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WORKING PAPER FOR THE OPERATION OF A NATIONAL AGRICULTURAL RESEARCH SYSTEM IN NEPAL

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HIS MAJESTY'S GOVERNMENT OF NEPAL

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WORKING PAPER

FOR

THE OPERATION OF A

NATIONAL AGRICULTURAL RESEARCH SYSTEM IN NEPAL

Compiled By:

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in collaboration with the staff

of the

Ministry of Agriculture and Department of Agriculture

and others

February - March 1986

"The capacity to develop technology consistent with physical and cultural endowments is the single most important variable accounting for differences in agricultural productivity among nations."

Arndt and Ruttan in
Resource Allocation and Productivity,
Ed. Thomas M. Arndt, Dana G. Dalrymple,
and Vernon W. Ruttan
University of Minnesota Press 1977.

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PREFACE

A NATIONAL AGRICULTURE RESEARCH SYSTEM FOR NEPAL

PHILOSOPHY AND GOALS

by

John C. Cool*

1. The Ministry of Agriculture is responsible for initiating a long-term plan and program to establish an effective national agriculture research system for Nepal.

2. The objective of such a system is to serve Nepal's farmers and to be responsive to their needs for research-based knowledge and technology. To successfully do this the system must be designed so that those responsible for its management are continuously aware of the true condition of farmers, sensitive to their needs and capacities and responsive to opportunities to relate scientific, research-based knowledge to action which improves their well-being.

3. The core philosophy of the national agricultural research system shall be one of service. While the ultimate objective is to serve farmers, rural communities and those responsible for making the agricultural sector robust, the immediate goal is to create a system which stimulates and rewards competent research scientists and permits them to work within an institutional environment where they are provided with the incentives and the facilities required to do relevant, high quality research which is directed towards well defined, achievable goals.

4. Overall design criteria for a national agricultural research system should be established through a process of careful and continuous

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feedback from farmers, agricultural administrators, decision-makers, political leaders and the research community. No single approach to agricultural research and no single pattern of institutional arrangements needed can hope to meet all requirements of all interest groups through all future time. Therefore, a central criterion must be to insure that the system is designed to be flexible and responsive to changing conditions and changing perceptions, opportunities and priorities.

5. A second systems requirement is provision for regular internal and external review of goals, organization and achievements with a view to making systematic (and systemic) changes and course corrections as often as is necessary to insure that the purposes of the system are being served. Most research systems have grown gradually over a period of decades. Often they incorporate procedures, institutions and personnel who were well qualified to deal with yesterday's problems. When afforded the rare opportunity to design a new national system, those responsible are obliged to assess thoughtfully the priority problems of today and of tomorrow and to build a system which has the resilience, flexibility and the growth potential to expand and change in keeping with the varying needs and increased capacities of the future. Continuous challenging of assumptions and goals, regular performance assessment and a process for frequent modification based upon experience, must therefore be built into the system.

6. The agricultural circumstances of Nepal are unique. It follows that no agricultural research system based exclusively upon imported models is likely to prove to be appropriate. Much can, nonetheless, be learned from the patterns of organization which have evolved or been adopted elsewhere. This is not the place to review the history of national agricultural research systems. It should be noted, however, that they are of very recent origin, having come into existence in a formal sense only within the last century. It is worthwhile

remembering that knowledge about farming, fishing, horticulture and animal husbandry has been a central element of human traditional knowledge conveyed from one generation to the next for more than ten thousand years of recorded history and, presumably, for a much longer unrecorded period before that.

7. The evidence suggests that throughout human history agricultural output has been increased almost exclusively through increases in the area of land cultivated. Only during the past hundred years have we begun to witness a fundamental change in which yield increases per unit of cultivated land have become the major factor responsible for increases in overall productivity. The application of science to the field of agriculture through effective research, good management, transfer of useable knowledge and appropriate economic incentives have been major factors in bringing about that change.

8. In Nepal it appears that even at present a major determinant of productivity continues to be area cultivated. This indicates that there may be great opportunities to increase productivity through the application of already extant scientific knowledge to farmers' fields. Thus, one of the design criteria for a comprehensive agricultural research system should be to insure that the system has a built-in capacity to continuously scan and monitor the research product and applications developed and tested elsewhere which are relevant to Nepal's farmers.

9. This implies a prior requirement. Too often it is assumed that administrators and researchers actually know and understand the needs, problems and opportunities of farmers. Too often that is a myth. For this reason it is regarded as critical that the overall systems design provide for an effective and continuous mechanism for assessing the actual situation of a wide spectrum of representative farmers from different socio-economic and agro-climatic circumstances. If the

research goals are to be needs-based and responsive to farmers, the system must begin with and be founded upon actual empirical knowledge of the conditions of the rural people.

10. Thus, the first task of the system is to know the actual needs of farmers, to monitor the results of the world's agricultural research, to identify research applications relevant to farmers' needs and to institute a continuing process to transfer and adapt techniques and knowledge to Nepal.

11. Only when it is clear that the knowledge required to meet the farmers' needs is not already available elsewhere, can the national system formulate a thoughtful program of research which will be both economic and relevant. Essentially, the goal should be to consider only those researchable issues which will not duplicate that which has previously been done and which are within the proven capacity of the system. The object is to build upon the knowledge base and continuing research work of universities, national research systems elsewhere and the international agricultural research system.

12. Those national research programs which have been effective have been focussed. They have not attempted to do everything in every field. In the international centers, results which have benefitted farmers rather than simply augmented the reputations of the research scientists, have been the result of clearly defined, practical goals established by research directors at the outset. The definition of broad areas of concern and policy goals is the responsibility of the high-level policy formulation and coordinating body. Yet the success of those policies depends heavily upon the quality of scientific leadership and research management provided on the research station.

13. With severely constrained resources and manpower, the most critical task of the senior body responsible for guiding the national research system may be the delineation of priority areas and the establishment

of clear decision-rules which define what will be undertaken and what will not be undertaken. Research is not politics. Nor should resource allocation within the research field be done in a even-handed, democratic way so that each disciplinary claim is honored and each research group receives equal treatment. Such a process is a certain prescription for a weak and ineffective research program.

14. The central criteria for selection of research targets and the allocation of resources should be a determination that the concentration of assets in a given field holds genuine promise of leading to results which may have a significant impact upon the well-being of Nepal's farmers within a reasonable period of time. If it is not possible to answer the 'so what?' questions, if no one can say with clarity what benefits will be likely to flow to what groups of farmers over what period of time as a result of a particular research program, then it seems doubtful that it should command a priority. Will the proposed research, if successful, make a significant difference in any long-term outcomes involving farmers? If that is not evident, other proposals should be considered.

15. Research laboratory, research station and field trial work in agronomy, horticulture, livestock and other biological areas constitute the core of the national agricultural research system effort. It must, however, be sensitive to the social and economic factors which affect farmer decisions. This means that an awareness of the institutional arrangements which affect the farmers' credit, the availability of inputs, the storage, transport, marketing and, most critically, the price he receives for his product must all be factored into the process of setting out a sensible research agenda.

16. This requires that there be active participation in the research system of those whose primary responsibility is to monitor not only today's institutional and market structure but, more importantly, to think

reflectively about the probable conditions prevailing five or ten years hence when current research results may actually reach farmers' fields. The global agricultural scene is in a process of flux. Significant changes in patterns of production and demand have taken place during the last five years. More such changes must surely be anticipated during the decade ahead. It therefore seems imperative to insure that the new national research system contain within it a mechanism for insuring that its program and policy decisions and its resource allocations are informed by expert knowledge regarding Nepal's internal needs, international trade flows, potential market niches and the long term price prospects related to alternative patterns of production.

17. In the past it may have been adequate to assume that senior officials could provide these macro insights. That is no longer true. Nor can the political leadership make wise decisions without solid analysis based upon a continuous and careful assessment of the national, regional and global scene. Thus, the system should insure that, no less than once annually, the research agenda is reviewed in the light of the best current professional assessment of the constraints and opportunities which may lie ahead for Nepal in the agricultural field five, ten and fifteen years into the future. Without such 'future time orientation' in the planning and design of research, there is a high probability that much research effort may be misdirected. The cost associated with "walking backwards into the future" has always proven to be high.

18. To serve the farmers, to be problem oriented and results based, the new system must be founded upon the solid training and experience of Nepal's professional agricultural research scientists. Yet creation of a new system affords a rare opportunity to be bold and imaginative. Those responsible should not be constrained by the immediate or short-term limitations. They should be encouraged to depart from existing

and traditional models and build a system specifically responsive to Nepal's unique circumstances and opportunities. The way ahead is not likely to be easy for Nepal's farmers. They deserve the best which the new system can deliver. That will require a maximum effort and a measure of conceptual blockbusting!

SUMMARY

The following report is an outgrowth of study of the existing and proposed administration of agricultural research; discussions of these factors with many officers in the Ministry, in the Departments; in the NARSC; and other agencies. In addition, reports were reviewed and are referred to in the text where appropriate and pertinent to the point.

Basic to Nepal's agricultural research is a clear cut identification of the strategy that considers the needs of Nepal farmers as the top most priority and amelioration of these needs is the only ultimate basis of agricultural development which, for Nepal, is basic to all development.

To address these needs the present known information and technologies available need to be evaluated to determine their utility in production systems.

A rapid auxiliary activity will be the aggressive determination of what is available elsewhere, that can be useful to Nepal's farmers.

With these two sets of information it will become possible to more clearly determine what research needs are required to correct the deficiencies in supporting Nepal's farmers.

Continued linkages with other national and international research programs will help to a considerable extent in supplementing the ongoing research that may not be able to cope with all the problems because of lack of funds, personnel or facilities.

This report seeks to outline some of the institutional structures and functions required to carry out such an effective farmer-oriented research strategy.

The body of the report deals with the two new institutional components of the agricultural research system and tries to separate the respective roles of each so that administration at one level will not be a duplication of another.

The report seeks to outline an evolutionary process in research administration through the present phase now being established to a second or future phase still under the Ministry of Agriculture. The third or ultimate phase envisionages a semi-autonomous or autonomous agricultural research organization.

The appendices are presented to provide an understanding of the basic requirements of a research system and the project structuring of research activities; programming these through establishing research projects; a monitoring and an evaluation system; and lastly, a cursory examination of research trials planned on a national basis and the rice program in particular. The evaluation and monitoring are by no means sophisticated, but constitute the minimum basic requirements to enable NARCC and NARSC to function in the capacity of evaluating and monitoring, respectively.

Appendix I is an abridgement of Mosher's report on the requirements of an agricultural research system.

The consultancy report of 1978 concerning a proposal for an Agricultural Research Council was used in developing Appendices II and III, covering the project system of structuring research and planning and implementation, respectively.

The present level of reporting agricultural research in Nepal does not allow for a sophisticated evaluation and monitoring system. Appendix IV outlines some of the initial requirements in the way of research reporting that will be required to enable administration to begin to function in evaluating research, guiding research and implementing agricultural research policy.

The report is not as a set of recommendations for others to follow but rather an attempt to provide guidance as these new institutional activities become functional. Also, the consultant as a member of Winrock staff has some responsibility for implementation of this phase of the ARP Project. In the past he has been one of those who could say what the defects in agricultural research were. It is now necessary to say what can be done to correct the defects.

A basic first step toward correction has been the receptivity to change which is evident among personnel of the Ministry, NARSC and the Department, Divisions and Commodity programs.

These winds of change offer opportunities that may come to many only once in a lifetime. We should take advantage of the opportunity to create a better agricultural research system for Nepal. This will require deliberation of the best minds that can be made available for the consideration of these and other proposals. Although there is need to avoid delays yet the basis for change will take time to develop. Guidelines and procedures will be needed to bring these changes about once they are agreed upon.

With these points in mind this has been identified as a working paper from which more detailed and clear cut plans can be developed.

Acknowledgement is gratefully given to all those who have so generously provided time for discussions and materials for review and study. To Dr. John C. Cool a special word of appreciation is given for providing the preface which sets out so well the philosophies and goals which, as agricultural researchers and administrators, we need to keep foremost as we objectively pursue the modifications and changes in agricultural research and its management with the hope to be better able to serve the farmers of Nepal.

ACRONYMS AND ABBREVIATIONS

ADB	-	Asian Development Bank
ARPP	-	Agricultural Research and Production Project
CIMMYT	-	The International Maize and Wheat Improvement Center
DOA	-	Department of Agriculture
FAO	-	Food and Agriculture Organization of the United Nations
FSRD	-	Farming Systems Research Division
GLIP	-	Grain Legume Improvement Program
HMG/N	-	His Majesty's Government of Nepal
IADS	-	International Agricultural Development Service
IARC's	-	International Agricultural Research Centers
ICRISAT	-	International Crops Research Institute for the Semi-Arid Tropics
IDRC	-	International Development Research Center
IRRI	-	International Rice Research Institute
ISNAR	-	International Service for National Agricultural Research
MOA	-	Ministry of Agriculture
NARCC or RCC	-	National Agricultural Research Coordination Committee
NARSC	-	National Agricultural Research and Services Center
NMDP	-	National Maize Development Program
NODP	-	National Oilseeds Development Program
NPDP	-	National Potato Development Program
NRIP	-	National Rice Improvement Program
NSCDP	-	National Sugarcane Development Program
NWDP	-	National Wheat Development Program
NTDP	-	National Tobacco Development Program
ODA	-	British Overseas Development Agency
SATA	-	Swiss Agency for Technical Assistance
SERD	-	Socio-Economics and Extension Research Division
STIP	-	Seed Technology Improvement Program
USAID	-	United States Agency for International Development
UNDP	-	United Nations Development Program
WI, Winrock	-	Winrock International Institute for Agricultural Development

WORKING PAPER FOR THE OPERATION OF A NATIONAL AGRICULTURAL RESEARCH SYSTEM IN NEPAL

I. INTRODUCTION

Agricultural research in Nepal is recognized as a key to move traditional agriculture from a low-level subsistence agriculture to more intensive agricultural systems that will provide a higher level of subsistence to resource-poor farmers and at the same time provide marketable surpluses which can be purchased by the ever increasing non-agricultural segment of the population. Although not a responsibility solely of the agricultural sector, income-generating activities that enable resource-poor farmers to purchase the balance of their food requirements, must be taken into consideration in the creation and development of an agricultural development strategy for Nepal.

Imbalances occur between populations in the Hills with the higher man-land ratio compared to populations in the Terai where the man-land ratio is lower and the open border with India frequently allows food grains and inputs to be diverted away from the Hills into India. These diversions have negative effects on food grains availability in the Hills.

Recent records[1/] showing 47 out of 55 districts in the Hills as food deficit districts calls attention to the urgency of increasing food grain supplies in the Hills by increasing indigenous production or by generating increased purchasing power which would hopefully attract the surplus production from the Terai to the Hills.

Because of the disparities in population and production potentials of the two large geographic regions (Hills and Terai) the government has been

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1/ Yadav, Ram P., Resource Allocation and Incentives for Agricultural Research in Nepal, International Food Policy Research Institute, Washington, D.C., Working Document, 1985.

obliged to address the short-term problems of food and energy supplies with little attention to long-range problems. Emphasis has been on production rather than on research in addressing food supplies and energy generation problems.

Studies (Sharma)[1/] have shown that agricultural research in Nepal has provided a very acceptable rate of return of 33 to 68% for the funds invested in agricultural research. Even so, research generally has not been well supported as evidenced by the small proportion, 0.23 to 0.28%, of the agricultural GDP devoted to research (Yadav 1985)[2/]. The World Bank has suggested a level of 2% of the agricultural GDP as a reasonable investment in research. Although the rates of return on investment brought about by expansion in area have been good, Yadav points out that the overall positive increase in agricultural production has been less than one percent and that, with the exception of wheat yield, changes have been negative.

In spite of investment in agricultural research over more than 30 years beginning in the early 1950s Nepal has not yet approached a take-off stage in a production cycle that would serve to feed its people and provide exportable surpluses for foreign exchange earnings.

