. • Sharing of resources between institutes/regional stations/SAUs placed at one location. • Since ICAR is one of the biggest agricultural research system in the world, strategic partnership not only with Indian institutes but also with International bodies is of utmost importance and this will provide an opportunity for ICAR to become the world leader in the agricultural research. For this, strengths of ICAR system and its constituent institutes should be exploited.

22.	<p>1. The competitive grants should be open to all institutions. Priority for funding should be for projects, which have inter-institution collaboration.</p> <p>2. SAUs should be asked to organize workshop/training. For elected representative in the area of Water Management, Integrated Farming System, new opportunities and challenges including IPR, biodiversity implications, etc.</p> <p>3. The research agenda of every institute should be formulated following PRA techniques.</p>
23.	<p><u>Promotion to Principal Scientist – Number of years required to qualify (1984-1986 ARS batches)</u></p> <p>With respect to the 5th Pay Commission, I am taking liberty to quote a specific case which is a matter of great concern and is creating frustration among the young scientists. This needs immediate redressal.</p> <p>In the new CAS notified by ICAR (vide no 21(10) 99-Per.IV dated 19th July 2000), a scientist with Ph.D. can get promoted to the post of Senior Scientist in 9 years in contrast to 13 years required in the old scheme. To become eligible for promotion to the post of Principal Scientist, a Senior Scientist is required to put in 8 years (Total 9+8=17 years) of service.</p> <p>This has put scientists of particularly of ARS of 1984-1986 batches at a disadvantage. If all Senior Scientists are required to put 8 years of service as Senior Scientist then Scientists who became Senior Scientist before 27th July 1998 would get promotion to post of Principal Scientist in 21 years while their juniors would get the same promotion in 17 years.</p> <p>In fact this is the same group of scientists who were not given option to continue under the earlier ARS scheme when ICAR shifted from ARS promotion policy to the UGC in 1989. Thus, they were denied Ph.D. increments and also opportunity for assessment as provided to their seniors. This group presently forms the strongest middle rung of the scientists who are feeling frustrated and left out by the system; are seeking deputations for national and international organizations and going abroad with or without intimation.</p> <p>Suggestion:The ICAR should implement the provision of the para 4 of the CAS as notified by ICAR which also has the concurrence of the DOPT and Ministry of Finance vide no 21(10) 99-Per.IV, which requires that total year of service (17 years) be counted as eligibility for promotion to Principal Scientist. Further this provision has already been invoked in SAUs such as TNAU.</p>
24.	<ul style="list-style-type: none"> • A national level policy and direction on the establishment of MOU between the institutes of both state and center should be evolved for uniform adoption across the country. • Delegation of power and necessary funding to Panchayat Raj for Agro-based activities such as maintenance of common structures like irrigation canal, village ponds, internet facilities, farmers club, community nursery, biogas unit

	<p>etc., in collaboration with line departments.</p> <ul style="list-style-type: none"> • Constituting a national committee to coordinate funding from various agencies to ICAR and SAUs and identify priority research areas. • Collaborative research may be initiated in the seed production sector involving government and private sector. • India Meteorological Department is the apex body assigned a task of producing forecasts for the country as a whole. Most important sector benefited out of such forecasts is agriculture as nearly 68% of our population depending on this sector. Some of the Agrometeorological research in ICAR, IMD and State Agricultural Universities (SAUs) are parallel with out any strategic partnerships. Though few activities are happening at much higher level, their ultimate goal has not been achieved at farm level. It has been suggested to have strong interaction and strategic partnership among these institutions facilitated through policy. Periodical meetings and exchange of climate information in the context of alternate crop planning will be highly useful. • Avoiding duplication in research and this may be achieved through collaborative research between bodies. • Panchayat Raj shall be accommodated in the Regional Research Councils / Extension Education Councils/ Local Monitoring Committee.
25.	<p>The concept of agri-clinics, with greater emphasis on vocational training by ICAR institutes and agricultural universities, be given high priority and such trainings be linked with initial Bank loan support by NABARD and other Banks so that young talents could become self-employed as transfer of technology agents and provide efficient custom hire services to the farmers. This would help in replacing the present inefficient extension systems in various States.</p> <p>The public - private sector linkages are required to be strengthened and the institutions be revamped to take required corporate function for commercialization of various technologies as well as products. Institutions and universities must establish “Technology Parks” where private sector could work as partners for up-scaling all available technologies in order to link those with markets as commercial products. Models of benefit sharing and private sector investment for joint agricultural research, if developed, would result in greater benefits both to institutions and to the society. Creation of a new "Technology Promotion Fund", of around Rs. 500 crores would play an important catalyst role, which could further be built through implementation of IPR regime (ex: PVP and Farmers’ Right Act, Biodiversity Act etc.) and possible benefit sharing by public institutions through agreed partnership with the private sector.</p>
26.	DOS may also be included under reference item VII of the Task group.
27.	The Indian Agriculture Research System has been working mostly in isolation. There has been little mobility and effective interaction among scientists and technologists working in agriculture sciences with other stakeholder institutions

