SECOND REPORT
STANDING COMMITTEE ON AGRICULTURE
(1993-94)

TENTH LOK SABHA

DEPARTMENT OF AGRICULTURAL RESEARCH & EDUCATION— ANNUAL REPORT (1992-93)

Presented to Lok Sabha on ..... *December, 1993*
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LOK SABHA SECRETARIAT
NEW DELHI

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3. Shri Hari Pal Singh—*Under Secretary*

* Resigned from the Membership w.e.f. 17 May, 1993.

PREFACE

I, the Chairman of the Standing Committee on Agriculture (1993-94) having been authorised to submit the Report on their behalf, present this Second Report on the Department of Agricultural Research & Education—Annual Report (1992-93).

In this Report, the Annual Report (1992-93) of the D.A.R.E. has been examined in detail, keeping in view the importance of agricultural research and education in our country. The Committee also took evidence of the representatives of the Department of Agricultural Research & Education on 28th June and 13th July, 1993. The Committee wish to express their thanks to officers of the Department of Agricultural Research & Education for placing before them the material and information which they desired in connection with the examination of the subject and for giving evidence before the Committee.

3. The Report was considered and adopted by the Committee on Agriculture (1993-94) on 14th October, 1993.

NEW DELHI
December, 1993
Pausa, 1915 (Saka)

NITISH KUMAR
Chairman,
Standing Committee on Agriculture.

1. INTRODUCTION

1.1 One of the regular features of parliamentary business is the presentation of Annual Report of the Central Ministry/Department/ Institution/ Organization/ Public Undertaking which is presented to the Parliament every year during the Budget Session. The Annual Reports are required to give a very cogent, authentic and coherent information about the activities undertaken and achievements made thereof by the respective Ministries/Departments during the preceding year. They are also to throw light on the new proposed schemes/programmes to be taken up during the succeeding year. Their importance can be gauged by the fact that Demands for Grants are discussed and passed on the basis of the information contained in them.

1.2 In this Report, the Committee have examined the Annual Report (1992-93) of Department of Agricultural Research & Education.

1.3 The Department of Agricultural Research & Education (DARE) was created in December, 1973. This Department provides the necessary governmental linkages for the Indian Council of Agricultural Research (ICAR). The major functions of DARE as given in the Annual Report are:

(i) To look after all aspects of agricultural research and education (including animal science and fisheries) involving coordination between the Central and state agencies.

(ii) To attend to all matters relating to ICAR and all matters concerning the development of new technology in agriculture, animal husbandry and fisheries, soil and land use survey and planning.

2. INDIAN COUNCIL OF AGRICULTURAL RESEARCH (ICAR)

2.1 The Indian Council of Agricultural Research (ICAR) is an apex body responsible for promoting, conducting and coordinating agricultural research, education and primary extension education in the country. The Council is directly involved in undertaking research through 46 Central institutes, 9 Project Directorates, 20 National Research Centres established so far, on fundamental and applied aspects of individual crops, commodities or disciplines which have direct relevance to agriculture, animal husbandry, fisheries and allied sectors. The Council also operates 71 multi-location, multi-disciplinary, All India Coordinated Research Projects on important commodities and research areas through the 26 State Agricultural Universities and selected few public and private institutions. The country has been divided into 120 district agro-climatic zones and in each one of them, a multi-disciplinary regional research station has been

established under the ongoing National Agricultural Research Project (NARP).

2.2 The educational programmes are by and large being conducted through 26 Agricultural Universities located in the various important states. Four of the ICAR's Institutes, *viz.*, Indian Veterinary Research Institute, Indian Agricultural Research Institute, National Dairy Research Institute and Central Institute of Fishery Education also perform educational functions by offering courses for post graduate degree programmes in the capacity of well recognised "Deemed University" and award degrees. The National Academy of Agricultural Research Management (NAARM), Hyderabad, trains new Agricultural Research Service (ARS) recruits in various aspect of project planning, implementation, Monitoring and Research Management. It also organizes orientation courses for inservice scientists, management personnel, administrators and other planners of agricultural universities and the ICAR system.

2.3 In Agricultural Extension ICAR has the responsibility of conducting first-line demonstration for the transfer of improved technology to the extension/State functionaries and the village level workers as well as to selected farmers. Towards this end, the Council has been operating projects like National Demonstrations Operational Research Projects and Lab to Land Programmes at 301 centres in the country. The Council has established a network of 183 Krishi Vigyan Kendras (KVK) for imparting on-farm training in various aspects of agriculture, animal husbandry, fisheries and allied areas for youth, farm men and women and other categories of rural workers. These programmes also have back up support in the form of 'Training Centres, for providing an up-to-date knowledge of the farm worthy advancements made in research.

2.4 ICAR came under the formal ambit of the Planning System during the Fourth Five Year Plan. The Planning process has been based on four cardinal objectives: growth Self-reliance, Social justice and modernisation. The R&D schemes in agriculture have a focus on these objectives to achieve increased productivity through better management, technological upgradation and modernization of agricultural practices. Over the years, the objectives and mandates of the Schemes have been modified, resources redeployed and the necessary infrastructural facilities developed periodically, so as to help the various R&D Units to develop farmworthy technologies leading to significant advances in production of agricultural products and by products.

2.5 In 1965, all the research organizations working in the field of Agriculture (including Horticulture), Animal Husbandry (including fisheries), Soils, Agricultural Engineering was transferred to ICAR, ICAR was also entrusted with the responsibility of fostering and supporting the growth and development of Agricultural Universities in the country. In certain areas of research like Bio-technology, genetic engineering,

molecular biology, tissue culture etc., other research organizations like CSIR, DST also undertake research programmes.

3. VIII PLAN PRIORITIES IN AGRICULTURAL RESEARCH & EDUCATION

The performance budget 1992-93 of DARE/ICAR has indicated that following priorities and thrust areas in respect of agricultural research, education and extension have been identified for the VIII Plan:

Inventory of Natural Resource base, especially in the area of land use, water use and agro forestry and wastelands systems for an identified area/ watershed.

Conservation of Germ Plasmah Resources and their Planned exploitation through genetic enhancement centres, technology blending centres for plants, trees, livestocks and fisheries.

Enhancing productivity through evolution of new high yielding hybrids/ varieties/breeds/strains with tolerance to biotic stresses.

Development and refinement of Dry Farming Technology.

Improving Integrated Nutrient Management System.

Development of Integrated Pest Management. Practices to optimize plant protection.

Diversification of Agriculture with emphasis on Agroforestry, livestock and fisheries.

Energy Management in Agriculture.

Post Harvest Technology and Engineering with emphasis on agro-processing and value addition.

