NEPAL

INTEGRATED CEREALS PROJECT

EVALUATION REPORT

Prepared for:

U.S. Agency for International Development
Kathmandu, Nepal
(Contract No. PDC-1406-I-00-2085-00)

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ACKNOWLEDGEMENTS

Evaluation missions are not intended to be painless and they rarely are. Thanks to the assistance, hospitality and friendship of many individuals in Nepal, for the evaluation team members at least, the ICP evaluation was very nearly an exception. We wish to express our gratitude to ICP, the Ministry and Department of Agriculture, and the USAID mission for help and patience as the team progressed, somewhat slowly at times, in its understanding of ICP and agricultural research in Nepal.

Special thanks must be given to ICP, including Carl Hittle, Wayne Freeman, Marlin Van der Veen, Ken Sayre, and Bong Bolo whose lives we disrupted in varying degrees during the five week mission. Gary Alex , William Nance and Doug Pickett in USAID/Nepal were most helpful in a variety of roles including overseeing the mission; reviewing successive drafts; and the nitty gritty of administrative and logistical arrangements.

Our warm appreciation is extended to Nani Sobha K.C., USAID/Nepal, and Manju Shrestha, ICP, for assistance in logistics and appointments; to Keshabati Kansakar and Hari Krishna Shrestha of the ICP staff for typing successive drafts of the report, and to Paula Gember for the final word processing of the report in Bloomington, Indiana. Finally, our thanks to David Lipinski, PPCV, who served as our guide on two occasions and whose enthusiasm about his work and Nepal was infectious.

BASIC PROGRAM IDENTIFICATION DATA

1. Country: Nepal
2. Bilateral Project Titles: "Integrated Cereals Project"
3. Bilateral Project Number: 367-0114
4. Program Implementation:

   a. First project agreement: FY 75
   b. Final obligation: FY 82
   c. Final input delivery: FY 84

5. Program Funding:

a.	A.I.D. bilateral dollar funding: (grant, FY 73-80)	$7,970,000
b.	AID PL-480 local currency funding:	$2,133,000 (equivalent)
c.	Peace Corps:	$ 183,000
d.	Host country counterpart funds:	$3,479,000

6. Mode of Implementation:

   a. Project Agreement between USAID/Nepal and His Majesty's Government of Nepal Host country contract between the Department of Agriculture and the International Agricultural Development Service (IADS)

7. Responsible Mission Officials:

   a. Mission Directors:

Charles R. Grader	1975-77
Samuel H. Butterfield	1977-81
Dennis J. Brennan	1981-83

   b. Project Officers:

John R. Wilson	1975-78
Staley L. Pitts	1978-79
Douglas R. Pickett	1979
John A. Huxtable	1979-80
Douglas R. Pickett	1980
Gary E. Alex	1981-83

8. Previous Evaluations and Reviews:

   a. Project Evaluation - 1977
   b. Project Evaluation - 1978
   c. Mid-term Evaluation - 1979
   d. Project Evaluation - 1982

9. Host Country Exchange Rates:

   a. Name of currency: Nepali Rupee:
   b. Exchange rate at time of project:

US $1 = NR 10.5	1974-75	US $1 = NR 13.1	1981-82
US $1 = NR 12.45	1975-78	US $1 = NR 14.2	1983-83
US $1 = NR 11.9	1978-81		

I. EXECUTIVE SUMMARY

The evaluation team shares the view of the overwhelming majority of individuals contacted in the course of the mission in Nepal that ICP has made a significant and positive contribution to improving the effectiveness of agricultural research in the country. On balance, ICP is clearly a successful project, especially relative to the majority of agricultural research projects supported by USAID over the past thirty years throughout the developing world.[1/] In terms of the availability of improved technologies which are ready for rapid and widespread extension to farmers, Nepal is on the front edge of a major increase in agricultural productivity. The question many are asking, especially senior officials in His Majesty's Government (HMG), is why hasn't this already happened.

Problem and Overview: In spite of national efforts to develop the agricultural sector over the past two decades, Nepal's agricultural productivity has remained relatively stagnant. Agriculture accounts for approximately 60% of the GDP and employs more than 90% of the population of 14 million. Agricultural production has been increasing at approximately 1.6% per annum as compared to a population growth rate of 2.6%, one of the highest in Asia. Farm size is small with limited scope for expansion, expecially in the hills where the majority of the population lives. Nepal has been self sufficient in food production and relies upon agricultural exports as a major foreign exchange earner, but levels of exports are declining. The hills are a major food deficit area.

The factors behind the poor performance of the agricultural sector include adverse weather conditions, difficult communications (especially in the hills), declining soil fertility, and low levels of utilization of improved inputs such as fertilizer. In addition, organizational and institutional problems seriously limit the effectiveness of agricultural development efforts. External assistance to the agricultural sector has been expanding dramatically and placed increasing demands upon the limited resources of HMG, particularly skilled manpower. Shifts in policy; changes in the institutional structure; and turnovers in the top positions in the Ministry and Department of Agriculture (DOA) have been frequent. A coherent operational strategy for agricultural development is needed along with a significantly greater capacity to direct and manage the implementation of the chosen strategy.

U.S. Assistance: U.S. support to agriculture in Nepal has a thirty-year history. ICP's immediate predecessor was the Food Grain Technology project which contributed to the strenghtening of adaptive research and extension activities with emphasis on commodity improvement programs for wheat, rice and maize. The project focused on the Terai (plains) where the prospects for extension of technologies developed elsewhere appeared most promising.

1/ AID Experience in Agricultural Research: A Review of Project Evaluations by Paul R. Crawford and A.H. Barclay, Jr.; Development Alternatives, Incorporated, Wash. D.C. 1982.

ICP was launched in 1976 under the terms of a contract with the International Agricultural Development Service (IADS) "to assist in strengthening the Government of Nepal's (GON) capacity (1) to generate improved production technology for the major food grain crops and related cropping systems; and (2) to transfer that technology to Nepali farmers in such a way that is readily adopted." ICP continued support for the major commodity programs and initiated a cropping systems program (CSP). The geographic focus shifted from the Terai to the hills in accordance with HMG policy. The major components of the project include training, technical assistance, construction and equipment for the three major commodity programs and CSP. In 1981 the project was extended for three years.

Purpose of the Present Evaluation: A mid term of evaluation of ICP was carried out in 1979 and internal evaluations have been completed since. The present effort is the first comprehensive external evaluation of the project. In addition to assessing the project and suggesting measures to improve its effectiveness, the evaluation team looked beyond PACD in 1984 to examine ways of more fully realizing ICP's potential benefits.

Project Accomplishments: Since the 1976, ICP has completed most of the construction satisfactorily and significantly enhanced the research capacities of the three major commodity stations through the provision of training and equipment. The most serious problems involve examples of inappropriate equipment and lack of trained staff to operate and maintain the equipment. None of the three seed processing units at the major commodity stations is currently in operation. Foundation seed production at these stations is diverting resources from the research programs.

ICP has introduced and sustained CSP which is now generally appreciated as an effective mechanism for 1) better understanding farmer conditions, particularly cropping patterns; and 2) testing improvements on farms with farmer participation. CSP has focused its efforts primarily in the hills and has identified and tested a number of promising technologies. Most of the first generation of recommended practices involve higher fertilizer utilization and varietal changes within existing cropping patterns which commonly result in a doubling of net income per hectare as well as significantly increasing grain production per family. In a growing number of instances, an additional crop (notably wheat) is replacing a fallow period in cropping patterns as a consequence of the use of shorter duration varieties. A Pilot Production Program (PPP) was initiated in 1981 and is successfully extending these improved practices to farmers in several locations using a "block" approach. Other projects are now making use of CSP methodology and findings.

Effectiveness: The probability exists that the principal purposes of the project, namely the generation of improved technology, especially for the hills and the transfer to farmers, will be largely but not fully realized by the conclusion of ICP in mid 1984. ICP has strengthened two links, the three major commodity programs and CSP, in a longer chain that contains many weak links. Major advances in productivity require improvements in extension services, input delivery, credit, marketing and transport, especially in the hills. Projects supported by AID and other donors are strenghtening these links and assisting Nepal to more fully realize the potential benefits of ICP.

All components of the research system including the discipline programs and CSP require further strenghtening if Nepal is to have additional ability to generate technology and deal with the range of second generation issues (e.g. pest management, intensification and forage crops) beyond its established capacity to screen and select technologies from the outside. ICP has strengthened linkages with external agricultural research institutions, notably in India and the international centers. More attention might be given to grain legumes, minor cereals, forage crops and peanuts.

ICP designers may have overestimated the strengths of the other links in the agricultural development chain, but also underestimated the difficulties of institutionalizing as revolutionary a program as CSP. CSP is unlikely to survive in its present form beyond the conclusion of ICP in 1984 without additional inputs. More generally, the utility of ICP has been hindered by the lack of an effective management system in DOA capable of setting priorities and overseeing programs for research and extension.

Major Issues for Priority Attention:

1. Input delivery systems, credit facilities and extension services must be further improved if Nepal is to realize the full benefits of ICP's accomplishments in technology development and transfer.
2. HMG should decide upon and implement a plan to strengthen agricultural research management.
3. The commodity programs and discipline divisions should be strengthened to improve the ability of the research system to generate new technologies and deal with second generation issues.
4. On the assumption that HMG wishes CSP to grow, priority attention must be given to making significant progress toward institutionalizing CSP between now and the conclusion of ICP in mid 1984. This might include:
   i) a policy statement on CSR by the Ministry;
   ii) creation of a Farming Systems Advisory Committee under the chairmanship of the Joint Secretary, Ministry of Agriculture;
   iii) elevation of CSP to a status within DOA comparable to the major commodity programs;
   iv) further utilization of CSP/PPP results and approaches by outreach programs and regional projects;
   v) more qualified staff for CSP;
   vi) improvement of the status of socio-economist in DOA;
   vii) transfering responsibility for the operation of PPP production blocks to project/district level authorities in specific locations as soon as this appears feasible; and
   viii) priority attention by IADS/ICP researchers to training (broadly defined) during the remainder of the project.
5. Future support from USAID and other donors to the research system generally and CSR in particular should be contingent upon positive HMG responses to items 2 and 4 above as well as progress toward implementing an improved research management system and institutionalizing CSP.

II. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSION A: ICP has successfully strengthened the three major commodity program (rice, wheat and maize) and initiated cropping systems research (CSR) activities in the Cropping Systems Program (CSP) of the Agronomy Division. As a consequence of component technology development by the commodity improvement programs and the design and testing of crop improvement strategies in specific locations by CSP, sets of improved practices have been identified which are both acceptable to farmers and can significantly increased agricultural productivity throughout portions of Nepal. Further, through the ICP supported Pilot Production Program (PPP) an extension approach focusing on production blocks which can effectively mobilize extension and input delivery services as well as assist in overcoming the reluctance of individual farmers to risk adopting new technologies, has been successfully launched in several locations in the hills and the Terai. A major increase in agricultural productivity in Nepal appears imminent if and only if there are significant improvements in input delivery systems for seed and fertilizer, credit facilities and extension services.

Recommendation 1: HMG efforts to improve input delivery systems, credit facilities, and extension services should be selectively pursued and supported in order to fully realize the potential benefits of ICP in raising agricultural productivity in Nepal. Development projects should in turn make greater use of the technologies and methodologies (including CSR and PPP) developed and tested by the commodity programs and CSP.

CONCLUSION B: The contribution of ICP to improving agricultural research capacity and research extension linkages has been greatly hindered by the absence of an effective system of research management at the Ministry and DOA levels as well as by frequent changes in leadership and policy. The three major commodity programs and CSP are parts of a larger agricultural research and extension chain that contains many weak links. Weaknesses in overall management have allowed ICP support in some instances to reinforce natural centrifugal forces in the research/extension system rather than contributing fully to the needed and potentially very productive collaboration. Several reports have been prepared over the past 10 years suggesting a variety of ways in which research management might be strengthened in Nepal.