	<p>under ICAR, CSIR, DBT, ICMR, DST, DRDO, MoEF, MNES, and private sectors. Since the application of frontier science and technology in agriculture requires trans-disciplinary methods and approaches, including biosafety and bioethics aspects, the Task Group must look into new ways and means to foster inter-institutional, interagency, interdepartmental and inter-ministerial network programmes on national project / mission mode agricultural research, involving the potential partners in both private and public sectors. The New Millennium Indian Technology Leadership Initiative (NMITLI) projects launched by the Planning Commission can be emulated to bring in time-bound target-oriented productive research programmes in the emerging areas of agriculture research and development. Agricultural Research Institutions should work towards developing trans-disciplinary research projects with active participation among the ICAR institutions and also with other public and private R&D institutions under other agencies.</p>
28.	<p>There are many overlapping or grey areas where ICAR, CSIR, DBT, SDT, DRDO, MNES and private sector are investing in R&D independently in repetitive manner. For example, research in genomics, climate change, weather forecasting and many other areas are being carried out independently. There are also certain areas like impact of heavy metal contaminations, pesticides, fungicides, herbicides residues and water contamination on human beings which call upon joining together of scientists of agriculture, ICMR and livestock. Similarly, efficiency of inputs like fertilizers, chemicals, pesticides, fungicides, herbicides, farm machinery can be optimized and environmental loading reduced with very active partnership of the NARS and the private industry. The private industry can also provide a feed back and future projections for the likely requirements of scientific manpower for servicing emerging scenarios of the development process. Even some of the reputed NGOs have also potential of mutually beneficial partnership. The industry should be persuaded to provide on hand job training to our graduate and post graduate students in their industry and they should have a freedom to retain some of them depending upon their own assessment. The interface with industry has to start at college/university level. The industry should be asked to provide some fellowships for the students who may work in their mandated area of priority. Many companies in the developed nations provide assistanceship to the students for research and education and their mandated area even without any critical commitment to server the company. There should be a small cell constituted by the industrial chambers to list their requirements and expectations from NARS keeping in view their future strategies and projections of manufacturing and business. This requirement can be circulated to all institutions/universities of NARS and students enrolled with very clearly mandated goals.</p>
29.	<p>Research on natural resource sustainability methods by the researching group alone, will be hardly of any use (so far lot has been done, of which we see very little translated in the field). Therefore, ICAR or the SAUs may not be able to</p>

	<p>achieve tangible result unless there is a practicable working partnership with other agencies such the the Land Development Corporations, the Command Area Authorities, the Agriculture Department, The Irrigation (or the Water Resources Department), etc.</p> <p>The DoC-ICAR Interface, the ICAR-CWC Joint Panel, The ICAR-MNES and the ICAR-DoE linkages may like to go beyond customary annual meetings and chalk modalities as to how sustainable natural resource management and exploitation technologies could be developed and practiced in the farmers' fields, both irrigated and rainfed.</p>
30.	<ul style="list-style-type: none"> • Involvement and collaboration in research work with CSIR, IVRI and other centres of the ICAR located in the State. • The scientists of sister institutions located in the State should also serve as faculty members of the SAUs. The laboratories of these institutions should facilitate the research to be conducted by SAU scientists/students and vice-versa.
31.	<p>Strategic partnership: ICAR, CSIR, DBT, ICMR, DST etc. should share the facilities and funds to support the adhoc projects allotted to deserving scientists. Preferences should be given to multidisciplinary projects aimed at studying all related aspects of of a particular problem so as to come out with comprehensive solutions. For this prgramme leader should have the liberty to select his/her team and recruit them.</p> <p>8. Long term programmes like maintenance of genetic resources, development of long term sustainable agronomic practices etc., however, should be the responsibility of the public institutions with regular projects.</p>
32.	<p>This is very very important. The national institute's facility should be made available to any user organization either on reciprocal basis or on charge basis, instead of duplicating the same facility in many institutes in the same city/place.</p>
33.	<p>Institutional mechanisms are needed so that there are regular meetings to plan and discuss collaborative work with research and funding organizations for support within and outside the country. For example, there are several projects (aromatic and medicinal plants, biodiesel, agricultural chemical development, etc) where collaboration (overlapping interest) between ICAR and CSIR and private industries would bring most desirable results.</p>
34.	<ul style="list-style-type: none"> • Biotechnology provides unprecedented opportunities to transfer genetic materials across unrelated plant genera and even from bacteria, fungi. • Molecular biology tools in understanding / assessing diversity for conservation, use and management
35.	<p>The existing Travel & Visit (T&V) system of extension is top-down in its approach, has a narrow focus in so far as it is oriented to individual crops grown in favourable areas, offers very little scope for the initiative and participation by the farmers and is also not accountable to them. Further, the squeezing of assistance to states by the Central Government for extension services has led to</p>

	<p>the virtual breakdown of extension machinery in the states. As a result, farmers are becoming increasingly dependent upon the private sector for extension services. In the absence of public regulation of such services, the resource-poor and gullible farmers are becoming victims of exploitation by the unscrupulous traders and moneylenders interested in selling spurious material.</p> <p>There is, therefore, an immediate need for revamping and revitalizing the existing agricultural extension system in the country, so as to conform to the new priorities in agricultural research, with adequate financial support from the Centre and the States. The main ingredients of this reform should be : (i) Active involvement of farmers through user groups and Self Help Groups (SHGs), and accountability to them; (ii) Enabling participation by the private sector, farmers' associations and the NGOs, to complement public services, by putting in place an independent regulatory body, to which samples can be submitted for quality checks, encompassing inputs like fertilizers, pesticides, and seeds; (iii) Increasing use of media and information technology, including cyber kiosks, to disseminate the knowledge on new agricultural practices and the information on output and input prices for improving the effectiveness of agricultural services in general. The use of information technology will reduce the requirement of a large number of extension workers at the block level and would indeed complement, to a considerable extent, the services rendered by the extension workers in remote areas; (iv) Building gender concerns into the system, for example, by manning the extension services predominantly by women in hill and tribal areas where farming is managed essentially by women ; and (v) Capacity building of extension functionaries and farmers, among other means, through distance education.</p>
36.	<p>Frontier and Anticipatory Research : These are endearing terms of high relevance and sophistication, and very appropriate in context of the first decade of the Third Millennium. Alas, like most Indian gubernatorial attempts at outreaching, this will also fail unless there is change of antiquated mindsets, in-depth comprehension, but above all some little honesty and sincerity in the Science establishments and more importantly in the `Science Managers/Babus' who manipulates the Heuristics of Indian Science. Agriculture is admittedly regarded as lesser enterprise simply because it's a little more mundane, but it is here that the grass roots can also be involved in the business of intellectual adventure. That's what Science, and Research, especially Frontier and Anticipatory Research is.</p> <p>One Principal Frontier and Anticipatory research area for India, and indeed for the world, without smudging be demarcations of `areas and subjects' , is :</p> <p>Genome Modification : - Of microbes, higher plants and animals. The fallouts would be both theoretical and immediately unrealizable as well as practical and of high utility. They could even be life/planet saving.</p> <p>Cues can come from exobiology, and projections for future terra-forming of potentially habitable celestial bodies. This assumes relevance in time as short as a decade in view of the increasing `eyeing' of the moon by many countries,</p>