Reasons for this stagnation vary from region to region and crop to crop but in general the main reasons would appear lack of varietal adaptation and a low level of fertilizer input use, poor agronomic practices, a lack of irrigation, and generally unfavourable market prices that discourage farmer investment of money and other resources to increase production.

Nepal has been able to use technology generated elsewhere to increase production, especially of wheat, rice and maize in the Terai. Wheat

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1/ Sharma, Ramesh P., Economic Returns to Agricultural Research in Nepal, APROSC Staff Paper No. 7, Agricultural Projects Services Center, 1983.

2/ Yadav, Ram P., Ibid.

varieties coming from India and CIMMYT, rice varieties coming from IRRI and various countries in South Asia principally Malaysia (Masuli variety), India and Sri Lanka and maize materials introduced from CIMMYT, Thailand and the Philippines have been responsible for the modest increases in production.

The transfer of technology has been successful in the Terai because geoclimatic similarities to countries from which the technology(ies) have been transferred. By contrast the Hills consist of a multitude of varying conditions created by a wide range of elevation, soils, rainfall, slope aspect and ethnic composition that are not compatible with research technologies coming from other countries. Technologies for the Hills of Nepal must of necessity be generated indigenously through applied and adaptive research.

Evaluations of the research systems in Nepal by external and internal evaluations have frequently pointed to the weaknesses in the existing research system.

The Asian Development Bank's[1/] report states "the underlying causes for lack of progress (in agriculture) are mainly organizational and institutional" and "a well-defined operation strategy for agricultural development is missing".

These broad problems have a negative effect on the morale of research and extension staffs. The role and function of the research stations and farms are not well defined and linkages between research and extension are tenuous even though both activities are in the same department.

Political pressure and other considerations affect the posting of staff so that getting the "right man for the job" or for the job which the staff member was trained is almost an exception rather than the rule.

1/ Asian Development Bank, Nepal Agriculture Sector Strategy Study, Vol. 1, December, 1982.

The promotion system is slow and cumbersome. Educational qualifications are often not recognized or discounted and the promotion system lacks objectivity.

The Department of Agriculture has grown and responsibilities have increased at the level of Director General and Deputy Director General but numbers of these posts have not increased.

The Department of Agriculture has expanded several fold at the field level but at the administrative level little increase has occurred. Because of time demands on officers at the centre, supervision and thus monitoring of research is the first to suffer.

The instability of staff leads to frequent changes in emphasis in the implementation of research activities. This often leads to research "by whim" of the individual researcher without serious consideration of the farmer needs or national goals. Particularly critical is the need for stable, strong leadership.

Financial management is not responsive to seasonality of research needs and budget releases are frequently delayed so much that the crop sowing, crop harvests, monitoring of research trials cannot be financed and a whole season's results are negatively affected with the resultant criticism from administration that research personnel are unproductive even though the primary fault is not theirs.

Certain non-line functions of the department (experiment station operations, laboratory, field, and vehicle equipment operation and maintenance, building and grounds operations and maintenance, library and information services, and biometrical advisory services) do not receive support and attention so that facilities are soon out of order and inoperable.

Because of these many factors it is not surprising that morale and research productivity have declined in the last few years.

The agricultural research system created in the 1950s has undergone little change. There was a consolidation of departments in the early 1970s that improved administration and services to farmers. Also multidisciplinary crop commodity programmes were created for rice, maize, and wheat in the early 70s, to more effectively deal with these principal cereal crops. Potatoes and citrus were also included but limited staff strength prevented effective multi-disciplinary teams from being created. More recently oil seeds, grain legumes and Hill crops are to become coordinated but will again be restricted by staff limitations.

The research system is generally characterized by: low priority level in the national funding; low paid staff with lack of specific job descriptions and who are often placed in positions where their expertise is underutilized or they are otherwise inadequately trained; low morale and low productivity. Research planning and research administration are not well organized and are fragmented into several departments and ministries. Assistance donors add to the problem by supporting projects having different development goals, perquisites or salaries and these further contribute to the fragmentation, low morale and difficulties in executing a comprehensive agricultural development plan.

New concepts regarding research to serve resource-poor farmers who have generally been by-passed by the Green Revolution will be required to generate technology of value to them. Farming systems and cropping systems use farmers' fields as field laboratories. Creating posts to serve sites is quite different from creating posts to serve a research farm or station. The structural-unit is different and location permanence is absent. Once satisfactory technologies are generated and adopted, other agro-climatic areas will need the same research. Also the composition of the interdisciplinary teams must include socio-economists as well as biological scientists. How to relate these administratively to a home base of discipline or programs must be taken into account.

Strong, pragmatic leadership will be required to produce a reversal in staff attitudes, their productivity, and the subsequent productivity of farmers they are serving.

An effective agricultural research system needs to be able to determine the direction of research consistent with national priorities for agriculture and in relation to other national priorities for industry, environment, education, social welfare etc. A research system, at the same time, should be able to assemble its available human, capital and other resources, and create and initiate research programs to serve farmers' immediate needs as well as longer-term development needs.

Planners in the Ministry of Agriculture and in the Planning Commission have recognized that an improved agricultural research system is required if the country is going to be able to meet the needs of an ever-increasing population which, at its present rate, will require a doubling of agricultural production in the next 15-20 years.

The present institutional structure to be improved and strengthened includes the reactivation of the Research Coordination Committee in the Ministry of Agriculture and the creation of a National Agricultural Research and Services Center within the Department of Agriculture. These two units are a beginning phase toward providing greater emphasis to agricultural research to more effectively deal with farmers' problems.

As this phase deals with certain basic requirements of research management it is providing a mechanism to advance to a stage of encompassing all agricultural research within the Ministry with linkages to other research activities in other agencies and Ministries. This second step to be accomplished sometime in the not too distant future is again preparation for another evolutionary step.

The World Bank has studied their experience and the experience of others in their efforts to strengthen agricultural research. Two important conclusions from the study show that a semi-autonomous or autonomous research organization is the much more effective research organization. It is more nearly able to facilitate research rather than to control it. The second conclusion was the importance of a strong interlinkage of research with extension to enable the rapid transfer of technology to farmers' fields. The ultimate research organization would have to address these two main issues - productivity of research linked through extension with productivity of farmers.

Using past experiences as a guide and considering the capabilities of the present manpower available for research and research administration, this phased approach to the improvement of administration of agricultural research and research itself, appears to be the only logical one to consider at the moment.

The broad outlines of the functions and authorities of these research administrative structures are presented in the remainder of this report and in the appendices which follow.

II. INSTITUTIONAL COMPONENTS OF THE NEPAL SYSTEM OF AGRICULTURAL RESEARCH

The ARPP has as one of its objectives the improvement in research administration in order to more effectively develop technologies to enable farmers to increase production and to overcome the often stated criticism that "the underlying causes for lack of progress in agriculture are mainly organizational and institutional"[1/]. Having these criticisms it is quite a different issue to change, modify, reform, or motivate the present institutional framework and staff to the various problems that confront agriculture to create a more effective research system to tackle development in Nepal. It would seem impossible to proceed if the admonition "Recommendations will necessarily be constrained by adherence to HMG/N administrative procedures and norms"[2/]. These are the very components that need to be addressed if any measurable improvement in administration is to be accomplished which will enable research to more nearly address the problems faced by farmers and the country. Fortunately, HMG/N has already considered and is proposing institutional changes which belie the above statement.

The Seventh Five Year Plan calls for the reconstitution and reactivation of the National Agricultural Research Coordination Committee and the creation of the National Agricultural Research and Services Center.

These institutional components of the agricultural research system which are being created can provide a structure which can effectively administer agricultural research provided "administrative procedures and norms" can be changed. The HMG receptivity to change will have to go beyond mere institutional structures if a productive agricultural research system is to develop.

1/ Asian Development Bank, Nepal Agriculture Sector Strategy Study, Vol. 1, December 1982, p. xix.

2/ Draft work plan of ARPP (but subsequently removed).

Improving the existing research agencies and units can accelerate agricultural development, and to a great extent these changes and improvements are basic to what can be accomplished in actually improving production in farmers' fields. In development, administration requires continuous adaptations to new situations, where experiences are learning processes for administrators and staff. "An administrator must have authority, but the critical question is how to use it. It is always productive to try to accomplish so much by leadership that wielding authority is seldom necessary"[1/]. Mosher[2/] further elaborates the critical requirements of a productive agricultural research system. These are presented in digest form in Appendix I, along with comments as these points relate to the situation in Nepal.

A. The National Agricultural Research Coordination Committee (NARCC or RCC)

Since agricultural research is crucial to agricultural development a ministry level unit which has responsibility for agricultural research is essential. Agricultural research is being carried out in various departments of the Ministry of Agriculture and in units of other ministries there is obvious need for research administration at the Ministry level. In addition to interdepartment and interministry coordination, the RCC will improve administrative efficiency and effectively promote timely decision making to improve resource allocation and mobilization of funds for agricultural research. The following are functions which will normally be discharged by a Ministry level unit in the research administration network.

1) Functions and Authority of the RCC

a. Objectives and Scope of Agricultural Research

The RCC will define the objectives and scope of research in agriculture and related resources.

1/ Mosher, A.T., Three ways to spur agricultural growth, IADS, 1981.

2/ Mosher, A.T., Some Critical Requirements for Productive Agricultural Research, International Service for National Agricultural Research, The Hague, Netherlands, 1982.

b. Priorities for Agricultural Research

The RCC will establish priorities for agricultural research and procedures for the regular review and updating of these priorities.

c. Resource Allocation for Research

Resources are always limiting and judicious allocation is required to meet development needs. Demands from the various units for research funds will have to be satisfied, or not, based on priorities for agriculture and how these priorities fit the overall priorities for agriculture and other sectors of the national economy and development. It will be the responsibility of the RCC to prepare forceful justifications of the budgets presented so that research can receive the support needed to create technologies to meet expanding food requirements.

Present budget allocations which provide as much as 90% for salaries in some divisions and 10% or less for operations illustrates the very alarmingly serious situation existing for agricultural research at the present time. (See Appendix I for further elaboration.)

d. Administration of Funds

Since funds are generally limited, budget reductions by the Ministry of Finance are generally across the board. These reductions need refinement to regulate the cuts according to the priorities in agriculture. Once the accounting system is perfected to enable identification of research funds (from funds for seed production, extension etc.), they should be administered by the RCC.

e. National Agricultural Research Policy and Strategy Statement

Preparation of well defined operation and strategy statements for agricultural research.

These statements will provide direction and guidelines for the various research units which are responsible for developing research plans whether for commodities, regions, disciplines, divisions or problem areas.

These or similar strategy statements are needed for submission to donors such as the World Bank, USAID, the Asian Development Bank, SATA, FAO, IDRC and other agencies who may be interested and concerned and accordingly would be better prepared to support Nepal's own development strategy.

f. Research Evaluation and Utilization

Research results are of primary concern at this level in order to assure that funds expended are producing technologies which can be effectively utilized in extension programs. In order for national goals of agricultural production to be realized, farmers must use these technologies in extensive areas. Research evaluation is necessary to determine those elements which can be of use in extension production programs, those requiring more research, and the interrelationships of the research from the various research units.

g. Coordination with Extension

The RCC will have a primary concern in coordination with extension to see that the results of research are properly utilized through literature for extension personnel and farmers, training centres, etc. and the incorporation of relevant findings into extension recommendations.

There must be a better understanding of the procedures involved in producing improved technology and getting it used by farmers. This involves the following steps:

1. Generating improved technologies--high-yielding varieties, soil and water management practices, disease, weed and insect control measures, cropping patterns, etc.

2. Assembling the various new technologies into "packages of improved practices."

3. Conducting adaptive trials to determine the suitability of the improved technologies to the different types of farming regions in Nepal by on-farm cropping pattern and component trials.

4. Conducting further preproduction verification trials on farmers' fields, to determine performance of the new technologies under specific microclimates, farm conditions, cropping patterns and farming systems.

5. Carrying out impact production blocks for observation by farmers in local communities and distribution of minikits to encourage rapid, widespread use of new materials and practices.

6. Assisting farmers in obtaining the necessary inputs of improved seeds, fertilizers, weed and pest control chemicals, credit, etc. on the time schedule required for the local farming system.

The foregoing are distinct and identifiable activities, and each is important in the strengthening of Nepal's

capabilities to achieve a more productive agriculture. The individual activities must be integrated or coordinated since they are interdependent. And this will require the design of a system that will clearly identify the areas of responsibility, and the assignment of trained personnel and other resources needed to achieve maximum output from investments in agricultural research.

h. Productive Agricultural Research is dependent on productive agricultural research personnel. Policies which will make research personnel more effective by proper assignment to positions for which they are trained; promotion of grades in situ; and incentives for research accomplishments - these and more are all components of manpower development and management which will concern the RCC.

i. Research on Policy Issues

The RCC has an on-going concern for problem oriented agricultural research being carried out by the various research units under their administration. They are concerned with production research. In addition, there is a need for research in the area of national policies on food, land use, subsidy, irrigation, markets and others. These issues are of concern to the RCC and the RCC will give direction and authorization for research on these topics by agencies qualified for these types of research activities.

j. Studies of Farmer-Support Services

Other areas of concern are those support services and infrastructures needed in order for farmers to increase production which government demands and targets. Research in these areas will be needed to provide guidance to the RCC and other planning bodies and will be appropriately authorized and funded by the RCC.

k. Technical Research Panels

To discharge its various responsibilities the RCC will be supported by a secretariat and by technical research panels which it may authorize in the discharge of its functions.

Technical panels should be composed of scientists that are more than agronomists, or soil scientists or entomologists etc. They have a broader interest, knowledge and capability that enables them to serve as an advisory group to the Chief Executive Officer of the RCC and to the RCC itself. They should also be practicing and publishing scientists. The panels should be interdisciplinary with a farming systems focus since they will need a broader and more objective view of agricultural research. Each panel should include a social scientist, drawing such members from APROSC, IAAS or others from outside the Department of Agriculture as may be necessary.

In order to enable capable young scientists to serve on the panels, membership should be on a rotational basis with the ultimate service period of not more than three years.

2) Organizational Structure

The present organizational structure of the RCC is presented in Figure 1. The research programme planning, administration and management will be handled by and through the RCC, technical panels as it may authorize, and the secretariat of the RCC.

