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MANAGEMENT OF AGRICULTURAL
RESEARCH AND TECHNOLOGY
(MART PROJECT)

A REVIEW OF THE
CONSULTANCY REPORTS

by

DR. MOHAMMAD NAZEER CHAUDHRY

CONSULTANT MART

AUGUST 8, 1992

PARC • USAID • MART • WINROCK

PN-ABS-850
isn 90732

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A

The MART (Management of Agricultural Research and Technology) Project is funded by the United States Agency for International Development (USAID). The MART Project's chief link to the Government of Pakistan is through the Pakistan Agricultural Research Council (PARC). A MART Project Coordination Committee composed of federal, provincial, and university representatives coordinates and guides project activities. Its purpose is to assist the Pakistani agricultural research system to strengthen its research management capabilities, and to improve communications, training, farming systems research, arid zone research, and research in the rural social sciences. Winrock International, through a contract with USAID, has responsibilities to assist with the first four of these tasks. Two international agricultural research centers, the International Maize and Wheat Improvement Center (CIMMYT) and the International Center for Agricultural Research in Dry Areas (ICARDA), are responsible for the other two tasks.

The mission of Winrock International Institute for Agricultural Development is to help reduce poverty and hunger in the world through sustainable agricultural and rural development. Winrock International assists people of developing areas - in Asia, Africa, the Middle East, Latin America (and the Caribbean), and the United States - to strengthen their agricultural institutions, develop their human resources, design sustainable agricultural systems and strategies, and improve policies for agricultural and rural development. As an autonomous, nonprofit organization, Winrock International provides services independently as well as in partnership with other public and private organizations. The institute is recognized as a private voluntary organization.

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I) INTRODUCTION:-

This study was undertaken at the suggestion of Dr. Zafar Altaf, Chairman, PARC, in April this year, and the original assignment stipulated a review of all the consultancy reports pertaining to agriculture in Pakistan during a total period of six months (four months in the first instance, extendable for another two months later). However, as the contract period could not be extended beyond four months on account of financial constraints, the study was confined to the reports available in the various sections of the PARC, most of which were published either by the FAO and the USAID-supported MART Project, or by the PARC itself.

Owing to the shortage of time, other research establishments and organizations, as well as the provincial research institutes and the Agricultural Universities could not be visited, nor could their reports be examined.

In all 142 such reports were critically reviewed, their topics ranging from management/training reviews to farming systems research, general agronomy, agricultural extension, plant protection and pest management, livestock development, germplasm conservation, horticulture, sericulture, apiculture, irrigation systems, soil and water conservation, watershed management, range development, social sciences research and socio-economic surveys, data collection for agriculture, information transfer systems, biometry and computer applications in agricultural research, agrometeorology, etc.

I, alongwith Dr. Abdul Sattar Alvi, Project Secretary, MART Project, visited the various Sections of the NARC, especially Audio-Visual Communications and Training Institute Building, the Animal Sciences Institute, the Animal Farm Centre, the Crop Sciences Institute, the National Herbarium, the Research Laboratories and the Electron Microscopy Unit, the Laboratory Equipment Maintenance & Repair Unit, and the Farming Systems Research Programme Unit/Section, and held detailed discussions with the Directors and other staff members so as to find out their views on the major problems and research constraints being faced by them. Our meeting with the Director-General, NARC, was very instructive and helped us a great deal in understanding the issues confronting the NARC. We also met the Secretary, PARC, the Members for Natural Resources and Crop Sciences, the Directors of Plant Protection, Coordination, Training, and Finance/Accounts to elicit their views on the various points at issue.

The terms of reference for this assignment are listed in Appendix-1 on page 61.

The Consultant wishes to express his deepest gratitude to Dr.Zafar Altaf, Chairman, PARC, for providing the necessary facilities and support for pursuing this work at the PARC, and to Dr.Abdul Sattar Alvi, Project Secretary, MART, for extending every possible help for the completion of this study.

Mr. Mushtaq Ahmad Mughal very diligently typed the manuscript of the text of the report, and his help is gratefully acknowledged.

This study was financed by the MART Project, and the Consultant takes this opportunity to offer his sincerest thanks to the colleagues in the Winrock/MART Project for their help, assistance and cooperation.

II) EXECUTIVE SUMMARY

The main purpose of this consultancy was to critically review all the consultancy reports pertaining to the field of agriculture in Pakistan. However, owing to the shortage of time, only those reports could be studied which were available in the various sections of the PARC or in the MART Project. In all 142 consultancy reports were reviewed, their topics ranging from management/training reviews to farming systems research, general agronomy, agricultural extension, plant protection and pest management, livestock development, germplasm conservation, horticulture, sericulture, apiculture, irrigation systems, soil and water conservation, watershed management, range development, social sciences research and socio-economic surveys, data collection for agriculture, information transfer systems, biometry and computer applications in agricultural research, agrometeorology, etc.

The main recommendations of the reports relate to measures needed for improvements in management policies and practices of the PARC/NARC (such as the appointment of a whole-time DG for NARC, invested with full administrative and financial powers, delegation of authority to the lowest practical level, improving the financial and administrative practices, and publication of PARC's Policy Administrative Directives, PAD), strengthening the NARC Training Institute and the Re-Entry Programme, strengthening the research programmes in Cereal and Fruit Crops, Pulses, Potato, Sugarcane, germplasm conservation, livestock development, agricultural extension and safer use of pesticides etc.

Most of the reports are of a routine nature, and quite ordinary in substance, and the work could have been done in a far better way and at a much lower cost by the local experts. Leaving aside a few notable exceptions, the recommendations of the consultancy reports have not been followed up, and the main reason for the non-implementation of the recommendations in point has been the absence of a follow-up mechanism in the Planning Directorate of the PARC.

It is, therefore, recommended that the Monitoring and Evaluation Unit of the Planning Directorate be strengthened and upgraded, and an Implementation Cell be established on a permanent basis to monitor the implementation of the recommendations.

Other specific recommendations for the PARC include the following:-

- i) As far as possible only local experts should be engaged as consultants, and the foreign consultants should be hired only when local experts are not available for any job of a specialized nature.
- ii) PARC must review its long-term training programme, and it must strengthen the postgraduate teaching and research programme of the agricultural Universities of Pakistan.
- iii) PARC must reconsider its support for the Rural Women Poultry Keeping Project at Fatehjang.
- iv) A policy decision must be taken soon by the Executive Committee of the PARC regarding such issues as the appointment of a whole-time DG for the NARC invested with full administrative and financial powers, and the delegation of more powers or decentralization of authority to the lowest practical level.
- v) A management review of the PARC be undertaken soon.
- vi) The Directorates of Planning and Research Coordination should be merged together, and the combined Unit be headed by a senior scientist. Likewise, the MART and World Bank Projects be united under one Section.
- vii) The Directorate of Planning should be required to keep a complete record of all the consultancy reports and their recommendations, as well as of further follow-up actions, and one set of the reports be deposited in the PARC Library.

III) A REVIEW OF THE CONSULTANCY REPORTS

The Pakistan Agricultural Research Council has the mandate to undertake, aid, promote, and coordinate agricultural research, arrange the expeditious utilization of research results, establish research institutions, arrange training of scientific personnel, maintain a reference library, and generate, acquire, and disseminate information relating to agriculture. Being a federally-funded organization, it not only supervises research at the NARC and other research institutes located at different places in Pakistan, but also coordinates research activities being done in the provincial research institutes as well as the agricultural Universities of Pakistan.

Since its inception in 1978, a number of reviews have been conducted to evaluate the performance of the research work being done by the various institutes of the PARC. Such studies were initially supported by the World Food and Agriculture Organization (FAO), and subsequently by the USAID/MART Project. The International Wheat and Maize Research Centre (CIMMYT) extended financial help in some of the studies, especially on Maize and Wheat Crops, while the Tokten Programme of the Government of Pakistan has also been of considerable assistance in arranging the services of some of the Pakistani Scientists presently working in the research institutions of Europe and North America.

The MART Project provided finances for five long-term advisers and 218 person months of short-term consultants. Bill C. Wright in his End of Tour Report (1992) lists the names of 95 foreign and 28 local consultants who were hired by MART between 1986 and 1992 to review the performance of the various research Institutes, programmes, projects etc. funded by the PARC. Some of the consultants have commented on the role of PARC in managing or coordinating the research endeavours, and have made very valuable recommendations.

The present author has reviewed 142 reports which have been classified subjectwise into the following 11 broad areas/ categories (vide Appendix-2 on page 62 for a detailed listing of the reports).

A) MANAGEMENT/TRAINING REVIEWS; NATIONAL COORDINATED RESEARCH PROGRAMMES; NARC MASTER PLAN(24+1+1=26 REPORTS).

B) GENERAL AGRONOMY AND RELATED FIELDS(40 REPORTS).

- | | | | |
|------|---------------|-------|---------------|
| i) | Cereal Crops; | ii) | Fodder Crops; |
| iii) | Pulses; | iv) | Potato; |
| v) | Sugarcane; | vi) | Sugarbeet; |
| vii) | Floriculture; | viii) | Horticulture; |
| ix) | Fruits. | | |

- C) GERMPLASM CONSERVATION; PLANT BREEDING & CYTOGENETICS (3+2=5 REPORTS).
- D) PLANT PROTECTION; WEEDS (12+1= 13 REPORTS).
- E) LIVESTOCK AND POULTRY DEVELOPMENT; VETERINARY SCIENCE; APICULTURE; SERICULTURE (4+1+2+1= 8 REPORTS).
- F) NATURAL RESOURCES (15 REPORTS).
- i) SOILS AND SOIL FERTILITY (4).
 - ii) SOIL AND WATER CONSERVATION (1).
 - iii) IRRIGATION SYSTEMS (2).
 - iv) WATERSHED MANAGEMENT (1).
 - v) RANGE DEVELOPMENT (2).
 - vi) AGROMETEOROLOGY etc. (5).
- G) FARMING SYSTEMS RESEARCH; AGRICULTURAL EXTENSION (8+2=10 REPORTS).
- H) SOCIAL SCIENCES RESEARCH; SOCIO-ECONOMIC SURVEYS; DATA COLLECTION & EVALUATION (4+3 = 7 REPORTS).
- I) BIOMETRY AND COMPUTER APPLICATIONS IN AGRICULTURE (3 + 7 = 10 REPORTS).
- J) AGRICULTURAL INFORMATION SYSTEMS (3 REPORTS).
- a) Agricultural Libraries (2).
 - b) Audio-Visual Communications (1).
- K) SUPPORT SERVICES (5 REPORTS).
- a) FARM MACHINERY (2).
 - b) LABORATORY EQUIPMENT MAINTENANCE & REPAIR (2).
 - c) NARC ARCHITECTURAL DESIGNING(1).

A) MANAGEMENT/TRAINING REVIEWS:

Of all the reports, the most important and well-written are those which pertain to the subject of management of agricultural research or agricultural organizations. There are ten such reports which are listed in a chronological sequence.

- 1) E.T. York, Jr. : Review of Organization and Management Practices of PARC/NARC and Recommendations (September 1986).
- 2) Tilo L. V. Ulbricht: Preliminary Report on Monitoring, Evaluation and Review of Agricultural Institutes/Programmes (December 1986).
- 3) Tilo L. V. Ulbricht: Priorities, Monitoring, Research Inventory, Institute Review, Personnel Assessment. (March 1987).
- 4) G.M. Khattak (Chairman), Tilo L. V. Ulbricht, Manzur Ahmad, Abdul Hafiz and Anwar Ahmad Siddiqui (Members): Management Review of National Agricultural Research Centre (Report of the Review Panel) (April 1988).
- 5) A.L. Brown (Team Leader), Mahbub Ali, Kenneth Brengle, Charles Pereira & John Woods: Evaluation of Management of Agricultural Research & Technology (February 1989).
- 6) Guy B. Baird: National Agricultural Research Centre: Master Plan Implementation (March 1990).
- 7) M. Masood Khan (Chairman), Idrees Anjum & Tahir Oureshi (Members): NARC Maintenance Organizations: A Review. (May 1990).
- 8) James B. Barnett: Management of Agricultural Research and Technology Project (End of Tour Report). (September 1990).
- 9) Bill C. Wright: Draft Research Plan for Agricultural Research Institute, Sariab, Baluchistan (March 1992).
- 10) Bill C. Wright: End of Tour Report (July 1986 - March 1992). (March 1992).

A-i)

MANAGEMENT REVIEWS:-

1. E. T. York, Jr. in his excellent report entitled "Review of Organization & Management Practices of PARC/NARC and Recommendations" has made a number of highly valuable observations concerning agricultural research in Pakistan, especially with regard to the imperative need for better coordination of agricultural research efforts in view of the fact that there has been a great proliferation of agricultural research institutes, both federal and provincial, throughout the country. He rightly points out that the National Coordinated Research Programmes should provide excellent means for improving this coordination. He has also made the following important recommendations which merit serious consideration:-

- i) It is recognized that given the opportunity, the agricultural universities could contribute significantly to an overall research effort. Furthermore, the quality of the universities' educational effort could be enhanced through such involvement.
- ii) Careful consideration needs to be given to the division of effort between PARC's in-house research responsibilities and its role in stimulating, coordinating, and funding research by other organizations.
- iii) While there is obvious need for better coordination of research activities, there is an equal need for developing closer linkages between research and extension functions. It would appear that much of the knowledge generated through research may not be achieving desired results because of the poor linkages between research and extension organizations.

E.T. York, Jr. has also pointed out the necessity of having in-depth reviews of the following:-

- a) The Coordinated Programmes; b) The process of monitoring and evaluating research programmes; c) NARC and two or three major provincial research institutes, with particular attention directed towards the organization and administration of research programmes in each; d) All the federal institutions concerned with agricultural research and how these research activities might be better coordinated or integrated; e) A review of financial resources devoted to agricultural research by all the federal and provincial agencies involved. This would provide what is being done and by whom as a basis for considering how the total national effort might be further improved.

2. Tilo L. V. Ulbricht's first report pertained to the Monitoring, Evaluation and Review of Agricultural Research Institutes/Programmes (December 1986) and examined the different stages of planning, and made specific proposals for introducing new procedures as an aid to monitoring and review, providing a basis for later evaluation. He suggested that NARC be reviewed during the period September-October 1987, and, while listing criteria for monitoring, emphasized that annual monitoring be made a basis for evaluation. He also suggested that a senior member of the Monitoring & Evaluation Unit should be an agricultural/natural scientist having personal experience of research and research management.

3. Tilo L. V. Ulbricht in his second report (March 1987) on the subject of "Priorities, Monitoring, Research Inventory, Institute Review, Personnel Assessment" has highlighted the importance of determining priorities for undertaking research programmes, and has suggested criteria for determining these priorities and has also given the specific examples of the vital areas of Oil Seeds, Pulses, Forestry, and Biological Control (of Pests/Insects) as some of the possible priorities of research to be undertaken by the country's major agricultural institutions, such as PARC. He has also emphasized the need for proper staffing of the Planning Directorate, particularly of the Monitoring and Evaluation Unit. A computerised inventory of agricultural research was proposed to be prepared by the Planning Directorate.