	<p>including India, in the manner of the Antarctica.</p> <p>There are no exo-biologists in India. One lone astronomer who has postulated esoteric theories on the supposed Cosmic Origin of Life! Agriculture would form an important part of any terraforming enterprise. What is to prevent the NAAS to at least start thinking on those lines. Make a beginning by allowing/encouraging relevant disciplines to explore, analyze, experimentbeginning with methanogens, going on to the extremophiles ... the list is formidable now. They might even come in handy right here, in multiple situations in countries like India bursting at the seams with populations and pollutions, and all `natural' bounties fast depleting, eroding.</p> <p>Exo-agriculture is a new discipline which is suggested as a component of Terraformation since human cultures and civilizations on earth have been established and have flourished only on the introduction and advent of agriculture. So, lets have exo-</p>
37.	<p>Statutory Status of ICAR for SAUs : A very harmonious partnership has developed over the years between ICAR and SAUs in the National Agricultural Research System. However, though ICAR acts as UGC for SAUs, the former does not enjoy a statutory status and hence, is constrained in exercising its role to the desired extent. Therefore, given the statutory status the Indian Council of Agricultural Research will be in a better position to ensure more resource-effective and location-efficient coordination aiming at a much-needed congenial, responsive and client –oriented agricultural research and education.</p>

The Impact of Tsunami on the Livelihood of Coastal Fisher-communities in Tamil Nadu, India - A Preliminary Damage and Needs Assessment

Almost all the countries situated around the Bay of Bengal were affected by the tsunami waves in the morning hours of 26th December 2004, (between 0900 –1030 hrs IST) The killer waves were triggered by an earthquake measuring 8.9 on the Richter scale that had an epicentre near the west-coast of Sumatra in Indonesia. Waves rose up to 6-10 meters and the impact was felt up to the East African coast affecting Somalia, Tanzania and Kenya.

The first recorded tsunami in India dates back to 31 December 1881. An earthquake of magnitude 7.5 on the Richter scale, with its epicentre believed to have been under the sea off the coast of Car Nicobar Island, caused the tsunami. The last recorded tsunami in India occurred on 26 June 1941, caused by an earthquake with magnitude exceeding 8.5. This caused extensive damage to the Andaman Islands. There are no other well-documented records of Tsunami in India.

Fisheries Scenario of Tamil Nadu

The State of Tamil Nadu has a coastline of 1076 kms and an Exclusive Economic Zone of about 0.19 million sq. kms (figure I & Table 1). Out of the 30 Revenue Districts in the State, 13 are located in the coastal area (Table 2). Toothukudi (Tuticorin) followed by Nagapattinam and Ramnathapuram have the longest coastlines. There are 591 fishing villages and 362 Fish landing Centers, which are mostly small and cater to the needs of small mechanized fishing crafts and traditional boats (Table 3). The 2001 census of the fishing craft in Tamil Nadu recorded 10278 mechanized fishing vessels, 21471 vallams and 27652 Catamarans. The last two categories are traditional fishing crafts and about 22000 such crafts are use outboard motors for propulsion (Table 4). The fishing crafts are either made from wood (procured locally and traditionally used for making fishing boats) or Fibre Reinforced Plastic (FRP).

The Marine Fisher folk Census carried out in 2000 enumerated 698268 fisherfolk with the maximum fishermen residing in Kenniyakumari district followed by Ramanathapuram and Nagapattinam (Table 5&6), The marine fish /landings in the State are estimated around 380000 metric tonnes per annum. About 58000 metric tonnes of seafood valued at about Rs. 21000 million is exported annually from the processing units located in Tamil Nadu.

The impact of Tsunami in India

A tsunami is not a single wave, but a series of traveling ocean waves generated by geological disturbances near or below the ocean floor. A Tsunami can rise across the water at speed of 500- to 1000 km/hour. The height of the wave only increases as the

wave nears the coast. A tsunami can be 10 to 20 m high when it hits the shore. The most tsunami prone area is the Pacific Ocean and the countries around it have developed a tsunami warning system.

In India about 9600 people have died of which the casualties in Tamil Nadu amount to about 7900. The maximum deaths have been recorded from Nagapattinam district. It is also estimated that about 5700 are still missing (as on 4 January, 2005) and chances of getting survivors are very remote.

Damage and needs Assessment for Fisheries Sector in Tamil Nadu

The fisheries sector in Tamil Nadu has suffered major damages followed by the Pondicherry, Andhra Pradesh, Kerala and Andaman & Nicobar Islands. Besides loss of lives and assets such as houses and personal belongings, fishing boats and nets, the fisheries infrastructure (fishing/Harbours and fish Landing Centers) has also suffered heavy damages. The first preliminary damage and needs essential given below deals only with Tamil Nadu.