Recommendation 2: HMG should decide upon and implement a plan to strengthen agricultural research management. The evaluation team endorses the suggestions of Dr. Freeman on research management contained in Appendix F and the specific recommendations in section III.I and Appendix X of the Joint Review Team Report on the Proposed Nepal Council for Agricultural Research (March, 1978).

Recommendation 3: Future donor support for agricultural research in Nepal should directly address and/or be contigent upon a significant improvement in research management capacity. Future support may take the form of a multidonor effort to implement a comprehensive HMG plan for strengthening the entire agricultural research system and research extension linkages in Nepal.

CONCLUSION C: In the medium term most of the benefits from ICP assisted efforts in the commodity improvement programs and CSP are likely to be centered in the Terai. CSP has successfully identified and tested improvements, particularly for maize and wheat, which are suitable for the hills, but much of the readily available component technology is applicable to better endowed areas in terms of soil conditions, water availability and input delivery systems as characterize the Terai more than the hills. All three of the major commodity stations supported by ICP are located in the Terai and thus are not ideally situated to develop and screen technologies for the hills.

Recommendation 4: A station in the hills (other than Khumaltar) should be upgraded to develop and screen technologies for all commodities for the hills.[1/] CSR/FSR methodology should be used at this station.

CONCLUSION D: ICP has been instrumental in strengthening the capacity of the research system in Nepal to screen and select improved technologies developed elsewhere for rice, maize and wheat. Nepal's capacity to generate new technologies suitable for the medium and low productive areas as well as to deal with the range of second generation problems is still very limited and requires further strengthening if Nepal is to have the ability to fully realize the potential benefits from ICP. In addition, the other commodity programs and discipline divisions require additional resources. CSP results have highlighted the need for and potential benefits from further component research on minor cereals, grain legumes, peanuts and forage crops.

Recommendation 5: The commodity programs and divisions should be strengthened to improve their ability to generate new technologies. Specific attention should be given to CSR/FSR, minor cereals, grain legumes, peanuts and forage crops.

CONCLUSION E: The overwhelming majority of individuals contacted by the evaluation team are supportive of CSR and think it should be extended to encompass a full farming systems research (FSR) capacity. CSP is currently designing, testing and extending on a pilot basis improved technologies for several parts of the country. CSP is also assisting various projects in creating their own CSR/FSR capacity to design and test technologies for specific areas. ICP has made the case for CSR in Nepal, but CSP in unlikely to survive even at its current somewhat modest level of effort relative to need, beyond the end of ICP. CSP continues to be largely sustained by ICP in terms of equipment and staff (Nepali and expatriate) and is unlikely to be sufficiently institutionalized by PACD unless major efforts are made in this direction almost immediately. CSP has been in existence long enough for HMG to reach a decision on the matter.

Recommendation 6: On the assumption the HMG wishes CSP to continue and grow after the conclusion of ICP, priority attention should be given to making progress toward institutionalizing CSR over the remaining 19 months of ICP. Specific measures might include the following:

[1/] Existing physical facilities such as those found at the Pakhribas Agricultural Center may be adequate for this purpose.

i) A policy statement by the Ministry of Agriculture should formally endorse CSR/FSR as a useful approach and define its relationship to other components of the research and extension systems.

ii) A Farming Systems Advisory Committee should be created under the chairmanship of the Joint Secretary, Ministry of Agriculture.

iii) CSP should be elevated to a status within DOA comparable to the major commodity improvement programs and headed by a class one officer. A full complement of core staff positions for agronomists and socio-economists should be created and filled. In addition, CSP should have a number of program associate positions by which researchers from commodity programs and discipline divisions can work with CSP on a full or part time basis.

iv) Further utilization of CSP results and methodology by outreach programs at regional stations and by adapative research activities in projects and ADOs should be strongly encouraged. CSP should provide advisory and training assistance to these programs. Additional resources and staff are required to make this feasible.

v) CSP should mount a one year internship program for approximately 15 interns (less time required in the case of socio-economic interns) and a series of shorter training programs to provide a pool of expertise in CSR to staff regional outreach programs and project/district SMS positions.

vi) ICP should focus it's remaining resources including training support and staff on strengthening CSP. The process of locating additional support to sustain the program after conclusion of ICP from HMG and possibly external sources should begin immediately.

Recommendation 7: Future USAID and other donor support for CSP in Nepal should be conditional upon a clear HMG decision to institutionalize CSR/FSR and substantive progress in the implementation of that decision.

CONCLUSION F: There are insufficient numbers of socio-economists in DOA and the few that are at post are not generally doing work that utilizes their training. The three major commodity programs and CSP all want and need socio-economists as members of multidisciplinary teams, but there are currently no regular HMG socio-economists at post in any of these programs. Socio-economists are generally not interested in working for DOA because of unattractive career and training prospects. Better collaboration with the Department of Food and Agricultural Marketing is needed, particularly in the area of farm management investigations, but DOA needs a core of socio-economists for research, planning and evaluation who are part of the Department.

Recommendation 8: The position and status of socio-economists within the agricultural research establishment and DOA generally should be improved and existing socio-economists should be more effectively utilized. Each of the major commodity programs should be provided with at least one socio-economist. As matter of urgency, at least one HMG socio-economist should be assigned/deputized to CSP since the expatriate socio-economist may be leaving Nepal in the near future. Suitable candidates exist within DOA. A pool of socio-economist in DOA might be created to serve research, extension and planning/evaluation programs.

CONCLUSION G: PPP is a valuable pilot extension approach which is utilizing a "block method" to extend improved practices tested by CSP to groups of farmers in contiguous areas. Like CSP, PPP is not likely to survive beyond the conclusion of ICP unless additional efforts are made now to incorporate the production block approach as a regular feature of extension activities in selected projects. The block approach complements rather than substitutes for other extension approaches, notably the T and V system.

Recommendation 9: PPP should transfer responsibility for operating production blocks to authorities at the project and district levels as soon as this appears feasible.

CONCLUSION H: The evaluation team endorses the findings of the APROSC review of the minikit program. The program has a number of weaknesses which should be corrected, but minikits have a continuing role to play in the promotion of improved varieties and fertilizer use.

Recommendation 10: HMG should continue the minikit program after the conclusion of ICP support. The program should focus on areas where improved varities of a specific commodity are not already grown. The commodity improvement programs should collaborate with CSR activities at the national, regional and district levels in designing and evaluating minikits for specific areas.

CONCLUSION I: The seed component of ICP has been a continuing source of difficulties. The three seed processing units at the major commodity stations are still not in operation and efforts by the stations to produce foundation seed is diverting resources from the research programs.

Recommendation 11: The commodity programs should not produce foundation seed, but should concentrate on increasing supplies of promising varieties which may be released in the near future. They should produce some breeders seed and help "monitor" the production of the remaining breeder and foundation seed. Other agencies, possibly the seed division of AIC, should handle foundation seed production.

Recommendation 12: Further expensive attempts to make the seed processing units operational should be suspended pending a decision on location and institutional responsibility for foundation seed production.

CONCLUSION J: Most of the construction activities under ICP have been satisfactorily completed. Equipment ordered under the project is generally satisfactory, although many instances were noted where equipment has proved unutilizable and/or qualified operators are not present. Repair and maintenance are serious and continuing problems.

Recommendation 13: Equipment operators should be properly trained and a mechanics post should be established and filled at each of the major commodity stations.

CONCLUSION K: Overall the training component of the project is being effectively implemented. There have been delays in the identification of candidates for oversees training and no candidates in social sciences have been sent for degree training. Most returning trainees are working in DOA, but frequently not in the jobs where they can effectively utilize their training. CSP has not benefited from the training activities as much as would be desirable, particularly since limited counterpart staff has been provided by HMG to work with the ICP technical assistance team.

Recommendation 14: Training, broadly defined, should be the priority focus of ICP during the remaining periods of the project with an emphasis on CSP. HMG should provide additional counterparts, particularly in socio-economics, to work with the ICP technical assistance team. Internships and short training courses in CSR methodology should be made available for SMS candidates and others at the regional and district levels with support provided by other projects.

III. PROJECT SETTING

Proper assessment of the contributions and performance of ICP requires an understanding not only of the overall agricultural development setting of Nepal, but also of the changing institutional and policy context which has accompanied and profoundly influenced the evolution of the project. In addition to changes in policies and institutions in Nepal, thinking about national agricultural research systems within the international agricultural development community and donor agencies has also continued to evolve since 1976 when ICP was designed. An adequate discussion of the project setting is beyond the scope of this report, and more important virtually impossible for an evaluation team to fully comprehend in the space of four weeks. Our only advantage over those that designed and implemented ICP is hindsight.

This section present a brief overview of agricultural development in Nepal and observations on the institutional and policy settings of the project. The task of the evaluation team has been greatly aided by the paper prepared by Dr. Wayne Freeman on "Improving the Effectiveness of Agricultural Research in Nepal" (see Annex F).

Nepal was under the oligarchic Rana Regime for 104 years. The revolution which overthrew that regime in 1951 unleashed many complex and multifaceted forces in the previously isolated, sternly regimented society. Complexity and diversity now characterize Nepal's population of approximately 15 million, as well as its topography.

Agriculture dominates the economy providing income and employment to over 90% of the population and accounting for two-thirds of the GDP. Approximately 80% of the export earnings were attributed to agricultural commodities in past years although tourism is assuming an increasingly important position.

Farming systems in Nepal are a mixture of several enterprise including grains, livestock, fruits and vegetables. Paddy, maize and wheat are the main crops for the Terai while maize, paddy and fingermillets are the most important crops for the hills.

Farming in Nepal is still largely traditional and subsistence oriented. There is an average use of seven kilograms of chemical fertilizers per hectare of cultivated land and only 15% of cultivated land is under irrigation. Agricultural production has been increasing at 1.1 percent per annum compared with a population growth rate of 2.6 percent. Since 1970, except for wheat, production of major food grains, fruits, vegetables, and potatoes has been relatively stagnant. Production grew largely due to an expansion of cultivated land. Yields have fluctuated widely from year to year, but have declined slightly on average over the past years.

The situation in the hills is worse than the Terai. The size of land holding is very small (less than 0.5 ha. per farm household) compared to about 1.5 ha. for the Terai. Despite the inherent disadvantageous characteristics of the hills (poor land resources; steep gradients; limited possibilities for substantially increasing the area under irrigation; poor communications; and costly transportation facilities), the lower hilly areas at least have some potential for increasing food grain production. This requires technologies suitable to irrigated and rainfed upland conditions of the hills.

In the past, establishment of infrastructures and the application of improved technologies in the better and more accessible areas of the Terai largely ignored the hills and mountains where the majority of Nepal's population live. The concentration of resources and malaria eradication has led to migration from the hills to the Terai and contributed to deforestation.

Attempts have been made to improve agricultural productivity for the last three decades. During the 1960s improved varieties of rice, wheat, and maize were introduced in Nepal from India. The few agronomy, horticulture, livestock and fish farms were not well staffed and equipped to conduct research and generate new technology. There were fe improved practices to extend to farmers. In a few instances in the Terai, armers (due to their linkages with Indian research and extension services) were ahead of local extension and extension was ahead of research.

The situation changed during 1970s when Mexican wheat and maize varieties started flowing to Nepalese agricultural research stations. Wheat production has increased dramatically in the past 20 years and is now commonly grown as a winter crop in many parts of the country.

During 1972/1973, 12 agro-climatic zones were delineated and commodity development priorities were set as follows: i) livestock farming in the upper hills (2,000m); ii) horticultural enterprises in the mid-hills (600m to 2,000m); and iii) food and cash crops in the Terai.