He also suggested that a full scale review of the NARC be conducted by a panel of scientists (6 Pakistanis and two expatriates) who should examine its internal organization, its management, and its relationship with other organizations etc.

Tilo Ulbricht has also made important recommendations regarding the modes of assessment of the scientists by means of Annual Confidential Reports and promotion procedures. He has suggested that the ACR proforma should include a job description which is discussed with the person to be reported on. As regards the promotion procedures, he suggests there should be two Boards, a Senior and a Junior one, the Institute Staff members be included as members of the Boards and the candidates be interviewed by a separate or special Interview Panel. He further recommends that outstanding scientists be provided opportunities for career advancement so that they are able to continue to devote themselves to research.

4. Of all the reports studied by this author, the one by G.M. Khattak et al. (Tilo L. V. Ulbricht, Manzur Ahmad, Abdul Hafiz and Anwar A. Siddiqui, April 1988) entitled MANAGEMENT REVIEW OF NATIONAL AGRICULTURAL RESEARCH CENTRE (REPORT OF THE REVIEW PANEL) is undoubtedly the best. The panel made an in-depth study of the

structure, organization and management of the NARC, its relationship with PARC, the role of the Director General, the various Research Institutes, Programmes and Projects of NARC, other support services, its linkages, and the NARC Training System, and after a detailed scrutiny of the various aspects of all the different bodies/constituent organs of the NARC, made some very important recommendations, some of which are listed below:-

- i) NARC has grown very rapidly into a very large and complex institution in a very short time. The mandate of the NARC needs to be sharply redefined, and the management structure of NARC requires immediate attention. The existing posts require full-time incumbents, and the Centre needs to be reorganized in such a way that it has a clear and easily understood line management structure. Because the present structure has become unwieldy and unsuitable, NARC has, in effect, been managed from PARC. We consider this highly undesirable, and believe that NARC cannot fulfil its potential to become a Centre of Excellence unless its research is managed, not merely administered, by the senior management of NARC itself. Effective powers need to be delegated to the Director General.
- ii) Our most important recommendations to achieve this desired objective are that NARC should have a full time DG supported by at least two, eventually three, full-time DDGs, so that the Members no longer have to try and manage NARC research themselves. One of the DDGs should be DDG Research, who would have 7 Units reporting to him: 5 Departments¹, namely, of Crop Production, Crop Protection, Animal Sciences, Farm Machinery and Natural Resources; the Central Laboratories (some of whose groups have been re-allocated to either Crop Production or Crop Protection), and the Social Sciences Group.
- iii) The Board of Management should be reconstituted as a smaller body, in effect acting as the Executive Committee of NARC under the DG, with the Research Committee reporting to it, the Board concentrating on the setting of priorities, research planning, major allocations and monitoring. It is to be serviced by a Planning and Monitoring Cell attached to the DG, headed by a Director.
- iv) The importance of training and management development of NARC Staff and of fostering research leadership needs to be emphasized.

¹ The conversion or redesignation of the "Institutes" into "Departments" will, in my view, be a retrograde step. What is actually required here is more autonomy for the Institutes.

- v) The Management Review of PARC itself be undertaken as soon as possible.
- vi) a) The Universities should be encouraged to produce and maintain a continuous supply of well-groomed graduates and postgraduates for whom PARC/NARC should encourage the writing and printing of textbooks relevant to Pakistani conditions, and provide scholarships for higher studies and training within the country.
- b) The PARC should provide special funds to the Universities for research to be carried out by selected postgraduate students.
- c) Postdoctoral programmes and refresher courses may be organized for updating the knowledge and expertise of the University teachers and staff of other agricultural research institutes.
- d) The NARC should help develop linkages of research organizations with the extension services by providing the services of subject matter specialists from the Talent Pool.
- 5) The Report by Col. (Retd.) M. Masood Khan (Chairman), Idrees Anjum and Tahir Qureshi (Members) reviewing the NARC MAINTENANCE ORGANIZATIONS (May 1990) is another well-documented in-depth study of some of the chronic problems facing NARC. In this study it was noticed that each NARC Unit had separate maintenance personnel on its strength, and there was all round duplication of effort. It has, therefore, been recommended that for better management, the repair and maintenance personnel be amalgamated into one unit and the Automobile and Farm Operations and Services Workshops be merged into a combined workshop under the Technical and Administrative control of a Director. This would result in better control, and fewer management problems, and would be more economical. Centralized maintenance will reduce many bottle-necks and provide better results.

The report further recommends that the Operations and Maintenance Unit be provided sufficient funds and the latest equipment for the repair and maintenance of buildings.

- 6) Guy B. Baird's assignment was to prescribe appropriate procedures for selecting research projects for the first stage implementation of the NARC Research Master Plan. A format is suggested in his report for project proposal formulation. A checklist of prioritized NARC Research Projects for the first stage of implementation of the NARC Research Master Plan was, accordingly, prepared, and the following recommendations were made for administrative and financial remedial actions/reforms:-

- i) A strong Director General should be placed at the NARC at the earliest, with full authority and support from the PARC to carry out the mandate of the Centre.
- ii) The post of a Deputy Director General for administration should be established as a measure to rationalize the Centre's management responsibilities.
- iii) Action is urgently needed to identify the high priority projects for first stage implementation.
- iv) Funds should be allocated and made available when needed to support the agreed-upon priority projects.
- v) The Planning Research Monitoring and Coordination Unit (PRMC) of the NARC should be strengthened to enable effective monitoring of progress and evaluation of results.

A-ii) REVIEW OF MART PROJECT:-

The performance of MART (Management of Agricultural Research and Technology) Project has been evaluated in the following three reports:

- 1) Albert L. Brown et al.: Evaluation of Management of Agricultural Research & Technology (February 1989).
- 2) James B. Barnett: Management of Agricultural Research & Technology Project (with particular emphasis on Sind and Baluchistan). (End of Tour Report) (September 1991).
- 3) Bill C. Wright: End of Tour Report (March 1991).

7) Of the three, the one by Albert L. Brown et al. is the most exhaustive account of the research activities sponsored and funded by the MART Project. This review (commonly known as the Mid-Term Review) is, in fact, a very good appraisal of the performance of some of the Management/Administrative policies of the PARC and strongly recommended a strengthening of the research management and improvement in financial management of the PARC. The panel also recommended that PARC must have a published administrative manual alongwith job descriptions for all the staff positions, recommendations made in Frank Byrnes' Report regarding the agricultural research training programme should be acted upon; high priority be given to the re-entry programme for returning scholars; the Arid Zone Research Programme be focussed on two major areas of Range Management/Livestock and Water Harvesting Agriculture; and the flaws in the coordinated Wheat and Maize Programmes be removed by engaging the services of an agricultural economist. The Panel Report strongly recommended that the findings/recommendations of

the Khattak and York reports be implemented, and that a comprehensive programme of project planning, monitoring and evaluation be established. The Panel's recommendations regarding the management practices in the PARC deserve very careful consideration. The report recommended that all research institutes need delegation of administrative and financial authority. The report also discussed the problems of low educational standards of agricultural graduates in Pakistan as well as of the continued loss of large acreage of arable land due to waterlogging and salinity, and recommended that the report on Agricultural Education in Pakistan (1983) be implemented with urgency and that the problems arising out of the menace of waterlogging and salinity be brought to the notice of the Federal Cabinet with a view to assuring coordinated attention.

8) James B. Barnett in his report on the Management of Agricultural Research and Technology Project (September 1991) laid special emphasis on the necessity of removing constraints to productive agricultural research in the provinces of Sind and Baluchistan. The major constraints identified in the report were : i) Inadequate operational funds; ii) Programmes lacked clearly defined objectives and a systematic procedures for pre-testing various cultivars under farmers' conditions; limited understanding of statistics and field plot techniques by the research staff and the administrators of the ARIs in both the provinces.

A simple, user-friendly statistical software package was, accordingly, written for the benefit of the research scientists to familiarize them with the use of computers as well as to increase their knowledge of statistics.

Recommendations were also made for the development of a Master Plan for ARI, Quetta/Sariab, and considering the existence of five ecological zones in Baluchistan, it was recommended that research sub-stations be established one in each of the ecological zones. It was also recommended that the research sections be re-organized into major crop groups instead of the present arrangement of discipline-wise organization.

The report also reviewed the progress made by the Farming Systems Research in the Sind Province, and recommended the constitution of a Coordination Committee as well as a Policy Planning Coordination Council for overall supervision of the FSR programme in the province.

9) The work being done in the Agricultural Research Institute, Sariab, Baluchistan, has also been reviewed by Bill C. Wright in his report on the Draft Research Plan for Agricultural Research Institute, Sariab, Baluchistan (March 1992). In this report seven major research priorities are identified. The topics for problem

-oriented research are: i) Fertilizer Use Efficiency; ii) Water Use Efficiency; iii) Nutrition of Vegetables and Tree Crops; iv) Weed Control; v) Plant Protection; vi) Farming Systems Research; and vii) Socio-Economic research. Bill Wright also supported the establishment of research sub-stations in five different ecological zones based primarily on elevation, and recommended a new organizational structure for the ARI, Sariab, dividing it into 10 sections instead of the present 12. He also recommended that the amount of operational funds in the budget be immediately increased to Rs. 50,000/- per scientist, and raised by 10% each year for the next 10 years.

10) Bill Wright's second report (End of Tour Report, March 1992) gives a resume of the activities conducted under the MART Project during the period July 1986 - March 1992, and is a very important document not only for a critical review of the MART Project but also for an objective evaluation and appraisal of the management practices of the PARC. While commending the successes of the MART Project in accomplishing its goals in some of the activities, Bill Wright makes some very pertinent remarks: "In research management there has been considerable accomplishment, but many Project activities have been only partly successful, largely because recommendations made by the study teams and reviewers have not been implemented.

"PARC and the Provincial research institutions should re-examine the recommendations already prepared by review teams and consultants, and accept them or reject them, then put those accepted into action." According to Bill Wright, the effectiveness of the national research system is far below its potential for two main reasons. Firstly, the operating funds are discouragingly low, and, secondly, the management systems stifle productivity of researchers". "The management of personnel and finances need the most attention." He further states that "before February 1990, the management review recommendations were discussed at length by committees in PARC, and some decisions were taken to implement certain of the recommendations, but little action followed. Since February 1990, the subject has been dormant. Except for a period of about 13 months there has been no full-time DG at NARC in 5.75 years the Winrock COP worked in the MART Project. A strong DG should be appointed for NARC, and he should be given full responsibility and authority to manage the institution."

The report while reviewing the performance of the organizational and administrative set-up of the PARC adds that there has been no follow-up by PARC to adopt the administrative orders (or "directives") and to publish the official PARC Policy and Administrative Directives (PAD).

Bill Wright is also highly critical of the financial practices being followed in the PARC. He says "if it can be said PARC/NARC has a single most serious problem, then the procedures for making funds available to scientists and the final accounting for these funds would be it. Funds are usually made available to scientists late, sometimes causing a planting season to be missed or other serious delays. This occurs even when the funds are available in the finance departments of PARC/NARC. Once the funds have been spent, much time is consumed in satisfying the accounting demands."

As regards the maintenance of buildings, vehicles, equipment etc. the report expresses its concern: "Routine maintenance of buildings, vehicles, laboratory equipment and field equipment at NARC is poor. In fact the maintenance of buildings is almost zero." It further adds: "NARC's Laboratory Equipment Maintenance and Repair Unit (LEMURU) is well-staffed and well-equipped, but has almost no operating funds."

While noting the results of a study undertaken by Robert E. Evenson and Qazi Taukir Azam on the subject of funding of agricultural research in Pakistan, he laments the fact that Pakistan invests less per scientist of any country in this region (including Nepal and Bangladesh), in spite of the fact that the cost for doing research in Pakistan is quite cheap and notwithstanding the hard reality that the investment in agricultural research in Pakistan pays very high returns (marginal internal rates of return to investment in Wheat research were 70% for the period 1956-1986).

He further points out that the participation of the private sector in agricultural research in Pakistan is almost minimal. He cites Dr. Mumtaz Ahmad's recent study on the subject according to which the private sector was doing very little research even within the larger firms. Only tobacco and sugar industries were carrying out activities that could be called research.

His comments about PARC's senior officials merit a very serious consideration by all those interested in the progress of the agricultural sector in Pakistan. He rightly remarks that PARC's senior officers should travel widely throughout the country and should be highly knowledgeable about what research is being done, where, who is doing it, what the results are, and where the gaps are, duplications are. PARC should counsel the Government and the private sector on policies relating to agriculture. The Council members should be the national leaders in agriculture in Pakistan. NARC should be managed by the DG and his staff. The PARC Chairman and Members certainly should be involved in developing the plans and budget for research at NARC. But once the plans are made and the budget is set, the Chairman and the Members should not be involved in the daily management of research at NARC.

Bill Wright's observations regarding the future management needs of Pakistan's Agricultural Research System are also very pertinent. Research institutions in Pakistan must develop a participatory management system. The researchers have to be rewarded for good work, and they must have a career ladder to enable them to continue in a focussed line of research; financial departments must provide efficient services and support the researchers. The research plans need to reflect the problems facing the farmers and agri-businessmen; and funds must be available for the critical research activities, and Pakistan's leaders have to understand the importance of research to agricultural development.

His final comment is also thought-provoking: "The Pakistani national agricultural system has the trained scientific manpower and physical facilities to be an outstanding research network. What is lacking is a management approach that will permit the scientist in the system to function at high degree of productivity. Although the MART/Winrock Project achieved many of the Project's goals, the management of research has not been fundamentally altered. However, the steps needed to make fundamental changes have been identified. Hopefully, the ARP-II Project will take over this task and utilize MART's experience to improve Pakistan's research management."

A-iii) TRAINING REVIEWS:-

There are 14 reports on the subject of Training for Agricultural Research in Pakistan:-

- i) Earnest W. Nunn: "Training for the Support of Agricultural Field and Greenhouse Research in Pakistan" (September 1988).
- ii) Francis C. Byrnes: "Training for Agricultural Research in Pakistan" (September 1988).
- iii) NARC Training Institute Publication on "Training in Research Management" (June 1989).
- iv) James B. Barnett: "In-country Training Needs: Focus on Sind and Baluchistan" (September 1989).
- v) Donald W. Barton & Abdus Salam Akhtar: "A Short Course in Research Management Training". (September 1989).
- vi) Donald W. Barton: "A Short Course in Research Management Training" (March 1990).
- vii) John L. Woods: "MART Training Review" (March 1990).