North Tamil Nadu:

Fishermen from hamlets stretching from Ennore in the north of the city to Neelankarai in the south suffered from the killer waves. In Royapuram Fishing Harbours (north Chennai) nature's fury caused maximum damage to property, wooden and FRP boats, catamarans and other infrastructure on the shore, many of the fishermen have damaged or lost their boats and gear. Means of livelihood for many fishermen have been destroyed.

Nagapattinam district:

Nagapattinam is one of the worst affected District in Tamil Nadu by the tsunami. Many of the fishing hamlets have simply vanished. Some of the affected areas include Nagore, Keechankuppam, Akkaraipettai, Velankanni, Seruthur, Vedaranyama and Poompuhar. Wooden and FRP boats and catamarans were destroyed by the waves. Seruthur a fishermen's colony about one km from the famous Velankanni shrine had about 230 FRP boats and 30 catamarans. A majority of the boats have been washed away while a few lie scattered, broken and twisted. The District has large number of catamarans, both wooden and FRP material.

Kanniyakunari District:

Over 400 fishermen and their families have been reported killed and thousands rendered homeless. Hundreds of fishing boats have been washed away. Kadiyapattinam and Colachal were the worst affected areas. The 3 km stretch of road between Colachal and Vaniya Kudi was flooded and damaged. The number of fishing boats in Colachal is also very high-9386 were enumerated in the last census and many of them have been damaged.

As a consequence of the tsunami, livelihood of a large number coastal fishermen in Tamil Nadu stand threatened. Fishing being their sole means of sustenance, assistance is required for repair/replacement of boats and procurement of nets, which have been resumed without much delay and sustenance needs met. Besides, immediate aid/relief assistance to the affected people, (food, water, clothing, shelter, etc.) by the Government and various aid/relief agencies, the Government has also announced rehabilitation scheme, which is detailed below.

Relief package announced by the State and Central Government

The Government of Tamil Nadu has announced a relief of Rs. 100,000 to families for every family member killed . In addition, much affected family will be given about Rs. 7000 to procure essential provisions and mend/ repair their dwellings. In addition to the above general packages, fishermen will be provided with Rs. 20000 to replace with each gill net in vallams “ and Rs. 10000 to repair gill nets in catamarans. The State would also provide about Rs.15000 and Rs. 5000 to repair/rebuild each unit of vallams and catamarans respectively. The State is also working out a detailed package for mechanized boats once the losses have been recently assessed. Rehabilitation and relocation would be done at a later stage. The Government of India has made available an amount of Rs. 2500 million as the first installment of relief fund to the State Government.

Needs Assessments

The cyclones and the rough sea during certain parts of the year have so far been the major cause of lose of life and property of small scale fishers in the Bay of Bengal region. The Tsunami has now added a new dimension to their safety and welfare issues. National Calamities like cyclones, earthquakes, tsunamis, etc. are also becoming more frequent in the coastal areas of the Bay of Bengal and the fishermen community faces major impacts of such calamities.

The consequences of natural calamities are manifold and bring considerable hardships to the small scale fisher families. Besides loss of dwellings and fishing assets many lives are lost. Since their socio-economic status is also low and livelihood option are limited the calamities further push them into the fold of poverty and deprivation.

While the immediate requirements of the fisher-communities (life food, water, medicines, clothings etc.) are being provided by the Government and the various relief/aid agencies, etc. the donors or specialized agencies(FAO, Regional Fishery Bodies, etc.) may consider providing technical interventions, which would be useful in livelihood, support and also institutional building on a long term basis. In this regard the following short-term and long-term suggestions are proposed:

Short-term Technical Intervention

Preliminary estimates indicate that about 75 – 80 per cent of FRP boats belonging to the small-scale fishers have been badly damaged. Boats have tossed against concrete structure or dragged hundreds of meters on the beach damaging their outer structure and the inboard motors or the outboard motors. The damages to the FRP boats are in the form of gaping holes or patches scrapped due to friction with rough surfaces. Most of these boats are in the size range of 27 – 30 meters and have been used for gill netting or hook and line fishing.

The cost of such FRP boats range from about Rs. 65,000 to 90,000 FRP. As these boats are costly those which have been partially damaged, and need to be repaired and put back to use. As it would be difficult for the fishers to transport the boats to their nearest FRP Boat Building Yard, it is proposed to provide a couple of Mobile FRP Boat Repair Units, which could go from village to village and service the boats. An estimate of the cost of a single mobile unit is at Annexure I. It is also suggested to deploy one or two FRP boat-building experts who could provide technological inputs and in the process also strengthen the local expertise in repair and further maintenance of FRP boats. The technical experts could be deployed for a period of about three months

A total cost of US\$ 125 000 is estimated for the deployment of two Mobile Units for three months in Tamil Nadu. However, this does not include the cost for deployment of an external expert/specialist in FRP boat construction, etc. Once the major repair work is over, the Mobile Units would subsequently be handed over to the Department of Fisheries, Government of Tamil Nadu for further continuing the assistance to the small-scale fisher-community in the State.