The resulting impact on productivity was not encouraging as yields remained static. The designated role of government farms changed from a research to a production orientation. Farms and research stations were assigned command areas usually comprising two or more districts in which they were expected to offer services to farmers.

During the past 10 years, external assistance to the agricultural sector has been expanding dramatically and placed increasing demands upon the limited resources of HMG, particularly skilled manpower. Shifts in policy, and changes in the institutional structure have been frequent. Finally, there have been four Secretaries and four Director Generals in the Ministry and Department of Agriculture in the past five years. Such high degree of turnover in any organization greatly impedes effectiveness.

Moreover, as discussed in Appendix F, lack of inter-disciplinary regard, lack of appreciation of each other's usefulness, and inadequate incentives (delayed promotion, low salary) for the research and extension personnel collectively magnify the environmental and socio-economic problems mentioned above. Thus, ICP was launched and implemented in a complex agriculture development setting plagued with exogenous as well as endogenous problems.

IV. PROJECT ASSESSMENT

The following sections discuss the accomplishments, status and prospects of ICP as compared with the original targets of the project. Since the accomplishments of ICP are reasonably well documented both in the project paper ammendment of 1981 and in the recent ICP Work Plan October 1982 September 1984, the major focus of the discussions is on the evaluation team's assessment of the current status, prospects and recommendations. Additional comments are included in Appendixes D and E.

With less than 20 months remaining in the project, the scope for implementing recommendations within the project is limited. At the request of AID/Nepal, the evaluation team look outside and beyond ICP and has commented more generally on approaches which might assist in realizing the major purposes of the project, namely to strengthen HMG capacity "to (a) generate improved production technology and inputs for the major food grain crops and related cropping systems and (b) to transfer that technology to farmers in such a way that it is readily accepted." (Project Paper, p 26).

IV.A. General

ICP has successfully strengthened the three major commodity programs (rice, wheat and maize) and initiated cropping systems research (CSR) activities in the Cropping Systems Program (CSP) of the Agronomy Division. As a consequence of component technology development by the commodity improvement programs and the design and testing of crop improvement strategies in specific locations by CSP, sets of improved practices have been identified which are both acceptable to farmers and can significantly increase agricultural productivity throughout major portions of Nepal. Further, the ICP supported Pilot Production Program (PPP) has effectively mobilized extension and input delivery services as well as assisted in overcoming the reluctance of individual farmers to risk adopting new technologies, in several locations in the hills and the Terai. A major increase in agricultural productivity in Nepal appears imminent if and only if there are significant improvements in input delivery systems for seed, fertilizer, credit facilities and extension services.

The contribution of ICP to improving agricultural research capacity and research extension linkages has been greatly hindered by the absence of an effective system of research management at the Ministry and DOA levels as well as by frequent changes in leadership and policy. The three major commodity programs and CSP are parts of a longer agricultural research and extension chain that contains a number of weak links. Several reports have been prepared over the past 10 years suggesting a variety of ways in which research management might be strengthened in Nepal including the Joint Review Team Report on the Proposed Nepal Council for Agricultural Research. In addition, a multidonor mission on agricultural research in Nepal scheduled for 1983 will address this issue.

Improved research management is needed to determine research priorities as well as oversee research design, execution and analysis. The summer and winter crop workshops are helpful in acquainting researchers with research progress and plans, but are less effective in organizing and planning

research programs. Better coordination and planning can dramatically increase the quality and relevance of research programs.

In retrospect, a research management component of ICP may have contributed to a better realization of the purposes of the project and assisted DOA in managing the overall system. Due to time and financial constraints, it is difficult to accomodate this service in ICP at this late date, but the ICP team leader might assist DOA in further defining research management needs and possible sources of future support. Toward this end, the ICP office and team leader should be relieved of responsibility for providing supporting services to any projects other than ICP.

In the medium term most of the benefits from ICP assisted efforts in the commodity improvement programs and CSP are likely to be centered in the Terai. CSP has successfully identified and tested improvements, particularly for maize and wheat, which are suitable for the hills, but much of the readily available component technology is applicable to better endowed areas in terms of soil conditions, water availability and input delivery systems as characterize the Terai more than the hills. All three of the major commodity stations supported by ICP are located in the Terai and thus are not ideally situated to develop and screen technologies for the hills. A station in the hills is needed to perform this function for all commodities. Farming systems research will provide an integrative theme for such a station(s).

Additional staff and equipment will probably be required, but large research stations with sophisticated equipment are not needed. The physical facilities at Lumle and Pakhribas appear adequate to perform this function and consideration might be given to utilizing one or both or these sites.

Recommendations:

1. HMG efforts to improve input delivery systems, credit facilities, and extension services should be selectively pursued and supported in order to fully realize the potential benefits from ICP in raising agricultural productivity in Nepal. Various donor assisted projects should in turn make use of the technologies and methodologies developed and tested by the commodity programs and CSP in designing crop improvement strategies for specific locations.

2. HMG should decide upon and implement a plan to strengthen agricultural research management. The evaluation team endorses the suggestions of Dr. Freeman on research management contained in Appendix F and the specific recommendation in section III.I and Appendix X of the Joint Review Team Report on the Proposed Nepal Council for Agricultural Research (March, 1978)[1/]

[1/] It is understood that a multidonor mission on agricultural research in Nepal will address the research management issue. In preparation for that mission, HMG has assembled a task force on agricultural research. The International Service for National Agricultural Research (ISNAR) which is the international center most specifically concerned with management of national research systems is a further possible source of assistance/advice, as required.

3. Further donor support for agricultural research in Nepal should directly address and/or be contingent upon a significant improvement in research management capacity. Future support might take the form of a multidonor effort to implement a comprehensive HMG plan for strengthening the entire agricultural research system and research extension linkages in Nepal.

4. A station in the hills (other than Khumaltar) should be upgraded to develop and screen technologies for all commodities for the hills. Farming systems research methodology should be used at this station.

IV.B. Major Commodity Improvement Program[1/]

ICP has made significant contributions to the commodity improvement programs for rice, wheat and maize. The training, technical assistance, construction and equipment components of ICP have helped these programs identify improved technologies which will enable Nepal to increase cereal production dramatically. Wheat production has already increased significantly in the past 20 years and now covers over 300,000 hectares.

The present emphasis on disseminating available technologies is necessary and desirable. However, the phasing-down of ICP support to commodity research may have been premature. The commodity and discipline research programs must be further strengthened if they are to generate new technologies. ICP support has been instrumental in developing linkages with external research organizations including IRRI and CIMMYT which have provided technologies for high production areas. Presently, there are few improved technologies available for medium and low production areas. Nepal does not yet have sufficient research capacity to develop technologies for these areas. Solving second generation problems which are beginning to emerge with the new technologies (i.e. disease and insect problems, soil fertility) also requires additional research resources.

The research being conducted by the commodity stations needs to be integrated with the basic research done by the divisions at Khumaltar. The divisions at Khumaltar should provide the technical leadership for the disciplines within the multidisciplinary commodity teams. Nepal cannot afford to develop all the disciplinary expertise which is needed for the multidisciplinary teams at each of the commodity and zonal stations. For example, in plant pathology, the division at Khumaltar should monitor the disease situation within each crop and determine its importance. Plant Pathology should help determine research priorities; monitor the different pest races; devise control measures; and develop screening techniques for the breeding programs. At the commodity stations, a good research technician can do the screening necessary for the breeding programs if he/she has the proper training and supervision.

CSP has highlighted the need to develop research in several crops, especially the grain legumes and peanuts. Legumes appear to fit well in the

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[1/] Additional comments on individual commodity programs are contained in Appendix D.

intensified cropping patterns being tested by CSP and contribute to improved soil management and human/animal nutrition. The identification of improved cultivars through extensive screening of materials from the International Centers and other national programs can result in high yielding/quality legume cultivars for the farmers in Nepal within a few years.

Each of the major commodity station has recently initiated an outreach program to serve farmers and support extension service in their respective "command areas". The outreach programs have zonal responsibilities for all commodities produced in their respective command areas. The outreach programs are a welcome development which should enhance the effectiveness of the commodity improvement programs and the agricultural research system generally. Some outreach programs are collaborating with CSP in utilizing CSR methodology and results.

One specific area in which outreach programs might assist the commodity programs is improving the supervision and feedback of the minikit and FFT activities. Presently, FFT data is often unreliable and trials are frequently too complicated to provide useful farmer feedback. The outreach programs together with CSP and ADOs might be consulted on FFT design in specific areas as well as collaborate in the supervision and evaluation of results. Ideally, FFTs should be an integral part of CSR activities.

Recommendations:

1. The commodity programs and divisions need to be strengthened to improve their ability to generate new technologies. Upgrading the present staff as well as better research planning and implementation are needed.

2. The discipline divisions at Khumaltar and the commodity improvement programs should collaborate more with one another and with CSP in planning and implementing research programs.

3. The grain legume program and research on minor cereals need support to select new cultivars as well as develop improved cultural practices. Such support should include more qualified staff, equipment and facilities.

4. The commodity programs should re-examine the design/utility of the FFTs, and collaborate with the outreach programs/CSP/ADOs in their design, supervision and evaluation.

IV.C. Cropping Systems Program (CSP):[1]

CSP activities largely initiated and supported by ICP have established six permanent research sites, including four in the hills, where on-farm trials have been carried out for several years. Considering the limited resources available for the effort, the quality of the investigations and the subsequent trials have been quite good, in large part as a consequence of the quality and continuity of ICP staff. Most important, CSP has identified a number of improved technologies emerging from the commodity improvement programs which are attractive to farmers and should spread rapidly.

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[1]/Additional comments on CSP are contained in Appendix E.

Most of the first generation of recommended practices involve higher fertilizer utilization and varietal changes within existing cropping patterns. Quite often, farmers are realizing a 100% increase in net incomes or more per hectare as well as significantly increasing their grain production. Increasingly, an additional crop is replacing a fallow period in cropping patterns. Production of wheat during the winter season was barely known 20 years ago, but is now common throughout the country. The use of short duration varieties of rice and maize is reducing the time farmers need to produce these crops by a month or more in each case and significantly increasing the scope for profitable double or triple cropping in many instances. Technologies have been identified and tested at several locations which can increase grain production three fold or more on existing land. In addition, more attention is being given to fodder crops, green manures, and minor crops such as grain legumes which have considerable potential for improving soil fertility, incomes and human/animal nutrition.1/

While some individuals contacted about CSP methods and accomplishments were mildly negative, the overwhelming majority understand and are supportive. Active collaboration between the CSP and a number of projects and programs has been initiated including the outreach programs at Bhairawa, Parwanipur, Tarahara and Nawalpur stations, AERP, KHARDEP, RAD, and RCUP. These projects and programs are covering at least part of the expenses involved in training and research activities.

CSP is a member of long standing of the Asian Cropping Systems Network and has made extensive use of the methodology developed by the Cropping Systems Program at IRRI. Current and former IRRI researchers, notably Dr. Richard Harwood, have been valuable sources of advisory assistance to CSP on an intermitant basis since its inception.

In spite of the above accomplishments CSR has not yet been sufficiently institutionalized at the national, zonal and district levels. Most CSP staff are currently employed by ICP and are not in regular HMG positions. The need will certainly grow in the entire process of identifying, designing, testing and disseminating the second, third and subsequent generations of innovations. More staff with CSR experience at various levels of the system is needed. In addition, CSP must handle an increasingly complicated set of research tasks while adequately providing the backstopping for a growing network of CSR activities throughout the country. ICP has made the case for CSR in Nepal; but is unlikely to provide from its own resources and from what can realistically be expected to be forthcoming from other sources, notably HMG, to make the program self sustaining by the conclusion of the project in 1984. Nor is that short a time frame realistic even with significantly greater levels of input.