3) Membership in the Research Coordination Committee

The functions and authorities of the RCC have been outlined. The RCC will furnish general leadership, guidance, direction, and evaluation for agricultural research to ensure that it is

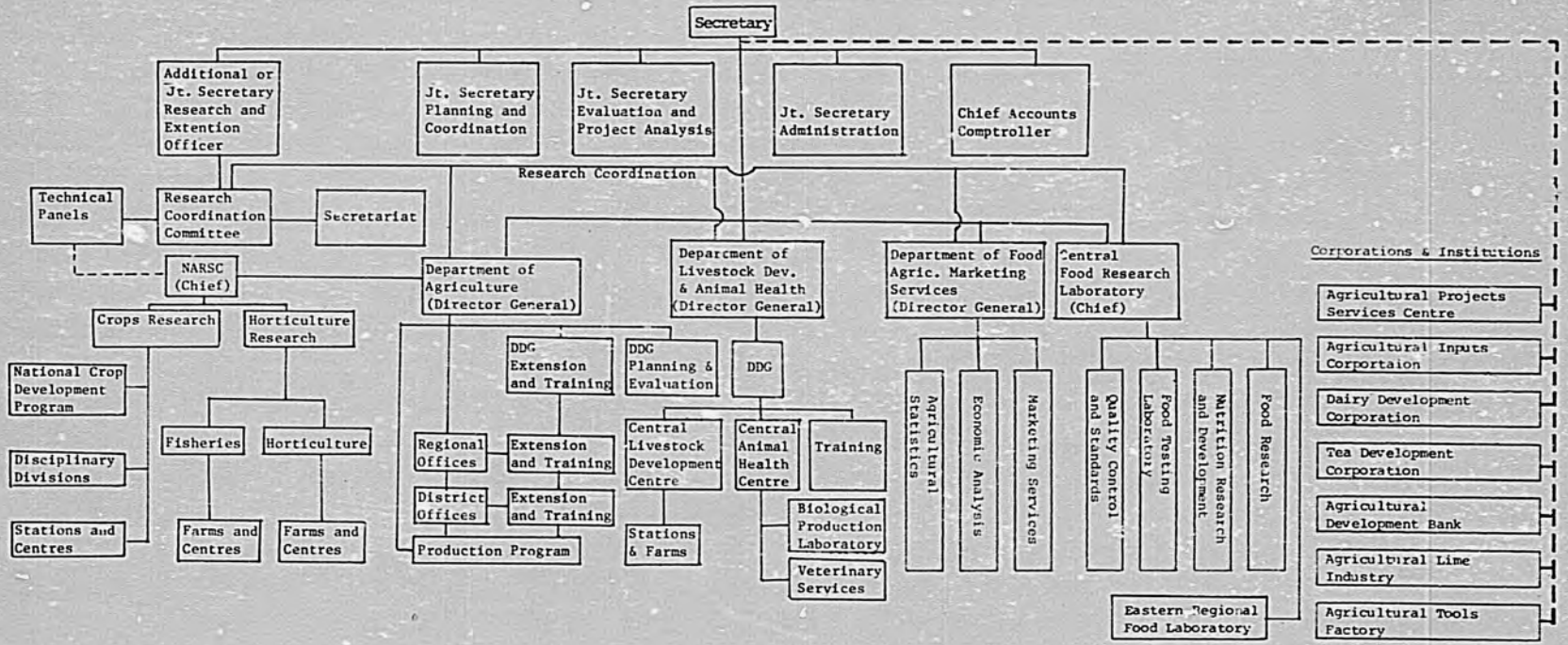

Figure 1. PRESENT MINISTRY OF AGRICULTURE - ORGANIZATION STRUCTURE

addressed to critical and relevant problems in national development. For the present, membership of the RCC will be as follows:

01. Secretary, Ministry of Agriculture, Chairman
02. Representative, Planning Commission (Agriculture)
03. Representative, Royal Nepal Academy of Science and Technology
04. Director General, Department of Livestock Development and Animal Health
05. Director General, Department of Food and Agricultural Marketing Services
06. Chief, Central Food Research Laboratory
07. Director General, Department of Agriculture
08. Chief, National Agricultural Research and Services Center
09. Director General, Department of Resource Conservation, Ministry of Forestry
10. Two Eminent Progressive Farmers, one preferably from the Hills
11. One or two Eminent Scientists selected by the Ministry of Agriculture
12. Executive officer of RCC and member-secretary will be Additional Secretary or Joint Secretary, Ministry of Agriculture

B. The National Agricultural Research and Services Centre (NARSC)

1) Introduction

a. By official order of 4 November 1985 (2042/7/19) the NARSC came into existence on 31 December 1985 (2042/9/16). This level of research administration is to implement technical research programs authorized by the RCC. The Seventh Five Year Plan specifically created the NARSC to more fully implement the directives of the RCC and to provide coordination of all those involved in research.

In order to improve research operations, management and focus in line with the Seventh Five Year Plan (1986-1991), the research units of the MOA are to be coordinated and managed by the National Agricultural Research and Services Centre, headquartered at Khumaltar and led by a Chief of Director General status. This centre is responsible for implementing the technical agricultural research programs under authorization vested in NARSC by the RCC.

Figure 2 provides an organizational diagram showing the NARSC administrative structure and linkages with the RCC, the research programs for which it is responsible, and the various support services provided to the research units.

b. In the past, research activities of the Department of Agriculture have been carried out under the various research divisions and crop development programs with trials being carried out on a network of farms and stations that have evolved to develop technologies for the various agroclimatic areas of the country. On-farm testing (in farmers' fields) has been carried out under commodity programs as farmer field trials (FFT) and in recent years by cropping systems teams working at selected sites mainly in the Hills. The cropping systems trials included cropping patterns, component technologies and socio-economic studies. As technologies were identified these have been tested in other agroclimatic areas through a series of pre-production surveys and preproduction verification trials (multi-location tests) preparatory to production programs that have been implemented by the projects and extension staffs of the DOA.

Research management and evaluation occurred to some extent during the semi-annual workshops for the winter and summer

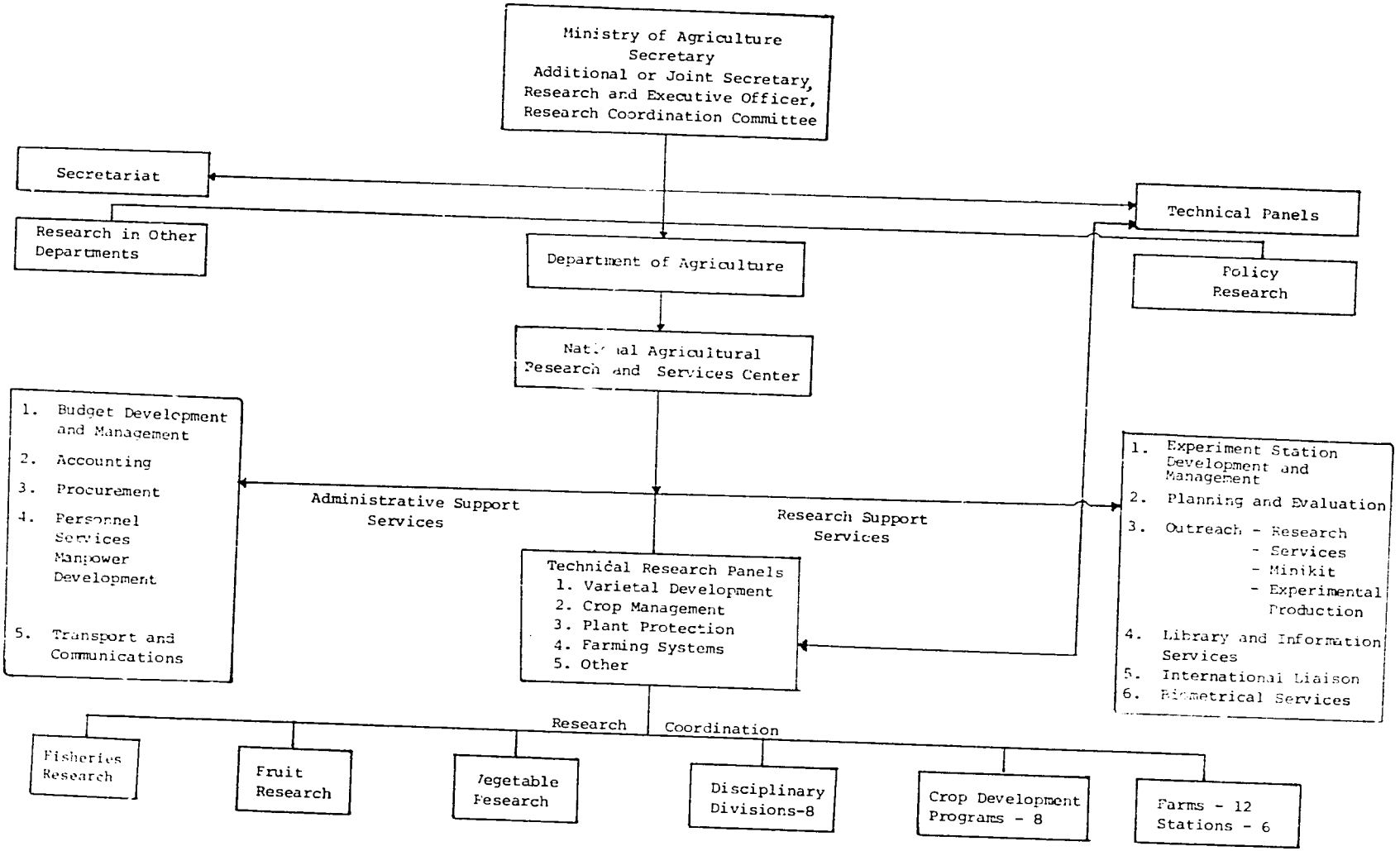

Figure 2. PRESENT AGRICULTURAL RESEARCH ORGANIZATION STRUCTURE

crops where participation by representatives of the commodity programs, divisions, farms/stations, and extension reviewed research results and provided guidance and direction for research. Budget preparation sessions which start with regional meetings provide opportunity for participation by staffs of regional extension, divisions and the commodity programs to identify regional problems demanding research effort. During these meetings budgets are prepared for presentation to divisions, farms and stations but specific funds for research were not identified. Other budgeted activities of the farms/stations include seed production, outreach, training, and diagnostic services. These occupy the time of many of the staff, but no separate accounting for research is maintained.

No special effort at the Ministry level has been made to evaluate research, establish priorities, and organize and promote quality research among the various units. Major focus has been on short-term production activities, and equally short-term research activities.

2) Objectives

The basic objective of NARSC will be to coordinate agricultural research through the various phases from planning, execution, monitoring, compilation and reporting results, and publication of results in appropriate forms for various users; not just other scientists but extension personnel, farmers, and administrators as well. The aim of NARSC is to eliminate duplication, improve facilities and their utilization, improve fiscal and personnel management, develop research plans with short-term and longer-term objectives, improve overall research efficiency in the search for appropriate technologies required for agricultural development in Nepal.

3) Functions and Responsibilities of NARSC

To fulfill these objectives NARSC will:

a. Execute and supervise the approved plans of the National Agricultural Research Coordination Committee and monitor the research programs undertaken by the various research units.

b. Research will be conducted by the various commodity programs, research divisions, and farms and stations.

To generate research technologies more appropriate to farmers' conditions a Farming Systems Research Division and a Socio-Economics and Extension Research Division have been created in addition to the discipline divisions presently in operation.

c. Prepare short and long term programs for the development of Nepal's agricultural research for submission to the RCC.

d. Prepare physical manpower and resource inventories for operational and developmental plans of the research units (in order to more efficiently utilize existing farms/stations and plan their further improvement and to develop long range manpower requirements).

e. Provide a sound environment for the encouragement of the research staff by making available the required physical services and other facilities.

f. Establishing a management system of farm operations and equipment, vehicles and building maintenance.

g. Transmit recommended technologies, the products of research, to the farmers through the extension materials provided to the extension services within the command areas of the farms/ stations and for other areas of Nepal where suitable technologies have been developed.

h. Publish technical papers of the results and technologies obtained from research.

i. Set up a well organized library to keep the necessary scientific periodicals, bulletins, booklets, reports and other materials relating to agricultural research.

j. Establish and maintain a liaison for maintaining and strengthening established linkages with the international agricultural research centers and relevant national research centers and programs.

k. Establish an office of biometrician whose duties would be to guide research centers and staff in sound biometrical procedures for research.

l. Provide a network of diagnostic services in entomology, pathology and soils at appropriate farms/stations to provide problem identification for farmers and extension personnel.

m. Provide specific supervision for research outreach activities of the farms and stations.

4) Planned Activities for the Fiscal Year 2042/43 (1985-1986) and 2043/44 (1986-1987)

a. To supervise and monitor the research plans of different research and development programs:

Preparation of these plans will follow a fixed system beginning with development in the working groups and then approval in technical panels. These research plans will then be forwarded to the RCC for approval.

b. Prepare an inventory of farms and stations to determine needs for improvement and priorities for development. This will include a manpower inventory as well as physical resources.

c. Manage and supervise the research outreach and support services programs of different divisions, farms and stations under the DOA.

Besides the above, there have been included some additional programs in subsequent years.

d. Establish experimental production programs in collaboration with extension personnel of the districts of the command area of the ARPP and others as new locally adapted technologies are developed. These production programs would be established to test new methodologies or technologies on a pilot scale before moving these methodologies or technologies to extension for wide scale use.

e. Establish a library for the collection of agricultural research publications and other information necessary to the research workers.

f. Manage the required physical services to provide necessary facilities (electricity, laboratory, water, canal, land, road, fencing etc.) for research.

g. Monitor the production programs in the Parbat, Baglung and Myagdi districts in the hills, launched under the ARPP, and other production programs of the DOA.

5) Needs for Effective Implementation

The introduction of new organizational structure and new operational procedures will require the integration of a host of interrelated activities. It is essential that there be a full awareness and understanding on the part of all personnel of the NARSC of the importance of full cooperation in areas of mutual concern. All activities must be addressed with the recognition that the research is to be problem-oriented, to accelerate agricultural production and development. And it must be kept in mind also that the research is to serve all of Nepal.

The contributions and success of the NARSC will depend upon the capability of the leadership not only at the level of the Chief of NARSC but also at the Divisional, Regional, National Development Program and the farm/station levels. In doing so it is possible to secure initiatives for conceptual research as well as personnel professional commitment and responsiveness that would make the NARSC a viable organization.

6) Administrative Support Services

Administrative Support Services to be provided by NARSC will include:

a. Budget Development and Management including preparation of budgets as required for the operation of the NARSC and its member research units, and the timely provision of funds through prescribed procedures.

b. Procurement of equipment, supplies and materials, and maintenance of inventory and records of the property of the NARSC and its member research units.

c. Personnel Services, and manpower planning including the processing of appointments and terminations, maintaining records of service, leave, etc.

Careful assessment of staff competence will be required in the different disciplines for the national coordinated research programs and for the various non-commodity research activities, will be needed to furnish a minimum level of staff at the various research stations. A priority scheduling will be set up for training, for both research and technical support staff. This section also will be responsible for developing or adapting position standards and grades, criteria for selection evaluation and promotion of the staff of the NARSC and for management of personnel in accord with policies laid down by the RCC.

d. Accounts of all expenditures, in accord with prescribed procedures including provision for such auditing as may be required by the RCC.

e. Transport and Communications will receive special attention in view of the current limited systems in Nepal. Effective linkages will be established between the central headquarters of the NARSC and the regional offices, as well as with and between the research stations.

7) Research Support Services to be provided by NARSC will include the following:

a. Experiment Station Development and Management

This would entail the development, improvement, and maintenance of the research facilities of the NARSC and its member units with special attention to facilities for research. The office would develop procedures for research station operations and management to maximize effective use of research personnel. The farms/stations superintendents or managers would be under this section.

b. Project Planning and Monitoring

The research of the NARSC should be set up on a project basis to provide for - project or program budgeting, allocation of funds to the respective projects, implementation, coordination, evaluation, and reporting of research, and for accounting. A proposed project structure for the NARSC is presented in Appendix II. This section will be concerned with developing the project structure, maintaining project records and reports, and with assistance in design and analysis of experiments.

c. Library and Documentation Services will be set up at the NARSC headquarters and, as required, in other farms/stations.

Information Services will include attention to all aspects of information gathering and dissemination, including scientific publications and reports, and recommendations for use of improved technology. This service will be established at the headquarters of the NARSC.

d. Biometrical Services. Preplanning of experimental design is essential to enable trials to provide results to answer the specific objectives of the experiments. Analysis of research

results can be more effective when the services of a biometrician are available to the research staff of the NARSC and its member units.

C. Future and Ultimate Institutional Structures for Agricultural Research

As mentioned in the introduction, these two institutional structures have been created to initiate a period of greater focus on agricultural research. The objectives will be to: 1) establish a research policy, 2) determine priorities for research, 3) create a better administrative system to guide and facilitate research, 4) create a reporting and evaluating system to enable evaluation of research and the utilization of results in extension programs to increase productivity and national production.

Considering the resources of funds and manpower the existing structure will encompass only the research in the Department of Agriculture at the NARSC level. Research in the other departments of the Ministry will be coordinated by and be the responsibility of the RCC at the Ministry level. These structures are presented in Figures 1 and 2.