Fostering excellence in Research and Education programmes.

Transfer of technology and improving information and communication systems.

Human Resource Development.

4. ALLOCATION TO DARE/ICAR

4.1 The programme-wise financial allocations proposed for the Eighth Plan and allocation approved by the Planning Commission are as given.

SECTOR	EIGHTH FIVE YEAR PLAN Outlay proposed	Outlay approved
1	2	3
		(Rs. in crores)
1. RESEARCH		
i) Crop Science	359.35	255.00
ii) Horticulture	106.31	100.00

	1	2	3
iii)	Soils, Agronomy & Agro-forestry	293.61	150.00
iv)	Agricultural Engineering	81.25	51.00
v)	Animal Sciences	237.08	140.00
vi)	Fisheries	82.16	65.00
vii)	Agril. Economics & Statistics	12.02	9.00
2.	AGRICULTURAL EDUCATION	220.00	140.40
3.	EXTENSION EDUCATION	267.00	160.00
4.	ICAR HEAD QUARTERS QUARTERS & DARE	50.00	20.00
5.	FOREIGN AIDED PROJECTS	300.00	201.60
		2008.78	1300.00

4.2 The financial requirement proposed for the VIII Plan (1992-97) was Rs. 2008.78 crores. While the allocation provided by the Planning Commission is only Rs. 13.00 crores. ICAR has stated that the Planning Commission have made large reduction in the Plan allocation to ICAR/ DARE. Responding to a query raised by the Committee regarding the impact of the budget reduction on the agricultural research ICAR replied that due to paucity of funds the following schemes have been dropped during the VIII Five Year Plan:

(i) AICRP on mechanization of Hill Agriculture

(ii) Advance Centre on village studies

(iii) NRC on Structures & Environmental on livestock & Plants

(iv) Pilot studies in rural agroprocessing industries

(v) Advance Centre on energy management in agriculture

(vi) AICRP on utilization of low value fish for development of socio-commercially acceptable products.

(vii) AICRP on diversification of aquaculture to develop fish farming system through integration with various crops and animal agriculture system.

4.3 ICAR also stated that it may be appreciated if adequate support to Agricultural Research, Education and Extension is not provided for at this juncture, there is every likelihood of substantial shrotfall in meeting the food production targets by 2000 A.D. In fact, the food production is to be stepped up to 3.5 per cent per year from the present level of about 2.8 per cent per year, i.e. increase of 7 million tonnes per year against 3.5 million-tonnes per year at present. Thus, agricultural sector has to be geared to face this challenge and the agricultural research and extension sector needs further strengthening to build up export capabilities. The present allocation of Rs. 1300.00 crores by the Planning Commission for VIII Plan fall very short of ICAR expectation rather it has greatly disappointed and is a pointer to a gloomy picture for the coming future.

4.4 The Ministry has stated that since Agricultural Research is a continuing Process, inadequate financial support will lead to slowing down of the technology generation process. The impact of this may not be realized immediately but over a period of time, it may lead to some serious dis-balance in the Agricultural Production System affecting the production adversely. The quantification of such short fall may, however, be difficult to make.

4.5 The agricultural Research has not been getting adequate financial support in the successive Plan. It has been very well brought out by the working Group of the Planning Commission on Agricultural Research & Education for VIII Plan formulation. The (%) of Plan allocation to ICAR from IV to VII Plan declined from 0.36% to 0.23%, it has further declined to 0.193% during the VIII Plan period.

4.6 The Ministry has stated that in view of dropping of the activities indicated earlier, the pace of technology generation would definitely be slowed down.

5. INVESTMENT ON AGRICULTURAL RESEARCH & EDUCATION

With the passage of time Agricultural Research & Education in India has become an important area where significant public investment has become necessary not only to strengthen the on-going research projects but also to initiate research in new areas such as dryland regions, coastal zones and other geographical regions not endowed with favourable natural resources for generation of appropriate technologies. Research to step up yields of most of the crops, livestocks etc. is urgently needed. Furthermore, substantial investment is required in "Social engineering" along with genetic engineering so as to make the fruits of agricultural research available to the millions of farmers especially, the small and marginal ones. Research in social science which has not so far been given the importance it deserves should be strengthened so that the biological revolution can have both forward and backward linkages in the society at large. All these activities require increased investment in agricultural research. The follow-

ing table shows the growth in agricultural research investment by the ICAR over time:

*Financial outlay for Agricultural Research (ICAR) Over Successive Five Year Plans

Plan period		Total plan outlay for ICAR (Rs. in crores)	Number of Scientists (Thousands)
IV Plan	(69 to 73)	85.00 (189)	—
V Plan	(74 to 78)	153.56 (222)	—
VI Plan	(80 to 84)	340.00 (340)	13.0
VII Plan	(85 to 90)	425.00 (305)	14.0
VIII Plan	(92 to 97)	1300.00 (575)	19.0

Source: ICAR, Draft Eighth Five Year Plan 1992-97 and Annual Plan 1992-93 Table: (1.3)

Figures in the parentheses in column 2 are in terms of 1980-81 prices.

The numbers shown in the above table convey an impression that the growth in research investment in ICAR is very high. The Ministry is, however, stated that this is not true. The compound growth rates, both nominal and real are given below:

Period between	Nominal Growth Rate (percentage per annum)	Real Growth rate (percentage per)*
4th & 5th Plan	12	3.27
5th & 6th Plan	14	6.27
6th & 7th Plan	4	(−)2.15
7th & 8th Plan	17.3	9.48

*Real growth rates have been computed at 1980-81 prices.

5.2 It may be seen from the above table that the growth rate was negative between the 6th & 7th Plan outlay in real terms. This has,

however, been corrected while finalising the allocation for the 8th Plan. The Ministry has also pointed out that the number of scientists increased from 13 thousand in the sixth plan to 19 thousand in the 8th plan (mainly due to expansion of State Agricultural Universities). The financial resource available per scientist varied from Rs. 26.15 lakh in the sixth plan to Rs. 21.78 lakh in the 7th plan and Rs. 30.26 lakhs in the 8th plan at 1980-81 prices. Although there is some increase in the financial resource available per scientist in the current plan a substantial part of such resource is meant for building and developing research infrastructure and hence less and less fund is made available for research contingencies.

5.3 Moreover, the outlay in the 8th plan for agricultural research under DARE / ICAR (Rs. 1300 crores at current prices) forms duly 0.299 per cent of the total plan outlay from the Govt. side.

5.4 In this connection, it may be useful to know that the developed countries spend about two per cent of their agricultural GDP on research. In contrast, India's total agricultural research expenditure constitutes about 0.32% of its agricultural GDP.