- viii) John L. Woods: "MART Training Review-Phase II: PARC Re-entry Programme; NARC Training Institute Programme" (October 1990).
- ix) Larry Littlefield & James White: "Training of Training Coordinators - Session II" (January 1991).
- x) Larry Littlefield & James White: "Training of Training Coordinators - Session III" (July - August 1991).
- xi) University of ARKANSAS International Agricultural Programmes: Experiment Station Operations Management Curriculum Outline (August 1989).
- xii) Loyd Johnson P.E.: Experiment Station Management Training Course (June 1990).
- xiii) Paul Bennell & Larry Zuidema: Human Resource Management for Agricultural Research : Overview and Issues (ISNAR) (September 1988).
- xiv) M. Ajmal Makhdoom: Report on Human Resource Management (May 1992).

Ernest W. Nunn's report recommended that seminars, advanced degree and on-the-job training be provided for developing awareness among the Institute Directors for the organization and management of research support services, M.Sc. Degree in Experiment Station Management/Development, and non-degree training for senior Farm Directors/Managers. The report also stressed the need for systematized equipment replacement in the agricultural research institutes as well as for having adequate seed threshing, cleaning and packing equipment and seed storage facilities.

Francis C. Byrnes in his report reviewed the training component of the MART Project, and discussed in considerable detail the various issues and problems pertaining to the planning and management of agricultural research in Pakistan, with particular reference to the roles of PARC and NARC TI. He laid special emphasis on the proper management of overseas Training Programme and placement and utilization of the trained manpower. While supporting the present policy of management of overseas Training Programme, he also echoed the growing concern about the lack of practical orientation in the overseas University education and the consequent recognition of the value of thesis research in the student's home country. He stressed the necessity of clarifying the mandate of NARC Training Institute and its reorganization, and emphasized the need to strengthen (short term) training programmes and reducing emphasis on the (short term) overseas training.

NARC Training Institute publication on Training in Research Management discusses the characteristics for an organizational structure for agricultural research, and lays down certain essential requirements for each research organization in order to have productive research, as well as the requisites for implementing and managing research.

The two short courses in Research Management Training, the first by Donald W. Barton and Abdus Salam Akhtar (September 1989) and the second by D.W. Barton alone (March 1990), summarise the proceedings of the two training courses held respectively in June, 1989 and February 1990, on the subject of organization and management of agricultural research in Pakistan.

The participants of the two courses identified the following problem areas: i) Inadequate budget; ii) lack of monitoring and evaluation; iii) lack of opportunity for promotion. They suggested the imperative need for decentralization of authority, better provincial coordination, and the necessity of establishing a procedure for planning priorities in research projects.

James B. Barnett in his report discusses the subjects of in-country training activities in Sind and Baluchistan, and remarks that the in-service training needs are too great for any single institution such as NARC TI, which should devote major attention to the development of training modules in various subjects and train a cadre of persons from the provinces in the use of these modules, who will then coordinate provincial training programmes. Linkages between the NARC TI and the training coordinators in the provinces must be maintained to prevent duplication of effort and maximize the use of limited resources. Although some courses will continue to be conducted at the NARC TI, major efforts should be shifted to the production of modular training materials.

John L. Woods in his first report (MART Training Review, March 1990) stresses the importance of re-entry programmes for the scientific staff/research personnel sent abroad for degree and non-degree training programmes. It is widely recognized that the returned participants are not as productive as has been desired. A broad-based approach is needed to increase the productivity of returned participants. This includes refining the selection process, better defining the training needed, maintaining communications with the participants while overseas, establishing links with their home institute for dissertation research, removing the administrative problems faced by the returnees, using returnees in continuing education programmes, establishing research networks with other scientists in the same field, helping them in establishing new research programmes, and promoting twinning arrangements with their overseas universities. The report recommends the appointment of an International Cooperation and Training Deputy Director for Re-

Entry Programmes, and stresses the imperative need for strengthening the staff and activities of the NARC Training Institute, shifting some training resources to in-service training, and establishing training centres throughout the research system by creating a network of training centres.

John Woods takes up the problem of re-entry programme and the strengthening of NARC Training Institute in considerable detail in his second report (MART Training Review - Phase-II, October 1990), and emphasizes the need for overcoming the administrative and financial problems that exist for the returnees, such as the issues of regularization of extra-ordinary leave (EOL) for matters of seniority of service etc., designating a NILTA (National and International Liaison, Training and Technical Assistance) staff member as Focal Point for Re-Entry administrative matters, continuous updating of the NILTA participant data base, developing a re-entry checklist for the returnees, implementing procedures for administrative arrangements for the returnees, reviewing job assignment for the returning participants, and integrating the returnees into local research programmes.

He also discussed the role, functions and staff-responsibilities of the NARC Training Institute to facilitate and support the NARS Training Network, and stressed the need for broadening the training horizon, dismantling the existing Training Evaluation Committee, diversification of funding sources for the Training Programme, identifying courses to be organized by the NARC/TI, Training of NARC/TI Staff, and procurement of equipment for the NARC/TI.

Larry Littlefield and James White in their two reports [Training of Training Coordinators-Session II (January 1991) and Training of Training Coordinators-Session III (July - August 1991)] have outlined the training programmes for inservice training of agriculturists in Pakistan. The Training Coordinators who participated in this course were expected to return to their home institutions and initiate training programmes needed by their colleagues and support staff. The second report gives an account of the on-site educational study tour/visit, by the participants of the course, of the Universities, Government agencies and experiment stations in the U.S.A. in Maryland, Arkansas, Iowa, Oklahoma, and Washington, D.C.

EXPERIMENT STATION MANAGEMENT TRAINING COURSE by Loyd Johnson P.E. (June 1990) was arranged for the Field Support Staff, e.g. Farm Managers, and recommends M.Sc. training and short term training programmes for the Farm Managers and other Field Support Staff.

EXPERIMENT STATION OPERATIONS MANAGEMENT CURRICULUM OUTLINE is prepared by the University of ARKANSAS International Agricultural Programmes (August 1989), and gives an outline of 16 units and 94 topics for a 2-semester course in Experiment Station Operations Management to be offered at the University of Arkansas, U.S.A.

Paul Bennell and Larry Zuidema of ISNAR in their excellent work entitled "Human Resource Management for Agricultural Research: Overview and Issues (September 1988), have discussed the vital question of the management of human resources for agricultural research through an effective planning and management of professional researchers and their support personnel. As potentially creative individuals, the agricultural researchers have especially high expectations for job fulfillment and need considerable autonomy in deciding on and carrying out their research activities. An important responsibility of agricultural research managers, therefore, is to ensure that the organization retains and effectively utilizes human resources with the specific skills, attitudes and motivations which will allow the organizational objectives to be attained as efficiently as possible.

**REPORT ON HUMAN RESOURCE MANAGEMENT² WITH SPECIFIC
REFERENCE TO AGRICULTURAL RESEARCH SCIENTISTS**
by M. Ajmal Makhdoom (May 1992).

The main purpose of the consultancy was to identify aspects of psychological bottlenecks that hinder the realization of the maximum potentials in terms of perception of scientific ideas, planning and preparation of projects, successful execution of the projects, and presentation of the research results of individual scientists and research programmes at NARC/PARC and to propose remedial measures.

RECOMMENDATIONS FOR INSTITUTIONAL MANAGEMENT:

1) Creation of a National Training Laboratory in which scientists take on short, crisp, sandwich courses. The NARC Training Institute can easily be redesigned into a National Training Laboratory where shared experiences of scientists, managers, administrators, extensionists and educationists can be brought together. A multidisciplinary team would be required, and special educational modules can be developed.

² It is a pity Dr. Ajmal could not see Paul Bennell & Larry Zuidema's excellent work on Human Resource Management, otherwise his approach and perspective would have been quite different.

- 2) University of Arid Agriculture: The field stations for this university could be all the arid stations of PARC, plus the laboratory facilities at NARC, and the Agricultural Research Institutes (11 in all the provinces).

The University must have different curricula, right from Comparative Religion to Computers. It should make a study of Plato and Aristotle compulsory. Plato's myth of the Cave and the myth of Er should be prescribed for the agriculture students. The moral basis of human conduct should be studied with special reference to contemporary problems.

The University of Arid Agriculture should also have the following faculties: i) Counselling; ii) Personal Relations; iii) Creativity and Joy; iv) Personal Growth.

A research oriented clinic should be attached to the University which should regard authoritarianism as a malady. A trained clinical staff should handle the authoritarian personality and should try to change it into a more or less democratic personality, preferably through non-directive methods. NARC laboratory should have trained personnel to change the fascist mentality.

Short Term Methods: i) Twinning with eminent scientists, to develop the inner censorship and ethical system; ii) Exposed to classical literature to broaden and deepen their views about the attitudes and issues listed in the diagnosis; iii) Post-doctoral education for a deepening and diversification phase. To be taken up within the country. Leave of absence be allowed; iv) Increase the spread of and strengthening of "Commonsense" in education; v) Short Sandwich Courses specially designed at the NTL for impersonal and communication skill development.

- A-iv) PAKISTAN'S NATIONAL COORDINATED RESEARCH PROGRAMMES
by E. T. York, Jr. (June 1987).

E. T. York, Jr. in this report has reviewed the performance of two such programmes, i.e. i) Wheat, Barley, Triticale and ii) Pulses, and has made recommendations for improving/strengthening the NCPs. He suggests that a National Coordinated Programme should involve research in which several investigators in different organizations are willing to collaborate in efforts having common or complementary objectives which relate to important national problems or needs.

A-v) NATIONAL AGRICULTURAL RESEARCH CENTRE:
MASTER PLAN 1988-2000. Volume 1, Research Master Plan
by N.I. Hashmi et al. (1989).

The Master Plan has been prepared with a view to determining priorities in research problems so that research can be directed at the most critical issues while coordinating NARC's research with the research programmes of provincial research institutes to minimize duplication or gaps in the national research effort. This master plan also provides information to ensure that resources are allocated to the highest priority research for the highest potential payoff. Besides, the master plan serves as a basis for planning the development of NARC's human resources and physical facilities. The master plan provides guidelines for NARC's future research programmes and physical development up to the year 2000.

B) GENERAL AGRONOMY AND RELATED FIELDS:-

i) CEREAL CROPS:

There are 40 reports on the various aspects of General Agronomy and related fields, including 17 on maize and 7 on wheat, and all these reports were published in 1986-87. Of these, H. A. Eagles contributed four papers, Derek Byerlee three papers, C.O.Gardner also three, E. John Stevens two, S. Sajidin Hussain two (including one with D. Byerlee). Besides, G. O. Edmeades, J. Dumanovic, Ramzan Akhtar, K. S. Fischer, Kiramat Khan, and Pervaiz Amir also participated in the CIMMYT Maize Programme Studies. J.Dumanovic presented a preliminary report for the establishment of a National Maize Research Institute. Pervaiz Amir's report on Maize Marketing and Utilization in Pakistan is a very useful contribution on this subject, and his recommendations regarding a minimum price support policy, provision of improved seed and a package of technology, a successful market model, changes in industrial capacity etc. deserve to be implemented.

There are seven papers on Wheat contributed by Derek Byerlee, M. Ramzan Akhtar, Peter R. Hobbs, S.Sajidin Hussain, M. Aslam, and others. D. Byerlee, M. Ramzan Akhtar and P.R. Hobbs have made a study of the sequential cropping patterns through Plant Breeding using cotton and wheat in the Punjab province.

Drs. A. Amaya, M. Akmal and Peter Hobbs, have studied the need assessment of Cereal Technology in Pakistan, and have recommended that NARC, being a central research organization, should play a leading role to coordinate the activities of the provincial Cereal Quality Laboratories.

SORGHUM IMPROVEMENT IN PAKISTAN:

Ali E. Kambal (June 1988) has studied this problem and has stressed the urgent need for strengthening the sorghum research capability in the country as well as for making a thorough review of the strategies, approaches, focuses and orientation of the sorghum improvement programme. There is a need to expand production of sorghum grain in Pakistan with a view to meeting the demands of the rapidly expanding poultry industry in the country.

ii) FODDER CROPS RESEARCH IN PAKISTAN:

Loy V. Crowder (April 1988) has made a very useful contribution to the study of this subject, and research data shows that fodder crops production can be increased by 50-100%. He recommends that a Seed Multiplication Scheme be launched with the financial backing of Agricultural Development Bank of Pakistan, a multidisciplinary Village Task Force for Transfer of Fodder Technology be formed as an adjunct to FSR, a Fodder Research Institute be established at the Bahadurnagar Livestock Production Institute and a Livestock Unit at the Fodder Research Institute, Sargodha. He further recommends the organization and implementation of a Pakistan Fodder and Forage/Pasture Network Programme, and the strengthening of the National Cooperative Fodder Research Programme at NARC, and linkages with the International Agricultural Research Institutes and National Programmes.

iii) PULSES:

CHICKPEA IMPROVEMENT PROJECT:

C. Johansen's report (October 1987) on the Chickpea Improvement Project of PARC/ICRISAT-ADB is a presentation of the agronomic experimentation to determine limitations of Rhizobium, nitrogen and phosphorus.

iv) POTATO IN THE FARMING SYSTEMS OF MALAM JABBA AND MAINDAM AREAS OF SWAT DISTRICT:

A. M. W. Geddes, Khalid Ahmad Bajwa and S.M. Mughal have presented the results of the survey conducted by them in this important Potato-growing region of NWFP.

v) SUGARCANE PRODUCTION AGRONOMY AND SUGARCANE RESEARCH IN PAKISTAN:

There are two studies of one of our important cash crops, i.e. Sugarcane. The first study was undertaken by J. P. Thijsse in December 1987, and the second one by R. S. Kanwar in March 1988.

While J.P.Thijse suggests improvement in the agronomic and cultural practices as well as in the breeding programme, and establishment of a better coordination system at NARC and extension linkages with other organizations, and better credit facilities and payment system for the growers, the report by R. S. Kanwar lays more emphasis on the strengthening of sugarcane research on a priority basis in Pakistan, and the establishment of a multidisciplinary National Sugarcane Research Institute for the development of improved varieties of sugarcane. He further recommends to have better coordination between the National Institute and the Provincial Research Institutes and the development of a coordinated research project to improve the research work. He also stresses the need for collection of new germplasm from U.S.A., Australia and India, rapid transfer of cane production technology to the farmers, and research programmes oriented towards the improvement in the productivity of sugarcane both in the matter of cane yield and sugar recovery.

vi) SUGARBEET PRODUCTION IN PAKISTAN

J.S. Mcfarlane's report on this subject recommends improvement in the agronomic and cultural practices, reducing the lapsed time between uprooting and processing (to be processed the day the beets are uprooted), better extension work, improving the relationship between the farmers and the mills management, and enhancing the price paid by the Government to the farmers for the beets. The report also recommends initiation of adaptation trials in other sugarcane producing areas of the country, especially in areas with saline and high pH soils.

vii) FLORICULTURE:

A report by Jorge Velarde Aspillaga (June 1985) stresses the need for a personnel training programme, fabrication of all nursery structures with locally available materials, and production of plants according to quality standards/specifications in order to be able to compete in the International Market and expand the National Market.

viii) HORTICULTURE:

There are three reports on the subject of Horticulture, the first one by N. Kaska (1987), the second by Richard A. Hamilton (November 1987), and the third by T. R. Subramanian (January 1988). N. Kaska recommends strengthening the training programme, expansion of germplasm of fruit varieties, off-season vegetable growing in walk-in tunnels and shade houses, undertaking post-harvest physiological studies on various fruits, manufacture of garden

tools and other horticultural implements in the Agricultural Mechanization Department at NARC, and the introduction of non-traditional fruit species such as Avocado, Pecan and Pistachio in Pakistan. Richard A. Hamilton surveys the tropical fruits already growing in Pakistan, and recommends the introduction of new fruit and oil-bearing trees from South and Central America.