Once these procedures become established covering the research of the Department of Agriculture, they can be used as a basis for reorganizing research in the other departments as well. Figures 3 and 4 show the modifications at the RCC level and in the research activities at the NARSC level. The time when these changes could take place could vary from a few to several years, depending upon staff capability and resources.

Still further into the future the creation of a semi-autonomous or autonomous organization may be the ultimate structure in providing an effective agricultural research system for Nepal. Such an organization will be less political, will be based on facilitating research

rather than controlling it, and will have personnel policies which are more appropriate to scientific personnel than for regular civil servants. The organization would involve all research activities concerning agriculture. Through formal linkages such as contracts with grant funding from the research organization, the research of such agencies as the IAAS would be a part of the research organization structure. The linkage of research and academic instruction will have merit in associating professors in active research which they are trying to teach. The main disciplinary research activities would be with the IAAS and the discipline division would be the main professional tie of the research staff to their parent discipline. Teaching will become more relevant and course content would improve. Students would also be benefited by the closer linkages of research and teaching. Figure 5 shows the Ministry of Agriculture and its relationship to the ultimate research organization.

Figure 6 gives the structure of the agricultural research organization itself down to the main research divisions. These would be grouped under different Assistant Executive Officers. The research structure below that would be similar to that already existing under the two previous phases of evolution of administrative structures for agricultural research. The linkage with extension is shown as a non-line function yet is a critical element in enabling the products of research to be rapidly utilized by farmers. In fact, the present trend is toward more and more research activity conducted on farmers' fields to generate appropriate technology for farmers. The linkage should be reinforced in every way to ensure that this adaptive research phase is a collaborative activity with extension.

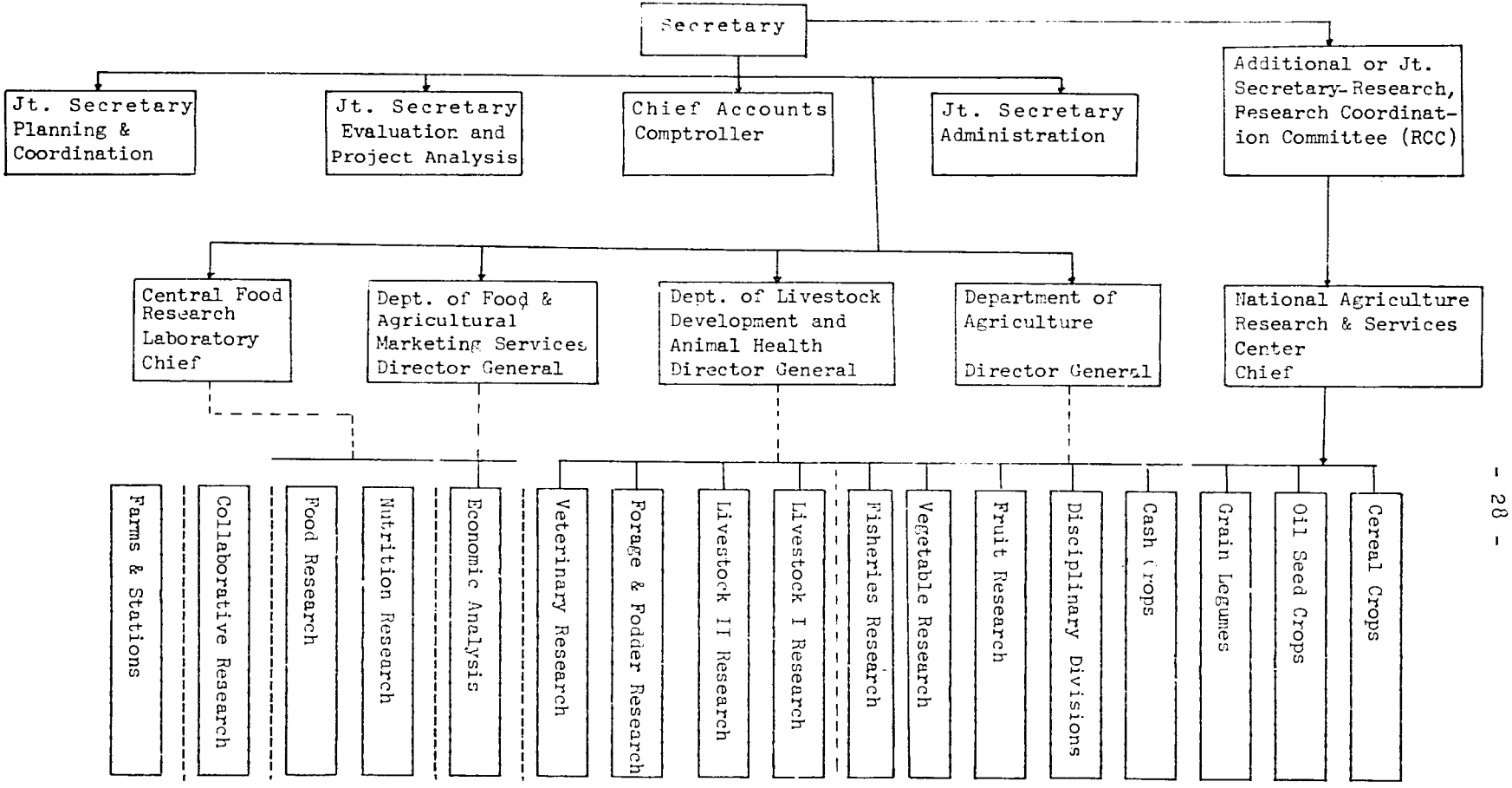

Figure 3. FUTURE ORGANIZATION CHART OF MINISTRY OF AGRICULTURE

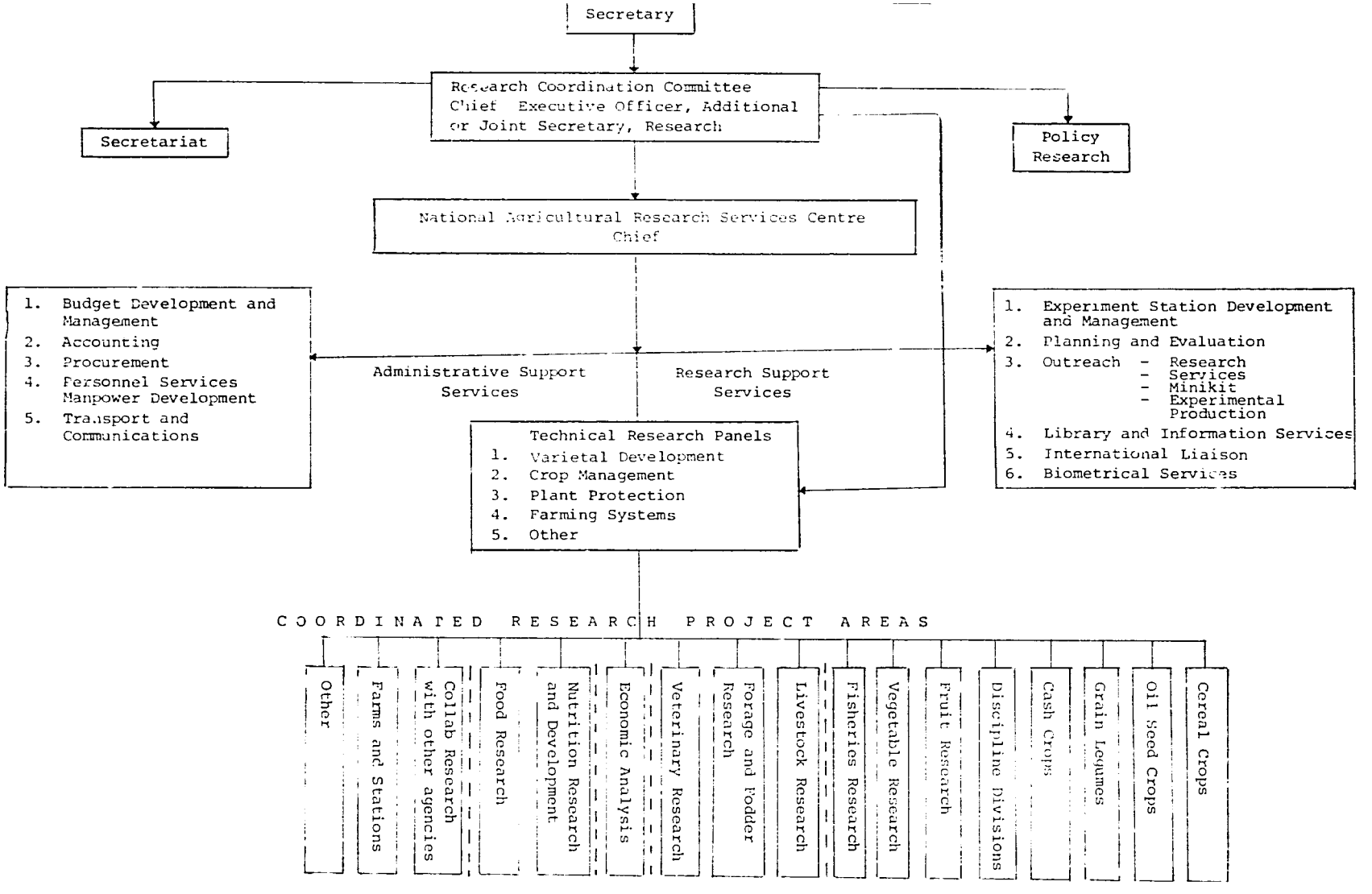

Figure 4. FUTURE AGRICULTURAL RESEARCH ORGANIZATION CHART

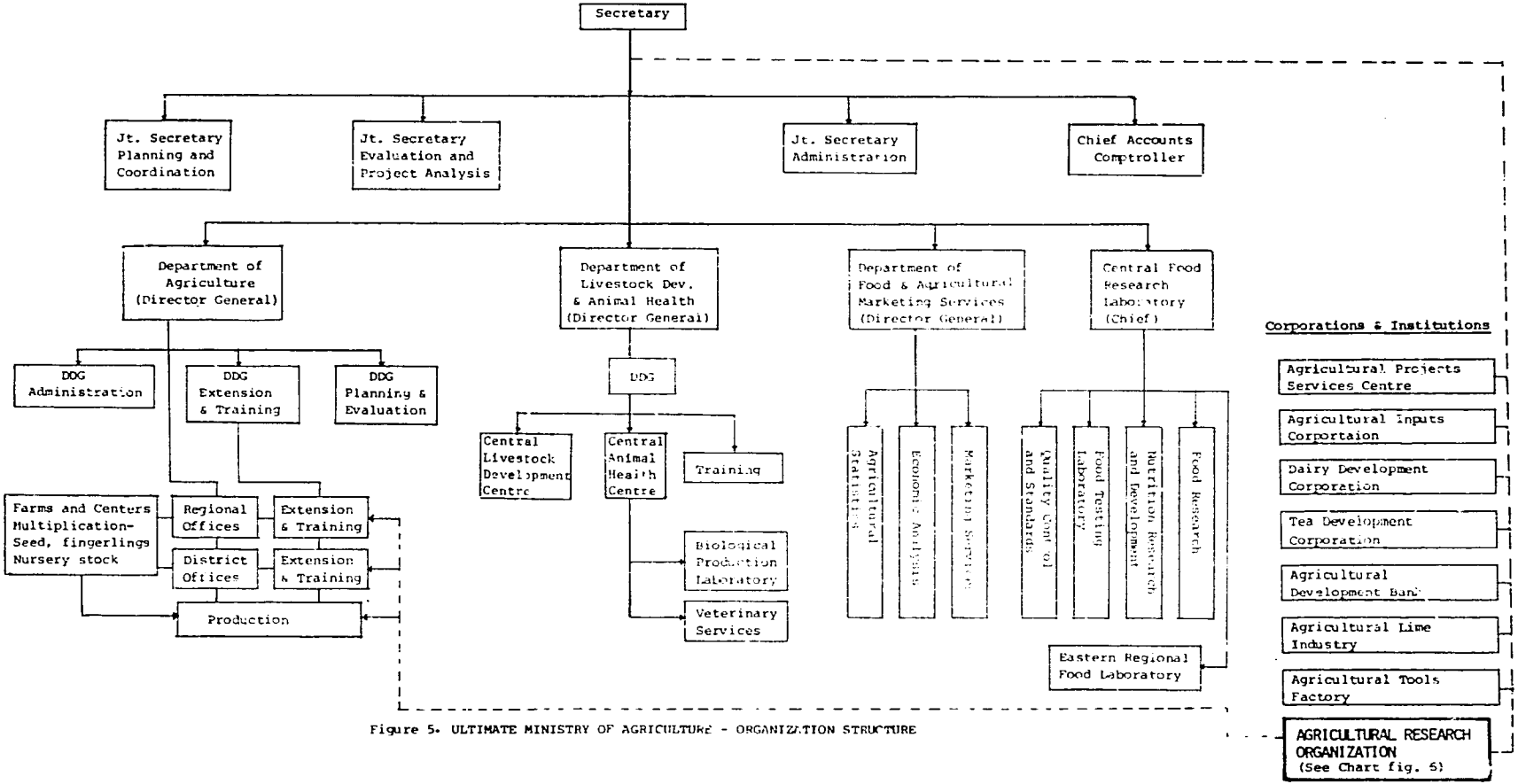

Figure 5. ULTIMATE MINISTRY OF AGRICULTURE - ORGANIZATION STRUCTURE

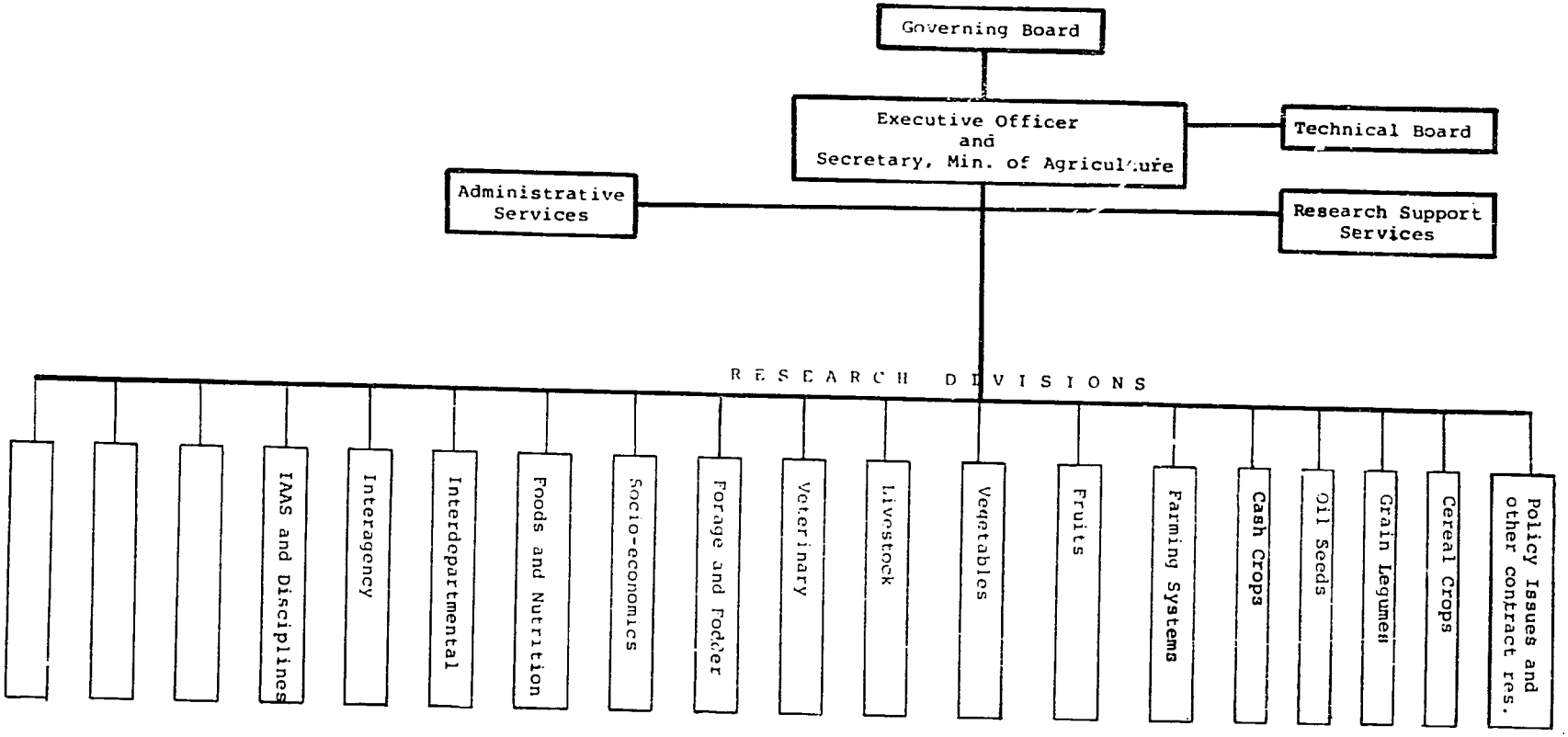

Figure 6. THE ULTIMATE AGRICULTURAL RESEARCH ORGANIZATION

APPENDIX I

ELEMENTS OF AN AGRICULTURAL RESEARCH SYSTEM

Dr. A. T. Mosher has written for ISNAR a booklet entitled "Some Critical Requirements for Productive Agricultural Research". Dr. Mosher served in developing countries in India and elsewhere before becoming President of the Agricultural Development Council. From his experiences and the experiences of others Dr. Mosher has identified fifteen critical requirements of an agricultural research system. Mosher emphasizes a "productive" research system implying that there are unproductive systems or that systems can be unproductive if these requirements are not met in the establishment and operation of a national agricultural research system. This section presents those fifteen points with a brief digest of his comments:

1. To be productive agricultural research must be conducted by specially trained research scientists.

Successful research and research management are related to research skills acquired as people pursue higher studies for the Ph.D. The danger, on the other hand, is that researchers will wish to pursue the sophisticated research they followed to acquire their degrees and do not use their skills for the solution of their countries urgent problems.