6. RETURNS ON INVESTMENT IN AGRICULTURAL RESEARCH

Estimation of returns on investment in agricultural research is extremely difficult mainly because of a lot of subjectivity and methodological imperfections. Specifically, attempts at estimating returns on research investment have been made even though the methodology and theoretical framework used in such studies are highly controversial and often misleading. Most of the theoretical development in measuring the contribution of agricultural research to growth are inadequate to account for empirical realities. Particularly, the models used in estimation of return on agricultural research investment often do not consider extraneous consideration and exogenous variables leading to the "spill-over effects". Nevertheless, some attempts have been made in the last two decades to estimate the rate of returns on agricultural research investment. Despite the subjectivity and the methodological inadequacies, these estimates are indicative of return on investment in agricultural research.

Authors	Year	Estimated rate of return
Jha and Evenson	1974	40 per cent
Kahlan and Bal	1976	72 per cent
Evenson and Mcknisey	1991	177 per cent

These studies indicate that returns on research investment continue to be much higher than most other investment opportunities and that there is considerable under-investment in agricultural research which should receive much higher priority in financial allocation.

6.1 A comparative study on resource allocations to National Agricultural Research Systems in developing countries which was undertaken by the International Service for National Agricultural Research (ISNAR) and International Food Policy Research Institute (IFPRI) in 1981. This study was undertaken to assesses the progress in the development of Agricultural Research Systems in developing countries since 1975. The report is based on the analysis of data from 51 countries. According to this report, the national expenditure on Agricultural Research Systems have risen by 71% and Scientist numbers by 38% in five years.

6.2 Annexure 1 Lists the changes in expenditures on Agricultural Research and Number of Agricultural Scientists during the decade 1970-80 in 47 countries. It indicates that considerably more resources are being invested in National Agricultural Systems now then a decade ago. The investment in relation to Agricultural GDP, the average level for 51 countries has risen from 0.3 per cent in 1975 to 0.56 per cent in 1980.

6.3 Annexure 2 shows that 62 per cent of expenditure and 46 per cent of the scientist manpower among the 51 developing countries is concentrated in only five countries and 88 per cent of the expenditure and 85 per cent of scientists in 15 countries. It may be noted that India is among the 5 and 15 countries as listed in Table 2. Even though India belongs to the first category, the financial investment for Agricultural Research Systems has been stagnating at the level of 0.3 per cent during the last two decades, if not declined in actual monetary value and therefore, there is a need to increase the support to Agricultural Research Systems.

6.4 Annexure 3 provides R&D expenditure per capita at a percentage of GNP for certain selected countries in developing and developed countries. The total R&D expenditure (including Agriculture) as a percentage of GNP is only for 0.9 per cent as compared to Australia 1.3 per cent; Japan 2.8 per cent; and USA 2.6 per cent. As already indicated the share of Agricultural Research is only 0.3 per cent.

6.5 Annexure 4 indicates the growth of Indian agricultural Research Institutes / State Agricultural Universities under different Five Year Plans and Annexure 5 indicates the growth of Financial outlay during the same period. It may be seen that on one hand the number of Institutes / Schemes have risen from 64 to 198, the plan allocation as percentage of total plan outlay has been steadily declining from 0.535 per cent in the Fourth Five Year Plan to 0.196 in the VIII Five Year Plan.

7. CROP SCIENCE AND GENETIC RESOURCES

Over the years there has been significant improvement in the productivity and production of several important crops such as wheat, rice, sorghum, maize, sugarcane, cotton, potato and others. However, produc-

tivity of pulses and coarse cereals continue to be low. Despite a constant increase in production of oilseeds, their production fluctuates with monsoon.

7.2 Plant genetic resources provide the basic raw material for the country's crop-improvement programmes. The National Bureau of Plant Genetic Resources (NBPGR) made a special effort towards their collection through exploration, introduction from abroad, evaluation, documentation and long term conservation. Seed samples and other propagules under import and exchange for research were subjected to rigorous quarantine inspection to exclude associated pathogens, pests and weeds.

7.3 The main thrusts in the field of Crop Sciences during 1993-94 in the following areas of research is as stated by ICAR:

1. Collection of germplasm of agriculturally important crop plants from unexplored areas.
2. Development of promising varieties of oilseeds, pulses, cereals and coarse cereals with inbuilt resistance to diseases and pests.
3. Major emphasis on hybrid research in crops such as rice, maize, bajra, sorghum, sunflower, cotton, castor, pieonpea and Indian Mustard.
4. Genetic improvement in quality traits emphasis required on the development of export-oriented Varieties and also for diversified uses as value-added products.
5. Breeding crops for tolerance to abiotic stresses, especially drought, salinity, fost and heat.
6. Development of seed production and seed technology strategies for various crops.
7. Development of integrated pest management strategies to optimise plant protection practices.
8. Emphasis on research relating to biotechnology as a promising tool for evolving new and superior genotypes.

7.4 In its reply furnished to the Committee, ICAR stated that the funds allocated for this sector under plan for 1993-94 is Rs. 48.79 crores and will be inadequate. An additional resource allocation of Rs. 10.00 crores will be required since investments in the above eight priority areas is to be made. Much of the cost will be for upgradation of instrumentation and laboratory facilities, contingencies and cost of field experimentation. At the moment most of the budget allocation goes away for committed liability and hardly a small amount is left for various other research requirements.

8. SOIL AND WATER MANAGEMENT

Natural resources of land and water presently avaiable are inelastic and are being lost rapidly for productive enterprises. The alarming growth of metropolis and urban areas is depriving the country of very valuable and fertile areas for crop production. Added to this are the large tracts of problematic and unproductive areas comprising of saline and alkaline soils presently estimated to cover about 11.00 Mha and also a large tracts of cultivable land lost due to wind erosion covering about 13 Mha and through water erosion effecting over 140 Mha. All these add to an enormous wastage of natural resources valuable for sustaining productivity and production of agriculture.

8.2 Water is another important resource which is not fully utilised and therefore becomes a vulnerable asset due to poor water management, fast rising river beds leading to frequent floods and siltation in the water tanks resulting in shrinking water body area for inland fisheries. Of about 400 Mha of water received through precipitation every year, only 10% is utilized and rest goes waste. Irrigation resources so far have been developed to cover only 43 Mha of net area (56.22 Mha gross area).

9. BIO-TECHNOLOGY

The latest biotechnologies such as recombinant DNA technology, tissue culture, microbiology and bio-processing have opened vast opportunities for developing new plant, animal and fish genetic materials; improving reproduction in livestock and developing new diagnostics and vaccines; and improved biological nitrogen fixation and biomass utilization. The diversity in variants obtained by protoplast culture, genetic basis and stability of somoclonal variation, plant improvement and other useful traits are areas of interest.