T. R. Subramanian's report recommends giving high priority to the strengthening of horticultural research by PARC through the establishment of a National Institute for Horticulture as well as the starting of a few selected regional stations under the jurisdiction of the proposed Institute. The report further recommends undertaking research on post-harvest technology of horticultural crops in which sizable losses occur during storage and handling.

ix) FRUITS:

There are four reports on this subject:

- 1) Maxine M. Thomson: Consultancy Report and Recommendations for Pakistan National Programme for Fruit and Nut Genetic Resources (April 1983).
- 2) Gerardo A. Santos: Coconut Cultivation (August 1987).
- 3) David L. Creech: A Study of Temperate Fruit Research and Production in Pakistan (July 1988).
- 4) Walter J. Kender: Citrus Research in Pakistan (January 1989).

The recommendations made by Maxine M. Thomson in her report need urgent consideration. She has quite rightly reported that "the genetic resources are seriously threatened because of the encroachment of humans and domestic animals on the natural flora. Woody plants in particular are rapidly being destroyed through land clearing and for forage and firewood, with young seedling trees unable to regenerate due to subsequent intensive land use. Furthermore, local species are being increasingly replaced by relatively few introduced cultivars. Therefore, first priority for fruit and nut genetic resources in Pakistan should be collection and maintenance of representatives of these indigenous temperate fruit and nut species (the names of which are listed by her in the report). She suggests the establishment of a National Clonal Repository for temperate fruit and nut species in Quetta, and exchange of plant materials between Pakistani and U.S. scientists.

David L. Creech points out the hard fact in his report that the technical manpower base in horticulture in Pakistan is tragically small and that a dramatic transfusion of advanced degrees is needed to upgrade the research base. Likewise, the libraries at the ARIs and the Universities need a transfusion of current books and periodicals. He also recommends that promising fruit material be imported on a continuous basis and the seedling germplasm of walnut, almond, loquat, guava and jujube needs screening for developing superior clones. In Murree area hail-protection net studies be conducted for protecting apple trees.

David Creech supports the strengthening of existing facilities at ARIs and NARC, but considers the creation of a National Horticultural Institute as "premature".

Gerardo A. Santos recommends the cultivation of coconut crop in the eastern and western Thatta area as the soil conditions and irrigation facilities are quite favourable there. He also recommends the use of permanent windbreaks made of forest tree species and fruit trees for protecting the young coconut plants. He favours the planting of seedlings at an earlier age (5-7 months after germination) and the selection of taller varieties which appear more tolerant to the harsh climatic conditions prevailing in the country.

Walter J. Kender has made many recommendations in his report for increasing the productivity of citrus fruits in Pakistan, such as varietal improvement, use of better adapted rootstocks, enhancing the nutritional status of trees, correcting high salinity problems, discontinuing the practice of intercropping, overcoming chronic diseases attacking citrus trees, improving the quality of nursery trees, emphasizing the good fruit condition during post-harvest handling, and upgrading the overall production efficiency through sound horticultural practices.

Certain other constraints must also be addressed, which include: a restructured marketing system, organization and funding of research, increasing the quality and number of research personnel, coordination of research and improved communications between researchers, extension personnel and citrus growers, and improved system of delivering new technology to the citrus growers. Alternate markets must also be developed and more processing plants be constructed. Simple, small scale, low-cost processing kits for preserving acid juices in small villages and remote areas be distributed/popularized.

C) GERMLASM CONSERVATION; PLANT BREEDING & CYTOGENETICS:-

a) GERMLASM CONSERVATION:

There are three reports on this subject. The first one by Maxine Thomson dealing with the germplasm conservation of fruits and entitled "Consultancy Report and Recommendations for Pakistan National Programme for Fruit and Nut Genetic Resources" has already been dealt with under the heading of "FRUITS". The second report titled "Germplasm Conservation and Preservation", is a short presentation by Jose Baeta (1986). He stresses the necessity of having the computer room to be completely free of dust and rodents, and proposes a better indexation system for the stored material and the implementation of the multivariate analysis after the completion of the data entry.

The third report entitled "Germplasm Evaluation in the Arid Highlands of Baluchistan", compiled by the Staff of the AZRI Germplasm Research Group (Sarfraz Ahmad et al.) (1991) presents the results for the 1990-91 session from the germplasm evaluation and screening programme testing Cereal crops (barley and wheat) and food/forage legumes (lentils and vetches). A large proportion of the material tested was exotic germplasm obtained from ICARDA and CIMMYT. Yield trials were held at Quetta, Kan Mehtarzai, Kalat and Loralai, the main agro-ecological zones in highland Baluchistan.

b) PLANT BREEDING/CYTOGENETICS TEACHING AND RESEARCH IN SIND.

There are two reports on this topic. The first one by Hugh Thomas is entitled "Strengthening Cytogenetics and Plant Breeding Teaching and Research in Sind Province (February 1989)", while the second one by Gurdev S. Khush is on "Plant Breeding Research and Teaching at Sind Agricultural University, Tandojam (March 1990)".

Hugh Thomas recommends the establishment of a Cytogenetics Laboratory in the Department of Plant Breeding and Genetics at Sind Agricultural University, Tandojam, and stresses the need to undertake cytogenetical work on Wheat, Cotton and Brassica on account of their importance in the economy of Pakistan. He further recommends improvement in the library facilities, in particular subscriptions to scientific journals, as well as in the equipment available in the Breeding Department at ARI, and underlines the importance of better collaboration between the different establishments on the Tandojam Campus.

Gurdev S. Khush in his report strongly recommends the establishment of an Institute of Plant Breeding at Sind Agricultural University, Tandojam to stimulate research on crop

improvement and thus help establish a centre of excellence on crop improvement. He suggests the designation of various Departments as Divisions, and the addition of Divisions of Genetics Research, Crop Physiology and Publications & Communications and the establishment of Laboratories for teaching and research on Cytogenetics and Tissue Culture. He stresses the need for developing linkages between Sind Agriculture University and IRRI so that graduate students of SAU are able to go to IRRI for thesis research.

D) PLANT PROTECTION; WEED RESEARCH PROGRAMME:-

a) PLANT PROTECTION:-

There are twelve reports pertaining to these fields:-

- 1) M. Hussain Sadar: Organizational Improvements and Research Needs for More Effective and Safer Use of Pesticides in Pakistan (1981).
- 2) Ajaz-ul-Haque Jamali: Regulatory and Environmental Problems of Pesticide Use in Pakistan (October 1981).
- 3) Travis R. Everett: Integrated Pest Management in Pakistan with a Focus on Vehari Agricultural Development Centre (November 1988).
- 4) C.C. Bernier: Action Programme and Strategy for the Control of Yellow Mosaic Virus (MYMV) in Mungbean (August 1982).
- 5) C. C. Bernier: Action Programme and Strategy for the Control of Ascochyta Blight of Chickpea (August 1982).
- 6) C. C. Bernier: Report of Consultantship on Food Legume (Pulses) Pathology in Pakistan (March-April 1983).
- 7) A. P. Roelfs: Epidemiology of the Cereal Rusts in Pakistan (April 1986).
- 8) Ir. L. J. Turkensteen: Survey on Bacterial and Fungal Diseases of Potato in the Hilly Areas of Pakistan (April 1986).
- 9) Ir. L. J. Turkensteen: Survey on Bacterial and Fungal Diseases of Potato in the Plains of of Pakistan (December 1986).
- 10) Antonino Catara: Compendium of Citrus Diseases and Disorders in Pakistan (November 1987).

- 11) J.M. Bove!: Virus and Virus-like Diseases of Citrus in Pakistan (1989).
- 12) R. H. Stover: Evaluation of Diseases and other Problems in the Sind Banana Industry (July 1991).

M. Hussain Sadar and Ajaz-ul-Haque Jamali have dealt with the important subject of pesticide use in their reports, and both have made very important recommendations which must be looked into and need implementation on an urgent basis.

Hussain Sadar made a strong plea for strengthening and updating the PARC Federal Pesticide Laboratory at Karachi as well as the Provincial Pesticide Laboratory/Institute at Faisalabad, and the establishment of a PARC Pest Management Research Institute at Islamabad to assume the role of planning, problem identification and research service to serve the needs of the farmers. PARC should also establish a permanent "Pesticide Committee" which should also include representatives from the Plant Protection Department, the Provincial Governments and the Chemical Industry. This Committee should be responsible for formulating and implementing the pesticide research strategy in Pakistan.

Ajaz-ul-Haque Jamali has discussed the regulatory and environmental problems of pesticide use in Pakistan and strongly recommended the implementation of Pesticide Ordinance of 1971 and Rules of 1973. He further recommends the creation of a new administrative structure, Pesticides Regulation Agency of Pakistan (PAKRAP), within the Federal Ministry of Agriculture, to regulate manufacture, import and the use of pesticides and related plant protection measures in the country. He also recommends the granting of special risk allowance for the scientific and other personnel involved with work on poisonous chemicals/pesticides, and proposes the establishment of a National Institute for Integrated Pest Management to coordinate the country-wide research in this field.

The subject of Integrated Pest Management in Pakistan is taken up by Travis R. Everett in his report with a focus on Vehari District (the Vehari Agricultural Development Centre). He recommends that pesticides should be used only when the value of the increased harvest is greater than the cost of the pest control and that the PARC should discourage all such research proposals for pest control that do not include components for pest monitoring and economic threshold research, and do not indicate a realistic appraisal of the contribution such research would make to an integrated pest management programme. He further recommends the establishment of a Coordinated Crop Protection Programme, along the lines of the Coordinated Crops Programmes, which should involve the participation of agronomists, entomologists, horticulturists, plant breeders, sociologists, economists etc.

C. C. Bernier in his three reports has studied the incidence of Yellow Mosaic Virus (MYMV) in Mungbean, the Ascochyta Blight of Chickpeas, and the pathology of blight disease in food legumes (Pulses) in Pakistan.

A.P. Roelfs has studied the epidemiology of the cereal rusts in Pakistan and recommends the establishment of a series of non-inoculated plots of a susceptible cultivar during the Kharif and rabi seasons to study the incidence of the disease.

Ir. L. J. Turkensteen in his two reports has conducted a survey of all the bacterial and fungal diseases of Potato in the hilly areas as well as in the plains of Pakistan.

Antonino Catara presents the results of his survey of the Citrus diseases in Pakistan in his report, and his "Compendium" includes the viroid diseases, Virus diseases, bacterial diseases, micronutrient deficiencies caused by physiological disorders and fungal diseases. J. M. Bove gives a detailed account of the Virus and Virus-like diseases of Citrus in Pakistan and suggests measures for producing disease-free plants.

R.H. Stover has made a significant contribution towards the understanding of the problems being faced by the Sind Banana Industry. He estimates that production of Banana in Sind has declined by 70% since 1988, and that 50% of the banana fields have been abandoned or converted to other crops. Two serious diseases (Bunchy Top Virus and the Heart Leaf Rot) and soil salinity are involved. He further estimates that by 1992 all of the banana area will be infected unless there is a general eradication programme.

He recommends that a Banana Bunchy Top Control Organization be set up as part of the Sind Department of Agriculture, and the banana plants showing symptoms of the bunchy top disease must be eradicated promptly by the growers or control inspectors.

New disease-free plants or cultivars be produced through the tissue culture technique and the entry of Musa plants of any kind into Sind be prohibited without an entry import certificate from quarantine authorities. The Heart Leaf Rot and Sucker Stunting are caused by a toxicity resulting from an excess of iron or boron or a combination of both. Leaf symptoms of sodium toxicity (chlorosis of the leaf lamina) are also widespread in Thatta District. The salinity levels can be reduced by installing a good drainage system and flushing the soil with good quality irrigation water. Paddy rice cultivation also helps in reducing salinity levels. For a successful rehabilitation of the banana industry a full-time research and extension service must be established.

b) WEED RESEARCH PROGRAMME IN PAKISTAN:-

Fayyaz Ahmad Oureshi has reviewed the on-going weed research programme at NARC, Islamabad, and the Provincial Research Institute (AARI), Faisalabad, and made some valuable recommendations, which include making the Coordinator (Weeds), fully responsible for planning and managing all the PARC Programmes on weeds and weed control, setting up a Research Planning and Appraisal Committee of Researchers and Extension Professionals with the Coordinator (Weeds) as Chairman, expanding research activities in weed science at NARC, establishment of a National Weed Research Institute/National Pest Management Institute as well as a research facility to study the impact of herbicides/pesticides on the environment.

E) LIVESTOCK AND POULTRY DEVELOPMENT; VETERINARY SCIENCE; APICULTURE; SERICULTURE.

a) LIVESTOCK IN PAKISTAN FARMING SYSTEM:-

1. Proceedings of the workshop on Livestock in Farming Systems Research, Islamabad (April 1987), edited by Pervaiz Amir, Abdus Salam Akhtar, and Murray D. Dawson (1987).

Recommendations were made pertaining to the following four topics:- i) Research on Large Ruminants; ii) Research on Small Ruminants; iii) International Linkages and Cooperation; and iv) Education and Training Needs for Livestock at the Universities, Research Institutes and Extension Departments. The following measures were recommended to improve the situation:-

- i) A Travelling seminar be arranged once a year for acquiring first-hand knowledge in selected villages.
- ii) Monitoring Farms be established for on-farm livestock research in selected villages.
- iii) Research-Education-Extension Linkage in Livestock be improved by following TIPAN-like experiments; by joint appointment of some staff members as a researcher, teacher and extension worker to narrow the gap between the three fields; by expanding international linkages; by proper feeding management practices; by reorganizing the livestock extension service; and by holding regular cattle shows/fairs/"melas".
- iv) The status of the Training Centre at NARC be raised to that of an Agricultural Academy.