However, if they do apply their research experience and skills, they must be rewarded accordingly. "The world recognizes the value of highly trained scientists, even when some administrators in ministries of agriculture do not". As often happens, lack of recognition and rewards at home leads scientists to look elsewhere in the world for job satisfaction and higher salaries.

While higher salaries would be appreciated this alone will not stimulate greater research productivity among scientists.

2. Productive agricultural research requires participation by research scientists, each of whom has been trained in a particular scientific discipline.

There are no "agricultural scientists". Each scientist is trained in a special field. The problems to be solved require their specialization in crops, soils, animal husbandry, agricultural engineering, agricultural economics etc.

Each scientist is a specialist in his/her field with special knowledge, skills, and methodologies. Farmers' problems are complex which makes team research necessary in tackling many agricultural problems. The inter-disciplinary team effort of the crop development programs has been established in Nepal to create the necessary interactions. Problem areas such as farming systems will further expand this need for inter-disciplinarity.

3. Each research team, and each research organization as a whole, needs to consist of a minimum critical mass of research scientists.

Scientists of five to eight disciplines and at least two in each, is an essential minimum critical mass for any serious research effort.

In pursuing the problems of a particular commodity the relative contributions of plant breeding, disease or insect control or improved agronomic practices are critical to their solution. The interactions of different disciplines and different scientists in the same discipline are essential to productive research. As areas being served are increased the need for numbers of scientists increases.

Consideration of the creation of an "effective" and "productive" Hill research site will require serious consideration of what the "critical mass" is. Pakhribas and Lumle might be reviewed with this particular point in mind.

In case the minimum critical mass of scientific manpower cannot be immediately forthcoming, two initial steps are suggested: (1) tackle the simpler research within the competence and numbers available and (2) accelerate the training, some to the Ph.D. level, of additional scientists.

4. A corollary of the preceding staff requirements is to have a research agency so organized to encourage staff interaction.

Research agencies usually organize their staffs along discipline lines. This may encourage staff interactions within disciplines but it almost always discourages interactions between disciplines.

To overcome this short-coming some international agricultural research centres have organized their staffs on a programme or project basis, temporarily assigning to each the requisite staff from the different disciplines. Staff interaction takes place within the program. (Table 1 of Appendix II shows the interrelationships of programs and the units established on discipline lines and even as programs, with Farming Systems Research with division status.)

Another method is to schedule frequent seminars in which a report is provided systematically from the various projects so that all are informed and discussions encouraged and pursued.

5. Productive research requires a style of administration which emphasizes leadership more than authority.

Moseman[1/] states, "It is difficult to establish, and maintain, the concept that in a research organization the administrative functions must be carried out in such a manner that research is facilitated rather than controlled".

1/ Moseman, Albert H., Coordinated National Research Projects for Improving Food Crop Production, in Resource Allocation and Production by University of Minnesota Press, 1977.

The administrator must find ways to bring research scientists to a process of selecting the projects to be pursued which are in the national interest. He must develop operating procedures that build and maintain high morale-enthusiasm for what the entire organization is doing.

Because the leadership role is so important the director of any research organization should be fully qualified to be a research scientist himself. Only such a person can have the professional respect of the staff.

6. Productive research requires appropriate selection of research projects.

Two questions are to be asked when deciding what research projects to undertake at any particular time.

1. What problems of farmers exist or which problems of the national economy most urgently need research attention?

2. For what research projects are adequately trained researchers now available?

"No project should be undertaken just because the problem is important: it is necessary also that conducting the particular project successfully is within the competence of the research personnel who are available".

Who decides what projects are to be undertaken is not the decision solely of the research scientist. They are the best to judge of which projects are feasible, how long the study should run, and how much it will cost. Farmers and field officers need to participate because they are most familiar with the farmers' urgent needs. Research administrators should manage and participate in the selection process. The working groups built around crop commodities and problem programs (FSRD) are being structured as an initial and basic line project identification process.

7. Research scientists must have appropriate scientific instruments, equipment, and other facilities with which to work.

These facilities must include, but are not limited to, experimental farms where precision farming can remove as much variation as possible and on-farm testing where conditions of the farmers' environment are accepted and become a part of conditions by which technologies are evaluated. Staff mobility is required to enable scientists to properly manage on-farm trials.

Library facilities are necessary to provide scientists a storehouse of knowledge of what is currently being done and methodologies and information already developed.

These supporting services need to be properly funded. Mosher estimates that normally less than half of the budgets of research agencies should be required to meet staff salaries.

By contrast, in Nepal, Yadav reports that in 1980/1981 salaries constituted 55% of the recurring expenditures. A casual spot check of discipline divisions at Khumaltar shows that the figure now is more nearly 90%. It is obvious that a research system cannot be productive with such limited resources for operating expenses.

8. Productive agricultural research usually requires a combination of experiment station research, adaptive research trials on a network of substations, and on-farm testing.

Some types of research require the precision and environmental control possible only on well equipped research stations. Plant breeding research, plant protection screening for disease and insect resistance, and many other types of research require controlled conditions of experimental fields, greenhouse, or laboratories.

Adaptive research, as is implied, seeks to verify technologies or adapt them to local environments. Farmers' fields are the ultimate environment where the technology must perform to be adopted by farmers.

Well trained scientists are required to conduct research in farmers' fields where variables are greater, often requiring decisions of judgement in interpreting data obtained under these conditions.

9. Research undertaken in connection with accelerating agricultural growth needs to include experimentation to improve rural agricultural support services and research related to national policies affecting agriculture.

Although agricultural research focuses on improving farm production technologies, the factors of the village or district affect the farmer and the economic viability of the technologies. Input services and their management-credit, fertilizers, pesticides, and irrigation water are factors greatly affecting the productivity of farmers.

Research with respect to national policies on these and other issues are frequently neglected yet are highly essential if the policies are to be effective in stimulating production.

10. Wherever accelerating agricultural growth is an important need, applied rather than basic research should be stressed first.

Applied research can be focused, from the beginning, on meeting particular needs known to be critical now. Even so, a lag time of 5 to 7 or more years is required for applied research results to begin to contribute to development. Basic research could take even much more time.

11. Provision should be made within the research system to assess production technologies imported from abroad.

In a small country such as Nepal which cannot afford large research programs, imported technology is an important source. Nepal has taken extensive advantage of such technology from IARC's and programs from other countries but Ruttan[1/] points out, as this point stresses, that it takes a skilled staff to make proper evaluation and utilization of such technologies.

12. Research results should be reported not only in a form that can be read by other scientists but in ways that can be understood by policy-makers, extension workers and farmers.

In Nepal, where the main thrust of agricultural research is applied and adaptive, its main audience is non-scientists so the primary presentations should be addressed to them in forms and language they understand.

13. Full advantage should be taken of opportunities for on-the-job training of scientists, laboratory and field technicians, and production specialists for extension services.

Training is a component of practically every development project and will be a continuing need. The international institutes and other agencies provide training opportunities. Research is learned by doing it. The M.Sc. or Ph.D. student does his own research and along with his formal studies enables him to use research methods to solve problems of national or farmer importance. All the staff of a research center are involved in research to some extent or another. These people must be trained for the work they are expected to do. The training of

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1/ Ruttan, Vernon W., Agricultural Research Policy: University of Minnesota Press, 1982.

research leaders enables them to impart research and skills and an appreciation of research to the junior staff. More concentrated training programs are planned by the ARPP.

14. Production agricultural research programs should take full advantage of international resources.

Strengthening national agricultural research is one of the objectives of international agencies. The technologies of the IARCs cannot be well utilized if a national program is weak. The World Bank, the Asian Development Bank, USAID, SATA, FAO, UNDP and others are supporting efforts to strengthen the national research programs in Nepal, to enable Nepal's research programs to be more capable of utilizing the assistance of the IRRI, CIMMYT, ICRISAT and other IARCs.

15. To be productive, agricultural research programs need continuous and long term financial support, and timely release of funds for expenditure.

Research is a continuing activity. Continuity is an imperative of a national agricultural research system. If funds are not conscientiously programmed and released, valuable research activities vital to a country can come to naught by, for example, the cut off of electricity for lack of funds. Cold storage of crop germplasm over long periods is required to preserve these genetic resources for future generations. Rust spores stored by refrigeration to be used the next season to screen for rust resistance in wheat are easily lost by a failure in electricity. More vivid even is the failure of electricity for a battery of egg incubators during incubation.

As changes are considered for improving research administration these 15 points should be carefully considered.

APPENDIX II

A PROPOSED PROJECT STRUCTURE FOR AGRICULTURAL RESEARCH

A. Purpose of the Project System

The National Agricultural Research and Services Center (NARSC) will consolidate into one organization the responsibilities for agricultural research on all aspects of agricultural development in Nepal. This involves broad problem areas concerned with crops, livestock, soil and water management, engineering, crop protection, crop utilization, economics and social sciences, and the numerous scientific disciplines that relate to these various problems.

The NARSC will have broad scope not only in subject matter but geographically; it will be concerned with different types of farming areas including production under irrigation in the Terai and in the Hills, intensive systems in the Hills, and the more dispersed or extensive livestock production in the High Hills.

NARSC, as an organization supported primarily by government funds, will have a special responsibility to set up its organization and management structure so as to clearly identify the nature and scope of its activities, as well as the progress and output of results. In order to "institutionalize" the complex and comprehensive research program the work should be organized under a project system designed to provide:

1. A complete description of the NARSC operations or activities.

2. Clearly defined units of work, as a basis for program planning, for establishing research priorities, for budgeting, and for accounting.

3. A record of objectives and plans of work, for the guidance of the research staff.

4. A basis for direction and management of research, with maximum delegation of responsibility for performance.

5. A framework for the regular reporting of progress and status of research, and for the evaluation of performance of research units and of individual research workers.

B. Composition of the Project System: Description of the NARSC Activities

The project system should include four levels of projects, vertically integrated so as to describe the broad activities at the division level, and the component parts in successively narrowing units of work at the section (or program) level, to the experiment or "line project", to the subline project or experiment at the individual research site. The levels of responsibility for implementing projects for the different units in the agricultural research system are presented in Table 2.1.

Table 2.1 - Levels of Responsibility for Agricultural Research at different planning and implementation levels (the greater the number of asterisks the greater level of responsibility)

Level of Administration	National Planning and Policy Research	Project Level			
		Division	Program	Line	Subline Project
RCC	***	**	*		
NARSC	*	***	**	*	*
Division Head, Crop Coordinator			***	*	*
Research Leader			**	***	*
Individual Scientist or Interdisciplinary team			*	***	***
Station staff			*	*	***

The four levels of projects would be as follows:

1. Division Project - a comprehensive activity aimed at the solution of related problems within a Division of the proposed NARSC organization, such as: a) cereal crops, b) horticultural crops, c) animal sciences, etc.

   Examples - Cereal crops
   Cash crops
   Grain Legumes
   Oil seeds
   Horticultural crops
   Fisheries
   Agricultural Marketing
   Animal Science
   Food Technology
   Socio-economics

2. Section (or Program) Project - an activity concerned with one major component or objective of a Division, such as: a) rice, or maize, or wheat, b) cattle, or sheep and goats, or piggery, or c) a non-commodity program such as crop protection or farming systems, etc. The national coordinated crop improvement programs would come under the Section Project category.

   Examples - 1. Interdisciplinary
      a. Coordinated Commodity programs
      b. Farming Systems
      c. Collaborative with other agencies
   2. Disciplinary
      a. Soils
      b. Pathology
      c. Entomology
      d. etc.

3. Line Project - a defined line of work or segment of a Section Project, with a precise objective and with a prescribed length of time required for completion. Table 2.2 illustrates the interdisciplinarity and locations where line projects could be conducted within a program.

Examples - 1. Interdisciplinary

a. Host plant resistance involving:
   - Breeding
   - Entomology
   - Pathology

b. Breeding for problem soils involving:
   - Breeding
   - Soils

c. Economic analysis of fertilizer trials involving:
   - Socio-economics
   - Soils
   - Agronomy

2. Disciplinary

a. Epidemiology of blast on rice
b. Insect biology of gall midge in rice
c. Efficiency of azolla as a source of nitrogen
d. Plant introduction, collection and evaluation

4. Subline Projects (Experiments at specific locations) - subline projects are subdivisions of a line project which have common objectives and are conducted in a coordinated manner to determine adaptability of varieties over regions or determine the incidence of diseases or insects to specific sets of varieties in more than one location.

Examples - 1. Coordinated variety trial at Doti
2. Long term fertility trial at Tarahara
3. FFTs of wheat in Kaski district
4. Blast screening at Palung
5. Cropping pattern trials at Pumdi Bhumdi

As mentioned in Appendix I farmer problems are not usually simple single disciplinary problems. The need for specialization exists in order to develop capability to solve problems but part of that specialization should be an awareness that in biological and social sciences simple problems exist almost exclusively in laboratories but not in farmers' fields. The project system seeks to bring scientists of various disciplines together as an interdisciplinary team to solve farmers' problems. Conscious effort is required for efficient research to find solutions to most farmer problems.

The Division Projects would have a high degree of continuity. The Section Projects would be subject to some modifications from time to time, as overall research objectives or priorities within the scope of the Project might change.

The Line Projects would be the more flexible working units, subject to completion within a given period of time, and subject to discontinuance or modification at intervals of not more than three to five years. Collectively, the Line Projects would present a clear picture of current work under a Section (or Programs), and the outlines for the Section Projects would describe the complete research program of a Division within the NARSC.

Suggested forms or outlines for the Division, Section, and Line Projects are presented at the end of this Appendix.