1/For further details on comparative cost and return information for various sets practices and locations, see "Cropping Pattern Testing in Nepal" by M.L. Malla, K.D. Sayre and Cropping Systems Staff, report presented at International Rice Research Conference, IRRI April 19-23, 1982 and various CSP papers prepared for 1983 Summer Crops Workshop, Rampur, January, 1983.

In retrospect, HMG and ICP could have made more progress in institutionalizing CSP than has occured to date. The initial decision to place CSP within the Agronomy Division may have been logical at the time, but an alternative arrangement which will give CSP the necessary status in the research system seems overdue. CSP should have a status comparable to that of the major commodity programs in order to i) avoid a suggestion of disciplinary bias; ii) improve its ability to attract and retain staff from a variety of disciplines; and iii) facilitate collaboration across departmental, discipline and program lines.

The slow progress toward creating and filling adequate numbers of positions for cropping systems researchers of various disciplines has clearly adversely affected CSP's ability to more fully realize the objectives of the project. Staff shortages have led to breakdowns in multidisciplinary collaboration which is vital for effective CSR. Unfortunately, many times socio-economists carry out the site surveys and administer the farmer trial evaluation questionnaires without the participation of an agronomist. Agronomists often act alone in designing trials and selecting trial locations without adequate consideration of the representativeness of participating farmers and their farms.

The unsettled status of socio-economists within the agricultural research establishment and DOA generally is especially critical. There are insufficient numbers of socio-economists in DOA and the few that are at post are generally not doing work that utilizes their training. ICP has been instrumental in creating a general appreciation of the utility of socio-economists in agricultural research programs, but the needed posts have not been created or filled in most instances. Socio-economists are generally not interested in working for DOA because of unattractive career and training prospects. Better collaboration between DOA and the Department of Food and Agricultural Marketing, especially in the areas of agricultural statistics and farm management surveys is highly desireable, but DOA requires its own core staff of socio-economists for research, planning and evaluation. At the project and district levels, collaboration between monitoring and evaluation units might result in economies as well as improvements in the quality of both sets of functions (see Appendix E for further discussion.)

By hindsight, SCP may have been more cautious than it needed to be in testing innovations at the initial set of cropping systems sites prior to initiating production activities in collaboration with district and zonal authorities. As a consequence, the complex set of relationships, formal and informal, involving the distribution of responsibilities (tasks and financial support) which cut across many administrative lines are just now in the process of being worked out. Communication problems are inevitable and are occurring. CSP Khumaltar has moved rapidly, perhaps too rapidly in relationship to staff resources, in the past two years to initiate activities in a number of areas in collaboration with others. In large part, this rapid expansion is a direct consequence of CSP's attempt to respond to HMG priorities and the terms of the ICP agreement. In some instances, such as in the Bhairawa area and Gorkha district, trials were initiated without the proper site surveys; in Rapti Zone a good beginning was followed by a falling off of efforts to collect information on trial results and farmer reactions. Too frequently, the personnel in these areas have inadequate experience with CSR methodology. District authorities sometimes feel that certain activities

are the responsibility of ICP or are being performed for CSP/ICP without their value and importance being appreciated at the local level.

The elements of CSR which are suffering most as a result of the current situation are multidisciplinary teamwork and involvement of the farmer. There is a real danger that short cuts in the methodology will dilute these critical features and CSR may revert to disciplinary isolation and a more traditional top down orientation aimed at "selling" improved practices to farmers rather than involving farmers in the design, testing and evaluation of new technologies which are ultimately intended for their use. Specific suggestions in this regard are contained in Appendix E.

The mid-term evaluation report on ICP in 1979 includes the recommendation that CSP should progressively incorporate a full farming systems research capacity[1/]. This view is endorsed by several HMG officials contacted and by the current evaluation mission with some important qualifications.

A FSR capacity in the context of Nepal might imply the ability to diagnose the total spectrum of farm enterprises including animal and water resource components, as well as design and test possible improvement measures. In terms of the site surveys and trial designs, CSP methodology already has a FSR perspective in the sense that all activities, farm and non-farm, and their relationships to each other are examined and taken into consideration in designing improvement strategies focusing on crop improvement and cropping p tterns. Further, CSP trials have included improved practices and patterns for crops other than the three major cereals such as fodder crops and green manures.

The feasibility of broadening the scope of the trials significantly in the near future to incorporate a whole farm approach must be seriously questioned in view of the institutional status and the very heavy work program of CSP. In addition, on farm trials with animals involves special problems and requires additional supervision.

As significant progress is made toward institutionalizing CSP and the staffing situation improves, the scope of investigations might be progressively broadened to eventually incorporate a full FSR perspective, but this is unlikely to be completely realized prior to the conclusion of ICP in 1984. In the near term, CSP should give priority to consolidating and strengthening activities already initiated in collaboration with various regional projects and districts.

Consideration is being given to "graduating" one or more of the six permanent CSR sites where adequate data on existing cropping patterns and trial results have already been collected. "Graduating" a site would not mean the termination of trial activities, but rather the reduction of CSP site staff as part of a process of handing over on-site supervision to district/project/outreach authorities. Further, farmers themselves should be encouraged to play larger roles in the design and implementation of trials (See Appendix E). Resident CSP staff would be phased down, but the site would

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1/"The Integrated Cereals Project-Nepal: Report of Mid-Term Evaluation," Oct-Nov, 1979, USAID/Nepal.

continue to be part of the CSR network with backstopping from CSP. This would release CSP staff and other resources for service elsewhere.

CSP has been in existence in Nepal for approximately seven years--long enough for HMG to make an assessment and reach a decision of whether CSR is a valuable feature of agricultural development efforts in the country. Although the full benefits of CSR are yet to be realized in terms of the widespread adoption of improved technologies for selected commodities by farmers, the evaluation team is strongly of the view that the approach is a vital element of the technology development and transfer process in Nepal and should be strengthened.

In considering specific suggestions for institutionalizing CSP it must be emphasized that CSR complements rather than substitutes for other research and extension activities. Without strong discipline and commodity research programs, CSP will not have the component technologies to design improved cropping patterns and practices for specific areas. Without strong extension services and input delivery systems, technologies acceptable to farmers are unlikely to be disseminated much beyond the immediate areas in which CSP (including PPP) is currently operating. Other research and extension activities must also be strengthened if Nepal is to mount effective agricultural development efforts in the future.

Recommendations:

1. On the assumption that HMG wishes CSP to continue and grow after the conclusion of ICP, priority attention should be given now to steps designed to institutionalize CSR at the national, regional and local levels. The Ministry of Agriculture might issue a policy statement formally endorsing CSR/FSR as a valuable approach and defining its relationship with other components of the research and extension system.

2. CSP should be elevated to a status comparable to the major commodity improvement programs and headed by a class one officer. A full complement of core staff positions for agronomists and socio-economists should be created and filled. In addition, CSP should have a number of program associate positions by which researchers from commodity programs and discipline divisions can work with CSP on a full or part time basis.

3. A Cropping Systems or Farming Systems Advisory Group should be created under the chairmanship of the Joint Secretary, MOA, whose function would be to i) review CSR/FSR programs and advise HMG on general directions; and ii) facilitate better communication and collaboration among departments, divisions, projects, commodity programs and regional/ district extension activities. Advisory Group membership might include representatives of DOA headquarters, Department of Food and Agricu tural Marketing, Department of Livestock Development and Animal Health, one or more commodity improvement programs, one or more discipline divisions, projects using CSR, and one or more ADDs. The Advisory Group might meet twice a year at the time of the winter and summer crop workshops.

4. The status of socio-economists within the agricultural research establishment and DOA generally should be improved and existing

socio-economists should be more effectively utilized. Each of the major commodity programs should be provided with at least one socio-economist in the outreach programs. As a matter of urgency, an HMG socio-economist should be assigned to the recently approved class II post in CSP since the expatriate socio-economist may be leaving Nepal in the near future. Additional class III level socio-economists are also needed.

5. Further utilization of CSP results and methodology by outreach programs at regional stations and by adaptive research activities in projects and ADOs should be strongly encouraged. CSP is already providing advisory and training assistance to these programs, but additional resources and staff are required. Projects/ADO's should be provided with SMS positions to handle adaptive research activities which would utilize CSR methodology or some variant thereof.

6. Projects which have monitoring and evaluation components should explore the possibility of linking these activities to adaptive research at the district/project level possibly involving CSR/FSR methodology. This can provide a cost effective mean of injecting a much-needed resident socio-economic capacity at the district level.

7. Major new extension programs and projects designed to extend improved practices to farmers in specific parts of the country should utilize CSR methodology in identifying and testing the improved technologies before launching extension activities on a large scale. Ideally, there should be a CSR group in each new project.

8. Future USAID and other donor support for CSP in Nepal should be conditional upon a clear HMG decision to institutionalize CSR/FSR and substantive progress in the implementation of that decision prior to the conclusion of ICP.

9. CSP should give major priority over the next two years to consolidating and strengthening activities already initiated with various projects. Consideration should be given to graduating (handing over) one of more of the original CSP sites which have been adequately surveyed and where projects/ADOs exist which can continue with some trials work. New sites should be added only as the staffing situation permits.

10. CSP should mount a one year internship program for approximately 15 interns (less time required in the case of socio-economic interns) and continue its series of shorter training programs to provide a pool of expertise in CSR to staff regional outreach programs and project/ district SMS positions.

11. The core CSP staff should be headquartered together at Khumaltar which requires additional office facilities especially as the staffing increases as proposed. In addition, a microcomputer would greatly facilitate the analysis and updating of trial results as well as survey data.

12. CSP should progressively incorporate a full FSR capacity including animal and water resource components, but only as improvements in

institutional status and staffing make this feasible. Initially, collaboration with the Department of Livestock Development and Animal Health involving the inclusion of a livestock production/forage crop specialist as a program associate in CSP should be explored. The inclusion of water resource expertise at an early stage is also desireable.

13. Additional procedures to improve the quality of farmer participation and feedback in CSR activities should be introduced (see Appendix E.)

14. Agronomists and socio-economists should work together as multidisciplinary teams in all CSR activities. This should include the involvement of agronomists in site survey and farmer evaluation work and the stationing of socio-economists at CSR sites (or collaboration with M & E units as suggested in recommendation 6.)

15. CSP should explore collaboration with the Department of Food and Agricultural Marketing, particularly with the office responsible for the country-wide farm management survey now in progress.

IV.D. Pilot Production Program

PPP or Badhi Utpadan Karyakram was initiated in 1981 to help farmers organize for more effective use of improved technologies , and to demonstrate on a whole farm basis the impact of such practices on agricultural production to farming communities. Since the technologies employed by PPP have already been tested by the commodity programs and by CSP in the locations, the chances of success are very good. PPP is a logical extension of and complement to the other activities supported under ICP and is providing good evidence of the effectiveness of the CSR methodology.

New technology viewed as risk is more acceptable to individual farmers when others in a common group share the same risk. The block approach utilized by PPP appears effective in overcoming farmer reluctance to risk trying new technologies. If anything, group pressures operate to encourage all farmers in the proposed block to join.

The Nepalese value system discourages going into debt. In addition, farmers fear that they may lose their land to the bank if they fail to pay back their loans. Where credit is a serious constraint to the adoption of new practices, such attitudes can seriously hamper development efforts even where credit is available. The PPP block approach does not require participating farmers to use their land as collateral and group psychology once again operates to encourage reluctant farmers to join the block.

A key feature of the block approach is the identification of leading farmers in an area and enlisting them in the effort to form a block. Production Leaders (PLs) have been hired for a very modest sum to: i) to identify farmers of contiguous fields; ii) motivate them to join the campaign; iii) collect demands for inputs; iv) visit and train farmers regularly; v) and feedback information to JTs/JTAs/Production Officers. PLs are local persons and have an advantage in gaining farmers' confidence.