Long-Term Technical Intervention and Institutional Building

As a long term measure it is proposed to address the issue of *safety and well-being* of small scale coastal fisher communities through better and efficient communication network, training and awareness programmes, organization of fishermen groups for disaster management, improved technologies for small/fishing crafts etc. The programmes could also be networked with the Tsunami Early Warning System, which the affected countries have now decided to set up. In this regard, the following steps are proposed:

- ❖ *A Small team comprising specialists from abroad and their local counterparts would undertake a detailed assessment of the nature and quantum of damages suffered by the fisher-communities. The Team would also assess the types of technical interventions that can be made in the State.*

- ❖ *A two-type Technical Workshop would discuss the damage assessment report and prepare strategy for further intervention, identification of geographical areas for intervention, quantum of funds required and their sources, technical manpower, timelines, etc. The workshop could also involve experts from other Tsunami-prone areas for sharing their experiences in reducing the impacts of Tsunami on coastal fisher communities.*

- ❖ *Implementation of the programme (based on the availability of funds).*

Table 1: Marine fisheries Resource

S.No.	Coastal Information	Tamil Nadu		
		E-Coast	W-Coast	Total
1.	Coastal length (in km)	1 016	60*	1 076
2.	Continental Shelf (n in sq. km)			41 412
	Up to 50 in depth	22411	844	2 3255
	51 m to 200 m depth	11 205	6 952	18 157
3.	Exclusive Economic Zone (in million sq mtrs.) extends to 200 miles from shore	-	-	0.19
4.	Territorial waters (in sq. km. (approximately))	-	-	19 000

*Kanniyakumari District of Tamil Nadu falls on the West Coast.

Table 2: District-wise Coastal Length (in kilometers)

S.No.	District	Coastal Areas				Total
		Coramenda1	Palk Bay	Gulf of Mannar	West Coast	
1.	Chennai	19	-	-	-	19
2.	Thiruvallur	27.9	-	-	-	27.9
3.	Kancheepuram	87.2	-	-	-	87.2
4.	Villupuram	40.7	-	-	-	40.7
5.	Cuddalore	57.5	-	-	-	57.5
6.	Nagapattinam	124.9	63	-	-	187.9
7.	Thiruvarur	-	47.2	-	-	47.2
8.	Thanjvur	-	45.1	-	-	45.1
9.	Pudokkotai	-	42.8	-	-	42.8
10.	Ramanathapuram	-	95.8	141	-	236.8
11.	Thoothukudi	-	-	163.5	-	163.5
12.	Tirunelveli	-	-	48.9	-	48.9
13.	Kanyakumari	-	-	11.5	60	71.5
	Total	357.2	239.9	364.9	60	1076

Table 3 : Marine Fishing Villagers and Fish Landing Centres

Sl.No.	District	Fishing Villages(nos.)	Fish Landing Centres(nos.)		
			Large	Small	Total
1.	Chennai	44	2	9	11
2.	Thiruvallur	58	1	24	25
3.	Kancheepuram	44	2	37	39
4.	Villupuram	19	1	18	19
5.	Cuddalore	49	2	26	28
6.	Nagapattinam	51	4	42	46
7.	Thiruvarur	13	-	-	-
8.	Thanjavur	27	2	19	21
9.	Pudokkotai	32	3	17	20
10.	Ramanathapuram	184	8	70	78
11.	Thoothukudi	21	2	20	22
12.	Tirunelveli	7	1	7	8
13.	Kanyakumari	42	3	42	45
Total		591	31	331	362

Source: Government of Tamil Nadu

Table 4 : Fishing Crafts Tamil Nadu

Sl. No.	District/Fishing Harbours	Fishing Crafts Registered as on 31.2.2001 (nos.)			Total
		Mechanised Crafts	Vallams	Catamarans	
1.	Chennai	899	17	1034	1950
2.	Kancheepuram	9	954	6608	7571
3.	Cuddalore	913	367	5586	6866
4.	Thanjavur	571	2008	93	2672
5.	Nagapattinam	1561	271	4020	5852
6.	Pudukkottai	1108	2069	66	3243
7.	Ramanathapuram	783	5886	-	6669
8.	Rameswaram	1488	1902	200	3590
9.	Mandapam	653	379	-	1032
10.	Thoothukudi	843	3684	4646	9173
11.	Chinnamuttam	181	117	1099	1397
12.	Colachel	1269	3817	4300	9386
	Total	10278	21471	27652	59401

Table 5 : Marine Fisherfolk Population

Sl. No.	District	Fisherfolk Population
1.	Chennai	72997
2.	Thiruvallur & Kancheepuram	69458
3.	Villupuram	15330
4.	Cuddalore	41690
5.	Nagapattinam	81946
6.	Thiruvarur	10648
7.	Thanjvur	26071
8.	Pudokkotai	25710
9.	Ramanathapuram	120493
10.	Thoothukudi	71457
11.	Tirunelveli	20762
12.	Kanyakumari	141706
	Total	698268

Source : Marine Fisherfolk Census -2000

Table 6 : Employment of Male and Female Fisherfolk in Tamil Nadu

Total Fisherfolk population	6.98 lakhs
Male	3.6 lakhs (51.6%)
Female	3.3 lakhs (48.4%)
Male employed	1.94 lakhs (55%)
Female employed	0.37 lakhs (11%)

Annexure-1

Mobile Fibre Reinforced Plastic (FRP) Boat Repair Units

Sl.No.	Item	Approximate Cost (in US\$)*	Remarks
A.	Hardware		
1.0	Medium-sized Truck	28000	
2.0	Generator Set (2.5 KV)	4700	
3.0	Hacksaw & Drilling Machine	300	
4.0	FRP Material	50000	For repair of about 5000 boats
B.	Manpower		
5.0	Supervisor-cum-Chief Technician	9000	Engagement for 90 days
6.0	FRP Moulder	4500	-do-
7.0	FRP Moulding helper	3000	-do-
8.0	Carpenter	4500	-do-
9.0	Driver	3000	-do-
C.	Miscellaneous	18000	
	Total	125000	

* 1 US\$ = UNR 44.00 approximately

The estimated cost is for two units.

Cost of deployment of the External Expert is not included.

Considerations for Paradigm Change in support to Agricultural Research

Agriculture productivity and production in the crop sector has already shown fatigue and acute growth retardation, particularly in the Green Revolution impacted areas. For the agriculture economy in such areas, it is the livestock component that brings about profitability in the total agriculture operations.