Table 2.2 - Programs (Section Projects) of the Crops and Horticulture Divisions of the DOA and the units performing the research

Programs (Section Project)	Program Performing Units									
	Hort	Agron	Agri Bot.	Soil Sci.	Ent	Path	Agri Eng.	Farming Systems	Soc Eco	Farms/ Stations
Farming Systems		x	x	x	x	x	x	xx	xx	x
Hill Crops		x	xx	x	x	x		x		x
NRIP		x	x	x	x	x	x	x	x	xx(Parwanipur)
NMDP		x	x	x	x	x	x	x	x	xx(Rampur)
NWDP		x	x	x	x	x	x	x	x	xx(Bhairawa)
NPDP	xx			x	x	x		x	x	xx(Khumaltar)
NSCDP		x		x	x	x				xx(Jitpur)
NTDP		x			x	x				xx
NODP		x	x	x	x	x		x	x	xx(Sarlahi)
GLIP		xx		x	x	x		x	x	xx(Rampur)
STIP			xx		x	x				x
Vegetables	xx		x	x	x	x		x	x	x
Fruits	xx		x	x	x	x		x	x	x

xx indicates lead division or unit.

x indicates membership of the interdisciplinary team which would also perform project activities.

C. The Base for Programming, Budgeting, and Accounting

The project system or structure furnishes a basis for planning research programs, setting priorities, preparing budget estimates, and accounting for expenditures.

The RCC Secretariat Staff, together with the Technical Panels and the NARSC, face the dual task of: a) carrying out the most effective research program possible, at the present time, with limited and inadequate resources of staff and facilities, and b) building the national research resources that can meet the continuing, longer-term needs for new technological inputs for sustained growth and development. In fulfilling the objectives of the RCC the second of these responsibilities must not be permitted to succumb to program planning and budgeting constraints geared only to immediate production goals.

The proposed project system provides for the clear definition of research within units that permit planning of research by the NARSC staff so that:

1. Program priorities may be assessed readily by the Technical Panels of the RCC.

2. Requirements of funds for current operations and for capital expenditures for development of facilities can be evaluated effectively by the RCC.

3. The funds can be allocated, with delegated responsibility for management and accounting, to the division, section, and work program levels.

Although research should not be funded on a strict "costs and returns" basis, the project system furnishes an excellent structure for program and performance budgeting. This is particularly helpful to an organization whose guidance on technical matters is furnished

by Technical Panels and whose administrative management decisions are subject to approval by the RCC.

D. Defining Objectives and Plans of Work

One of the immediate and continuing problems in the development of the NARSC will be the limited number of research workers. This means that each member of the research staff must assume a broad scope of responsibility for planning and supervising research. The work programs, including the objectives and procedures, must be clearly defined to ensure effective conduct of research on the wide variety of problem areas.

The periodic absence of scientists who are sent out for further training under the staff development program will result in some discontinuity in research over the next several years. It is essential that the NARSC research program should have stability and continuity even though staff continuity may not be possible during these early years. The project system furnishes a base for long-range planning, and for adjustments as desirable, based on revised objectives. The project descriptions also would provide a means of keeping the research workers on target by furnishing a constant reminder of the objectives and the plans for achieving them.

E. The Direction and Management of Research

A well designed project structure systematizes research activities. The clearly stated purposes and objectives for work at each project level provide a framework for delegating responsibility--to the Division Head, Section Chief or Coordinated Program Leader, and each individual research officer--for conducting research, and for the management of funds, which should be assigned as close to the working level as feasible.

The Line Project is the unit of research work that is time-limited--subject to completion or to periodic modification. The continuous review

of these projects, for termination, revision, or extension, will help to ensure a dynamic research program.

F. Reporting

Each research worker in the NARSC should submit a report at least annually on the research for which he is responsible. The purpose of reporting on a project basis is not only to ensure a steady flow of information for use in development, but also to ensure consideration at least once a year by the research worker of what he has done, why he is doing it, and how he is progressing toward his objectives.

The reports from the individual Line and Subline Projects would be included in the reports at the Section and Division levels, which in turn would be summarized in the annual report of progress of NARSC activities submitted by the Chief of the NARSC to the RCC in the Ministry of Agriculture, and other levels of government.

The annual reports would furnish information on the current status of research and would be reviewed by the Technical Panels in considering priorities for ongoing research. Likewise, the reports provide the basic information resource for the RCC in its evaluation of the merits of the NARSC research programs, and for the RCC directorate staff in its assessment of performance in achieving research objectives.

The reports, along with formal publications and other evidence of progress in achieving research objectives--such as the development of improved varieties or better production practices--will be a major resource in evaluating performance for consideration of merit promotions for the research staff.

Division Project

1. Project No.:

2. Division: (Eg. Cereal Crops, etc.)

3. Description of Work:

   a) Origin and Brief History

   b) Objectives

   c) Plan of Work

4. Approved:

   Head of Division _____ _____ Date _____

   Deputy Director General _____ Date _____

   Director General _____ Date _____

Section Project (Program)

1. Project No.:

2. Division: (Cereal Crops, etc.)

3. Section or Program (Eg. Coordinated National Wheat Improvement Program)

4. Purpose and Character of Work:

   a) Origin and Brief History

   b) Objectives

   c) Plan of Work

5. Locations:

6. Cooperation:

7. Approved:

   Program Coordinator, or
   Chief of Section _____ Date _____

   Head of Division _____ Date _____

   Deputy Director General _____ Date _____

   Director General _____ Date _____

Line Project

1. Project No.:
2. Division: (Cereal Crops, etc.)
3. Section or Program: (Coordinated National Wheat Improvement Program)
4. Line Project Title: (Efficiency of chemical and local fertilizers)
5. Description of Work:
   a) Origin and Brief History

   b) Objectives

   c) Plan of Work

   d) Estimated duration (Years)
6. Locations:
7. Cooperation:
8. Project Leader:
9. Other Research Staff:
10. Approved:

Program Coordinator, or
Chief of Section _____ Date _____

Head of Division _____ Date _____

Deputy Director General _____ Date _____

Director General _____ Date _____

Line Project Annual Report*

1. Project No.:
2. Division:
3. Section or Program:
4. Line Project Title:
5. Project Leader:
6. Other Research Staff:
7. Locations:
8. Cooperation:
9. Objective of Work:
10. Progress during the year:
11. Important contributions of past 3 years:
12. Work to receive emphasis in coming year:
13. Approved:

Program Coordinator, or
Chief of Section _____ Date _____

Head of Division _____ Date _____

Deputy Director General _____ Date _____

Director General _____ Date _____

* Similar forms to be followed for Section and Division Annual Reports.

Line Project Discontinuance/Extension

1. Notice of Discontinuance:

2. Request for Extension of Time:

3. Section or Program:

4. Line Project No.:

5. Line Project Title:

6. Reason for Discontinuance/Request for Extension:

7. Summary of Accomplishments:

8. Estimated date for completing project for which extension is requested:

9. Recommended:

   Program Coordinator, or
   Chief of Section _____ Date _____

10. Approved:

    Head of Division _____ Date _____

    Deputy Director General _____ Date _____

    Director General
    (Extensions only) _____ Date _____

APPENDIX III

PROGRAM PLANNING AND EXECUTION

A. Program Planning

Agricultural research must solve problems of the farming community, which are usually more acute and pressing in a developing country such as Nepal. This is so because a gap always exists between the research and technology support provided, and the actual development needs. As development needs expand, entire sets of new problems come up and the technology gap tends to widen--unless the research output expands at a relatively faster rate on the basis of planned research programs. It is precisely for this reason that national agricultural research programs must be based on the needs of the country as a whole, in accordance with agricultural policy formulated at the highest level.

Research planning encompasses two distinct phases:

a. Establishing programs which are based on overall national objectives, and which define areas, commodities, or problems for which research is required.

b. Determining priorities between research programs.

Research planning assumes critical importance under conditions of scarce and limited resources which are to be applied as efficiently and as judiciously as possible to the solution of the most important problems. Planning the research programs involves the maintenance of a balance between the various disciplines and commodities, as well as a balance between long-term research and research on immediate problems.

1. Development of a National Agricultural Research Plan

One of the first steps that should be taken is to understand clearly what the national goals and strategies for agricultural

development fully mean. Next, is the broad interdisciplinary analysis of the physical, biological, ecological, and socio-economic factors that influence the overall agricultural situation in Nepal. These should be looked at closely, on the basis of individual commodity industries, and more comprehensively, on the basis of the total agricultural sector. This analysis should be followed by deliberations on how the existing agricultural situation may be improved in order to move toward the achievement of national goals for agricultural development. Such an exercise would necessarily identify the critical problems and constraints, and would permit sharp focus on areas of research needed to overcome the more serious limiting factors.

The plan should be developed through a series of national agricultural research program planning workshops that would be conducted in three stages:

a. Preparation of a draft national agricultural research program.

b. Determination of problems and constraints in agriculture in each of the three main geographic regions--Terai, Hills and High Hills--and testing the draft national research plan against the regional needs and making appropriate modifications.

c. Collating and analyzing the various research plans, as arrayed against the draft national plan, adapting these into a national agricultural research program.

The deliberations and output of the research program planning process should be complete, to include: (1) the plan proper, (2) estimates of resources needed to implement the program in terms of manpower, research infrastructure (research field stations, on-farm research, laboratories, equipment, etc.), and operating funds, and (3) priorities for implementation.

When the national research program is crystallized, it will be necessary to develop a phasing for its implementation. This can be done by first undertaking an inventory of (1) the quantity and quality of existing research manpower, (2) a full description of the available research stations (in terms of area; soil/topography, available major equipment, and laboratories and other research infrastructure), and (3) an appraisal of available budgets for agricultural research. It will then be necessary to determine the gaps between what is required to fully implement the approved national agricultural research program and what now exists in terms of available resources.

The success or failure of research program planning depends on the following factors:

a. The identification of relevant and critical problems, and assignment of priorities.

b. The development of effective research strategies.

c. Setting up procedures for execution of the research.

d. Providing for a system for delivery of research results.

2. Determination of Priorities

In any developing country, research resources are almost always inadequate. Hence, it is important for the research administrator to fix priorities in deciding on allocation of scarce research resources.

The determination of research priorities is usually made at three levels: (1) at the national ministerial level (the Research Coordination Committee) for development plans and policies, and priorities among Division Projects or development regions, (2) at the research administrator level (the NARSC and Directorate) for

priorities between commodities or constraints, (Section Project [Program] Level) and (3) at the research leader level (the Research Division Heads and the Commodity Program Coordinators and Heads of Stations/Farms) for priorities among specific experiments (Line and Subline Projects).

The determination of priorities begins at the planning of a given commodity research program. First, the benchmark information on available technology is assessed; secondly, the problems and constraints are identified and studied; thirdly, the national goals vis-a-vis the commodity industry are considered; and lastly, appropriate investigations are designed, to develop solutions for the identified problems and constraints.

Invariably, most researchers will claim that all of the problems and constraints identified for a commodity are of equally high priority. It is essential to encourage the research team members to jointly determine the appropriate priorities--or the research administrators and directorate staff will be forced to set priorities for the program on the basis of their own latent expertise on the subject, whether ample or not. Generally, the question to ask is: "If you had an X-amount of money, which of the listed research areas should be covered first, and to what extent should they be covered?"

In the determination of research priorities between commodities or research area programs, the decision makers at the ministerial level (the RCC and the Technical Panels) would essentially consider: (1) the relevance of the proposed research program (Division/Project level) to national development goals, (2) whether the identified problems or constraints can be solved by simple implementation of known technology, or whether new research is needed, and (3) how soon the impact of the proposed new technology to be generated could be available.

One important consideration in the determination of priorities is the providing of flexibility, to ensure adequate response to the dynamics of the given commodity industry. In the case of setting priorities within commodity research programs, this should be done each year through an annual working group meeting of the research-team members. Review of priorities between commodity research programs is generally considered satisfactory if done once every two to three years. This would be done by the RCC and the NARSC, adjusted in such a way that two reviews would be conducted within each national plan period. One should be timed so that the national plan could reflect the findings of the review.

B. Program Execution

Soon after the establishment of the NARSC, it will be desirable to put together information on the following:

a. Available agricultural research manpower--indicating discipline or field of specialization, level of training attained, percentage of time spent on research, and where located (proceeding in the current work plan).

b. Available research infrastructure--indicating for each research station or center the total area, topography, soils, climatic factors, altitude, area of experimental fields, physical structures and laboratories, and major equipment (proceeding in the current work plan).

On the basis of the proposed national research plan, it will be necessary to refine the short-term and long-term resource requirements and compare this with the currently available research manpower and infrastructure. The short-term and long-term program requirements would then be translated into the appropriate budget proposals for the respective plan periods--annual and five year--and submitted for approval through the regular program and budget approval process.

The proposed programs should move through the NARSC as follows:

a. The NARSC Chief would submit the proposed national agricultural research program to the Technical Panels for review and approval of the overall plans, including the priorities between commodities or problem areas.

b. After approval by the Technical Panels the national agricultural research program would be submitted to the RCC, for review and approval of priorities and for approval of proposed funding for development and operations.

c. The NARSC directorate staff would incorporate the views and modifications proposed by both the Technical Panels and the RCC in completing the plans and recommendations, with attention to pricrities between as well as within commodities and problem areas.

d. The NARSC Chief would then submit the final version of the national agricultural research program for review and final approval by the RCC.

From the very beginning it should be stressed that the RCC has authority and responsibility for all agricultural research in Nepal. This would cover all agricultural research done in Nepal in cooperation with international agencies and research centers, as well as the development-oriented research done by other agencies in Nepal.

The research should be funded by budgets released by RCC directly to the NARSC directorate and allocated to the respective Divisions, Commodity Programs, and stations or centers, subject to the established accounting and auditing regulations. The approved priority research activities to be conducted outside of NARSC research stations-which might include some research by IAAS, semi-autonomous organizations, individual research scientists, or the private agribusiness sector-

would be supported through grants-in-aid funded by the NARSC under provisions for "contract research".

The research thrusts for each of the NARSC research stations and centers should be defined shortly after program approval by the NARSC. This would then become the mandate for provision of research resources to each station and center.

It would be imperative to produce, as soon as possible, some concrete wide-impact technology from the research program of the NARSC. It is suggested that a Nepal Recommends series be established promptly, initially for each of the principal food crops, industrial crops, and animal sciences. These will expand upon the present Krishi Diary and would be annually updated publications, aimed at extension specialists, which would include "packaged technology" and farming systems recommendations drawn from indigenous verified and farm-tested technology. Area-specific technology and pattern/systems recommendations should be developed as soon as possible in the Nepal Recommends series.

APPENDIX IV

EVALUATING AND MONITORING AGRICULTURAL RESEARCH AND PRODUCTION

A. Establishing a base

Research monitoring and evaluation is a continual and continuing process and in the new administrative set-up will occur at four different levels - the Ministry (RCC) level, the NARSC level, the research leader level, and ultimately but by no means lastly, the farmers of Nepal.

A review of information provided to the Ministry for all phases of agricultural research (for NFY 1985-86, 2042-43) showed primarily an itemization of experiments to be conducted by the various stations and farms. These were not uniformly presented so that it would be difficult to assess merit of the different experiments. Costs were generally not given so the information provided no means of generating a budget. Interestingly the main commodity programs were presented by stations and not by the crop commodity.

Submitting even a well organized report of trials would have little purpose at the Ministry level. Broad groupings by commodity programs or problem or project areas along with objectives and sound budget estimates would.

The really critical information to submit to the Ministry would be the results of a series of experiments by these broad groupings. These then would provide a basis for the Ministry to evaluate research.

In recent years the question of research management and allocation of resources for research have been studied extensively by a number of researchers. These studies have been made in developed and under-

developed countries as well. Criteria for rating research, establishing priorities, and thereby allocating resources have been developed, some of which are highly technical and would require considerable expertise and data base to enable their application.

An initial step in the process and one which is vital to Nepal's agriculture is timely and comprehensive reporting of the results obtained from experiments conducted. Only then could evaluations be attempted to determine the benefits to Nepal's agriculture and the relative returns being provided for the investment in the many experiments (nearly 700 for the year 1985-86, (2042-43) being conducted throughout Nepal).