The use of PLs appears very effective on balance. There may be a tendency for larger and richer farmers to emerge as PLs and dominate production blocks, but there is no clear evidence that this is occurring. In addition, some individuals contacted felt that role conflicts between PLs and JTAs/AAs were probable, but once again no clear examples of such problems were encountered.

Female PLs have been hired in anticipation that they might be better agriculture teachers among farming women. In the past among several Nepali ethnic communities, females were not easily reached by male change agents, but this situation is rapidly changing. In the case of Chitwan, the Tharu and Chepang ethnic groups indigenous to the area have no sex discrimination. The rest of Chitwan's population are migrants who are relatively advanced and progressive and it appears not to matter if PLs are male or female. A woman may be a subject of criticism and "tea-shop" talk in villages if she is involved in a public relations-type job. Thus, the philosophy that female workers are more effective as extension agents among farming women needs verification, at least in Chitwan.

PPP has been successful in coordinating the required assistance from ADB, ADO and AIC in the production blocks and in insuring that inputs, credit and advisory services are available when they are needed. Since PPP has focused on certain areas and mobilized credit, inputs and extension services to serve the production blocks it has made these agencies work harder. Thus, their existing resources may need to be expanded in order not to divert services from other areas and farmers.

PPP has limited resources and may not be able to cover many additional areas effectively. There is a need to institutionalize the production blocks within the district level extension services and/or projects as this becomes feasible so that PPP can initiate activities elsewhere. CSP personnel participated in a regional meeting and convinced the ADOs of Parsa and Chitwan to run their extension program not by commodity, but by cropping pattern. However, in some areas ADOs may not yet be able to provide the same level of support to production blocks that PPP has provided. These production blocks will hopefully become self sustaining in a year or two.

Areas selected appear to be above average in terms of resource endowment and access to roads and water for the country as a whole. These tend to be areas where existing improved technologies perform best and where farmers are already somewhat knowledgeable about improved varieties and fertilizer. This appears to be the case in Chitwan and Bara districts, but less so in other areas visited.

The production blocks probably will provide dramatic examples of the problems which accompany the widespread adoption of new technologies. Serious pest and disease problems in blocks are quite possible and require alert plant protection services. Further, as individual blocks grow in size, the need to refine and differentiate the technology packages for a block will increase. On farm trials of new practices should remain a regular feature of the production blocks with farmers assuming an increasing role in trial design and execution.[1/]

[1/] Trials within blocks are discussed in more detail in Appendix E.

PPP blocks have had a much more dramatic demonstration impact than scattered plots and additional farmers are joining the blocks each season. Farmers have already distributed, sold, and/or exchanged seeds produced in production blocks. The initial success of the PPP is a reflection in a large part of effective and dynamic leadership. However, it is not clear how this program is going to continue with the same momentum when ICP ends in 1984.

The evaluation team feels that PPP is complementary to other extension approaches, notably the T and V system.1/ PPP is a pilot approach and not a substitute for extension efforts which cover entire districts or regions. The block approach can provide a valuable starting point in an area and serve as a focal point for training and demonstration activities under the T and V system.

Recommendations

1. There is a need for technology testing and refinement on a continuing basis in support of PPP. This might take the form of an ongoing trials program within each block in which farmers play an increasing in design and execution.

2. Efforts should be made to insure that ADB, AIC and ADO offices can effectively serve the rapidly expanding block programs on a regular basis without diverting services from other users.

3. Efforts should be made to institutionalize production blocks at the district level as soon as this appears feasible. PPP might organize two day seminars in regions involving ADOs and RDs to explore means of making local district offices increasingly responsible for production blocks in their areas.

4. Adequate plant protection services should be available in production block areas, including regular monitoring of pest and disease problems.

IV.E. Minikits:

The minikit program was the subject of detailed assessment by APROSC in 1982 and the evaluation team finds itself in basic agreement with the results of that study.2/ The main objectives of the minikit program are (1) disseminating new varieties quickly; (2) allowing farmers to participate in the selection of varities; and (3) transfering new technology packages directly from the research station to the farmers field. The program has been successful in distributing improved varities of rice, wheat and maize to thousands of farmers via more than 50,000 minikits.

The expected feedback of information from the farmer to the research station has not been effective. The APROSC study notes other weak aspects of

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1/The question is examined in a recent report by Dr. Wayne Freeman for AERP titled "The Training and Visit System of Extension and Research Outreach" (December 1982).

2/"Evaluation of Minikit Performance in Rice, Maize, Wheat and Soyabeans: Final Draft Report," APROSC, Kathmandu, 1982.

the project, including lack of training for extension workers, poor delivery system and undefined responsibilities of crop coordinators, RD's ADO's and JT/JTAs.

Increasing crop production involves more than introducing new varieties. A complete managment package is needed which includes improved varieties, proper management and availability of inputs. Unless the whole package is addressed as is being done by CSP, limited progress will be made towards increasing productivity in Nepal.

Recommendations:

1. When ICP terminates support for the minikit program, HMG should continue the program. The commodity programs should direct the program but with more consultation with the ADO's and CSP in designing minikits for specific areas.

2. The minikit program should be directed more to areas where improved varieties are not grown. Site surveys are needed to identify these areas. The survey data along with research data will aid in designing the appropriate minikit for each area and help identify the need for minikits in other crops. Arrangements need to be outlined for their composition and distribution.

3. The JT/JTA's who distribute the packages should instruct the farmers about the complete management package; variety, fertilizer and other cultural practices. The JT/JTA/AA's should prepare demonstration signs in as many good minikit plots as possible. The sign should give variety, fertilizer dose and other relevant information.

4. The farmer feedback of the varieties should be obtained by surveys done by the SMS at the district office. With the help of the JT/JTA, a SMS could survey at least 10 of the minkit participants in each area. The feedback forms would be provided by the commodity programs and/or CSP and completed forms returned to the commodity programs by the ADO.

IV.F. Seed Program:

Initial plans for ICP included a rather large seed component to help insure the production and delivery of quality seed to farmers. Most of this component was subsequently removed from ICP and became the SPIS project.

ICP built a seed processing plant and purchased equipment for each of the major commodity stations. These units have never operated effectively on a continuing basis and have been a continuing source of problems for ICP and the stations.[1/] The unit at Parwanipur was test activated by an ICP short term consultant in 1982. The units at Bhairawa and Rampur are not operational. However, no one at any of the stations is presently capable of operating the equipment. When they are in operation, the reliability of the seed cleaner is questionable.

1/See consultancy reports by Fred E. Nichols, August and December, 1982.

The seed component probably should not have been included in ICP. It is a minor component of ICP, but it has caused many problems. The production of seed by the commodity stations has diverted land and other resources from the research program at the three major commodity stations. Instead of producing foundation seed, the commodity stations should put more effort into increasing their seed supply of promising lines which will be released in the near future. This will provide more seed for evaluation and testing. Many stations are facing land constraints because of the land needed for seed multiplication. MOA is currently reviewing the role of the government farms which are currently producing foundation seed.

Recommendations:

1. The commodity programs should not produce foundation seed, but should concentrate on increasing supplies of promising varieties which may be released in the near future. They should produce some breeders seed and help "monitor" the production of the remaining breeder and foundation seed. Other agencies possibly the seed division of AIC, should handle foundation seed production.

2. Further expensive attempts to make the seed processing units operational should be suspended pending a decision on location and institutional responsibility for foundation seed production.

IV.G. Construction/Equipment:

Most of the construction activities supported by ICP have been completed. The three major commodity stations have been the principal beneficiaries of this support and in general, now have adequate facilities, except insufficient staff quarters. ICP constructed office/laboratory facilities, seed processing plants at all three major commodity stations. Advisors quarters were built at Rampur and Parwanipur. The Rampur station is finding it hard to utilize the large house built for the expatriate scientist. A few other structures were built at the major commodity stations. Godowns were constructed at Daman, Kakani, Jumla, Jiri, Doti and Dhankuta. The irrigation and drinking water supply at Rampur are still unfinished, but are scheduled to be completed in the near future.

ICP provided equipment needed for the research programs primarily at the three major commodity stations. A complete equipment list was not provided to the team. In ordering the equipment, the research staff made equipment lists which were given to ICP to order. Many of the research scientists requested equipment without adequate information on specifications and alternatives. As a result some equipment received including the Oyjord Planter, threshers and batch dryers, are different from what researchers thought they were ordering and/or have proved unutilizable. The problems of the seed processing equipment are discussed in the seed section.

Some of the laboratory equipment is not being used due to the lack of qualified operators. None of the commodity stations have qualified mechanics to properly maintain and repair the equipment. Spare parts are a continuing problem. Transportation constraints (shortages of operating vehicles) continue to cause problems and the stations will soon require additional vehicles beyond what has been supplied by ICP.

Each of the commodity stations have small libraries as do the divisions at Khumaltar. However, none of them have even the minimal set of books and journals necessary for research. One complete library should be maintained at one central location.

The ICP is in the process of procuring equipment which include bikes, tractors, transformers, lab equipment and seed dryers. Considering the past record of tractor operation and maintainance the appropriateness of the large tractors is doubtful. ICP probably should not have ordered the tractors until the stations had mechanics. Large tractors are not needed to generate technology.

Recommendations:

1. Equipment operators should be properly and promptly trained.

2. A mechanics post should be established and filled at each of the stations.

3. Additional vehicles are needed. The vehicles should have a "softer" suspension system for the road conditions.

4. A complete library should be developed and maintained at a central location. Divisions and Commodity Stations should maintain small libraries containing key books and journals which are used frequently by its staff.

IV.H. Training:

H.1. Academic Training:

Overall ICP has done a good job in organizing and implementing the participant training element of the project. There were initial delays in identifying, processing and placing candidates in academic programs in the U.S. and the Philippines which caused the training program to be one year behind. These delays were due to difficulties faced by MOA in identifying candidates with appropriate credentials for advanced study. These difficulties seem reduced during later stages of project implementation.

Thirty three participants have gone for training, out of which nearly two-thirds have successfully completed their programs. Most are trained in breeding/agronomy and few in plant protection and extension.

All except one of these returned participants are working inside DOA, but the utilization of is trained manpower is often questioned. The project calls for specific plans for returning participants with their assignments related to their training, but this has not been done in several instances. In general the quality of training is reported to be excellent and most of the participants have completed their program in time.

A need for strong socio-economic group has been noted in the discussion of CSP; yet no degree training in the social sciences has been provided under the project. The absense of candidates in social sciences may reflect the fact that support from other sources, notably the Agricultural Development Council (ADC) in the case of agricultural economics, was available. However, CSP and

the major commodity stations are currently without a single social scientist in a regular HMG position.

H.2. Non Academic:

H.2.1. Training Abroad:

Returning participants feel that this kind of on-the-job training should be a part of a staff development program. After visiting CIMMYT, IRRI, and/or ICRISAT, returning participants realized the importance of getting involved in a particular research/extension program. Formal education often tends to separate an individual from practical work, but the non-degree training programs provide participants with skills, and a sense of the dignity of work. Short term training has also been important to update scientists and technicians with rapidly changing technology.

Difficulty has been experienced in identifying and clearing candidates since almost all those from commodity programs have already attended training programs making them ineligible to attend for a second time. The team feels that opportunities should be given to those scientists and technicians who are really involved with the related research/extension activities and unrelated persons should be discouraged. Till now priority was given to personnel from commodity programs, but it could be extended to other technical divisions and ADO offices dealing with CSP. Assignment to a job related to the training received should be a prerequisite for selection.

H.2.2. In-Country Training:

In-country training supported by ICP has included short courses on CSR methodology for ADOs, POs, JTs, JTAs and PLs. CSP is providing trainers for short courses at the request of projects such as KHARDEP, RAD and RCUP at the expense of these projects.