2. i) RECYCLING WASTES FOR LIVESTOCK FEED;
 ii) LIQUID SUPPLEMENTS FOR RUMINANTS:
 by Z.O. Muller & D. H. L. Rollinson (December 1977).
3. DRAFT REPORT OF THE WAYS DAIRY INDUSTRY CAN BE DEVELOPED IN SIND PROVINCE:
 by Norman A. Clarke (January 1979).
- 4) REVIEW OF POULTRY PRODUCTION AND ECONOMICS IN PAKISTAN:
 by C. Jackson (1980).

The last three reports include studies on various aspects of our livestock and poultry.

Z.O. Muller and D.H.L. Rollinson recommend a supplementation of tropical forages by a feed composed of molasses and urea for the domestic animals (buffaloes, cattle, sheep and goats).

Norman A. Clarke recommends that the dairy industry cannot be developed along economic lines until the major constraints are first removed, which are ; i) the influence and high cost of milk powder imports; ii) the inefficient transport system; and iii) the problem of unhygienic and adulterated milk.

C. Jackson in his report recommends that marketing of eggs should be changed from sale by numbers only to sales by weight, the mass slaughter of birds in the markets be abolished for health reasons, the industry be organized by the formation of cooperatives, farm recording and accounting systems are demonstrated, and that no equipment should be imported, and that the hatcheries be required to submit weekly returns of broilers and layer chicks sold or placed for growing, and weekly returns of eggs and poultry meat sold should also be maintained by the market sellers etc.

- b) THE COLLEGE OF VETERINARY SCIENCE, LAHORE.
THE FACULTY OF VETERINARY SCIENCE, FAISALABAD.
THE FACULTY OF ANIMAL HUSBANDRY, FAISALABAD.

A TRIP REPORT by William C. Wagner (March 1990).

His comments about the work being done in these institutions are very relevant: "There is a potential for a greater level of excellent work to be done in improving the livestock production in Pakistan, but the current situation is not conducive to making the type of progress needed. In some cases there appears to be a lack of focus on solving the problems which are affecting the animal agricultural sector. There is also a lack of delegation of authority and an unwillingness on the part of some individuals to

accept responsibility and provide the needed leadership. Much of what needs to happen cannot be made to occur solely from the office of the administrator. More interdepartmental cooperation which would improve efficiency of use of funds in research is needed.

There is a feeling that some of the important problems in animal production such as basic nutrition and genetics are not receiving the necessary attention. There is a growing need for animal scientists, agricultural economists and veterinarians to work together on the problems of the animal agriculture sector.

c) APICULTURE. by C. Zmarlicki (1987).

C. Zmarlicki in his report has reviewed the status and scope for research in apiculture in Pakistan, and has made numerous recommendations, including training of staff, provision of extension services, appointment of a bee disease specialist at the provincial level, establishment of small honey processing plants, queen rearing stations, and establishment of three to four small workshops for the manufacture of beekeeping equipment and bee foundation.

Another report prepared by the Honeybee Project Staff gives details about the implementation of Zmarlicki's main recommendations.

d) SERICULTURE by Xia Jian Guo (December 1985).

The report suggests measures for improving the sericulture production in Pakistan by setting up a National Silk Company of Pakistan, a modern Silkworm Egg Production Centre and Cocoon Purchasing and Drying Station, and the establishment of a formal Filature Mill, besides imparting training to the Sericultural Technicians and importing new silkworm races from China.

F) NATURAL RESOURCES:-

i) SOILS AND SOIL FERTILITY STUDIES:-

There are four reports on this topic:-

1. A PLAN FOR A SOIL FERTILITY EVALUATION AND IMPROVEMENT PROGRAMME: by Sam Portch (October 1985).
2. METHODS MANUAL SOILS LABORATORY:
by G.E. Winkleman, Rohul Amin, W.A.Rice and Mohammad Bakhsh Tahir (April 1986).
- 3) NATIONAL SOIL FERTILITY EVALUATION & IMPROVEMENT PROGRAMME:
by Sam Portch (1987).

4) SOIL FERTILITY RESEARCH AT TANDOJAM:
by Robert L. Fox (February 1989).

Sam Portch in his two reports recommended the development of a nationally coordinated Soil Fertility Evaluation and Improvement (SFEI) Programme.

Robert L. Fox presents his observations about the laboratory facilities and work being done in the Department of Soils at Sind Agricultural University and the Agriculture Research Institute, Tandojam, and in view of the inadequate facilities for Soil Fertility/Chemistry(Soils) research, he does not support the idea of establishing a National Centre of Excellence in Soil Fertility and Plant Nutrition at SAU, Tandojam.

G.R.Winkleman et al.'s Methods Manual Soil Laboratory is an excellent laboratory guide book for Soil Laboratory. The manual is a compilation of methods for soil and plant material analyses currently being used by the Soils Laboratory of the Barani Agricultural Research and Development (BARD) Project and provides information on the essential analytical procedures for soil fertility and moisture utilization research and related crop management programmes.

ii) SOIL AND WATER CONSERVATION

The report prepared by Alex Mitchell (1987) recommends that research be initiated to investigate run-off and soil loss measurement in the Gully Land Management Project and Rawal Watershed Project by installing single stage automatic sediment samples and peak flow recorders. The report also recommended that water harvesting and aquifer recharge investigations be undertaken at AZRI, and also investigate the effectiveness of mini dams on barani lands. Vegetation trials be implemented in Rawal Watershed Project, and gully stabilization trials be implemented using Casuarina cunninghamiana and streamside stabilization trials be undertaken using Eucalyptus camaldulensis along the Indus River. Gully Land Management Project be started and also a Pilot Streamside Protection Project in the Northern Areas. A National Soil Conservation Policy be developed.

iii) HIGH EFFICIENCY IRRIGATION SYSTEMS

There are two reports on this subject. The first one by J. Gwynne Evans (September 1985) recommends that PARC establish a national research programme for the development and use of high efficiency irrigation systems which would coordinate the work of existing institutions and provide greater emphasis towards the development of indigenous manufacture of equipment and the establishment of appropriate agricultural practices under local conditions.

The second report by J. F. Alfaro (August 1987) recommends the establishment of a national programme, including a training component, for researching trickle and sprinkler irrigation systems as major component of a more comprehensive Agricultural Water Resources Research Programme. PARC is also strongly recommended to initiate intensive practical problem-solving research in the area of surface-irrigation. Product development research should be carried out under the leadership of Irrigation Research Institute, Lahore, in cooperation with interested manufacturers and in coordination with PARC. The national coordination unit for trickle and sprinkler irrigation should be housed at the FMI, NARC.

iv) WATERSHED MANAGEMENT

The report prepared by Alex Mitchell (1986) recommends that strategically located watershed research projects be established over the next decade to obtain accurate data on rain/run off relationships and sediment yield under different kinds of land use and management. These projects be located in the watersheds to Mangla, Tarbela, and the proposed Kalabagh storage on critical sediment source areas, in addition to the two located near Quetta, to investigate water harvesting and demonstrate benefits of aquifer recharge.

A Pilot Project be established near Hunza to determine the feasibility of stabilizing streambanks and slumping affecting streams with the aim of reducing sediments discharged into Tarbela storage, and establishing productive plants (e.g. Casuarina and Eucalyptus spp.) on slopes and terraces, and application of water harvesting techniques. PARC should also take action for the establishment of a Watershed Authority with an associated Land Use Council.

v) RANGE DEVELOPMENT:

a) THE POTENTIAL FOR RANGE DEVELOPMENT IN PAKISTAN
by J. Looman (1984)

In Pakistan rangelands occupy approximately 72% of the total area (with 24% under cultivation and 4% classed as mountains and rocky areas). Most of the rangelands, about 56%, are in Baluchistan; about 16% is in the Punjab, and 16% in Sind, and the remaining 12% in NWFP. In the Punjab it occupies 47% of the total area, in Sind 61%, in NWFP 66% and in Baluchistan 9.3%. Most of the rangeland is in areas of low rainfall and most of the cropland in areas of higher rainfall.

In all the provinces the rangelands are severely overgrazed. However, all rangelands in Pakistan have a good potential for substantial improvement of productivity.

The report recommends that there is an urgent need for a fully integrated Range Management Programme which should undertake the projects of Plant Introduction, Range Improvement, Forage Utilization, Forage Quality Evaluation, Animal Nutrition, Plant Breeding etc. It is also recommended that the Government of Pakistan create a Department of Livestock and Forage Production and should also encourage the creation of a Department of Range Management in one of the Universities to make up the great shortage of trained personnel.

b) PASTURE ESTABLISHMENT IN THE NWFP AND PUNJAB PROVINCES OF PAKISTAN

Paul J. Talay (1985) reports that in Pakistan 60 million hectares of land is suitable for pasture development and recommends the establishment of an authority with a mandate to improve the state-owned rangelands and a pasture seed multiplication unit to produce seeds of known quality for release to growers; introduction of legislation to protect the vegetation of rangelands; and training courses for pasture agronomists/extension officers.

vi) AGROMETEOROLOGICAL RESEARCH: RAINFALL PROBABILITIES IN THE DISTRICTS OF RAWALPINDI-ISLAMABAD, HARIPUR, MIANWALI, BANNU, AND D.I. KHAN AREAS:-

George W. Robertson has reported (1985) the analysis of the data collected (in 1984) from five districts of the Northern Punjab and NWFP based on daily /monthly rainfall values for a period of 15 to 53 years. The long term rainfall trends (annual averages) indicate that such trends occur at random and cannot be predicted. A better comparison of rainfall with crop water requirements can be made by using a rational soil water budget based on the water holding capacity of the soil.

G) FARMING SYSTEMS RESEARCH; AGRICULTURAL EXTENSION:-

a) FARMING SYSTEMS RESEARCH:-

There are eight reports on the Farming Systems Research, one jointly by Robert E. Hudgens and Marlin Van Der Veen, two by Marlin Van Der Veen alone, four by Murray D. Dawson, and one by Bushra Tariq.

- 1) Robert E. Hudgens & Marlin Van Der Veen: Assessing the Impact of Farming Systems Research in Pakistan (March 1990).

- 2)
 - i. Marlin Van Der Veen: Farming Systems Socio-Economic Research in Pakistan (August 1991).
 - ii. Marlin Van Der Veen: Pilot to Production Programme: Planning, Monitoring and On-Going Evaluation (August 1991).
- 3)
 - i. Murray D. Dawson: Farming Systems Research: Management of Agricultural Research & Technology Project (End of Tour Report) (March 31 1990).
 - ii. Murray D. Dawson: Farming Systems Research and NARC Master Plan Implementation (Report-1). Accomplishments; Issues; Recommendations (July 1990).
 - iii. Murray D. Dawson: Farming Systems Research and NARC Master Plan (Report III) (September 1991).
 - iv. Murray D. Dawson: Farming Systems Research (March 1992).
- 4) Bushra Tariq: Rural Women Poultry Keeping at Fatehjang (April 1992).

Robert E. Hudgens & Marlin Van Der Veen have, in their report, reviewed the working of the Farming Systems Research in Pakistan, and very rightly remark that the participation of agricultural extension service is severely lacking in several provinces. Extension workers, who were initially involved in the diagnostic surveys have, since, become spectators. Farmer participation also appears limited to survey response, attending field days, supplying land, labour and livestock for on-farm research. Decisions on research priorities seldom included farmer perspectives on management constraints and feed back from farmers concerning trial results was inadequately collected and reported. Special attention should be given to farmer participation in the FSR. They also made some important recommendations:

- i) A "Manpower Development Plan" should be prepared by the National and Provincial Coordinators to delineate the FSR Training needs.
- ii) All FSR scientists and graduate students should take inservice short courses to acquaint them with the FSR concepts and methodologies.
- iii) Initial emphasis should be on "training trainers" who would then be responsible for conducting follow-up training programmes in their respective provinces.
- iv) FSR subject matter should also be incorporated into the agricultural University curriculum in each province.

- v) A workshop should be organized by the National FSR Coordinator to standardize the format used by FSR Site Coordinators.
- vi) The "National FSR Monitoring Team" should begin annual assessment of FSR activities in selected provinces.
- vii) Adaptive Research Programmes and the Barani Agricultural Research and Development (BARD) Project should be integrated with the nationally coordinated FSR Programme.
- viii) A PC-I for FSR should be developed by each province, and should request PARC funding for the National FSR Coordinator, travelling seminars, annual planning meetings, and publications, from both federal and donor agencies.

Marlin Van Der Veen in her first report (August 1991) advocated a broadening of the FSR approach and methods and strengthening farm profitability analysis. She recommended the adoption of a multidisciplinary integrative and cooperative approach, and proposed the initiation of a women's Poultry Production Programme at Fatehjang. She also studied the factors responsible for low cropping intensity at Fatehjang, and conducted a workshop at Lahore to prepare a pilot production programme based upon the zero till wheat seeder.

The second report by Marlin Van Der Veen (August 1991) discusses the various aspects of planning, monitoring and on-going evaluation of pilot to production programmes especially the Zero Tillage Wheat Pilot Production Programme for the Punjab Rice-Wheat System, and the Women's Poultry Pilot Production Programme at Fatehjang.

Murray D. Dawson, in his four reports on the Farming Systems Research and NARC Master Plan (March 1990, July 1990, September 1991, March 1992) repeated the points raised by Robert E. Hudgens & Marlin Van Der Veen (March 1990) and some other consultants on the same subject. He recommends institutionalization of the FSR Programme in Pakistan, implementation of the NARC Master Research Plan (per consultant Baird recommendations, March 1990), appointment of a strong DG at NARC with two CSOs, delegation of administrative and financial authority, resetting research programme/project priorities, resource allocation to priority research, collaborative interdisciplinary research programmes, establishment of a Research Monitoring Cell and strengthening the Training Programme at NARC. These suggestions are repeated in one form or another in all the four reports which, in fact, could be very conveniently combined into one report.

Bushra Tariq in her report (April 1992) gives the findings of a survey of rural women carried out at two villages of Fatehjang regarding their involvement in a training programme in improved poultry husbandry and pest management of household grain storage.

b) AGRICULTURAL EXTENSION

- 1) S.K.T.Williams (1986) has identified the deficiencies in the current extension system in the country, and made the following recommendations to rectify the situation:
 - i) The present agricultural extension structures are highly defective and need restructuring with new approaches to meet the needs of the farmers.
 - ii) The extension systems recommended for adoption are: a) Crop Maximization Project (CMP); b) World Bank Integrated Agricultural Development Project (IADP) or T & V System; and c) Group Farm supervised credit approach.
 - iii) T&D technique with emphasis on practical demonstration of packages of technologies with built-in mini production kits; extension programme for livestock; the need to employ a cadre of lady extension workers with background training in agriculture and home economics to work with farm women.
 - iv) The Input Delivery and Supervised Credit Agencies should liaise with the research institutes in the provinces to be up-to-date in the technology being transferred to the farmers.
 - v) Establishment of Coordinating Mechanism between Research and Extension system by integrating provincial research institutes with the agricultural Universities (through the creation of a Technology Transfer and Communication Department (TTCD). The Agricultural Universities should organize short courses for farmers and extension agents on a regular basis.
 - vi) A Central Agricultural Media Resource Centre (AMRC) be set up at PARC to provide support for the Communication Unit of provincial TTCD with necessary soft and hardwares.
 - vii) Establishment of Extension/Research Liaison Unit at PARC within the Social Sciences Division of PARC to undertake research in all aspects of the agricultural activities.