This vital first step will provide an annual report which will establish a baseline for use in making assessments of future research and accomplishments.

This report will provide a clear picture of accomplishments of the respective divisions and programs. Numeral summaries of trials (line and sub-line projects) would be presented and in addition data summaries of relevant information that would lead to the release of new varieties, changes in practices, cropping patterns, or plant protection measures. It would also provide highlights of research accomplishments upon which further research could be based or which could lead to new improvements in the future. In other words, short-term perspectives and longer-term perspectives of the ongoing research activities.

The first annual report will be for the year 1984-85 with instructions provided so that 1985-86 data can be collected and summarised in a more uniform and meaningful manner.

As additional background information a second report would be a comprehensive review of agricultural research since its beginning in

Nepal. This report would provide a significant baseline for future planning. It could be titled "The Beginning of Agricultural Research in Nepal, The first thirty-five years, 1950 to 1985". This report would enable comparisons of past priorities with those of the present and provide a more sound base for future planning.

Each division, commodity program or other unit in which research is performed would be expected to contribute. An estimated two months of a 3 or 4 person team for each commodity program, cropping systems, and some divisions will be needed to develop the reports. At or near the end of that period, a Winrock consultant will be available to organize these two reports and edit them into a suitable form for a historic record and for a background for future research planning.

Both of these reports should be completed and be available prior to the planning process for the 1987-88 (BY 2044-45) year.

A third step and one of immediate consequence to farmers will be the development of sets of recommendations for farmers. The Krishi Diary contains many items with which new data can be compared and the old information up-dated. It can also be expanded to become a "Nepal Recommends" publication which would include information that would be as location specific as possible, such as provided by Farming Systems site research. In view of the need for location specificity of recommendations it should include the criteria for recommendations for specific site situations. The recommendations would then be site based cropping patterns with the various components of the patterns. The level of inputs recommended would be farmer - resource dependent to show that farmers need not be resource-rich to take advantage of the recommendations. In this process alone, deficiencies in knowledge will lead to the identification of problems that require research. A Winrock specialist will assist in formulating these extension messages.

These three interrelated reports would serve several purposes -

1) Provide a base for national agricultural research planning.

2) Provide a baseline against which further research activities can be measured.

3) Use existing technologies as a base for recommendations to farmers.

4) The fourth step will be the process of developing a national plan for agricultural research. A workshop of scientists and administrators would be convened after the review documents have been prepared and circulated to the participants. In addition papers would be prepared for presentation on:

   1) National goals for agricultural development

   2) Strategies for agricultural development

   3) National profile of the agricultural sector

   4) Draft national development plan for agriculture

   5) Commodity - Division - Geographic Region overview papers in which the following would be included:

      a. available benchmark information

      b. development problems

      c. suggested priority research areas

The expected outputs of the workshop would be:

1) Consolidated and up-dated information on each commodity or research area.

2) Listing of the major development problems affecting 1) above.

3) Priority listing of research needs.

4) A review of the adequacy of the research station network.

5) A review of the adequacy of the research manpower.

6) Estimates of budgets required.

7) Extent of coordination and at which level for various types of interdisciplinary research activity.

8) Understanding of the respective roles of different administrative units in the new administrative structure.

B. Operating a monitoring and evaluation system for agricultural research

In the implementation of any research program, it is essential to keep in touch with the progress of the work, in relation to its planned pace of implementation. Potential trouble spots or deficiencies in implementation should be remedied before they magnify into real problems.

In the implementation of Nepal's national agricultural research programs, the following monitoring activities are suggested for the different levels of research administration.

1. At the Ministry Level

Once the base is established for operating an evaluation system the different levels of evaluation can then be put into operation.

a. In the RCC, the process will be primarily an evaluation of research. Although the numerical quantitative measures of research will be available, these measures of research as they address national goals will be mainly qualitative and subjective but must be administered with judgement if they are to maintain an objectivity removed from personal bias or capability. One function of technical panels will be the annual evaluation of all research of the Ministry.

The objectives of evaluation from the RCC standpoint are:

1) compare progress of research with the goals of the national plan.

2) enable intelligent adjustments in the allocation of funds.

3) to be assured research is responsive to changes in needs.

4) enable forward planning for agricultural development.

Criteria for evaluation will have to be primarily what can be learned from reports since it would not be possible to monitor or supervise research from the RCC level. That is why different levels of administration are created.

Reports submitted to the RCC by NARSC would be primarily the compilation of annual reports of the various commodity and division programs with a summary overview prepared by NARSC which would highlight research results of the current year and with significant cumulative information which could have immediate application.

RCC through its technical panels would be responsible for an evaluation of the proposed research plans (line and sub-line projects) developed by the various divisions, commodity programs, stations and farms. There would be a need to be aware of changes in thrust in the research proposals to see whether these are consistent with the overall agricultural plan and whether priorities are being maintained. These would be primarily RCC responsibilities. Budget assessments need to relate to resources available and if modifications need to be made before the budget is forwarded to the Planning Commission and the Finance Ministry modifications should be consistent with national goals and priorities. Also, as and when any modifications are made in budgets by the Planning Commission

or the Ministry of Finance, the RCC would need to make adjustments, in consultation with NARSC, and justify modifications consistent with the overall budget reductions, but more in line with MOA's priorities.

b. Triennial Review of National Agricultural Research Programs

It will be highly desirable to review and assess the progress of implementation of the agricultural research programs, and also the national agricultural research program as a whole, twice during each five year plan period. The methodology for effecting these reviews will be to (1) make effective use of annual workshops (preferably seasonal workshops as at present) for review of the commodity programs and other programs, (2) set up procedures for annual reviews by working groups of the research and the technologies recommended for the extension system, and (3) on a three-year schedule for research programs, on a rotating basis to distribute the workload, conduct an in-depth review of the research of a program. It might be useful to bring in external specialists on a selected basis, from an international center, neighbouring country, or technical assistance agency, to participate in the three-year review.

c. Monitoring and Evaluation by the Ministry

The Monitoring and Evaluation cell of the Ministry would have a definite monitoring role to make on-the-spot studies of the effectiveness of the various units of the Ministry in discharging their functions. Because input supplies are essential to production programs the cell would be concerned about timeliness and adequacy of these supplies - not only of physical inputs but credit inputs as well. These are especially vital to effectiveness of the special production programs of the DOA, and to continued increases in production.

Since NARSC is new, the relative effectiveness of the new unit in administrating research needs to be followed. Such vital activities as research planning; the timely release of funds to stations; the effective implementation of experiment stations' maintenance and management; timely summarization and presentation of research results; and the creation and filling of posts as factors in research administration must be considered. Likewise, management of development plans and the less tangible factors of research leadership, esprit de crops, accomplishment, and relationships to extension and the inter-disciplinary aspects of the research effort need to be monitored.

2. At the NARSC Level

The objective of NARSC is the effective administration of agricultural research at the implementation level. At this level there will be a portion of their activity which is evaluation of research by reports submitted, there will be evaluation by monitoring, and there will be a supervisory role for NARSC. The objectives of these evaluation, monitoring, and supervisory roles will be to maintain close contact with research activities, problems, and accomplishments, even at the field level. Many problems can be solved on the spot or anticipated if NARSC is closely in touch with its research staff and their activities. It can also be more effective as a research leader when discharging the supervisory and monitoring role. At present this is one of the weakest points in research administration - the lack of leadership in the field. "Services" as a part of NARSC's designation implies that there is an overall service function of administration which can be exercised only on a personal basis if it is to be effective. In essence it is leadership.

To accomplish its monitoring, evaluation, and supervisory roles NARSC will have to depend upon:

a. Effective and timely reporting. The annual reports will provide information but these are ex-post and management of research cannot be effectively done if this is all that is available to it.

b. Timely progress reports for a specified period of time are essential to enable NARSC to be aware of progress and problems. This shouldn't be a burden to the reporting unit and could be in the nature of a form to be completed except for a short narrative component.

The use of annual working group meetings provides a monitoring system that can be very useful. The working group leader needs to prepare the working paper, or annual report, and submit it well before the working group meeting to enable NARSC to be up-to-date on results obtained and be able to guide the working groups in case change of direction is needed or increased effort needs to be directed in a special problem area.

The summary of the working group meetings provides NARSC with the numerical measure of trials, line projects completed and trials proposed and enables a quantitative evaluation to that extent.

Proposals for varietal release, changes in fertilizer recommendations, or agronomic practices, cropping pattern recommendations, or plant protection recommendations would be measures for research evaluation at the NARSC level of administration. And appropriate actions need to be taken by NARSC on the basis of this type of information received.

3. At the research leader level

a. On-site Monitoring of on-going Projects. It is very important that each on-going research project be reviewed on-site every year by the Section Leader or Program Coordinator, to assess the following:

(1) problems of implementation encountered, (2) whether research support services are reaching the researcher in the field on the required time schedule, and (3) whether what the researcher reports are programmed research activities as they have actually been done. Such on-site project monitoring tours should be made at a pre-determined time of the year, when it is deemed best to evaluate the specific project on the ground.

At this level the primary function is supervision, again as leader not a commander. "Monitoring trips" as undertaken by the commodity programs are appropriately named. The objective is to closely observe the performance of varieties and other variables at out-lying stations or as FFTs or minikits in farmers' fields.

Almost daily contact with staff at work, visits to research trials, discussions of relevant points of an experiment or problems will involve quite a good portion of the time of the research leader. The objective is support to the staff as well as to monitor progress of the crop and various trials under his supervision. At the time of completing a confidential report on staff, there is no better background for the research leader than this day-to-day contact with the staff under his/her leadership and supervision. Judgement can be made on research capability, the

value of experiments underway, the researchers perception of the problem to be solved, the implications of observations made and personal attitude toward research and colleagues.

b. Annual working group meetings. Each year, the multidisciplinary team for a given commodity or problem-area program should meet for a two or three day period, to review the progress of research activities in the past 12 months, and to determine the gaps in research which are not receiving adequate attention. Such an analysis, coupled with the annual status report on on-going research activities by the Section Leader or Program Coordinator would provide an effective mechanism for close monitoring of NARSC research activities, as well as provide the opportunity to call attention to implementation problems faced by the staff in the field. The annual program review meetings should likewise provide the mechanism for reassessing the respective research program priorities, to see if developments in the current agricultural situation affecting the commodity or problem area would justify change in the existing priorities.

In summary, Table 4.1 provides an attempt to show the respective roles of the RCC, NARSC, and the research leader in evaluation, monitoring and supervision. The priority activity of each administrative level is recognized by the ordinal listing of the roles. The table also presents the measures each would apply and the methods used in applying these measures.

c. Monitoring and Impact Criteria for Production. The ARP Project seeks to accelerate the generation of adoptable technologies especially for the Hills, and to generate methodologies that will accelerate the adoption of these technologies under Hill conditions.

Table 4.1 - Evaluation, monitoring and supervision of Agricultural Research by different levels of research administration

Level of Administration	Role	Measures	Methods
RCC	1-Evaluation	1-Superiority of a.Varieties released b.New patterns c.New practices	Annual reports from NARSC Seminars (Triennial) Workshops
	2-Occasional monitoring	2-Research papers 3-Number of Projects 4-Minikits	Working group reports Occasional field visits
NARSC	1-Monitoring	-Problems encountered and solved at leader level	Management Information System (MIS) Reports
	2-Evaluation	-Research trials completed	Research leaders' Annual Reports
	3-Supervision	-Interpretation of results -Number of Trials -Relevance to Nat'l or farmer objectives -Quality of crop -Significance of Treatments -Implications of results	Working group Research Proposal Frequent Field Visits Technical papers
Research leader	1-Supervision	Trial management	Day-to-day supervision Leadership
	2-Monitoring	MIS Reports	MIS Reports
	3-Evaluation	Relevance to Nat'l or farmer objectives Originality Analysis and implication of results	Research Proposals submitted for working group meetings Technical papers

Research done at the research stations will clearly develop components of technology while the FSRD will test these components under farmers' conditions for the express purpose of adapting the components into productive and economic patterns packages. These and other criteria must be met if farmers are to adopt the technologies extensively enough to affect farmer and farm family welfare and overall national production.

The ARP Project production programs in the three Hill districts of Myagdi, Baglung, and Parbat provide opportunity to closely evaluate technologies and their affects on production. ARPP will be responsible not only for the generation of the technology but in addition will, with the ADOs and their extension staffs, be responsible for dissemination of the technologies and their utilization by farmers.

The methodologies developed under the ICP will be used initially as the dissemination system. These methodologies provide for an intensive system in well defined areas where preproduction surveys are conducted to identify present production levels, cropping patterns, and farmer resources. Then pre-production verification trials are systematically conducted in these potential areas. And ultimately, as the technologies are verified, impact production blocks are established as farmer demonstration of the technologies. Around these initial impact blocks other farmers become participants in similar or expanded production blocks until adoption significantly affects the majority of the areas where the technologies are adoptable.

Concurrent with the intensive system the minikits will provide an extensive system of technology dissemination in

the same and in other districts in the Hills. The spread of new varieties, if adopted, will be achieved primarily through the farmer-to-farmer seed system already prevailing among farmers. This system will be fortified with other components of ARPP to enable more and better quality seed to begin to flow into and through the farmer-to-farmer system.

Systematic monitoring of farmers' production and other activities will be followed by ARPP to enable evaluation of the technologies, evaluation of the extension methodologies, and evaluation of the various support services and input services required to enable and encourage production to expand.

The following indicators of on-farm activities will chronical project impact in the ARPP districts and in other districts where FSRD-SERD activities identify technologies and these are put into extension programs.

A. Indicators

1. Numerical

a. Number of Pre-production Verification Trials (PPVT's) in areas identified by Pre-Production Surveys (PPS) to be potential areas for PPVTs and for potential production increases.

b. Numbers of Impact Production Blocks and areas covered.

c. Numbers of Minikits distributed and time of distribution by specific areas in districts (to assure distribution).

d. Numbers of farmer seed producers, amounts produced, and seed bins utilized.

e. Input use - seed, fertilizer, credit.

f. Functional farmer producer groups (as an indicator of the permanence of the production system).

2. Quality indicators

a. Yield increases and favourable marginal benefit-cost ratios over farmer practices (FP) in PPVTs.

b. Yield increases over farmer practices in IPBs.

c. Lateral spread of technologies to neighboring adjacent farmers compared to remote farmers - spread of varieties, spread of patterns, spread of input use, and other practices will be measured.

d. In other areas spread of improved varieties from minikits.

e. Changes in land utilization - cropping intensity, perennial crops, forages etc.

3. Measures of impact on family welfare

a. Changes in number of days of family food supplied by the farm.

b. Changes in number of days of off-farm employment required for family sustenance above farm subsistence levels.

c. Changes in income generation by sale of livestock and/or livestock products, or other cash-generating products or activities.

d. Changes in quality of life

1) School attendance

2) Consumer goods acquired

3) Home improvements

4) Home gardens

5) Health care and family planning services utilized

6) Real estate transfers among villagers

7) Community activities stimulated by efforts of organized farmer production groups.

B. Methodologies

The SERD and the FSRD, in collaboration, will follow many of these indicators in the course of their on-farm research activities. More extensive studies in other areas and in other districts may require special studies to be contracted by the project. In most cases the surveys will involve methodologies that can provide adequately precise measures and yet not involve extra unnecessary expense in the collection of vast volumes of data which later prove meaningless and/or are too slow of analysis to enable their use as effective impact indicators.

APPENDIX V

RESEARCH PROPOSALS RECEIVED BY THE MINISTRY OF AGRICULTURE FOR 1985-86 AND AN EVALUATION EXERCISE FOR CROPS RESEARCH PROJECTS AND THE RICE PROGRAM

A. Research Activities of the Ministry of Agriculture

Early in the consultancy, a report was provided by the Ministry concerning the research activities underway (1985-86) by the various departments and units of the MOA. Table 5.1 gives the listing of these research activities. Aside from compiling the list it appears no other use was made by MOA of the report submitted.