Livestock is also emerging as a driving force in the growth of agricultural sector of India. Several factors underline this development. Contribution of livestock to Agricultural Gross Domestic Product (AGDP) has increased from 14% in 1980-81 to 26% in 2000-02. Demands for livestock product is income elastic and sustained growth in per capita income of the population, rising urban population, change in food habit are going to fuel further growth, implying larger share of resources to this sector.

Livestock plays a crucial role in the economy of the country. More than equity and balance, the rural livestock provides sustainability to the total agriculture operations. In spite of poor infrastructure, low investments and low priority shown to this sector, livestock has provided sustainability and stability to Agricultural Production. The greatest contribution from livestock in the current concept of global economy and the national agriculture resurgence is in terms of sustainability to the total rural development, which the livestock only can provide.

1.1 The lost decades

Our planning process over the past decades in the agricultural sector has been focused on increasing food grains. All strategies have been addressed to the crop sector and rightly so, because the focus was providing the food grains. But incidental to such planning process, as per the “law of un-intended consequences” the livestock sector got neglected and in its wake the landless and the marginal farmers, which constitute 58% of the rural population, never received the due attention. Incidentally this population sustains itself through 472 million livestock and 410 million poultry birds which serve as the most critical components of our rural production system.

Over these years there was lack of support for the inherent capacity of livestock sector, which is now being recognized. The Crop sector programs for farmers both in the central and state governments, particularly the subsidiaries were meant for people with land. There were no committed programs for animal sector or for landless and marginal farmers who live by livestock. There being much greater equity in livestock holdings any attempt to directly reach the animals and animal owners would have brought about faster rural transformation.

Besides the above, nascent or non-existence animal industry and absence of subsidiary, absence of big players in the livestock sector, contributions from the livestock sector not getting its recognition, absence of technology interventions, no support for marketing and commodity pricing structure for livestock and livestock products, the livestock operations remained least remunerative. The overall effect of this apathy resulted in the sector not

being able to express itself to its potential resulting in the economy of the animal owners and the economic standing of the sector remaining low. Through a limited support, dairy sector has amply proved as how rural transformation through nutritional support, health care and disease protection of animals and marketing system can bring in more income to resource poor farmers and bring about rural development with its true social implications.

These should be the basic assumptions on which revamping and refocusing of National Agricultural Research be based. Hence, the Agriculture and the Livestock Research should have a major shift to answer the issues raised and redeem the situation.

1.2 Considering the overwhelming evidence that sustainability in agriculture is through livestock and that the issues of poverty alleviation, nutritional security, rural employment, women empowerment, particularly among the resource poor farmer can best be addressed through livestock, there should be a policy shift to greater financial, infrastructure and program support to this sector.

1.3 Livestock production all round the world is currently accepted having triple role as food animal, work animal and companion animal. The envisaged research policy should focus on all the three components in its entirety.

1.4 Livestock research should be seen as a major component for human health and development and not only for livestock per se. The role of animal is greatly accepted as provider of health inputs (nutrients and commonality of disease considerations) and interalia the role of animals and the veterinary professionals in human health and disease should come as a research objective rather than confining livestock professionals (veterinarians) only to animal disease.

1.5 Contributions and Investments.

The proportionate contribution of livestock sector (4.8 - 6.6 per cent) to total GDP has remained steady over the years; it was 6.61 per cent (5.51 per cent from the livestock and 1.10 per cent from the fisheries sector) during 1999-2000 at current prices. The value of output of livestock and fisheries sectors was estimated to be Rs. 1,53,829 crore during 1999-2000 which is about 26.5 per cent of the total value of output of about Rs. 5,81,535 crore from the agricultural and allied sector. The contributions from the livestock through draught animal power valued at 8000 crores in terms of fuel equivalents should be added to the total GDP contributions. The *contribution* of milk and milch products alone (Rs.90,358 crore) was higher than wheat (Rs.51,002 crore) and sugarcane (Rs.30,986 crore). Against this, the investments of the Central Government including the share of the States in AH&D sector were extremely low and varied between 0.4 per cent and 1.0 per cent. The investments in AH&D as a percentage to total investment of the Government in the Ninth Plan was 0.4 per cent only. Increased investments and planned activities for development of AH&D will necessarily provide more economic benefit to the rural poor in the country. The investments in agricultural research should, therefore, change as per the requirements for this sector.

Livestock is emerging as a driving force in the growth of agricultural sector of India. Several factors underline this development. Contribution of livestock to Agricultural Gross Domestic Product (AGDP) has increased from 14% in 1980-81 to 26% in 2000-02. Demands for livestock product is income elastic and sustained growth in per capita income of the population, rising urban population, change in food habit are going to fuel further growth, implying larger share of resources to this sector.

1.6 Financial audit in terms of investment on livestock improvement and Human Development Index relationship is convincing enough, with a dramatic and far reaching impact, to commit massive financial support to animal production and health for economic prosperity, nutritional security, rural development and health of poor populations in the developing economy.

1.7 **Export Earnings:** The total export earning from the livestock sector and livestock products has shown an annual growth of about 12 per cent. Out of the total exports, leather and leather products accounted for Rs.1,745 crore (50 per cent) and meat and meat products accounted for Rs.1,457 crore (42 per cent) in value terms. The value export of marine products (including fish) during 2000-01 was Rs. 6,368 crore. This implies special policy frame work as to cater to such a high growth and great export earning for the country.