9.2 In a note furnished to the Committee, ICAR stated that improvement in terms of resistance to various biotic and abiotic stresses through biotechnology would be an area of great relevance. In animal science and fisheries, the use of molecular genetics in genome analysis for genetic characterisation, genetic resource conservation and improvement through cry-preservation of sperms in species where not yet developed, gametes, DNA fragments and use of multiple evaluation embryo transfer, oocyte culture and in-vitro fertilisation for increasing rate of genetic improvement and salvaging of superior genetic material, reproducltion and nutritional manipulaltions, development of sere diagnostics using mone-colonal antibodies, DNA probes and synthetic and sub-unit vaccines through DNA recombinant technology are areas which would require emphasis.

10. FISHERIES

India has rich aquatic resources comprising rivers (29000 KM), canals (113,000 KM), Major reserviors (1.892 MHAO, tanks/ponds (1.996 Mha), and marine EEZ (2.02 Msq. KM) brackishwater areas (0.9 Mha) derelict and marine Swampy waters (1.036 Mha). India also has one of world's most extensive coastline of 7517 Km and therefore, has an excess to a wide variety of tropical marine produce from its EEZ. From this renewable resources, only 59% was exploited during 1990-91. As such, the Indian ocean is the least fished region and more so the Indian EEZ.

10.2 In a note furnished to the Committee, ICAR has stated that the share of India in the terms of export will be over Rs. 2000 crores by the end of the century. The future gap between the demand and supply has to be met by culture fisheries through upgradation and transfer of existing levels of technology in farmer's ponds, propagation of fresh water and brackish water aquaculture in new areas with new species and high technology intensive system aquaculture as an industry in ponds, cages and pens. Similarly, a sizeable quantum jump is possible in marine sector in the EEZ by extending the areas of operation beyond 50m, depth zone with adequate post-harvest and marketing support and also be replenishing the dwindling natural stocks through sea renching, to met an additional 1.5—2.0 million tonnes.

11. SEEDS

The Annual Report (1992-93) os DARE/ICAR has indicated that during 1991-92 against the indent of 17,205.5 quintals of breeder 23,783.37 quintals of breeder seed of cereals, coarse cereals, pulses, oilseeds, fibre and forage crops have been produced and cost effective, desease-free seed production technology for hybrid seed production of pearlmillet has been developed.

11.2 In a note submitted to the Committee, it has been stated that at the end of VIIth Plan high yielding varieties/hybrids cereals, oilseeds, pulses and commercial crops have been identified released in addition to varieties/hybrids possessing inbuilt resistance/tolerance to various biotic and abiotic constraints Super fast and early maturing high yielding varieties of rice and disease resistant varieties of wheat suitable for late sowing conditions have opened ways for sustained productivity. India has made the first hybrid cotton in the world. Sunflower hybrid MSFH-17 has recorded 16% higher yield and 23 per cent higher oil yield. The production of basic and breeded seed of various high yielding varieties and hybrids have been stepped up considerably over the sixth plan i.e. about 400% over the production of 1984-85.

11.3 The new policy on seeds Development which came into effect from Ist Oct. 1988, ensures Indian farmers access to best seeds availability anywhere in the world, NSP III launched in March, 1990 with the

assistance of World Bank is carrying on its main objective by ensuring timely and adequate availability of certified/quality seeds of suitable varieties at reasonable prices. NSP III also assures to improve the working efficiency of National and State level public sector seeds Corporations so as to make them economically viable. At present the public and private sector institutions in our country have not been able to satisfy the needs of the farmers. Presently both sectors are able to produce only 11% of our quality seed demands.

12. HORTICULTURE

Presently, horticulture crops are grown in 12 Mha (i.e. 7% of total cropped area of the country) of which 2% is under vegetable. The production of horticultural crops contributes to over 18% of the gross agricultural output in the country. India is the third largest producer of fruits after Brazil and USA. In respect of vegetables, India is only next to China.

12.2 In a note furnished to the Committee, ICAR has stated that at the end of VII Plan, 39 improved varieties of fruits and 119 improved varieties of vegetables in 16 crops have been developed. In plantation crops a total of 67 improved varieties of medicinal and aromatic plants have been developed. Two promising high yielding hybrids of mushroom have been identified which yielded 60—70% more mushroom per unit. The period of composing has been reduced from 28 to 18-20 days. In floriculture also two promising hybrids in rose have been developed. Oil palm has emerged as a potential new oil yielding plant for which seed production techniques, tissue culture and several management practices have been developed for growing the crop on a large scale.

12.3 Credit institutions like NABARD and NCDC have supported post-harvest Management of horticulture crop. Import of seeds and planting material of horticulture crops has been permitted to improve the seed supply. Mushroom has also been given importance alongwith horticulture and medicinal plants.

13. BIOFERTILIZERS

One of the most important components of increasing our agricultural production has been use of chemical fertilizers. Biofertilisers improve soil structure and texture, water holding capacity, supply of nutrients and proliferate useful soil organisms. It is cheaper, pollution-free and renewable.

13.2 As given in the Annual Report ICAR has been providing research support in the area of Microbiology with particular reference to Biological nitrogen Fixation using micro-organism such as Blue Green Alge and Azoils for rice culture and bacterial fertilizers such as Rhizobium specise for symbiotic Nitrogen Fixation and Azospirilum and Azotobacter for non-symbiotic Nitrogen fixation.

13.3 There is currently an All India Coordinated Research Project on Biological Nitrogen Fixation working at the following centres (1) USA, Bangalore; (2) TNAU, Coimbatore; (3) BCKVV, Kalyani; (4) JNKVV, Jabalpur; (5) MAU, Parbhani; (6) HAU, Hissar; (7) MSU, Baroda; (8) BHU, Varanasi; and (9) Annamalai University.

13.4 Bio-fertilizers research is also being funded and strengthened by programmes sponsored by the Department of Technology There is also an on-going Project on Technology. Development and Demonstration on Biofertilizers BGA and Rhizobium by the Department of Bio-Technology.

13.5 The Department of Bio-Technology has also provided funds for the establishment of a National facility for BGA and National Rhizobium culture collection centre at IARI, thus serving as a national repository for collection and preservation of authenticated strains of nitrogen fixing micro-organism.

13.6 During evidence, highlighting the importance of organic/bio-fertilizers for maintaining sustainability in agriculture, DDG (soil, Agronomy & Agro-forestry), ICAR stated:

> "Inorganic's use cannot keep on sustainability. Therefore, integrated use of organic and inorganic will be the only answer to it."