2) RESEARCH EXTENSION LINKAGES FOR EFFECTIVE TECHNOLOGY TRANSFER

Khalid Masud CHAUDHARY, Taj Mohammad Khan and M. Salim Zia Toor have edited the proceedings of the National Workshop on Research Extension Linkages for Effective Technology Transfer held at NARC (October 1986). The following recommendations were made:-

- i) A Technology Transfer and Communication Centre be established at the Federal level for providing facilities of training and research in extension methodologies and training of manpower of all the provinces.
- ii) All private sector organizations producing and marketing agricultural products such as fertilizers, pesticides, agricultural machinery, etc. should set aside a reasonable percentage of their budget for supporting research in extension education.
- iii) Farmers' Organizations be involved in agricultural extension through a suitable institutional mechanism.
- iv) Supervised Credit Schemes of the Government of Pakistan be intensified with more emphasis on dissemination of improved technologies of crop and livestock production.
- v) Agriculture Service Centres be organized by the private sectors, and farmers be provided facilities for repair and maintenance and advisory services for agriculture machinery and implements.
- vi) All agricultural Universities and research institutes should have their own technology transfer and communication institutes.
- vii) Ph.D. Programme for agricultural extension and communication be instituted at least in one of the Universities in Pakistan.
- viii) The NARC, having the physical and technical capacity for the training of manpower at advanced level, be declared as a deemed University.
- ix) A National Bureau of Plant Genetic Resources be established at the federal level with its components at the provinces.
- x) A National Academy of Agricultural Research Management be organized at the federal level to upgrade the managerial skills of the scientists.

- xi) For effective coordination of research and extension, coordination cells be created in the provincial institutes, and each University should have an outreach research programme.
- xii) Extension programmes for special groups of farmers such as rural women and landless farmers be organized.
- xiii) Area development plans be followed for a given area jointly by researchers, extension specialists, representatives of delivery systems and progressive farmers and representatives of local institutions.
- H) SOCIAL SCIENCES RESEARCH/SOCIO-ECONOMIC SURVEYS; DATA COLLECTION AND EVALUATION.
- a) SOCIAL SCIENCES RESEARCH/SOCIO-ECONOMIC SURVEYS:-
There are four very useful studies on this topic:-
- 1) CONSULTANCY IN SOCIAL ANTHROPOLOGY: by Concepcion Del Castillo (1987).
 - 2) GENDER & DEVELOPMENT IN BARANI AREAS OF PAKISTAN: by Jim Freedman & Lokky Wai (January 1988).
 - 3) SUGGESTIONS REGARDING THE ROLE, TRAINING PROGRAMME, AND RESEARCH AGENDA FOR THE SOCIAL SCIENCES DIVISION, PARC: by Richard H. Goldman (March 1988).
 - 4) SOCIO-ECONOMIC SURVEY OF THE MAKHRAN DIVISION OF BALUCHISTAN: by Nek Buzdar (November 1988).

Concepcion Del Castillo's study focusses on village organization and communication patterns in Quetta District. The study was designed to provide data on the nature of community life in that area as a part of a series of "Community profiles".

Jim Freedman & Lokky Wai's Barani Gender Survey is a useful study of the involvement of women in farm and livestock production in the Barani Areas of Gujar Khan (Punjab) and Haripur (NWFP) Tehsils, but some of their findings, especially those relating to the total income generated by women in a household, are open to question. Nevertheless, their recommendation for starting a Women's Livestock Production Project deserves urgent consideration.

R.H. Goldman sets forth research priorities and goals for the Social Sciences Division and recommends strengthening of the Agricultural Economics Research Units (AERUs) and stresses the need for developing closer interactions between the Social Sciences Divisions and other Research Institutes and University Faculties. He suggests that Senior Scientific Officers in each AERU should teach a University Course and a small group of the best post-graduate students can be selected to carry out their M.A. Research through AERUs.

Nek Buzdar's report of the Socio-economic Survey of Makran Division of Baluchistan is one of the best studies of this nature in any area of Pakistan, and such work should be undertaken in other regions as well.

b) DATA COLLECTION/EVALUATION FOR AGRICULTURAL RESEARCH:

There are three reports on this subject. J.A. Wicks' survey report on FARM MANAGEMENT/PRODUCTION ECONOMICS (1986) is a study of farm management in five districts of the Punjab, and 100 households (mostly of small farmers) were sampled.

The second report by Robert E. Evanson on RESEARCH EVALUATION PROJECT (Phase-I, March 1988), deals with the development of an inventory of agricultural research activities (and related extension activities) in Pakistan.

The third report by Douglas Gollin (August 1988) on DATA COLLECTION FOR EVALUATION OF INVESTMENT IN AGRICULTURAL RESEARCH is a detailed study of the data relating to agricultural production and productivity needed for evaluating investment in agricultural research in Pakistan (i.e. Crops, Livestock, Irrigation, Tubewells, Tractors and Machinery, Fertilizers, Pesticides, Labour and Human resources, infrastructure variables, land use, soil resources markets etc.), and the constraints. The report recommends the establishment of a single central organization, preferably PARC/NARC for collecting materials related to agriculture.

I) BIOMETRY IN PAKISTAN; COMPUTER APPLICATIONS IN AGRICULTURE:-a) BIOMETRY IN PAKISTAN:-

- i) REPORTS ON THE BIOMETRICAL CAPABILITIES OF AGRICULTURAL RESEARCH CENTRES AND AGRICULTURAL UNIVERSITIES OF PAKISTAN:
by K. M. Eskridge (1986).
- ii) BIOMETRY IN PAKISTAN:
by Roger G. Peterson (September 1989).

Both these reports emphasize the importance of sound biometrical/statistical design and analysis principles and their applications in agricultural research, and recommend strengthening the Computer and Statistical Units(CSU) at NARC, creation of Biometrics Units in the Provincial Research Centres, and improving the Statistics Departments in the Universities.

iii) K.M. Eskridge's short report on "Selection for Genotypic Stability Using Expected Utility Maximization and Safety First Rules" is a paper devoted to deriving stability indices.

b) COMPUTER APPLICATIONS IN AGRICULTURE (DATA HANDLING AND ANALYSIS; DATA BANKING ETC.):-

There are 7 reports on various aspects of computer applications in agricultural research:-

- 1) AGRICULTURAL ECONOMICS DATA BANK:
by D. N. Altman (1987).
- 2) A PROPOSAL TO SET UP A NATIONAL AGROECOLOGICAL DATA BASE AND LAND RESOURCES INVENTORY FOR RESEARCH AND DEVELOPMENT:
by Amir Kassam & Harry Van Velthuizen (February 1987).
- 3) REPORT ON DATA HANDLING AND ANALYSIS WORKSHOP:
by K. A. Gomez & Edward Mallorie (December 1987).
- 4) MANPOWER DATA ANALYSIS AND PLANNING:
by John M. Dukesbury (April 1989).
- 5) PAKISTAN AGRICULTURAL RESEARCH NETWORK(ARN); INVENTORY AND DIRECTORY OF INSTITUTIONS AND MANPOWER DATA ANALYSIS:
by John M. Dukesbury (March 1990).
- 6) COMPUTER APPLICATIONS FOR AGRICULTURAL INFORMATION TRANSFER:
by Richard W. Tenney (April 1990).
- 7) THE PAKISTAN AGRICULTURAL RESEARCH NETWORK DATABASE:
by John M. Dukesbury (December 1990).

J) AGRICULTURAL INFORMATION SYSTEMS:-

a) AGRICULTURAL LIBRARIES IN PAKISTAN:-

1) SCIENTIFIC RESEARCH INFORMATION:

by F.L. Garagorry-Cassales (1986).

2) STRENGTHENING AGRICULTURAL LIBRARIES IN PAKISTAN:

by Melvin R. George (1988).

Garagorry-Cassales' assignment was to computerize the PARC Information Directorate. He suggested a suitable system for this purpose and recommended the installation of appropriate hardware in the PARC, and also made recommendations for the Plant Genetic Resources Laboratory at NARC.

The report by Melvin R. George (1988) reviews the current status of libraries supporting agricultural research in Pakistan and makes recommendations for the establishment of a national agriculture library network. The report recommends that the NARC Library be given the responsibilities of a National Agricultural Library with two major divisions: the National Library and A Network Coordination Unit.

b) MART INFORMATION TRANSFER: AUDIO-VISUAL COMMUNICATIONS:-
(END OF TOUR REPORT) by J. Cordell Hatch (May 1992).

Cordell Hatch reviews the accomplishments of the MART Information Transfer Network in developing the Audio-Visual Communication(AVC) Programme at NARC, computerising the research system by providing more than 220 Personal Computers, the Agricultural Text-Book Publishing Programme, the Library Strengthening Programme, Communications-Training-Outreach (CTO) Operations, and the Computer Training Programme for Information Transfer.

He calls for advanced training of Agricultural Communication Scientists, increased audio-visual productions, more research in the field of communications and information transfer, and strengthening and properly managing the extension services in Pakistan. He has made some very valuable recommendations in his candid way, which must be given serious consideration by the higher authorities. Some of the recommendations are:-

- i) Repair and Maintenance: Equipment, buildings and facilities should not be out of service for long periods.

- ii) Security vs Utilization: Security and responsibility should be organized and shared so that equipment and facilities are readily available to the whole staff for the widest possible use.
- iii) High Productivity and Performance: Perhaps PARC/NARC could be run more along entrepreneurial lines of a private profit-driven enterprise, where those not producing are pruned from the payroll. This calls for management and staffing based strictly on organizational need and performance.
- iv) Centralized Decision-Making: Delegate decision-making to the lowest practical level. This should include budget control, staffing authority, and programme responsibility.
- v) Supervisory Echelonizing: The Directors should be intimately involved in every phase of the operation, evaluating performance and progress, promoting, directing, encouraging, planning the work and seeing it through on the field.
- vi) Coordination and Communications: Organize the existing Communications-Training-Outreach (CTO) Units as Division or Bureau of Communications-Training-Outreach.
- vii) Scientific Engagement and Renewal: Each scientist should be required to do an exhaustive review of literature in his field of specialization, citing references only from these new databases, and should spend a lot of time in the library.
- viii) Credit for CTO Contributions:- Administration must establish and articulate clearly that CTO is an integral part of every researcher's job. CTO contributions must be part of the criteria for promotion, travel, training and other rewards.

c) AUDIO-VISUAL COMMUNICATIONS BUILDING
(AS SEEN BY THIS CONSULTANT):-

J. Cordell Hatch states in his report (May 1992) that "the new AVC/TI building at NARC provides excellent and ample space for training and AV productions. The video studio is large and could serve as the national centre for the production of agricultural telecasts, documentaries, and informational videos. The building will soon have equipment installed for doing just about any kind of training or AV Production."

"Working with Dr. James Miller, MART Architectural Consultant, design plans for the new Audio-Visual Communications/ Training Institute Building were developed. Collaborative efforts resulted in floorplan design for both AVC and TI facilities."

To find out the actual facts the present writer, accompanied by Dr. Abdul Sattar Alvi, Secretary MART Project, visited the AVC building on 2/8/1992, and we were appalled to see the situation there. We went through almost every part of the building, and met members of the AVC Technical Staff, all of whom were unanimous in their views that the building in point was badly designed and constructed. The studio is neither sound-proof nor it has proper lighting arrangements. The corridors in both the AVC and Training Institute buildings are not fitted with on-off switches, and the electric current has to be switched on or off from the circuit-breaker main switch board box which normally should not be opened at all. (In our homes we open the box only in cases of emergency). The ceilings and walls in many rooms on the first floor showed prominent marks of water seepage. The equipments installed in the rooms were without operating manuals, and the Director and other members of the technical staff bitterly complained of the absence of spare parts, which could have been purchased with a small amount of funds.

I think it is imperative that necessary changes be made in the AVC Building in consultation with the AVC Director and the technical staff if at all it has to become fully functional. As a matter of fact the building in point should not have been taken over by the AVC staff until all the serious defects in construction had been rectified.

K) SUPPORT SERVICES:

a) FARM MACHINERY:-

There are two reports on this subject, both describing the design and development of a Seed Drill and a Thresher respectively for Pakistani conditions.

i) MULTI-CROP SEED DRILL DEVELOPMENT (APPROPRIATE TILLAGE AND PLANTING MACHINERY):

by P.B.R. Long (1986).

ii) STATIONARY GROUNDNUT THRESHER (PRODUCT, DESIGN AND DEVELOPMENT):

by A. H. Lundberg (February 1986).

Both the machines are now being manufactured on a commercial scale.

b) SCIENTIFIC/LABORATORY EQUIPMENT MAINTENANCE AND REPAIR:-

There are two reports on this subject:-

- 1) LABORATORY EQUIPMENT MAINTENANCE AND REPAIR:
by Tony Blair (May 1987).
- 2) SCIENTIFIC EQUIPMENT OPERATIONS AND MAINTENANCE:
by Leonard R. Mattick (March 1989).

The recommendations made by R. Mattick are very pertinent and need urgent and serious consideration. The report says: "Millions of dollars (worth) of scientific equipment have been donated and purchased for the agricultural research institutes and universities of Pakistan without any stipulation or provision for their maintenance or repair. With the exception of the Laboratory Equipment Maintenance and Repair Unit at NARC, a small repair Cell at the University of Agriculture at Faisalabad, and the repair Unit in the Electrical Engineering Department at NWFP University of Engineering, repair skills do not exist at the remainder of the institutes".

"A system for the repair and maintenance of scientific laboratory equipment should be established within the agricultural system of Pakistan. Repair cells should be established and equipped with test equipment, tools and properly trained service personnel." A central Library of service manuals and operations manuals for laboratories should also be established at LEMRU, NARC, Islamabad. The major spare parts can be kept and stored at a Central Storage at NARC where temperature controlled room facilities exist. The utilization of coupons for the purchase of spare parts has been suggested. A Training Course for training operators and users of laboratory equipment/instruments be held at the NWFP Agriculture University, Peshawar.

c) NARC/MART INTERNAL REPORTS ON NARC ARCHITECTURAL DESIGNING AND PLANNING WORK (IN 4 PARTS) by H. James Miller (August 1986 - August 1987)

The report reviews the work of designing the various buildings of the NARC as well as the presentation of the physical master plan for the building areas of NARC.