1.8 **Employment:** Animal husbandry provides self-employment to millions of households in the rural areas and is single largest employer for round the year activities in the rural sector. Women constitute 71 per cent of the labour force in livestock farming. Rural women play a significant role in animal husbandry and are involved in operations like feeding, breeding, management and health care. A large manpower is also involved in livestock-related activities like manufacture of animal food products and beverages, manufacture of textiles, tanning and dressing of leather, farming of animals, production, processing and preserving meat and meat products, manufacture of dairy products and retail and wholesale trade of livestock products.

1.9 **Factor productivity:** Total Factor Productivity growth study shows highest economic returns have been seen in investments made in livestock sector with a significant contributions coming from impact of research. Technology supported and demand driven Livestock sector will be the future engine for growth to ensure nutritional security and livelihood of landless rural poor below the poverty line. This demands a paradigm change in agricultural production and research concepts.

2.0 LESSONS FROM GDP GROWTH RATE IN AGRICULTURE:

Over the last decade, the overall growth rate in Gross Domestic Product at 93-94 price varies between 10.10 and -2.19. This shows great influence which agro-climatic and other external factors exercise on the agricultural production. Over the same year, animal growth rate in GDP for livestock sector varied between 6.75 and 3.98. This steady and sustainable growth in livestock sector, in fact, stems the total agricultural growth thereby ensuring an annual average of 2.5%. Despite comparatively limited investment, the sustained growth in the livestock sector is illustrative of the fact that livestock gives sustainability to the total growth output. Increased investment in the livestock sector to

increase its annual growth rate on an average of 4.5% to 5.5% is highly implied to ensure the required agricultural growth.

Average production per lactating and per milch animal during a year proved beyond doubt that high rate of acceleration in milk production in the country was achieved basically due to enhancement in productivity of cow and buffalo and was not merely due to increase in number of these animals.

In the concepts of development and sustainability, it is, therefore, essential that livestock be considered the real estate around which the future agricultural development should be based.

POLICY OBJECTIVES FOR REVAMPING AGRICULTURAL RESERCH:

Considering the overwhelming evidence that sustainability to agriculture is through livestock, the issues of poverty alleviation, nutritional security, rural employment, women empowerment, particularly among the resource poor farmers can be best addressed through livestock.

Population growth, urbanization, changing food habits and increasing income are fueling an increase in demand for non-grain based food of animal origin. Significant portion of total energy and protein intake, of late, comes from animal products and the increasing trend over the years is bound to change the production strategies of cereal crops and national land use policy

A transition from subsistent livestock farming to sustainable and financially viable livestock and poultry farming will imply creating an enabling environment in which the farmers will have a better access to cheap, assured and easily available input resources. There is no such program focused for such transition as of now.

Animal productivity is connected with nutritional input to the animal. About 50-78% of the cost of production is attributed to feed alone among different species. While calculating the national demands on food grains, animal requirements need to be taken into consideration particularly for improved livestock whose productivity is linked to the feed input (high yielding cows, buffaloes, sheep, goat and poultry). For the past decade, animal nutritional augmentation has been based on utilization of straws and agricultural by-products, which should now change and priorities be fixed for grain production for animal use. Low yielding sub-fertile soil can, especially, be utilized for such coarse grain production where the nutrient input and management demands are low. Similarly, in irrigated land, a mandatory appropriation of certain area for fodder production can be linked to agricultural production incentives.

A livestock production system is considered robust since there are hardly any mentionable incentives or subsidiary systems. This has created a highly uneven playing ground for livestock and crop husbandry farmer. Incentives/subsidiaries of crop production are connected to land, but, marginal/landless farmer subsistence on low

income generating livestock remains unsupported. There is a great need for a new approach policy for incentives/subsidaries to livestock sector.

The organized financial sector is unwilling to finance livestock program and the livestock farmers are mainly dependent on financial intermediaries and thus the farmers have to pay higher interest rate. With economic return from livestock being low, higher investments are prohibitive for the farmers. Suitable input models need to be introduced to reform the situation.

To have any systematic Disease Risk Analysis in place, there should be a strong research back up. At present, the research institutions work in absolute isolations with state Disease Investigation Laboratory which often do not have a strong technical back up. All State Agricultural Universities and designated ICAR laboratories should have a mandated disease investigatory role to set up a research data base and to provide a research backup for risk analysis of animal diseases.

To ensure biodiversity conservation, a national livestock genomic policy envisaging improvement and conservation of breeds should be framed and an Implementing Agency set up which will work in close collaboration with Private Breed Societies /organizations/NGO.

To reduce economic losses from morbidity and mortality in livestock, quality diagnostics and vaccines are made available to the farmers at cheap rates is a pre-requisite. In spite of the fact that several technologies are available through ICAR system, there are no takers in the industry due to poor economic viability of such ventures. The discipline of Animal Health is, therefore, at cross roads. On one hand, the developed biologicals (diagnostics and vaccines) are available and at the same time, they cannot be used by the stakeholders. As a policy issue, the Central Govt. should take the scaling up and commercial manufacturing, since any investment is going to have a large pay off through reduction in disease losses, increase in productivity and better health of animals and human being.

The Animal Science and Veterinary Institutions, particularly those in the SAUs are acutely under staffed to the tune of over 50 percent, which is a serious situation. A graduate after over five years study finds academic pursuit less remunerative and our poorly equipped colleges offer no challenge to these graduates. There needs to be a policy change in a) recruitment qualification, b) salary structure c) infrastructure facilities and d) a massive HRD support.

ICAR over past decades has grossly been dominated by the core crop sector and the animal sector has not only received a poor secondary status but has been neglected as regards its sectoral strength and potentialities. Judging the importance of the veterinary sciences in the current context of future total agriculture growth and national economic prospectus, particularly among the rural populations, there is an imperative need for having separate DIVISIONS for Livestock resources, Livestock feeds and feeding, and Livestock Health in ICAR.