The courses appear useful in acquainting staff with CSR methods, but not adequate to ensure that inexperienced staff will perform effectively in the field without an additional period of close supervision on a one-to-one basis.

In-country training, broadly defined to include counterpart training, internships as well as short courses and field supervision of staff is vital to progress in institutionalizing CSP and should be the major focus of ICP staff activities for the remainder of the project.

Recommendations:

1. Training (academic and non academic) should be continued and the socio-economic component expanded. Short term training in CSR is also desirable.

2. Policy should be outlined and agreed upon by the DOA regarding the better utilization of trained manpower.

3. In non-academic training, only subject-related persons should be sent to attend no matter how often he or she needs to be sent.

4. Training, broadly defined, should be the priority focus of ICP staff activities for the remainder of the project.

IV.J. Role of Women:

The Project Paper Ammendment calls for increased efforts by ICP to involve female as well as male villagers in on farm research and pilot production programs. In addition to more use of female PCVs to assist ICP, the Ammendment proposed the inclusion of female extension agents in PPP activities and the provision for short term consultancies for an anthropologist/rural sociologist "to suggest culturally appropriate solutions to any difficulties that may arise which would inhibit the participation of female and male villagers in the project." (PP Amendment p. 7a.)

Overall, ICP has made only limited progress in addressing the issue of the role of women to date. One female PCV and two PCV spouses have assisted the project for varying periods of time. These individuals functioned as regular staff members of CSP and were not given specific responsibility to address women's issues. Nor does the evaluation team feel they should have been given such a responsibility. Additional PCVs with the necessary qualifications and who are sensitive to the issue of women's participation in technology transfer can be effectively used by CSP, but the impact, in terms of greater women's participation, is likely to be slight.

More significantly, ICP has included female PLs in PPP activities in Chitwan, Kandbari and soon Chauri Jahari. However, as discussed in section IV.D, the need for female change agents (as opposed to change agents of either sex) in order to better reach female villagers, is open to question in many parts of the Terai. Predictably, it has been more difficult to involve women as change agents in the hills where the need may be the greatest.

ICP is finalizing arrangements to employ a local consultant in rural sociology to examine issues relating to the role of women in technology transfer. Specific attention will be given to i) more use of women in extension activities (e.g. as PLs); ii) special field days for women at CSP/PPP sites; and iii) training on issues such as seeding and compost making in which women are specifically involved.

Given the short period remaining in the project and the modest progress made to date in this area, (as well as the problems of institutionalizing CSP/CSR discussed in section IV.C), it is unlikely that ICP will be able to make major advances in issues relating to the role of women in increasing agricultural productivity. The Status of Women project has provided a substantial amount of documentation on the role and condition of women in Nepal which together with the experience of ICP and other projects might provide the basis for a more determined effort in the context of other future projects.

V. PROJECT IMPACT[1/]

ICP has made a significant contribution to the development of agricultural research capacity in Nepal as well as to processes for dissemination of research results to extension services and ultimately to farmers. Building upon earlier USAID supported projects ICP has provided three commodity improvement programs (rice, maize and wheat) with training, technical assistance, construction and equipment which have collectively appreciably enhanced the capacity of these programs to design improved technologies for Nepal. The minikit program is having an impact acquainting thousands of farmers with improved varieties.

ICP support has been particularly critical in initiating and sustaining CSP. CSR is now generally (but not universally) understood and appreciated by research and extension personnel as a potentially effective mechanism of 1) better understanding farmer conditions in various parts of the country, particularly the important cropping patterns, in designing improvements for specific areas, and 2) testing of improvements on farms with farmer participation. Through this process CSP has identified technologies which can be selectively used in the hills in the cases of maize, wheat and to a lesser extent rice. In addition, CSP with ICP support has successfully initiated a pilot production program (PPP) in various parts of the country utilizing the technologies emerging from the commodity improvement programs and targeted/screened by CSP. These activities have considerably increased the potential impact of a number of major agricultural/rural development projects including RAD, RCUP and SPIS.

In spite of these accomplishments which represent only part of more than 20 years of efforts to develop agricultural research and extension capacity in Nepal, the impact upon agricultural production is limited to date. Wheat production using an improved variety (RR-21) has expanded dramatically; an improved rice variety, Masuli, is now dominant; maize varieties (Khumal Yellow, Rampur Composite, Rampur Yellow) have been widely accepted by farmers; and fertilizer comsumption continues to rise. Yet national food production has not kept pace with population growth--uncultivated land is scarce, particularly in the densely populated hills, and overall productivity appears stagnant. The constraints to improving agricultural productivity are numerous, complex and reasonably well documented. They include insufficient credit, inadequate input delivery and extension services, a limited and high cost transportation network, and marketing problems. Research and extension personnel are generally demoralized as a consequence of limited progress, poor incentives, and criticisms from farmers and government leaders alike.

With some notable exceptions, the technology that has proved acceptable to farmers in Nepal on any significant scale has been based on introduced

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[1/] The 1982 impact evaluation of ICP's predecessor (Food Grain Technology, 367-11-110-054; 367-0054) contains findings which are relevant to an assessment of ICP's impact. See AID Project Impact Evaluation Report No. 33, "Food Grain Technology: Agricultural Research in Nepal" by E. Simmons *et al* (May 1982) PN-AAJ-614.

varities such as RR-21 and the application of imported chemical fertilizers. The research system has played an important role in screening, selecting and disseminating technologies, particularly new varieties. However, these introduced technologies by and large perform optimally only under better conditions than characterize nearly all of Nepal, namely high fertility, water control, pest management and good cultural practices. Selected improved practices have spread widely and rapidly in parts of the Terai, especially on irrigated lands, but less so in the hills and in those areas which are not well served by roads, the input delivery systems and the extension services.

The goal of ICP as expressed in the Project Paper "to increase the average productivity of Nepal's foodgrain cropping systems" is in sight, but may not be realized before the end of the project. In addition, most of the benefits will probably flow in the near term more to farmers in the Terai than in the hills.

ICP might have given more attention to developing and institutionalizing a capacity to screen technologies for the hills in order to give higher priority to agricultural development in these regions. CSP has partially filled the void, but additional on-station research capacity to develop and screen component technologies for the hills is needed.

In spite of serious problems and challenges, the present pessimistic attitude is not justified. A major expansion in the use of improved technologies in many areas of the country is imminent if adequate supplies of seed, fertilizer and credit are available to farmers. The extension service can significantly accelerate this process. CSP activities have identified and farm tested attractive technologies for use by farmers in several parts of the country, including the hills, and pilot production projects (PPP) are now in progress in these areas. However, sustaining and expanding increases in agricultural productivity in Nepal requires further strengthening of agricultural research capacity beyond what is likely to be generated internally in the medium term or forthcoming with the assistance of the current generation of externally supported projects such as ICP. Over the next few years, Nepal will harvest the lowest fruits on the agricultural research tree (improved seed and fertilizer). Without a stronger research system, the higher fruits (intensification; improvement of soil fertility through alternate cropping patterns; and better cultural practices acceptable to farmers) will largely go untouched. Nepal's rate of growth of production will be far slower and more geographically imbalanced than it otherwise might be.

CSP and PPP are revolutionary concepts which require significant time, effort and political will to fully institutionalize in Nepal. Given their current status and the very limited time left in the project, CSP and PPP are unlikely to survive in their current form beyond mid 1984 without more support than is likely to be forthcoming from HMG or the current generation of externally funded projects.

CSR is viewed by some representatives of the commodity programs, primarily or exclusively as a mechanism to get research results out to farmers. CSP has contributed significantly to an appreciation of cropping patterns or sequences among scientists, but this appears to have had only

limited impact on research priorities to date. Further, CSP has suggested that fertilizer recommendations developed by the commodity and discipline divisions should be changed in some instances, which has not been universally well received. In other countries, as well as the international centers, FSR and commodity improvement programs have not infrequently found themselves in adversarial relationships over such issues as the appropriateness of a particular variety or varietal improvement strategy. On the other hand, some outreach programs at the major commodity stations as well as adaptive research components in various regional development projects are making increasing use of CSP methodology and results.

In its implementation, ICP accepted the reality of three strong commodity programs and chose to reinforce them, especially in the construction, equipment and training components of the project. The complementarity among CSR, commodity and discipline programs which project designers might have assumed would be recognized, has not resulted as yet in effective linkages amongst the various components of the research system in many instances. Nor is this likely to naturally emerge during the final period of the project. The absence of an effective research management system at the center together with frequent changes in policy and leadership in MOA and DOA already noted, has perhaps allowed ICP support to reinforce natural centrifugal forces in the research system rather than guiding the needed and potentially very productive collaboration.

APPENDIX A: ACRONYMS

AA	-	Agricultural Assistant
AADO	-	Assistant Agricultural Development Officer
ADB	-	Agricultural Development Bank, Nepal
ADC	-	Agricultural Development Council
ADO	-	Agricultural Development Officer/Office
AERP	-	Agricultural Extension and Research Project
AIC	-	Agricultural Input Corporation
AID/USAID	-	Agency for International Development
APROSC	-	Agricultural Projects Services Centre
CIMMYT	-	Centro Internacional de Mejoramento de Maiz Y Trigo
CSP	-	Cropping Systems Program
CSR	-	Cropping Systems Research
DOA	-	Department of Agriculture
FFT	-	Farmer Field Trial
FSR	-	Farming Systems Research
GDP	-	Gross Domistic Product
GLIP	-	Grain Legume Improvement Program
GON	-	Government of Nepal
GTZ	-	German Agency for Technical Cooperation
HFPP	-	Hill Food Production Project
HMG	-	His Majesty's Government of Nepal
IAAS	-	Institute of Agriculture and Animal Sciences
IADS	-	International Agricultural Development Service
ICP	-	Integrated Cereals Project
IRRI	-	International Rice Research Institute
ISNAR	-	International Service for National Agricultural Research
ISTI	-	International Science and Technology Institute
JADP	-	Janakpur Agricultural Development Project
JT	-	Junior Technician
JTA	-	Junior Technical Assistant
KHARDEP	-	Kosi Hill Area Rural Development Program
M & E	-	Monitoring and Evaluation
MOA	-	Ministry of Agriculture
NMDP	-	National Maize Development Program
NRIP	-	National Rice Improvement Program
NWDP	-	National Wheat Development Program
NZIP	-	Narayani Zone Irrigation Project
PACD	-	Project Activities Completion Data
PL	-	Production Leader
PO	-	Production Officer
PPP	-	Pilot Production Program
PPVT	-	Pre-Production Verification Trials
RAD	-	Rural Area Development Project
RCUP	-	Resource Conservation and Utilization Project
RD	-	Regional Director
SMS	-	Subject Matter Specialist
SPIS	-	Seed Production and Input Storage Project
T and V	-	Training and Visit System

APPENDIX B. EVALUATION SCOPE OF WORK AND METHODOLOGY

B.1. Scope of Work:

In addition to conducting a general evaluation of ICP, AID/Nepal requested that the evaluation team give special attention to the following:

1. Assessing the pilot pocket production campaigns, especially the use of techniques to disseminate new technology and the methods of organizing such campaigns.

2. Assessing how well production information for extension workers and farmers has been derived and packaged from findings produced at the research stations.

3. Assessing the results of the expanded use of production minikits for the three major crops as well as for associated minor crops.

4. Identifying factors, if any, that may prevent the production campaigns from increasing crop production to the extent anticipated. Identification of such factors may have significance for future GON policy and program decisions. Lack of credit and inputs, low commodity prices, and inefficient marketing channels are possible obstacles to increasing productivity despite existence of proven technologies and dissemination systems.

5. Reviewing the cropping systems work, particularly with respect to assessing the linkages established between ICP and the RAD, SPIS and RCU Projects.