13.7 Indian agriculture is primarily rain dependent. Nearly 70% of cultivable land of our country depends on rain, consequently restrict the use of chemical fertilizer and demanding biofertilizers. These biofertilisers can prove a boon for small and marginal farmers (who are 75% of the total farmers in our country) whose purchasing capacity does not allow chemical fertilisers but they can supplement them considerably and enhance production 20% in rainfed area.

14. CHEMICALS & PESTICIDES

Easily adaptable and economically viable integrated pest management strategies have been developed for the control of major pest in rice, cotton, pulses, sugarcane etc. Large success in biological control of crop pests has been in the conservation of biologically useful organisms through either selective use of pesticides or their avoidance. The control of pyrilla and top borer of sugarane, mealy bug of coffee, lepidopterous pests affecting cotton, tobacco, coconut, sugarcane etc. are some of the examples where success has been achieved through the release of bio-control agents. Spectacular success has been achieved in biological control of two aquatic weeds, *viz.*, water hyacinth in Karnataka and Kerala and water fern in Kerala.

14.2 The Integrated Pest Management has the objective of maximisation of returns to the farmers from their efforts to control diseases and reducing the adverse effects of toxic chemicals.

14.3 While responding to the concern of the Committee regarding unscientific and indiscriminate use of especially banned agro-chemicals, the Secretary, DARE stated:

> "As regards the agro-chemicals that you referred to, that again is something which is of considerable concern to us for two reasons. Firstly, their residues pose problems of health; secondly, their indiscriminate use leads to build up a resistance in target organisms against which they are applied. This may also affect our export prospects if we do not take account of the residues of these chemicals which are not acceptable to countries where we want to export."

14.4 The Committee wished to know the Ministry's opinion about the banning of hazardous agro-chemicals. In this connection, the witness during the evidence said:

> "There are about seven chemicals about which deliberations are going on as to what would be the implication if they are banned immediately. Then, we have to see what are the alternative chemicals which might have to be manufactured and whether they would be available in as much quantity as would be required."

15. ANIMAL SCIENCES

At present almost 30% of the total agricultural output is credited to Animal Science. The technology mission on Diary Development was established to dovetail the activities of the Central and State governments, NDDB and ICAR research institutes for better implementation of programmes.

15.2 During the 4th Five Year Plan the Animal Sciences Division in the ICAR had initiated a number of multi-disciplinary research projects in various species of animals and since then these projects have been functioning under the framework of All India Coordinated Research Projects. Under these projects, it was envisaged to generate superior strains through the combination of some of the exotic breeds and indigenous breeds in various ecological regions of the country. A number of exotic breeds, *viz.*, Holstein, Friesan, Jersey, Brown Swiss in cattle for augmenting milk production, Rambouillet, Russian Merino for augmenting fine wool and Dorset Suffolk for improving meat production in sheep and Sannan and alpine for improving milk production in goats as well as Angora for increasing monair have been tried. Under the AICRP on Poultry various high yielding layers and broiler strains have been studied both with respect to their performance under pure breeding and under strain crossing with a view to develop high yielding crosses.

15.3 In live-stock improvement research the major emphasis has been on diary, cattle have received greater attention than buffaloes. In addition to contributing to milk the buffaloes has important contribution to meat and draft. In a note given to the Committee, ICAR has stated that there is

need for intensifying research on meat production both from conventional and non-conventional species. This should cover research on genetic improvement through selection and cross-breeding.

16. POST HARVEST TECHNOLOGY

Post-harvest technology's main activities relate to: (i) assessment of lossess and how to reduce them (ii) developing new technology for storage at farmers' level not at the mandi and higher level; and (iii) developing primary and secondary processes so that the value addition can be enhanced. There is an all India project on post-harvest technology, which has been operating at fourteen different centres in India.

16.2 These centres have been working on the specific problem relating to oilseeds, pulses and cereals. During 7th Plan at the national level a Central Institute of Post-harvest Engineering and Technology for agro processing and value addition of cereals, pulses, oilseeds, vegetables and fruits at Ludhiana was established.

16.3 It is a well-known fact that post-harvest technology area has been given least importance in our country. During evidence, responding to the concern of the Committee about the gloomy picture of post-harvest technology the Secretary, DARE said,

> "We do agree with you that post-harvest technology has been one of the weak areas."

He further stated:

> "We are in a diversification of our agriculture and giving emphasis to high value production like floriculture, and so on and we are interested in giving emphasis to value addition to agricultural production so that farmers get higher returns."

17. AGRICULTURE EXTENSION

The Division of Agricultural Extension of the DARE/ICAR is devoted to first line extension education efforts for the farmers as well as the extension workers of the State Governments and NGOs. The first line extension education projects of the ICAR aim at: (i) promptly disseminating the latest agricultural technologies to farmers and extension agencies; (ii) testing the latest technologies in the socio-economic conditions of the farmers; (iii) analysing the constraints to their adoption and providing feed back to scientists; (iv) evolving models of transfer of technology and farming practices appropriate to local conditions; and (v) promoting research in transfer of technology. The first line projects are:

(1) Krishi Vigyan Kendras (KVKs); (ii) National Demonstration Projects (NDP); (iii) Operational Research Projects (ORPs); (iv) Lab to Land Programme (LLP); and (v) Projects for Scheduled Castes and Scheduled Tribes.

17.2 Krishi Vigyan Kendra is an innovative model to transfer the developed agricultural technologies and techniques to the farmers in a cost-effective way, the major aim to reduce the time lag between the generation of technologies and their transfer to the farmers in the larger interest of the farmers and agricultural production. To achieve this aim the following functions have been included in the design of the KVK: (i) Farm advisory services—demonstration of latest farm technologies; (ii) vocational training of the farmers, farm women and young farmers; (iii) in-service training of the field level extension functionaries of the State and governments; and (iv) on farm research farming system research. Since KVK is a very successful model for transfer of technology for reaching the unreached farmers, it has been decided by the ICAR to establish at least one KVK in each district of the country by the end of VIII Plan. The first KVK was established in Pondicherry in 1974 and since then 183 KVKs have been established. The KVKs Project at present, is being implemented by the State Agricultural Universities, ICAR institutes and some selected NGOs.

17.3 The Committee feel that the financial management of some of these KVKs have not been satisfactory. There were certain State Agriculture Universities implementing KVKs project under them, which have grossly misappropriated the funds released by ICAR for KVKs project. When the Committee sought to be informed from ICAR about the feasibility of keeping a separate head for KVKs fund. The Secretary, DARE informed:

> "Since we are State Organizations, we are governed by State requirements of audit and the State requirement of audits insist upon us that we have only one head under which audits are conducted. We will be very happy, if, through some mechanism, this money which goes from ICAR can be reported under separate heads because this will go on a long way for proper utilisation of money for the purpose for which it is set apart."