IV) IMPORTANT RECOMMENDATIONS SUMMED UP:

Some of the important recommendations can be summed up as follows:-

1) MANAGEMENT/TRAINING REVIEWS OF THE PARC/NARC:

- i) E. T. York, Jr. (1986) recommends that: a) The National Coordinated Research Programmes should provide excellent means for improving the coordination between the federal and provincial agricultural institutes; b) given the opportunity, the agricultural universities could contribute significantly to an overall research effort, and the quality of the universities' educational effort could be enhanced through such involvement; c) careful consideration needs to be given to the division of effort between PARC's in-house research responsibilities and its role in stimulating, coordinating and funding research by other organizations; d) while there is obvious need for better coordination of research activities, there is an equal need for developing closer linkages between research and extension functions.
- ii) Tilo L.V.Ulbricht (1987) emphasizes the need for proper staffing of the Planning Directorate, and of the Monitoring and Evaluation Unit in particular.
- iii) G.M.Khattak et al. (1988) recommend that : a) the NARC should have a full-time DG with effective powers, and he be supported by at least two, eventually three, fulltime DDGs; b) the Institutes be redesignated as Departments and the groups should be reorganized; c) a Management Review of the PARC itself be undertaken as soon as possible; d) the PARC should provide special funds to the universities for postgraduate research; e) PARC/NARC should encourage the writing and printing of textbooks relevant to Pakistani conditions, and provide scholarships for higher studies and training within the country; f) the NARC should help develop linkages of research organizations with the extension services by providing the services of subject matter specialists from the Talent Pool.
- iv) M. Masood Khan et al. (1990) recommend the amalgamation of the repair and maintenance personnel into a centralized unit, and merging together of the Automobile and Farm Operations and Services Workshops under the administrative and technical control of a Director, and provision of sufficient funds and the latest equipment to the Operations and Maintenance Unit for repair and maintenance of the buildings.

- v) Guy B. Baird (1990) recommends the appointment of a strong DG at the NARC to be assisted by one DDG for administration, identification of high priority projects for necessary funding, and strengthening of the Planning Research Monitoring and Coordination Unit (PRMC) of the NARC.
- vi) A.L. Brown et al. (1989) recommend that: a) PARC must have a published administrative manual (PAD) along with job descriptions for all staff positions; b) a comprehensive programme of project planning, monitoring and evaluation be established; c) all research institutes be delegated administrative and financial authority.
- vii) James B. Barnett (1991) and Bill C. Wright (1992) recommend the establishment of five research substations in Baluchistan based on elevation/ecology.
- viii) Bill C. Wright (1992) recommends that: a) the management of personnel and finances of the PARC must be improved; b) a strong DG be appointed for NARC and he be given full authority to manage the institution; c) the PARC Policy and Administrative Directives (PAD) be published; d) operating funds be provided for maintenance and repair of buildings, vehicles, and laboratory and field equipment at NARC; e) PARC must develop a participatory management system, and the researchers must be rewarded for good work and be allowed to function at high degree of productivity.
- ix) John L. Woods (1990) stresses the importance of re-entry programme for the scientific staff sent abroad for overseas training as well as the need to adopt a broad-based approach to increase the productivity of the returned participants. He recommends the appointment of an International Cooperation and Training Deputy Director for Re-Entry Programme, and emphasizes the need for overcoming the administrative and financial problems being faced by the returnees, and calls for diversification of funding sources for the Training Programme of the NARC Training Institute.
- 2) GENERAL AGRONOMY AND RELATED FIELDS (CEREAL CROPS/FODDER CROPS/ SUGARCANE/ HORTICULTURE/FRUITS etc.)
- i) Pervaiz Amir (1986) recommends provision of improved seed of maize and a package of technology to the farmers in Pakistan; and J. Dumanovic (1986) pleads for the establishment of a National Maize Research Institute.

- ii) L.V.Crowder (1988) recommends that Seed Multiplication Scheme for fodder crops be launched with the support of Agricultural Development Bank of Pakistan, and setting up a multidisciplinary Village Task Force for transfer of Fodder Technology to the farmers, and the organization and implementation of a Pakistan Fodder and Forage/Pasture Network Programme.
- iii) R.S. Kanwar (1988) lays emphasis on the strengthening of sugarcane research on a priority basis in Pakistan and the establishment of a multidisciplinary National Sugarcane Research Institute for the development of improved varieties of sugarcane.
- iv) N.Kaska (1987) suggests the introduction of non-traditional fruit species in Pakistan, such as Avocado, Pecan and Pistachio; R.A. Hamilton (1987) proposes the introduction of new fruit and oil-bearing trees from South and Central America; and T. R. Subramanian (1988) recommends establishment of a National Institute for Horticulture with a few selected regional stations under the jurisdiction of the Institute.

3) GERMPLASM CONSERVATION:-

Maxine M. Thomson (1983) points out that the genetic resources of our valuable plant species are seriously threatened because of the encroachment of humans and domestic animals on the national flora, and woody plants in particular are being rapidly destroyed through land clearing and for forage and fuelwood, with young seedling trees unable to regenerate due to subsequent intensive land use. She, therefore, strongly recommends that the first priority for fruit and nut genetic resources in Pakistan should be collection and maintenance of representatives of these indigenous temperate fruit and nut species and the establishment of a National Clonal Repository for temperate fruit and nut species in Quetta.

4) PLANT PROTECTION AND WEED RESEARCH PROGRAMME:-

- i) M. Hussain Sadar (1981) made a strong plea for strengthening and updating the PARC Federal Pesticide Laboratory at Karachi as well as the Provincial Pesticide Laboratory/Institute at Faisalabad, the establishment of a PARC Pest Management Research Institute at Islamabad, and the setting up by PARC of a permanent "Pesticide Committee" which should include representatives from the Plant Protection Department, the Provincial Governments and the Chemical Industry.

- ii) Ajaz-ul-Haque Jamali (1981) strongly recommended the implementation of Pesticide Ordinance of 1971 and the Rules of 1973, as well as the creation of a new administrative structure, Pesticides Regulation Agency of Pakistan (PAKRAP) within the Federal Ministry of Agriculture to regulate the manufacture, import and the use of pesticides and related plant protection measures in the country, grant of special risk allowance for the scientific and other personnel involved with work on poisonous chemicals/pesticides, and proposed the establishment of a National Institute for Pest Management to coordinate the countrywide research in this field.
- iii) Travis R. Everett (1988) stresses the need for the establishment of a Coordinated Crop Protection Programme on the lines of the Coordinated Crops Research Programmes.
- iv) R. H. Stover (1991) recommends that a Banana Bunchy Top Control Organization be set up in Sind, and the affected banana plants be eradicated promptly. Flushing the saline soils with good quality irrigation water and the installation of a good drainage system are suggested as control measures for the control of high salinity and toxicity caused by sodium, iron and boron.
- v) Fayyaz Ahmad Qureshi (1987) recommends setting up a National Weed Research Institute/National Pest Management Institute as well as a research facility to study the impact of herbicides/pesticides on the environment.

5) LIVESTOCK DEVELOPMENT:-

- i) Z.O. Muller and D.H.L. Rollinson (1977) recommend supplementing the tropical forages by a feed composed of molasses and urea for the domestic animals.
- ii) Pervaiz Amir et al. (1987) recommend establishment of monitoring farms for on-farm livestock research, research-education-extension linkages in livestock, and raising the status of the NARC Training Centre to that of an Agricultural Academy.

6) NATURAL RESOURCES:-a) RANGE DEVELOPMENT:

J. Looman (1984) stresses the need for a fully integrated Range Management Programme, and the creation of a Department of Livestock and Forage Production by the Government of Pakistan and Range Management Teaching Department in one of the Universities of Pakistan.

b) IRRIGATION SYSTEMS:

J. Gwynne Evans (1985) suggests that PARC establish a National Research Programme for the development and use of high efficiency irrigation systems which would coordinate the work of existing institutions. J.F. Alfaro (1987), on the other hand, recommends the establishment of a comprehensive Agricultural Water Resources Research Programme, and also the initiation of intensive practical problem-solving research in the area of surface irrigation.

7) AGRICULTURAL EXTENSION:

i) S.K.T. Williams (1986) emphasizes the need to employ a cadre of lady extension workers with background training in agriculture and home economics to work with farm women, and recommends the establishment of a coordinating mechanism between research and extension system by integrating the provincial research institutes with the agricultural universities through the creation of a Technology Transfer and Communication Department (TTCD), setting up a central Agricultural Media Resource Centre (AMRC) at PARC to provide support for the communication unit of provincial TTCD with necessary soft and hardwares, and an Extension/Research Liaison Unit at PARC within the Social Sciences Division to undertake research in all aspects of the agricultural activities.

ii) Khalid Masud Chaudhary et al. (1986) recommend the establishment of a Technology Transfer and Communication Centre at the Federal Level as well as in the Universities and research institutes for providing facilities of training and research in extension methodologies, involvement of Farmers' Organizations in Agricultural Extension, starting a Ph.D. Programme for agricultural extension and communication in one of the

Universities in Pakistan, the conversion of NARC into a University, and establishment of a National Academy of Agricultural Research Management at the federal level to upgrade the managerial skills of the scientists, and also a National Bureau of Plant Genetic Resources, and organizing extension programme for special groups of farmers such as landless farmers and rural women.

8) MART INFORMATION TRANSFER:

J. Cordell Hatch (1992) recommends delegation of decision-making authority to the lowest practical level for such matters as budget control, staffing authority, and programme responsibility. He also exhorts the scientists to do an exhaustive review of literature in their fields of specialization, and stresses the need for organizing the Communications-Training-Outreach (CTO) Units as a Division or Bureau of Communications-Training-Outreach, and suggests that full credit be given for researchers' contributions to CTO.

9) AGRICULTURAL LIBRARIES:

Melvin R. George (1988) recommends that the NARC library be given the responsibilities of a National Agricultural Library with two major divisions, the National Library and a Network Coordination Unit.

10) LABORATORY EQUIPMENT MAINTENANCE:

L.R. Mattick (1989) recommends the establishment of a system for the repair and maintenance of scientific equipment within the agricultural system of Pakistan by setting up repair cells equipped with test equipment, tools and properly trained service personnel.

V) CONCLUSIONS AND RECOMMENDATIONS:-

The consultancy reports were, quite evidently, desired to be written with a view to helping the PARC/NARC and other research institutes in achieving their objectives of improvement of research standards, training skills, management practices, or simply for having a better understanding of the improved agricultural technologies. But have these reports made any appreciable impact on our present agricultural set up? Has there been any improvement in the organizational structure of the various agricultural institutions in point? Have the research efforts of the scientists benefitted the system in any way, and the output shown any enhancement? These are only some of the questions which instantly come to our minds when it is realized that millions of rupees were spent, a lot of precious time and enormous amounts of efforts and endeavours were expended in preparing these reports, almost all of which, to our great misfortune, have been put away in the endless piles of the office files or else consigned to the remote corners of the bookshelves in the Planning Directorate of the PARC.

It is indeed very tragic to note that, apart from three or four notable exceptions (e.g. Apiculture/Honeybee Project, Farm Machinery, and Scientific Equipment Maintenance & Repair), hardly any other consultancy report has been seriously considered for a follow-up action, and none of the recommendations has been implemented.

We must realise that the only way to make any worthwhile progress in any sphere of activities is by having an objective appraisal and evaluation of our past performance. The sooner it is done the better it will be not only for the agricultural research institutions and establishments but also for the whole country. We simply cannot afford to indulge in such colossal exercises in futility.

Several reasons can be put forward to explain the factors which prevented the implementation of the recommendations of the reports in point, the most important being the absence of a well-defined policy and the lack of an organizational or administrative mechanism to put the main recommendations into effect. There should, actually, have been an Implementation Cell/Section within the Planning Directorate for this purpose. Unfortunately, however, even the Monitoring and Evaluation Unit/Section of the Planning Directorate of the PARC has not functioned properly not to speak of the establishment of any Implementation Section. Anyhow, we must try to put our house in order. After all, the evaluation of our work has to be a continuing process.

The most important recommendations of these reports pertained to the management policies and practices of the PARC/NARC (vide reports by G.M.Khattak et al., E.M. York, Jr., Tilo Ulbricht, Masood Khan et al., A.L.Brown et al., John Woods, Guy Baird, Murray Dawson, Bill Wright, and Cordell Hatch, etc.), stressing the imperative need for reforming the administrative and financial practices, the delegation of authority to the local supervisory heads/officers incharge of the Institutes, and the appointment of a full-time Director General (with two Deputy DGs) for the NARC.

Some of the other recommendations which must be promptly looked into relate to the fields of personnel training, re-entry programme, improvement of research in our cash crops, especially sugarcane, sugarbeet, horticulture, fruit germplasm, pest management and safer use of pesticides, livestock, poultry production, range development, irrigation systems, soil and water conservation, watershed management, soil fertility studies, laboratory equipment maintenance and repair, agricultural libraries, social sciences research, biometry and computer applications, agricultural research extension, information transfer programmes, and Pakistan's National Coordinated Research Programmes, etc.

Leaving aside a few significant exceptions, the consultancy reports have, by and large, been of a routine nature and quite ordinary in substance. As a matter of fact, the job could have been done in a far better way and at considerably less expense by the local consultants who, being familiar with the language, culture and local traditions, can undertake a thorough in-depth study of the subject. At Tandojam, for example, Dr. Khushnood Ahmad Siddiqui, one of our most outstanding experts in the fields of Plant Breeding & Genetics, very well-known internationally for his research publications and experience in this particular area, and one who has already contributed a lot towards the development of new, high-yielding varieties of wheat and cotton, has been working in the Pakistan Atomic Energy Agricultural Institute for the past several years (as Head of the Plant Breeding and Genetics Division), and yet two foreign consultants were hired to advise on improving/strengthening the discipline of Plant Breeding and Cytogenetics in Sind Province in general and Sind Agricultural University, Tandojam, in particular. Another foreign consultant came here all the way to teach Poultry keeping methods and practices to the rural women of Fatehjang!! This is a task which can be assigned to the extension (lady) workers, or the local adult education/population welfare centres of the Union Councils, by engaging the services of the primary schools' lady teachers. PARC must review its involvement in Projects of this nature.

It is worth noting that a number of consultants came here on more than one occasion to do a job of almost identical nature, which could have been easily completed in a single assignment. Alex Mitchell (Soil and Water Conservation and Watershed Management), Sam Portch (Soil Fertility Evaluation), John M. Dukesbury (Agricultural Network Database), Tilo Ulbricht (Monitoring, Evaluation and Review of Agricultural Research Institutes), James B. Barnett (MART Project, and Training Needs in Sind and Baluchistan), John L. Woods (MART Training Review), Marlin Van Der Veen (Farming Systems Research) and Murray D. Dawson (Farming Systems Research) are some of the names which can be cited to substantiate this point. Then there seemed to be no justification for having consultancy reports from two different experts for a particular area in less than three years' time (e.g. Horticulture, Sugarcane Research, High Efficiency Irrigation Systems, Plant Breeding & Cytogenetics Teaching and Research in Sind, etc.).