6. Recommending desirable changes in project activities which may assist in more fully achieving the goal of the project.

7. Assessing whether project construction, training, and commodity procurement have contributed effectively toward meeting the objectives of the project.

8. Identifying problem areas of priority for GON attention in planning further efforts to improve the agricultural research/extension system.

B.2. Evaluation Methodology:

The methodology employed by the evaluation team was like CSR/FSR, both interdisciplinary and iterative in nature. The team consisted of representatives of three disciplines; agronomy, agricultural economics and rural sociology. For the most part the team was together and able to share impressions and later, drafts on a daily basis. The agronomist and agricultural economist were together on January 5-7 in Washington D.C. for a review of documents and discussions with USAID, IADS and the World Bank prior to traveling to Nepal.

In Kathmandu, following a week of further reading and preliminary discussions with USAID/Nepal, DOA, MOA and ICP personnel, the full team

traveled together to visit the CSP sit at Phumdi Bhumdi in Kaski district. In the course of the ensuing weeks visits by one or more team members were made to NWDP (Bhairawa), NRIP (Parwaniput), NMDP (Rampur), RAD (Tulsipur), and ADOs (Kaski, Bhairawa, Gorkha, Parsa, Bara, Dang, and Palpa) as well as several on farm trial and PPP locations. In each instance, farmers as well as extension and research personnel were interviewed. In talking to farmers, a questionnaire guide was employed which focused on how farmer practices and perceptions might have changed as a consequence of ICP supported activities.

The impressions gained from these visits and discussions were first expressed in writing in a preliminary report on findings and recommendations which was reviewed by HMG and AID/Nepal personnel toward the conclusion of the fourth week. The comments on the preliminary report plus the results of another round of discussions and travel led to the second and third drafts. The agronomist left Nepal after four weeks while the agricultural economist and rural sociologist embarked on a final round of field trips, this time as participant/observers in the company of CSP/ICP staff in the course of their regular duties. By the conclusion of the assignment of the rural sociologist, the evaluation team began to understand both the complexity of its task and, it is hoped, something of the reality of ICP and its place in the agricultural development of Nepal. In this process the team was greatly assisted by Dr. Wayne Freeman's background paper on "Improving the Effectiveness of Agricultural Research in Nepal" which is included as Appendix F in the evaluation report, but even more by the insights gained from discussions with over 100 people ranging from farmers to high level government officials. A near-final draft was prepared prior to the departure of the team leader after six weeks. The main conclusions and recommendations were discussed with Ministry and DOA officials and with AID/Nepal. Prior to finalization of the report in Washington, AID/Washington and IADS were provided with the final draft for review and comment.

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Appendix D: Commodity Improvement Programs

In reviewing ICP support for the three major commodity programs one or more members of the evaluation team visited the stations at Bhairawa, Rampur and Parwanipur.

The team attended the first three days of the summer crop workshop at Rampur, Jan. 24-26. Research findings for maize and rice along with other summer crops were presented. The quality of the papers ranged from excellent to poor. Many of the papers presented information obtained from good research technique and implementation. However, some of the papers were reporting experiments which should not have been conducted.

The paper presentations were generally too long. The objectives should be stated and then the results should be discussed. Background information and methodology should be presented only in the paper. The discussions were lively and should be encouraged. Too many papers were presented at the sessions. Papers should be screened for their merit and those with little value should not be presented.

Specific comments on the research programs for wheat, rice and maize follow:

D.1. National Wheat Development Program (NWDP):

Wheat is a relatively new crop for the Nepalese farmer. The wheat area has increased from 300 hectares 20 years ago to 404,000 hectares in 1982. For the last 15 years the national yield average has remained around 1.2 tons per hectare. Most of the wheat (85 percent) is grown under rainfed conditions.

The NWDP, located at Bhairawa, has the responsibility to provide the farmers with improved wheat varieties and management practices. ICP has provided adequate office and laboratory space as well as equipment for this task, but staff housing is still insufficient.

ICP helped strengthen linkages with many international organizations, including CIMMYT, All-Indian coordinated wheat program, ICARDA, IRRI, and the Universities of Nebraska and Oregon State. Each year CIMMYT provides several yield nurseries and segregating populations to NWDP. Many of the staff have attended CIMMYT for short-term training.

NWDP has relied exclusively on these international linkages for their variety release program. Varieties from other research organizations are screened for their adaptability in Nepal. Those that perform well are entered into the initial evaluation trials (IET). After several years of testing some are released as recommended varieties.

RR-21 is planted extensively throughout Nepal, as well as India and Pakistan (10 million ha.) However, RR-21 is susceptible to leaf rust, Puccinia recondita, which is a serious problem in certain areas of Nepal. UP-262, Lumbini, and Triveni are recent releases with rust resistance. All of these varieties are from CIMMYT or India.

Several years ago a breeding program was started. The major criteria of the program include rust resistance, early and medium maturity, drought tolerance, dormancy, loose smut resistance and high yield.

In 1982 the program made over 1000 hybridizations; all were single crosses except 4 top crosses and 34 back crosses. About 1500 single plant selections were made from the segregating populations (F_2-F_7). They will be planted again and reselected. NWDP recently started to use the Nigale potato station as a summer nursery site. This will enable the program to produce two generations per year, thus reducing the time needed to develop new varieties.

In 1982 NWDP planted 200 F_2 plants from 357 crosses made by CIMMYT. 319 plants from 133 of the crosses were selected to be planted next year. Technically, this procedure is not very likely to be effective in developing varieties for Nepal. The population size should be between 2000 and 5000 F_2 plants (not 200).

All the screening work with the segregating material is done at Bhairawa. This is appropriate for the Terai wheat growing area, but not for the hills. For the hill wheat varities, the segregating material should be planted and selected in the hills. In 1982/83 NWDP is screening 36 introduced varieties at four hill stations. There is a small breeding program for the hills within the Botany Division at Khumaltar. Technical support is provided by NWDP. The breeding strategy is to develop varieties with rust and loose smut resistance, early maturity, medium to tall height, non lodging and high yielding. In addition to the crosses made at Khumaltar, F_2 populations are received from CIMMYT.

The general appearance of the research trials at the station was excellent. The trials were well kept and the plots were uniform.

The station has been conducting a long term fertility trial to check the NPK and organic fertilizer response to a rice-rice-wheat rotation. The experiments have shown the importance of organic fertilizers as well as NPK, and zinc in an intense rotation. The minimum and no till experiments have shown some other management practices the farmers can use.

NWDP collaborates with several divisions at Khumaltar. The Agronomy Division designed a weedicide trial and provides the necessary technical support. NWDP station outreach staff have good links with CSP and are running some PPVT's in the district. CSP has also provided feedback about variety performance in their trials and helped to identify NL30 as a potential variety release.

One of the station FFTs was planted with 16 different fertilizer treatments. This is too many treatments for an on-farm fertilizer trial. Before going to farmers' fields the number should be reduced to around four treatments.

After observing several FFT variety trials it is hard to see much value in them. The plot size is very large (80 sq. meter) and the variation within plots is also large. Several people said they don't trust the data.

It would be better to conduct some researcher managed trials for more reliable data.

Suggestions:

1. Increase the size of segregating populations to increase the probability of selecting an improved variety. Between 2000 and 5000 F_2 plants should be planted. It is better to decrease the number of crosses and increase the number of plants within a population.

2. Be selective in what international trials are tested. The CIMMYT/IRRI trial will be of little value since all the varieties included in the trial have already been tested.

3. FFT's should be simplified, better supervised, and preferably carried out in the context of CSR activities in various parts of the country. Outreach and CSP staff might assist in designing FFT's for various districts.

D.2. National Rice Improvement Program (NRIP):

Rice is the staple food crop for Nepal. The 1.2 million hectares of rice land is divided into 60 percent rainfed lowland, 30 percent irrigated and 10 percent upland.

NRIP located in Parwanipur has been doing varitial evaluation and breeding work in addition to the crop management studies. Disease and insect resistance, drought tolerance, different maturity lengths and high yield are the major breeding objectives. Sowing dates, sowing rates, N management, long-term fertility, and water management studies are the major types of agronomy trials.
ICP has helped strengthen NRIP's linkages with IRRI. IRRI provides disease and insect screening nurseries, yield trials, observation trials and cold tolerance nurseries. NRIP has used these nurseries to identify rice varieties for Nepal. IRRI has trained many of the NRIP staff.

NRIP continues to participate with IRRI's International Rice Testing Program in screening and selecting varieties which are adapted to Nepal. NRIP has recently released four varieties for the irrigated lowland; sabitri, Durga, Laxmi and Janaki, Bindeswari and Malika are recent upland rice varieties. For the hills Himali and Kanchan were released. The rice program is still looking for a replacement for the rainfed lowland variety Masuli.

NRIP has good relationships with the divisions at Khumaltar and is trying to get a memorandum of understanding with each of the divisions to clarify responsibilities.

NRIP has a good linkage with CSP. The outreach section is conducting pattern PPVTs. CSP is also testing promising rice lines for NRIP.

NRIP has adequate physical facilities, staff and eqiupment to perform its duties. The greenhouse facility needs repair.

D.3. The National Maize Development Program (NMDP):

The NMDP is responsible for providing the farmers with improved varieties and management practices for maize. Around 60 percent of the maize is grown in the hills and mountains. The national yield average has declined in the last few years because of low soil fertility in the hills, poor weather, soil erosion, and pests.

ICP has provided technical assistance. buildings, training and equipment to NMDP. NMDP has developed and released several improved varieties including Khumal Yellow, Rampur Yellow, Rampur Composite, and Arun-2. The early maturing Arun-2 (95 days) has given the farmer more flexibility to improve their cropping patterns.
NMDP has management trials relating to irrigation, spacing, long-term fertility, insect and disease control, pest harvest losses and storage. The collaborative work with the botany division has provided a seed storage technique that is very useful. Maize seed at 10-13 percent moisture can be stored for two years in a 250 gauge polyethylene lined cloth bag without a significant loss in germination. Economic analysis of several intercrop combinations are being conducted.

CSP is testing many of the improved maize varieties provided by NMDP, but linkages between NMDP and CSP are not currently very strong. Increased collaboration in outreach activities in particular would be mutually beneficial.

ICP assistance has strengthened the linkage between NMDP and CIMMYT mainly through the CIMMYT training programs. NMDP also has good linkages with Farm Suwon in Thailand and the CIMMYT regional program based in Thailand where NMDP material is screened for downy mildew.

NMDP has research activities at the high hill stations of Lumle, Kakoni and Pakhibas and the mid-hills at Khumaltar and Kabre in addition to the main station at Rampur in the inner Terai. These stations provide the needed environments for the different conditions where maize is grown. However, there is a need for a much stronger breeding program in the hills.

NMDP has several constraints which are hindering their program. The irrigation and drinking water problem is very serious and should be corrected as soon as possible. The problem is out of the control of ICP. Continued support should be given to the recently initiated breeding effort to improve maize populations at the mid-hill and high-hill stations. These populations can lead to the development of new varieties better tailored to these two broad agroclimatic zones. To successfully follow through with this strategy, the maize breeders and other pertinent staff members stationed at Rampur will need to make frequent visits to these stations to carry through with the breeding procedures.

APPENDIX E: CROPPING SYSTEMS PROGRAM

The following comments on CSR methodology and procedures are not a comprehensive assessment. Rather, they are a series of observations and suggestions on measures that might improve CSP activities in Nepal. As much as possible the suggestions are mindful of the resource constraints (particularly staff) which exist. It is appreciated that several suggestions may not be feasible without more experienced CSP staff. Further, few if any, of the suggestions are original ideas. Most emerged in the course of discussions with CSP staff and/or can be found in the literature on FSR/CSR methodology.