He further stressed:

> "If the account can be separate, then it will be good, Audit takes time. A new method can be worked out to audit this account."

17.4 Indian agriculture will require to produce 225 million tonnes of foodgrains to feed an estimated population of over one billion in 2000 A.D. This means an additional production of 45 million tonnes of food grains in next seven years. This places a heavy demand on the agricultural extension services for transferring latest technical know-how to the farmers for their behavioural change in agriculture cultivation.

To meet the increasing requirements of farmers in complex, diverse and risk-prone areas in the country, agricultural extension can be broad-based to include the following:

1. Land, soil and water management
2. Crop management

3. Horticulture, fruit processing and tissue culture
4. Live stock management, dairying and poultry
5. Fodder management
6. Credit and input supply
7. Promotion of women status
8. Infrastructure planning
9. Human resources development
10. Economic viability of KVKs
11. Better participation of NGOs.
12. Better participation of farmers
13. Presentation of a model agriculturally developed village
14. Better incentives for extension services
15. Better coordination between KVKs and SAUs.

Observations/Recommendations

1. The Annual Report is considered to be a very basic, reliable and instrumental document of the Ministry/Govt. Department/Public Undertaking. It is supposed to present an authentic and coherent annual record of the performance of the concerned department during the year covered in it. It is also to reflect the philosophy and perspectives of new/proposed schemes and programmes to be launched during the next financial year with the estimated budgetary allocation alongwith targeted projections.

The Annual Report (1992-93) of the Department of Agricultural Research & Education describes various activities relating to agricultural developments in the field of research, education and extension. These activities are covered under eleven disciplines. The Report does give a detailed coverage of achievements made during the year mentioned, but lacks the basic philosophy implied in it. It does not reveal an integrated approach covering all the activities relating to agricultural research, education and extension alongwith budgetary allocations made/proposed, expenditure incurred/estimated and targets achieved/projected scheme-wise/programme-wise under each disciplines.

In this context, the Committee is of the view that the Annual Report of the DARE should cover the important development during the given year under the respective discipline alongwith targets achieved/projected and expenditure incurred/estimated. It should also throw light on the proposed schemes and programmes to be launched alongwith their requirement, financial support and targets to be achieved. This will give a very crystallized idea of sector-wise and discipline-wise policies, thrusts and programmes.

2. Though the investment in agriculture research has been increasing from Rs. 85 crores in IV Plan to Rs. 1300 crores in VIII plan, which conveys an impression that the growth in research investment in ICAR is very high. This is, however, not true. The growth rate was negative between the 6th & 7th Plan outlay in real terms. The financial resources available per scientist varied from Rs. 26.15 lakh in the VI plan to Rs. 30.26 lakh in the VIII plan at 1980-81 prices. Out of this a substantial part is meant for building and developing research infrastructure and hence less and less fund is made available for research contingencies. Moreover, the outlay in the VIII plan for agricultural research under DARE/ICAR forms only 00.325 per cent of the total plan outlay from the Govt. side. In this connection, the Committee were informed that 51 developing countries are spending more than 0.56 per cent of their country's agricultural GDP while developed countries about 2 per cent of their agricultural GDP on

agricultural research. In contrast, India's total agricultural research expenditure constitute about 0.32 of its agricultural GDP and is stagnating for the last two decades.

The Committee is of the firm opinion that Indian agriculture is the backbone of the Indian economy and contributing nearly 32 per cent of the national GDP. Though this contribution has been declining from 57 per cent of the national GDP in the fifties to 32 per cent in the year 1991-92, agriculture still contributes a significant amount in the national economy. It has been recognised world-over that availability of the abundance of natural resources like water and land in India heralds new prospects for enhancing agricultural production as well as surpluses for export. But this would require substantial investment in agriculture by both public and private sector.

The Committee during the evidence have also noted that ICAR proposed an allocation of Rs. 208.78 crores under the VIII plan as suggested by the Working Group. But Planning Commission has cut it down by 35 per cent and allocated only Rs. 1300 crores under the same Plan. The Committee, in this context, is of the opinion that this allocation of Rs. 1300 crores under the VIII plan will not serve the twin purposes: firstly, to enhance the foodgrains production upto 210 million tonnes by the end of this century and secondly, to produce more and more surpluses for export. The Committee have also been informed by ICAR that if this reduction in Plan allocation continues, there can be little or no chance of enhancing the targetted food production to 210 million tonnes by the turn of the century. The Committee, therefore, recommend that the outlay for agriculture research should be targetted to reach a graded level of 1% of the total agricltural G.D.P., if there is to be any meaningful achievement in the country's research.

3. Agriculture being a State subject, ICAR's mandate as awarded by the Central Government is to develop the new agriculture research & technology and transfer the same to the farmer's community of the entire country in a cost-effective and timely manner. The role, therefore, played by the machineries directly or indirectly involved in the process of extension of these agricultural research and technologies from lab to land demands the utmost attention and priority. The extension period of these research and technology developed by the institutes under ICAR ranges from 5-7 years. The interesting and note-worthy point in this regard is that by the time these research and technology reach the farm, they become obsolete because of new horizontal development in the same sphere. Thus, this phenomenon calls for an urgent attention to speed up agriculture extension process. The Committee in this connection observe that the

present agricultural extension strategy needs to be tempered with an innovative vision to lead Indian agriculture into a prosperous era. Its basic approach requires appraisal and reorientation. The Committee also feel that unless timely and cost-effective methods for agricultural research extension are given due importance the results of newly developed research and technology would be economically unviable. The Committee, therefore, recommend that utmost thrust should be given to extend these agricultural research and technologies during the remaining years of VIII plan. The impact of agricultural extension on new techniques and technologies should also be dealt with in greater detail in the Annual Report.

4. The Committee have been informed that ICAR give State Agriculture Universities mainly three types of grants: (i) developmental activities, (ii) projects implementation, and (iii) establishment of KVK's. Over the last two-three years, it has been noticed that some SAUs are either diverting the money allocated for KVKs project to some other areas or not utilising the grants properly. During the official evidence, the ICAR's representatives also stated that such discrepancies had come to their notice.

The Committee recommend that ICAR should consider the feasibility of a separate head for KVKs project and a separate account in the each State Agriculture University for KVKs scheme. The Committee hope that the suggested measure would ensure better financial management of KVK's alongwith that of all agriculture universities.