Needless to add that, as far as possible, only local experts should be engaged for consultancy work, and foreign consultants should be hired only when local experts are not available for any job of a specialized nature. After all, the national interests must take precedence over all other considerations. We must also bear in mind that the World Bank loan for ARP-II will have to be repaid at the market rate for hard currency (SDR) out of Pakistan's hard-earned taxpayers' money.

In fact PARC must determine its own research priorities by strengthening its own relevant bodies, such as the Planning Directorate and the Research Evaluation/Coordination Committees. Then there are several other issues/areas/subjects of very vital nature (for instance, oil-yielding plants/crops, fragmentation of agricultural holdings, consolidation of tracts, absentee landlordism, cropping patterns, desertification, waterlogging and salinity, rapid colonization of agricultural/cultivable areas, the menace of deforestation and degradation of our natural habitats, etc.), which have to be studied on a priority basis.

The problems of re-adjustment being faced by the agricultural scientists who have rejoined PARC/NARC after obtaining their training/degrees from abroad, especially from U.S.A., vividly portrays the shortcomings of the long-term training programme of the PARC. It is, indeed, very unfortunate that we did not bother to learn from the experience of our next-door neighbour, India, in this respect, where the entire emphasis is on local training, and the students complete their postgraduate/advanced studies in the Indian Universities, and visit the foreign countries only for pursuing post-doctoral research.

PARC must review its long-term training programme, and it must help in strengthening the post-graduate teaching and research programmes of the agricultural Universities of Pakistan, and the policy of sending its employees abroad for higher studies/training must be reconsidered.

VI) NARC AND ITS PECULIAR PROBLEMS:

The NARC is undoubtedly the largest organization for agricultural research in Pakistan, employing about 600 highly qualified and well-trained scientists (including 124 Ph.Ds), and carrying out research in almost all phases or aspects of agriculture. The Centre now possesses some of the finest laboratories in the Subcontinent, but in spite of all the infrastructural facilities, the technical and scientific staff are faced with a number of problems, which can be ascribed to the fact that there is no effective Director General at the Centre, and the scientists have to come to the PARC even for the disposal of ordinary/routine cases. It is, therefore, imperative that a whole-time DG be appointed as soon as possible, and invested with full administrative powers to deal with any situation without any outside interference. The duties and responsibilities of the various Members of the PARC must also be clearly spelt out, and they be required to confine themselves to coordinating research activities on a national basis, rather than guiding research programmes at the NARC. The question of delegation of administrative and financial powers to the lowest practical level has also to be decided on a priority basis. Likewise, the budget for operational research will have to be considerably enhanced, and any increase or decrease in the research funds must be decided by consulting the relevant committees or the scientists themselves.

There are also a few special cases which should be taken care of on a priority basis:-

- i) The Audio-Visual Communications Building is highly defective in design and construction. Its defects must be removed as suggested by the AVC Director and the Technical Staff.
- ii) The Automobile Workshop needs improvement. It should be placed under the charge of the Director, Farm Machinery Institute, and a special committee of scientists be formed to scrutinize the expenditure incurred for repairs and purchase of spare parts etc.
- iii) The Laboratory Equipment Maintenance & Repair Unit is functioning very well, but is somewhat handicapped by the non-availability of a transport vehicle for carrying heavy equipment from one place to another, as well as by

the very meagre operational budget. There is also an

urgent need to develop the Spare Parts Bank so as to serve the entire National Agricultural Research System in Pakistan. Besides, the technical staff must be provided with a separate cadre for career advancement and given research allowance as is already availed by the other scientific staff.

- iv) The National Herbarium, PARC, is in a mess, and there is an urgent need to appoint a senior, or well-qualified, taxonomist as its Curator/Director.
- v) The Weed Science Programme must be upgraded and strengthened further.
- vi) The Animal Farm Centre urgently requires a Tubewell to meet the water supply needs of its large herd of cattle as well as the inhabitants of its colony. It should also be provided a generator and a transport vehicle.
- vii) The Nursery for plants must be established on sound lines.
- viii) The Staff Housing Colony needs to be expanded to accommodate the growing number of PARC/NARC Scientists.
- ix) The idea of establishing a University for Arid Zone Agriculture at NARC needs to be pursued further. That there should be such an institution in Islamabad is, in my view, not a matter of dispute. What is actually not yet certain is the level at which it needs to be developed, that is, whether as a Faculty of Arid Zone Agriculture, as a part of a Central/Federal University of Agriculture, or as a full-fledged University itself.

Finally, a word about PARC's organizational structure. As G.M.Khattak et al. and some others have already pointed out, a management review of the PARC is long overdue. It has now become overburdened with bureaucratic echelons whose highly irksome practices of perfunctory punctiliousness are a major impediment in the research programmes of its component institutes, thereby adversely affecting the future agricultural development in the country. PARC must establish itself as the main coordinating body for agricultural research for the whole country, and must, accordingly, play its full role in guiding and stimulating research not only at the NARC but also in all other institutions and organizations engaged in agricultural research in Pakistan.

VII) SPECIFIC RECOMMENDATIONS:-

- 1) PARC should appoint a high-powered Committee to go through the recommendations of the Consultancy Reports, chalk out a phased plan of action for implementing the recommendations, and follow up the progress of implementation. A special Implementation Cell should be created for this purpose on a permanent basis.
- 2) A policy decision must be taken soon by the Executive Committee of the PARC regarding such issues as the appointment of a whole-time Director General for the NARC and two DDGs, and the delegation of more powers or decision-making authority to the lowest practical (hierarchical) level.
- 3) PARC must review its long-term training programme, and it must strengthen the postgraduate teaching and research programmes of the Agricultural Universities of Pakistan.
- 4) As far as possible, only local consultants should be engaged for studying the problems/issues having a significant bearing on, or relevance to, our agriculture. (These issues/problems should, of course, be decided by the PARC itself through its relevant bodies, such as the Planning Directorate). Foreign consultants should be hired only if local experts are not available for any job of a specialized nature.
- 5) PARC should re-consider its support for the Rural Women Poultry Keeping Project at Fatehjang.
- 6) The recommendations of M. Hussain Sadar (Organizational Improvements for More Effective and Safer Use of Pesticides in Pakistan, 1981), Ajaz-ul-Haque Jamali (Regulatory and Environmental Problems of Pesticide Use in Pakistan, 1981), Maxine M. Thomson (Pakistan National Programme for Fruit Genetic Resources, 1983). S.K.T. Williams (Agricultural Extension, 1986), Fayyaz Ahmad Qureshi (Weed Science Research in Pakistan, 1987), T.R. Subramanian (Establishment of a National Institute for Horticulture in Pakistan, 1988), R.S. Kanwar (Sugarcane Research in Pakistan, 1988), L.R. Mattick (Scientific Equipment Operation and Maintenance, 1989), M. Masood Khan et al. (NARC Maintenance Organization, 1990), John L. Woods (MART Training Review/PARC Re-Entry Programme, 1990), and Guy B. Baird (NARC Master Plan Implementation) should be implemented without further delay.

- 7) There seems to be a lack of coordination between the various Directorates of PARC and NARC, and in some cases, even within the PARC itself. It will, therefore, be in the fitness of things if a management review of the PARC is undertaken soon, as already suggested by G. M. Khattak et al. However, pending such a review the Directorates of Planning and Research Coordination should be merged together, and the combined unit be headed by a senior scientist in BPS 20/21. Likewise, the MART and World Bank Projects' Sections can also be united into one Section.
- 8) The Monitoring and Evaluation Section of the Planning Directorate is almost non-existent in the PARC. Needless to add that it must be strengthened and made fully functional, under the supervision/direction of a senior scientist, preferably a natural scientist.
- 9) The Directorate of Planning be required to keep a complete record of all the consultancy reports and their recommendations, as well as of further follow-up action, if any, and one set of the reports should be deposited in the PARC Library.

APPENDIX-1

VIII)

TERMS OF REFERENCE/SCOPE OF WORK
FOR THE PROJECT MONITORING CONSULTANT

Under the supervision of MART Project Secretary, Pakistan Agricultural Research Council (PARC), the Consultant will collect and put together all the reports/publications etc. that have been prepared so far by various national/international agencies, MART/Winrock consultants on different agriculture topics; review these reports, summarize the recommendations and ascertain the status of implementation of the recommendations. The specific tasks and responsibilities for the Consultant will include:-

- 1) Collection of the consultancy reports relating to Pakistan on different agricultural fields submitted by experts commissioned by or on behalf of the concerned national institutions and international agencies like WAPDA, ADBP, Ministry of Science and Technology, Food and Agriculture Division, World Bank, FAO, UNDP, USAID and other bilateral and multilateral donors.
- 2) Review the reports so listed/collected and summarize recommendations made therein as are of interest to PARC and are relevant to its mandate.
- 3) Prepare a list of the reports of consultancies commissioned by PARC.
- 4) For each consultancy report under item 3 prepare a list of recommendations, categorizing them on the basis of their nature (policy, institutional reform, research gaps, extension arrangements), indicating the agency to take action, the progress of any action taken so far and suggestions for further actions.
- 5) To evaluate the impact of recommendations under 4 above which have been implemented so far.

APPENDIX-2**IX) SUBJECTWISE CLASSIFICATION OF THE CONSULTANCY REPORTS****A) MANAGEMENT/TRAINING REVIEWS:****A-i) MANAGEMENT REVIEWS:-**

1. Review of the Organization & Management Practices of PARC/NARC. E.T. York, Jr. (September 1986).
2. Preliminary Report on Monitoring, Evaluation and Review of Agricultural Research Institutes/Programmes. Tilo L.V. Ulbricht (FAO) (December 1986).
3. Priorities, Monitoring, Research Inventory, Institute Review, Personnel Assessment. Tilo L. V. Ulbricht (FAO) (March 1987).
4. Management Review of National Agricultural Research Centre. G.M. Khattak et al. (1988).
5. Evaluation of Management of Agricultural Research and Technology. A.L. Drown et al. (1989).
6. National Agricultural Research Centre: Master Plan Implementation. Guy B. Baird (March 1990).
7. NARC Maintenance Organizations: A Review. M. Masood Khan et al. (May 1990).
8. MART Project. J.B. Barnett (September 1991).
9. Draft Research Plan for ARI, Sariab, Baluchistan. Bill C. Wright (March 1992).
10. End of Tour Report (July 1986 - March 1992). Bill C. Wright (March 1992).

A-ii) TRAINING REVIEWS:-

1. Training for Agricultural Research in Pakistan. Francis C. Byrnes (September 1988).
2. Training for the Support of Agricultural Fields and Greenhouse Research in Pakistan. Earnest W. Nunn (September 1988).
3. Human Resource Management for Agricultural Research: Overview and Issues. Paul Bennell & Larry Zuidema (ISNAR) (September 1988).

4. In-country Training Needs: Focus on Sind and Baluchistan. James B. Barnett (1989).
5. A short course in Research Management Training. Donald W. Barton & Abdus Salam Akhtar (September 1989).
6. A Short Course in Research Management Training. Donald W. Barton (March 1990).
7. NARC Training Institute Publication on "Training in Research Management" (June 1990).
8. Experiment Station Management Training Course. Loyd Johnson P.E. (June, 1990).
9. MART Training Review. John I. Woods (March 1990).
10. MART Training Review: Phase II. PARC Re-Entry Programme. NARC Training Institute Programme. John L. Woods (October 1990).
11. Training of Training Coordinators:
Principles and Techniques of Continuing Adult Education (Session II). Larry Littlefield & James White (January 1991).
12. Training of Training Coordinators:
Principles and Techniques of Continuing Adult Education (Session III). Larry Littlefield & James White (July-August 1991).
13. Experiment Station Operations Management Curriculum Outline. University of Arkansas International Agricultural Programmes (August 1991).
14. Human Resource Management (with specific reference to Agricultural Research Scientists). M. Ajmal Makhdoom (May 1992).

A-iii) NATIONAL COORDINATED RESEARCH PROGRAMMES:-

1. Pakistan's National Coordinated Research Programmes. L.T. York, Jr. (June 1987).

A-iv) NATIONAL AGRICULTURAL RESEARCH CENTRE: MASTER PLAN 1988-2000. VOLUME-1, RESEARCH MASTER PLAN BY N.I. HASHMI ET AL. (1989).

B) GENERAL AGRONOMY AND RELATED FIELDS:

B-1) CEREAL CROPS:-

a) MAIZE:-

1. Maize in the Irrigated Farming Systems of the Punjab. An Exploratory Survey. M. Ramzan Akhtar et al. (1986).
2. Maize Marketing and Utilization in Pakistan. Pervaiz Amir (1986).
3. Maize Production in NWFP: A Review of Technological Issues in Relation to Farmers' Circumstances. Derek Byerlee et al. (1986).
4. The Maize Programme in Pakistan and a National Maize Research Institute: A Preliminary Report. Janko Dumanovic (1986).
5. Maize Breeding Strategies for Improved Productivity from cool season environments in Pakistan. H. A. Eagles (1986).
6. High Altitude Tropical Maize in Temperate Zone Breeding Programmes. H. A. Eagles (1986).
7. Exploiting high altitude tropical Maize as a source of cold tolerance in temperate zone breeding programmes: The New Zealand Experience. H.A. Eagles (1986).
8. High Altitude Maize in Pakistan. H. A. Eagles (1986).
9. Characterization of environmental stress and development of selection techniques: A reproduction to strengthen the Maize programme in Pakistan. G.O. Edmeades (1986).
10. Production of Maize Grain and Fodder in the Northwest Frontier Province and Islamabad Capital Territory of Pakistan. K.S. Fischer & Habib Iqbal Javed (1986).
11. Recurrent Selection for Cold and Freeze Tolerance in Maize. C.O. Gardner (1986).
12. Population Improvement and its Integration with Hybrid Development Activities to produce superior Maize cultivars for different Maize growing areas of Pakistan. C.O. Gardner (1986).
13. Population Improvement and its Integration with Hybrid development activities to produce superior Maize cultivars for

different Agroecological Environments in Pakistan. C. O. Gardner (1987).

14. Maize in the irrigated Farming Systems of Mardan. Syed Sajidin Hussain. (1986).
15. Farmer-managed verification of improved maize technology: Results and experiences from Swat (1985). Kiramat Khan et al. (1986).
16. Farmer-oriented Research and the Transfer of Maize Technology for NWFP and the Islamabad Capital Territory of Pakistan. E. J. Stevens et al. (1986).
17. Report of an On-farm Maize Travelling Workshop. E. John Stevens et al. (1986).

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