The listing has some serious deficiencies in that all the research was listed by divisions or stations or farms, and none by commodity development programs. There was also only limited information on research outreach and minikits so that this aspect of research activity could not be accurately assessed. Funding information was incomplete and not consistently presented.

Table 5.1 — List of Research Proposals and Other Activities for Fiscal Year 1985-86 (2042/043) submitted to the Ministry of Agriculture by various Departments

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1. Ministry of Agriculture
   - 1.1 Agricultural Price
   - 1.2 Management & skill development
     - 1.2.1 District level agri-plan
     - 1.2.2 Sub-District level agri-plan
     - 1.2.3 Training on monitoring & evaluation
     - 1.2.4 Training on Agri-project
     - 1.2.5 Management skill development
     - 1.2.6 Follow-up
     - 1.2.7 Decentralized plan
2. Department of Food and Agricultural Marketing Services
   - 2.1 Food and Price Management
     - 2.1.1 Agri-market information system
     - 2.1.2 Farmgate prices
     - 2.1.3 Vegetable & fruit price
     - 2.1.4 Food-outlook
     - 2.1.5 Agri-Input price
     - 2.1.6 Minimum support price (Recommendation)
     - 2.1.7 Minimum support price (Impact)
     - 2.1.8 Food balance
     - 2.1.9 Supply utilization account
     - 2.1.10 Stock estimating method
   - 2.2 Market Research
     - 2.2.1 Coffee market
     - 2.2.2 Agricultural wholesale markets
     - 2.2.3 Trade flow study
     - 2.2.4 Long term food supply policy in food deficit
     - 2.2.5 Minikit subsidy
   - 2.3 Economic Analysis
     - 2.3.1 Farming occupation
     - 2.3.2 Cost of cultivation
     - 2.3.3 Econ. analysis of fertilizer trials
     - 2.3.4 Farming system in Hill
     - 2.3.5 Livestock rearing occupation
     - 2.3.6 Contribution of agri-inputs
3. Department of Agriculture
   - 3.1 Agronomy Division
     - 3.1.1 Cropping Systems
       - a. Component technology
       - b. Cropping patterns

3.1.2 Khumal Agronomy

a. Varietal Investigations
b. Weed control
c. Farmers' Field Trial

3.1.3 Legume Research

a. Varietal Investigations
b. Cultural practices
c. Entomological
d. Pathological

3.2 Agricultural Botany

3.2.1 Plant Genetics

a. Genetic exploration
b. Genetic conservation
c. Genetic Screening
d. Data processing & documentation

3.2.2 Plant Breeding

a. Hybridization and generation advance
b. Introduction for selection
c. Adaptive trials
d. Source seed production and maintenance

3.2.3 Seed technology and Improvement

a. Seed testing
b. Dormancy
c. Seed production

3.3 Pomology

3.3.1 Kirtipur

a. Apple
b. Peach
c. Plum
d. Walnut
e. Mango
f. Pineapple
g. Banana
h. Coffee
i. Grapes

3.3.2 Citrus Development

a. Mandarin
b. Sweet orange

3.4 Olericulture

3.4.1 Vegetables

a. Cauliflower
b. Radish
c. Tomato
d. Potato

e. Onion
f. Cabbage
g. Cucumber
h. Sponge Gourd
i. Hot pepper
j. Sweet pepper
k. Dwarf bean
l. Eggplant

3.4.2 Potato

3.5 Plant Pathology

3.5.1 Rice
3.5.2 Wheat and barley
3.5.3 Maize
3.5.4 Vegetables

a. Chili
b. Cauliflower

3.5.5 Groundnut
3.5.6 Soybean

3.6 Entomology

3.6.1 Insect survey
3.6.2 Biological studies
3.6.3 Toxicological studies
3.6.4 Biological control
3.6.5 Pest management
3.6.6 Storage pests
3.6.7 Vertebrate pest management
3.6.8 Industrial entomology

3.7 Soils

3.7.1 Long term fertility
3.7.2 Fertilizer rates and efficiency
3.7.3 Lime requirement
3.7.4 Micronutrient
3.7.5 Organic recycling
3.7.6 Soil survey
3.7.7 Soil resource map
3.7.8 Rhizobium application
3.7.9 Effect of azolla
3.7.10 Maize and wheat rotation
3.7.11 Compost making
3.7.12 Tissue culture & inoculation
3.7.13 Soil test methods for P & K
3.7.14 Clay mineral distribution
3.7.15 Soil pH and rhizobium
3.7.16 Bio-fertilizer

3.8 Agricultural Engineering

3.8.1 Grain storage structures
3.8.2 Depth of ploughing

3.9 Agricultural stations/farms

- 3.9.1 Jumla
- 3.9.2 Tarahara
- 3.9.3 Kavre
- 3.9.4 Doti
- 3.9.5 Nepalgunj
- 3.9.6 Parwanipur
- 3.9.7 Bhairawa
- 3.9.8 Rampur
- 3.9.9 Surkhet
- 3.9.10 Kakani
- 3.9.11 Hardinath

3.10 Fisheries Development

- 3.10.1 Toxicity of polygonum sp
- 3.10.2 Ratio and stocking density
- 3.10.3 Use of animals/fowls
- 3.10.4 Parasites
- 3.10.5 Management of nursery ponds
- 3.10.6 Management of brood fish
- 3.10.7 Fingerlings rearing in cages
- 3.10.8 Biological/Limological

4. Department of Livestock Development and Animal Health

- 4.1 Organisation
- 4.2 Upgrading central livestock development
- 4.3 Case studies
  - 4.3.1 Productivity of Medicago sp.
  - 4.3.2 Controlling Eupatorium adenophorum
  - 4.3.3 Maternal antibody against Ranikhet
  - 4.3.4 Coccidia strains
  - 4.3.5 Cross-bred cows
  - 4.3.6 Foot and Mouth diseases
  - 4.3.7 Urea treated and untreated straw

5. Central Food Research Laboratory

- 5.1 Local germ plasm of ginger

B. Crops Research Project Areas of the Department of Agriculture

In an attempt to provide the MOA with summaries of research activities in the crops divisions and coordinated programs, the NARSC secretariat was asked to make summarizations by location (Table 5.2) and another by crop (Table 5.3) with broad discipline/problem areas (as used in the report) for each grouping. This enables an assessment of the relative emphasis provided in categories of varietal improvement, agronomy, pathology, entomology etc.

The summaries are obviously incomplete since the totals on the two tables differ widely. The main reason is that experiments for soils, pathology and entomology were not identified by specific crop and were not included in Table 5.3. Although Table 5.3 is still incomplete by crop as will be seen when the rice program is studied in Section C, it does give some idea of the magnitude (444 trials) of interdisciplinary activity under the crop commodity programs compared to the total of 696 trials from Table 5.2.

Socio-economic research which is an active part of the cropping systems research was not identified and is not tabulated.

The active research centers of Pakhribas and Lumle conduct research trials from the commodity programs as well as their own and none are shown because the main funding support is through ODA and not HMG.

C. The National Rice Improvement Program for 1986-87

By contrast, the rice commodity program, for which trials are available, can give a more complete picture for that commodity program and is included in this Appendix V (Table 5.4) with a more detailed study of the composition of the numbers of experiments presented. (Similar data are available for 1985-86 but unfortunately these were incomplete, lacking information on Hill trials and others. It is of interest that there were 82 FFTs in 1985-86 and only 67 in 1986-87.)

Table 5. - Agricultural Research Summary By Locations, Trials Planned, 1985-86 (2042/43)

Farm/ Station/Division	No. Crops	Tot	Var	Agr-on.	Soi-ls/ Fert	Wat-er Mgt.	Path	Ent	Res. outreach		Other
									FFT	Mini-kits	
Bhairawa	2	64	8	1	3	-	-	-	52		
Rampur	6	35	8	1	2	-	1	-	23		
Parwanipur	7	22	4	8	1	2	2	1	4		
Khumaltar											
- GLIP	7	37	16	4	2	-	6	6			3
- Agronomy	9	16	7	9	-	-	-	-	-	-	-
- Agr. Botany	5	33	27	3	-	-	1	1	-	-	1
- STIP	-	7									7
- Plant Path	8	82	-	-	-	-	82				
- Entomology	10	70	-	1	-	-	-	69			
- Industrial Entomology	-	8						8			
- Soil Science	8	112	-	-	112						
- Agric.Engineering		2	-	-	1						1
Tarahara	5	17	6	3	1	-	2	1	4		
Hardinath	4	13	4	2	1	-	1	1	4		
Kavre	7	20	6	3	1	-	2	-	5		1
Kakani	7	19	5	4	-	-	3	-	5		2
Nepalgunj	7	21	9	2	2	-	3	1	4		
Surkhet	6	9	5	-	-	-	-	-	4		
Jumla	6	16	7	1	1	-	2	1	4		
Doti	5	13	6	-	1	-	2	1	3		
Cropping Systems Sites											
- Khandbari		16	1	12	1	-	-	-	2		
- Lele		7	-	1	3	-	-	-	3		
- Pumdi Bhumdi		16	-	12	-	-	-	-	4		
- Chauri Jahari		15	6	3	-	-	-	-	6		
- Parsa, Bahuwari		12	-	11	-	-	-	-	1		
- Ratna Nagar		14	-	10	1	-	-	-	3		
TOTAL	10	696	127	91	133	2	107	90	131		15

Table 5.3 - Agricultural Research Summary By Commodity, Trials Planned, 1985-86 (2042/43)

Commodity/Program	Total	Variety	Agro-nomy	Soils Fert.	Water Mgt.	Path	Ent	Research outreach		Other
								FFT	Mini-kits	
Rice	71	22	5	5	-	5	5	22		7
Maize	56	11	4	2	2	3	-	29		5
Wheat	91	14	11	1	-	7	0	54		4
Pulses	54	23	10	2	1	7	6	5		
Cropping Systems	78	8	49	2	-	-	-	19		
Finger millet	9	4	5	-	-	-				
Potatoes	69	25	4	1	-	3	5	24	4	3
Barley	3	2	-	-	-	-	-	1		
Oilseeds, except Sarkhi	11	9	1	1						
Amaranthus	1	1								
Buckwheat	1	1								
TOTAL	444	120	89	14	3	25	16	154	4	19

Insofar as the data are available the following is the type of analysis that NARSC or RCC might pursue and which could then be used to assess whether the programs are following national objectives and goals in planning their research activities. Reports of research from a specific program would provide results which could then be compared with objectives established by the researchers and the degree of success achieved in meeting objectives at the national level. Only such an analysis of trial results would give an indication of the degree of achievement of the experiments themselves.

The rice working group meeting held December 22-26, 1985, developed a very comprehensive set of trials (Line and Sub-line Projects) covering 18 locations besides the 67 FFT trials for 5 different agrogeographic situations. The group is to be complimented for the detail and scope of work outlined for 1986-87.

Minikits were organized for early season rice with six varieties and over 3000 packets. For the normal season, minikits numbered nearly 9000 and involved 17 different varieties although seven constituted the majority with more than 500 packets each. Two of the seven were hill varieties. Seed multiplication plans were proposed for twentytwo varieties at 12 different stations and farms totaling 184 ha.

Individual line projects totaled only 59. When NARSC included activities of discipline divisions, the total came to 67. These are grouped into four main headings in Table 5.4, which are Varietal Development, Varietal Evaluation, Crop Management, and Pest Management. When sub-line projects, i.e., where trials occurring at more than one location are considered, a total of 293 trials were planned. The rice coordinator reported in the 13th Annual Summer Crops Workshop that 175 activities (contrasted with 71 in Table 5.3) had been planned for the previous year. The 1986-87 trials would be an increase of 118 or 67% over 1985-86 trials reported. However, as earlier mentioned enumeration of the 1985-86 trials was incomplete.

Table 5.4 - Trials of the National Rice Improvement Program by Line Project in the Terai and Hills, 1986-87 (2043/44)

Line Projects	Terai		Hills		FFT		Total	
	No.	%	No.	%	No.	%	No.	%
Varietal Development								
Breeding								
1 - F_2 Populations 2 - Progeny rows	15		10				25	
Variety Evaluation								
3 - Irrigated, Normal/Season	22	12	-	-	11	16	33	11
4 - Irrigated, Early Maturity	11	6	-	-	4	6	15	5
5 - Rainfed lowland	48	25	-	-	29	43	77	26
6 - Rainfed upland	29	15	4	11	15	22	48	16
7 - Hills	5	3	21	58	8	12	34	12
Sub-total	115	61	25	69	67	100	207	71
Crop Management								
8 - Cultural practices	9	5	0	0	-	-	9	3
9 - Fertilizer use efficiency	26	14	2	6	-	-	28	10
Sub-total	35	18	2	6			37	13
Pest Management								
Host Plant Resistance								
10 - Diseases	18	9	6	17	-	-	24	8
11 - Insects	15	8	3	8	-	-	18	6
Sub-total	33	17	9	25			42	14
Plant Protection								
12 - Diseases	1	0.5	0	-	-	-	1	0.3
13 - Insects	6	3	0	-	-	-	6	2
Sub-total	7	4	0				7	2.3
Totals and % of Total	190	65	36	12	67	23	293	100

In an attempt to assess priorities as indicated by numbers of trials a tabulation was made (Table 5.4) classifying trials according to thirteen broad line projects within the main line projects mentioned above. These were further divided into Terai and Hills, with only eight categories for the Hills or a total of 21 altogether.

Breeding effort is a critical assessment of a commodity program, yet 15 F_2 populations at Parwanipur and 10 F_2 populations at Khumaltar are rated as only one experiment for each center. Actual numbers are presented here but not added to the totals of experiments. Number of progeny rows are not presented but would again be significant measures of breeding activity in a program.

A study of the relative importance attached to the Hills and the Terai can be noted for the different classifications. Variety trials for the two geographic regions involve almost completely different materials with the Terai having semitropical varieties and the Hills temperate zone varieties. Variety trials for the Hills constitute only 18% of all variety trials. Farmer field trials for the Hills include upland FFTs which are primarily for tar areas in the Hills and are not true Hill conditions although the geographic location is in the Hills.

Rainfed lowland rice accounts for a total of at least 70% of the rice area in Nepal, yet the numbers of rainfed lowland trials is only 37% of all variety trials while 43% of the FFTs are for rainfed lowland situations. Fortunately varieties in other categories offer potential for these situations but the fact that the number of trials under these actual situations is so low reflects a disproportionate lack of emphasis on farmer problems in rainfed conditions.

Crop management and fertilizer trials are even more skewed to the Terai with two out of 35 trials or only 6% of the total give any stress

on agronomy or soil fertility under Hill conditions. The greater heterogeneity of agronomic and soil conditions in the Hills compared to the less variable conditions of the Terai would indicate greater emphasis is needed on agronomic problems in the Hills as well as for variety development as pointed out earlier.

In the case of host plant resistance studies the weightage is probably more nearly congruent with areas in the Hills and Terai. However, considering the relative incidence of blast in the Hills on new and old varieties congruence is not a reliable measure of the level of stress to use. On the other hand it could be said that the number of diseases and insect pests is much greater in the Terai and therefore even more effort should be made on host plant resistance for the Terai. An inevitable conclusion would be that, from the data presented, this part of the program should receive greater emphasis. More rigorous screening programs would probably reduce the number of entries in varietal trials but those being tested for agronomic traits would have greater assurance of ultimate consideration for variety release.

Plant protection trials perhaps are in a similar category with soils and soil fertility and there are more trials than the NRIP lists. Within this group of trials insect control should have the greater importance than disease control because of the effectiveness of materials and their relative economy of application compared to fungicidal treatments for disease control.

As mentioned earlier this is only a partial evaluation of a program. Reporting results of a program as is done at the crops workshops provides some assessment of results but the evaluation is that of the researchers themselves and does not serve the needs of NARSC or the RCC. The mechanism of reporting as outlined in Appendices II, III, and IV will need to be developed to serve this need.