5. The Committee have been given to understand that availability of land & water have been depleting alarmingly. The fertile potentiality of our soil has been destroyed by a number of facts like unscientific cropping, discriminate use of agro-chemicals and inorganic fertilizers, intensive farming, flood erosion, poor drainage facilities, waterlogging, salinity, alkalinity, poor drainage facilities for moisture conservation and the last but not least is the fragmentation of agricultural holdings. Likewise, water potential available in our country has not been properly managed in a cost-effective manner. The Committee have noted that out of 400 m ha of water received through precipitation every year, only 10% of it is utilised and the rest is wasted due to poor water management.

The Committee feel that unless land and water are managed properly it is not possible to step up our agricultural production and productivity. The Committee, therefore, strongly recommend that water and soil management should be given top priority during the remaining years of VIII Plan alongwith simultaneous emphasis on nutrient management in soil and drip and sprinkler irrigation systems which save 30-50% of water available at present for irrigation. Emphasis should also be given towards rainfed & dryland farming & watershed development programmes and this should be done in a time bound programme.

6. Today in our country, agriculture is taken up as a subsistence profession rather than an economically viable profession and the farmer is not allowed to process his whole produce. Even though 70% of the total population of our nation is directly or indirectly engaged in agriculture. This has been the state of agriculture because of the fact that Indian farmer is not equipped or provided with the basics of value addition, i.e. post-harvest-technology. The facilities like processing, cooling, storage and transport are to motivate and support the farmers to take on agriculture as a commercialised profession. These facilities are hardly provided to Indian farmers. There are some agro-crops, like fruits, vegetables, animal and dairy products, fibre and marine products, which require indispensable post-harvest technologies mentioned above. During evidence also ICAR representatives admitted frankly that ICAR's efforts have been weak in this field.

The Committee are unhappy to note that even after nearly ½ a century after independence agriculture continues to be an unviable profession. Even though Agriculture has been accorded a priority area in the VIII plan, the Committee feel that unless value addition to agro-commodities is given, our farmers cannot take on agriculture on commercial-lines. Thus, the Committee strongly recommend that ICAR should develop the latest post-harvest technologies qualitatively at par with international standard and this should be transferred on priority basis to the agriculturists in a cost-effective way.

7. Unabated and unchecked use of inorganic fertilisers in agriculture especially in the areas where Green Revolution took place undoubtedly increased our agricultural production and productivity to an appreciable extent but affected the fertility potential of the soil of that area. The micro-bio-organisms which help in developing, conserving and preserving fertility contents in the soil are disappearing at an alarming rate. Another factor of concern is that the irrational application of these inorganic fertilisers has also marred the nutritional value of foodgrains, fruits and vegetables.

Today, it has been recognied that the use of these inorganic fertilisers may enhance production but not productivity which is very low in our country as compared to that of developed countries. To sustain agriculture as an industry, as it has been admitted by the ICAR's representatives during evidence, the integrated use of organic and inorganic fertilisers is the only panacea to all these problems directly related to the side-effects of unscientific and excessive use of inorganic fertilisers.

The Committee recognise the importance of the use of organic fertilisers in increasing crop productivity and maintaining an ecological balance. They feel that use of organic fertilisers which increase 20-30% productivity and enrich foodgrains in terms of nutritional minerals, should be promoted by ICAR and suitable technologies to develop bio-fertilisers should be

developed and transferred the same to the farm. The Committee also recommend that integrated management of organic and inorganic fertilisers should be emphasised and popularised by ICAR and this aspect should be emphasised in the Annual Report.

8. The application of quality seeds have helped immensely in making the Green Revolution into a reality. Their adoption by the farmers of North Western region of India not only enhanced our agricultural production from 521 million tonnes in 1950-51 to 180 million tonnes in 1992-93 but also the rate of productivity.

ICAR's mandate in this sector– i.e. seeds is to develop new hybrid and quality seeds and transfer the same to the seeds producing agencies both in public and private sector. The Committee have been informed that till the end of VII Plan 261 high yielding varieties/hybrids of cereals, oilseeds, pulses and commercial crops have been identified/released in addition to other varieties possessing resistence to various biotic and abiotic constraints. ICAR also achieved one more breakthrough by producing the first hybrid of cotton in the world.

Despite ICAR's commendable efforts since its inception, i.e. 1929, the picture of the quality seeds is far away from satisfactory. Their availability and distribution are restricted only to areas where the Green Revolution took place. The farmers of other highly fertile regions endowed with enriched resources of land and water have suffered a lot due to non-availability of these quality seeds. The Committee have been informed that only 11% quality seeds of the total need are made available to the farmers in our country.

The Committee note with concern the non-availability of quality seeds in certain regions of the country. They strongly recommend that the imbalance between the production of quality seeds and their distribution should be corrected alongwith efforts to develop new high yielding varieties/hybrids of commercial crops.

ANNEXURE I

Change in Expenditures on Agricultural Research and Numbers of Agricultural Scientists, 1970-80: 47 Countries[1]

Region	Expenditures (000' US $ constant 1975 terms)					Scientist Numbers				
				Change					Change	
	1971[2]	1975[3]	1980[4]	1971/75	1975/80	1971[2]	1975[3]	1980[4]	1971/75	1975/80
South Asia (5)	41,219	73,278	139,656	78	91	2,529	6,120	12,293	42	101
Southeast/East Asia (5)	28,009	46,732	101,013	67	116	2,285	4,400	5,830	95	31
N. Africa/Middle East (5)	21,943	21,867	35,122	−1	60	1,432	1,163	1,375	−21	18
West Africa (6)	41,777	86,454	112,480	107	30	915	3,239	1,897	154	−42
East/Southern Africa (5)	18,044	18,950	27,865	5	47	513	605	861	18	42
Central America/ Caribbean (11)	18,626	22,718	59,949	22	86	967	1,393	1,680	44	21
South America (10)	110,139	160,373	342,826	46	214	4,100	5,291	5,939	29	12
Total (47)	279,757	430,372	818,911	54	90	12,741	22,251	29,875	75	33

Sources for Expenditures and Scientist Numbers:

[1] These are countries for which we have data for all three years.

[2] 1971: Boyce, J. K. and Evenson, R. E. Agricultural Research and extension Programs, Aqric. Development Council, New York, 1975. Data taken from constructed time-series tables (Tables 2.1) for 1971 expressed in constant 1975 dollars.

[3] 1975: Oram. P.A. Current and Projected Agricultural Research Expenditures in Developing Countries, Working Paper No. 30, International Food Policy Research Institute, Washington, November 1978, Annex 1.

[4] 1980: From Annex Table 1 of this report for the same countries as 1971 and 1975 data.