Important domestic animal (dogs and cat) and wild animals are not at present covered under the purview of the Council and there is no programme on their health and management. These animals are in fact vital links in animal and human disease and therefore should come under the research and education agenda of ICAR.

Livestock extension is presently a part of and modeled on agriculture extension. But livestock extension, which is primarily based on providing services and goods, needs to be treated differently from crop related extension activities based mainly on transferable knowledge. Services and goods involve costs, which are of much higher magnitude than transfer of knowledge alone.

Over the years, limited studies are available regarding the quantification of inputs and outputs on yearly basis among various species under different production system. A real time economic analysis on input-output ratios and impact of livestock industry for sustainable livelihood of rural people needs to be undertaken.

Considering the National and International scenario and the future demand it is recommended that the Council should undertake the following programs.

- ❖ Establishment of a repository of pathogenic microbes and a national repository of microbes of dairy and food use.
- ❖ A national center for pet animals
- ❖ A national center for ethno medicine.

Currently total fluid milk production out paces consumption pattern with a 4.5 % annual increase, it is envisaged that during the next few years, a large quantity of fluid milk will be in excess. The main reason for this, being the lack of purchasing power by the vulnerable population. This calls for a major effort to evolve processes and technologies to convert the excess milk to products, package them and market them both nationally and internationally. Clean milk production under rural conditions, milk hygiene and quality assertion will undoubtedly supervene other considerations.

Low fertility rate in AI program and lack of quality assertion in frozen semen is a great impediment in breed improvement and animal reproduction program. A large number of parameters for judging processed semen are available. Since ICAR Institutions have a rich resource of genetic material, such evaluation is mostly not up to the standard mark. A Central referral laboratory for quality assurance of semen and embryos therefore is essential with a designated authority for control of semen through a National Semen Grid.

There is no 'State of the Art' animal farm with any of the Institution where latest management, techniques and technologies are practiced. This is particularly true for the teaching Institutions. The 'State of Art' facilities for small animal units to serve as demonstration becomes essential.

Biotechnological research and application in animal production has remained segmented with support to individual scientific project, but no major program has been launched with a clear end of the program objective. In spite of small units having been set up, in some individual ICAR/ SAUs, there are no major program focused to the utilization of techniques and technologies. As an R&D initiative, ICAR should take up with adequate infrastructure; manpower and contingency support the following programs.

- ❖ A National Buffalo genomic program encompassing exploitation of the genetic superiority of the world's best buffalo breeds like Jaffarabadi and Murrah.
- ❖ A bovine genetic genomic initiative on milk producing animals of the country which are in sizable number and whose breeding tracts are identified (Kankrej, Ongole)
- ❖ Genomics for high fecundity exploitation among sheep and goats (high prolificacy- Black Bengal, twining-garole sheep).
- ❖ Transgenics for modification of milk, carcass growth and composition, disease resistance, fiber and hair and the manufacture of pharmaceutical.
- ❖ Gene environment interaction for disease and stress resistance.

Since the scientific manpower available in the Council is already having a commitment to their program and since each such scientist is associated with an on-going program the new challenging areas of research mentioned above in biotechnology do not find any scientific takers. To expedite the research investigation, it is imperative that a new mandated laboratory/institute be set up with expertise selected from the best functioning laboratories in the world and the scientific personnel given full functional autonomy to deliver a time targeted output.

5.0 Information Systems and Human Resource:

The information and the management system in the central as well as State A.H. departments is either non-existing or has crumbled to such a pathetic and non-responsive state that the whole future of the department of Animal husbandry and Dairying looks bleak and in a state of limbo with non professionals not able to effectively service the technical areas. This has led to complete disorganization; poor plan implementation and pathetic target achievement. There is an urgent need for a central and state interaction with ICAR to streamline the total programme implementation. The departmental and the Government policy need to be recast and implemented.

1. Persons occupying the management positions in the central and the state govt. Institutions should be Professionals and have a clear vision about the needs of the country and possess leadership quality.
2. Because of distortions in personnel and incentive policies, the R&M system has become highly rigid and opaque and both central and state systems have resorted to highly straightjacketed recruitment and omnibus time-scale approaches for advancement.
3. Although government has given autonomy to ICAR, but in practice the autonomy stops at archaic government rules. No worthwhile work could be done unless the scientist is empowered to undertake his/her research program without any administrative hindrance.

4. With the ban on fresh recruitment of scientist at entry level, the ratio of RMP scientist and working scientist has been distorted. Divisions in many ICAR Institutions are in a precarious condition due to very poor strength of scientific manpower particularly the bench workers; most of the scientists are now busy with day-to-day administrative works.

5. Recruitment to Animal and Veterinary Science colleges in ICAR/State Agriculture Universities needs a policy change. At present, there is a common recruitment policy for the agriculture and veterinary graduates. The veterinary graduates spend five years for their professional degree and are at a disadvantage with respect to recruitment. The paucity of trained manpower and the availability of better avenues in the State Veterinary Services or private practice happen to be the greatest deterrent for scholars joining for post-graduate program. To tide up the deficiency in availability and to encourage the young and bright professionals to go for a carrier in research and teaching, the recruitment to the Assistant Professor level should be B.V. Sc& AH qualification, with the condition that the said graduates will have to complete their Masters' program within five years period and will be formally allowed two years study leave after three years of regular job. Failing to complete this requirement, their services will have to be terminated.

6. Due to visible apathy towards the function of the Veterinary Institutions, the infrastructure of most of the Veterinary Colleges in shamble and devoid of modern diagnostic and research facilities. As a policy issue, there should be one time grant of 10 cr. to each College given over a five-year period, as a "Catch Up Grant" for which there should be a Central Plan Allocation.