Note: The figures in parentheses denote the number of countries in each region.

Concentration of Agricultural Research Resources, 1980

1980	Actual 1980 Expend.	Popu-lation 1978	Country as % Tot. Expend.	Country as % Tot. Popu-lation	Country as % Tot. Ag. GDP	Expned. as % Nat'l Ag. GDP	Growth Nat'l Ag. GDP 1970/80	Number of Scientists	Percent Total No. Scientists	Number of Post-Grads.	Post-Gra-ds as % of Total Nat'l Resear-chers
1. Expenditure (over $ 50 mil.)	($ 000)	('000)									
Brazil	160.026	126.377	19.8	7.2	9.6	1.15	5.3	2,957	10.1	1,684	57
Argentina	108.648	27,056	13.4	1.5	4.6	1.64	2.3	1,064	3.6	285	27
India	101,098	693,887	12.5	39.5	24.2	0.29	2.6	7,103	24.1	2,959	29
Nigeria	79,634	77,082	9.8	4.4	7.9	0.70	−1.5	1,084	3.7	276	25
Mexico	54,181	69,994	6.8	4.0	5.7	0.65	2.1	1,269	4.3	395	31
Tot. Budget (over $50 mil)	503,587	994,396	62.3	56.6	52.0	0.67	—	13,477	45.8	4,699	35
2. 1980 Expenditure ($10-49 mil. or over 1000 scientists)											
Colombia	31,455	26,907	3.9	1.5	3.2	0.67	4.9	333	1.1	184	55
Indonesia	29,056	151,894	3.6	8.6	4.6	0.44	4.0	1,473	5.0	71	5
Malaysia	29,023	13,640	3.6	0.8	2.5	0.81	5.0	822	2.8	n.a.	n.a.
Venezuela	25,586	14,914	3.2	0.8	1.3	1.32	3.5	365	1.2	115	31
Korea Rep.	18,962	37,979	2.3	2.2	5.7	0.23	4.0	960	3.3	190	20
Bangladesh	17,385	88,705	2.1	5.0	2.5	0.48	1.6	1,642	5.6	1,262	77
Thailand	15,203	47,674	1.9	2.7	4.0	0.26	5.6	1,525	5.2	242	16
Pakistan	16,510	82,441	2.0	4.7	2.8	0.41	1.9	2,900	9.9	1,638	56
Kenya	14,204	16,402	1.8	0.9	0.9	1.08	5.5	400	1.4	356	89
Philippines	8,769	50,996	1.1	2.9	3.8	0.16	4.9	1,050	3.5	618	59
Tot. ($10-49M)	206,153	531,555	25.5	30.3	31.3	0.46	—	11,470	39.0	4,676	41
Total 1 and 2	709,740	1,525,951	87.8	86.9	83.4	0.59	—	24,947	84.8	9,375	38
3. Tot. Below $10M	98,662	229,714	12.2	13.1	16.6	0.41	—	4,451	15.2	n.a.	—
Grand Tot. 1+2+3	808,402	1,755,665	100.0	100.0	100.0	0.56	—	29,398	100.0	n.a.	—

ANNEXURE III

R&D Expenditure Per Capita and as Percentage of GNP for Selected Countries

Sl. No.	Country	Year	Per Capita R&D expenditure in US $	Per Capita GNP in US $ (Year 1989)	R&D Expenditure As % of GNP
1.	Australia	1987	153.85	14360	1.3
2.	Austria	1985	110.71	17300	1.3
3.	Brazil	1985	6.41	2540	0.4
4.	Canada	1987	216.06	19030	1.4
5.	Cuba	1987	30.14	—	0.9*
6.	Czechoslovakia	1988	177.43	3450	4.5
7.	Denmark	1987	283.30	20450	1.5
8.	Egypt	1982	1.29	640	0.2
9.	Federal Republic of Germany (FRG)	1987	523.98	20440	2.8
10.	France	1987	364.13	17820	2.3
11.	German Democratic Republic (GDR)	1988	383.21	—	4.6*
12.	Guyana	1982	1.03	420	0.2
13.	Hungary	1988	60.82	2590	2.4
14.	India	1990	2.76	340	0.9
15.	Indonesia	1988	0.88	500	0.2
16.	Israel	1983	246.43	9790	3.7
17.	Italy	1987	157.64	15120	1.2
18.	Japan	1987	558.80	23810	2.8
19.	Republic of Korea	1988	75.21	4400	1.9
20.	Pakistan	1987	2.91	370	1.0
21.	Panama	1986	0.10	1760	0.0
22.	Philippines	1984	0.68	710	0.1
23.	Singapore	1987	68.14	10450	0.9
24.	Spain	1987	45.97	9330	0.6
25.	Sweden	1987	577.57	21570	3.0
26.	U.K.	1986	226.83	14610	2.3
27.	U.S.A	1988	514.70	20910	2.6
28.	USSR	1988	218.63	—	6.2*
29.	Venezuela	1985	10.87	2450	1.3
30.	Yugoslavia	1988	26.24	2920	1.2

Source: 1. UNESCO Statistical Year Book 1990.
2. World Development Report 1991.

Note: * Provisional
... Not Available

ANNEXURE IV

Growth of Plan Schemes under Different Five Year Plans

Name of the Programmes		Plan IV		Plan V	Plan VI	Plan VII	Plan VIII
		Begin-ning	End				
A.	**RESEARCH**						
	1. Institute	22	23	35	39	46	50
	2. National Research Centres	—	—	2	11	20	36
	3. Project Directorates	—	—	5	5	9	9
	4. All India Coordinated Project	37	69	57	63	71	79
	5. Other	—	—	4	8	2	9
B.	**AGRICULTURAL EXTENSION**	1	1	3	6	6	3
C.	**AGRICULTURAL EDUCATION**	4	8	14	17	16	12
	Total (A+B+C)	64	101	120	149	170	198
D.	**STATE AGRICULTURAL UNIVERSITIES**	7	17	21	23	26	26

ANNEXURE V

Growth of Financial Outlay During IV to VIII Five Year Plans

		IV	V	VI	VII	VIII
A.	Total Plan Outlay (Rs. in Crores)	15902	37250	97500	180000	792000
B.	Total Plan Outlay for ICAR (Rs. in Crores)	85.00	153.56	340.00	425.00	1300
C.	% ICAR Outlay	0.535	0.412	0.349	0.236	0.196
D.	% contribution of Agriculture to GDP	44%	—	—	—	30%
E.	No. of Scientists	—	—	12,909	13,983	19,160
F.	R & D Exp. per Scientist per year	—	—	16,000	22,000	40,000