E.1. Selection of Areas:

CSP, in theory, selected areas to work in on the basis of relative potential for improvement. This is laudable, but not always practical, especially where existing information is limited. In addition, CSP has tried to accomodate several (perhaps too many relative to available staff) requests for assistance, particularly from various regional development projects. Demand is currently a more important criteria in selecting areas than potential for improvement. An additional criteria is, or should be, the ability of projects/districts to provide the staff and supporting services/financial support to carry through on a CSR program, initiated with the assistance of CSP.

Once an area, usually a district, has been selected more attention might be given to objective criteria in selecting specific panchayats and wards. Accessibility is important as are the opinions of local leaders and extension personnel. However, selection of specific wards does not always use other considerations such as knowledge/use of improved practices; soil conditions; and potential for extrapolation of trial results. Over the past two years a number of areas were selected which were atypical or were areas where farmers were already using improved practices. This information could have been obtained either before or during the initial site reconnaissance. In the selection of areas as well as in the actual site surveys, CSP does not appear to be making as much use of available information as seems desireable (population census, agricultural census, input utilization, etc.) Areas where there are already high levels of input use should have a lower priority in terms of CSP staff time and resources, even though input use in these areas may not be at optimal levels. In the case of Bara and Kavre districts, farmers appear to be using higher levels of fertilizer than needed. PPVT's and PPP's should not be necessary to induce farmers to lower input levels and the returns to such efforts (primarily in terms of savings on fertilizer use) probably do not compare favorably to returns to promoting higher fertilizer use and improved varieties in districts where these inputs are not commonly used at present.

E.2. Site Reconnaisance:

Site reconnaisance currently tends to be very subjective and does not involve more than one discipline in most instances. More objective criteria, including potential for improvement and extrapolation should and could be applied more systematically than at present. Shortages of staff

and pressures to meet targets should not be used as excuses to make short cuts here since the consequences will be felt for several seasons. Site reconnaisance should involve at least one agronomist and one socio-economist in all instances.

E.3. Site Surveys/Trial Design:

The key informant surveys are a quick and reasonably effective mechanism to obtain the basic information necessary to design the initial trials. The following suggestions focus on improving the process without increasing the time and resources required:

a. The basic site survey team should consist of an agronomist and a socio-economist. At present, only socio-economists are involved in the site survey work which violates one of the basic tenants of CSR/FSR.

b. A "first cut" at trial designs for a site should be made immediately following the key informant surveys on location. This is only practical if agronomists are involved in the site surveys. In addition, when work in a district is just commencing it would be desireable for a senior CSP agronomist and possibly a representative of a commodity improvement program and/or outreach program to be present for the "first cut" discussions. The resulting trial possibilities (more than one option is desireable) should be discussed with the ADO, extension personnel and the key informant farmers.

c. In a disturbing number of instances, including Gorkha district (RCUP), PPVTs were designed and established before site surveys had been conducted. Although the pressures to initiate trials are real and understandable, conducting trials prior to site surveys is a serious departure from CSP methodology and should be avoided. At the same time efforts should be made to improve the efficiency as well as utility of the site surveys so that they become more of an integral part of the trial design, implementation and evaluation than they are present.

d. At the conclusion of the site survey, the team might prepare the basic data information sheet as rapidly as possible (including the suggested trials program prepared on site as discussed in b. above) for circulation to CSP staff and a review network composed of program associates and others in the discipline and commodity programs for comments. A micro computer with a Visicalc program/word processor program should make it possible to prepare the basic data sheets and perform the initial set of cost benefit calculations very rapidly. The final set of recommendations for trials would be prepared on the basis of comments on the basic data sheets.

e. Site surveys could make much better use of available information (population data, farm managment data, marketing data soil surveys) than is presently the case. CSP should have a basic data unit responsible for assembling the basic information on a site prior to the survey or even prior to the reconnaisance involving regular

arrangements with the census office, Dept. of Food and Agricultural Marketing, etc., to obtain information on a district, panchayat and ward basis where possible.

f. The site surveys might include more information on agronomic practices (once again a reflection of a lack of agronomic input into the survey work). Limited agronomic input has led to mistakes in trial design on such matters as planting methods which would have been avoided with the proper information. In addition to participating in the key informant interviews, agronomists should seek out innovative farmers (not necessarily the same as knowledgeable farmers who are selected as key informants) for open ended discussions on what has already been tried; variations in cropping practices and patterns; and what might be worthy to test. Farmer knowledge could be much more effectively utilized in all stages of CSP than is presently the case.

g. At first glance, there appears to be a possible bias in the selection of key informants in favor of larger, richer farmers from high castes. As discussed in the CSP Technical Report, Data Collection Methods for Initial Site Descriptions, the key informant survey is adequate and efficient for certain types of information (things that are publically and directly observable; things which are well known in the community; and topics which are non controversial). To date, most CSP trials have focused on changes in varities and fertilization levels and the current key informant questionnaries are probably adequate for these purposes (except the need for more agronomic information already noted). As CSP moves increasingly to explore pattern and enterprise changes, more subjective information on motivations and objectives will be useful. Thus, efforts might be made to include key informants of lower castes and poorer groups where these appear important in a Panchayat and under-represented in the list of names provided by the Pradhan Panch and others. One possibility would be to select 10 names at random from the voter roles and group into two sections by size of holding and/or caste. All would be administered a brief objective questionnaire on the basis of which one person from each section would be selected as a key informant. This procedure might be used only where there is good reason to believe that significant biases might exist in the list of key informants suggested by the Pradhan Panch and others.

h. Ways might be explored to speed up the processing of data and the report preparation for the site surveys. The need for a micro computer with word processor capacity has already been noted. Originality is fine, but not if this seriously slows the process of getting reports out and consumes excessive amount of staff time. Certain discussions and recommendations are quite standard (eg. "The Sadjha needs to be strengthened. . .").

i) Following a site survey, CSP and the regional/districts offices involved should review whether or not PPVT's should be implemented in the area. If prospects for mounting a successful production program appear slight based on the results of the site survey, PPVT's should probably not be initiated in that area until more

promising technologies have been identified through component/pattern trials and/or on-station research by CSP, commodity programs and discipline divisions.

E.4. Trial Supervision:

At least one supervisory visit to a trial site by those responsible for evaluating trial results is essential. This is not always happening. CSP has resident teams at the six permanent CSP sites to perform this work, but trial supervision in other areas is irregular. Participating locations in the CSR network should be visited at least once during each of the seasons in which trials are laid out. The task of regular supervision will grow beyond the capacity of CSP to handle and should be assumed by outreach program staff and SMS's at the regional and district levels. In addition, CSP program associates and/or others from discipline divisions and commodity programs should be invited to participate in supervisory tours.

Where trials in an area are being offered for all three seasons, three supervisory visits should be made. Using the example of a rice-wheat-maize pattern, the first visit would take place two to six weeks before the rice harvest at which time: i) the standing trials would be observed; ii) the results of the past maize season trials would be evaluated and preliminary plans made for the following year; and iii) trial plans and sites for the upcoming wheat season would be finalized. Evaluation questionnaires for the maize trials should have been administered by site personnel/SMS/adaptive research teams at the regional district levels and agronomic results of the trials collected in advance of the visit of the supervisory team. The results should be ready for discussion with district staff and farmers. Similar visits would be made during the wheat and maize seasons.

E.5. Farmer Modification of Recommendations:

In PPVTs, farmers are supposed to plant the recommended practices on two-thirds of a plot and use their own regular practices in the remaining third. However, farmer modification appears to be taking place in some instances. First, in poorly supervised trials, farmers may modify the recommended practices through neglect or misunderstanding. Second, even where trials are well supervised, instances were encountered where farmers viewed the PPVT as a test between their approach and the recommended approach and "cheated" a bit by applying more fertilizer or water to the farmer practice portion of the PPVT than they normally would do.

Some way to accomodate farmer modification of recommendations should be found since it serves two important functions: i) it suggests what other farmers might be inclined to do with a particular recommendation when it is extended on a wider scale using the block approach and/or other methods; and ii) farmer modifications represent sources of ideas on how recommendations might be improved. The farmer just may be right given his/her constraints and objectives. However, such modification should ideally take place outside the PPVT since otherwise it will further compound measurement problems to the point where it will become very difficult for anyone, with the possible exception of the farmer, to understand what has happened.

One method for accomodating farmer modifications of recommendations might be to invite farmers participating in the PPVTs to use a set of practices for a crop on additional fields during the second year (assuming the first year PPVT is a success). This has been called a farmer test where the operations are totally under farmer control with the research team simply taking note of performance and any modifications that are taking place (any why). The farmer might be assisted with some credit, but inputs should not be provided free. Farmer tests should approximate as nearly as possible the actual conditions that farmers more generally will face in considering whether or not to adopt the recommended technology. This could lead directly into the block system, but with more information about how farmers might modify the recommendations when they use them on a whole field or whole farm basis.

There appears to be no easy method of reducing data comparability problems in the PPVTs. One approach might be to designate three or more fields in the vicinity of each replication at a PPVT site. The fields should have similar characteristics, identical cropping patterns (or at least identical as far as the crops for which trials are being offered), and preferrably be owned/farmed by the same farmer. Yield cuts could be taken from these fields in addition to the PPVT and averaged to have a check on gross returns to farmer practices. This approach will probably not work in areas where there is a high degree of heterogeniety among fields such as commonly exists in the hills.

E.6. Trials in Blocks:

A production block provides an excellent setting to continue trial work with cooperating farmers on a more or less continuous basis. Some farmers will probably want to continue running trials on possible improvements, even without continuing close supervision and special inducements from the research/extension staff. In effect, the block would operate its own mini-adaptive research unit. As blocks become well established, more and more options on possible trials should be offered to farmers. The farmers should assume an increasing role in deciding what specific trials they will set out. Designing, monitoring and evaluating trials in their own block should provide an additional mechanism to reinforce group spirit and solidarity in the block. Before long farmers will be making increasingly specific requests for technologies which they believe will fit into their cropping systems. They already are. This can be invaluable in helping shape research priorities. The research/extension system must find ways to improve its hearing.

E.7. Evaluation of Trial Results:

Administering evaluation questionnaires to farmers should be an integral part of trial supervision as discussed under section E.4. Farmers might be interviewed just prior to and during the visit of the supervision mission to an area. The mission should be interdisciplinary. The mission should review the results and immediately take a first cut at what modifications should be made in the trials for the next year, if any. The resulting possibilities should be discussed with ADO, extension staff and selected farmers.

A two page summary report on the mission including results from the trials, farmer evaluations and suggestions for the next year, should go to CSP Khumaltar with the questionnaires for processing: The summary should be circulated through a review network of scientists in CSP, discipline divisions, commodity programs and out research programs. Composition of the review network would depend on the commodity, area and nature of the trials. Comments would go back to the project/district office responsible for the trials.

E.8. CSP and Monitoring and Evaluation (M & E):

A number of projects currently have monitoring and evaluation units. These same projects may or may not have adaptive research/CSR/FSR capacity. These activities belong together. In a world of unlimited staff and resources, one might argue that they should be separated, but that is not the situation in Nepal. Some observations:

1. M & E and CSR draw upon very similar, but not always identical data sets. Major economies in data collection/trial supervision seem quite feasible.

2. M & E and CSP are two sides of the same coin: M & E looks at what is happening/happened and why/why not. CSP uses the same information to design and test ways of doing things better.

3. M & E tends to focus on socio/economic skills and perspectives; CSR is multidisciplinary in theory, but often weighted toward agronomy and the biological sciences. There is a natural complementarity.

A more detailed discussion of how M & E and CSP might be integrated will be the subject of a forth coming paper by the evaluation team leader in collaboration with others. A copy will be sent to CSP and AID/Nepal.

APPENDIX F: IMPROVING THE EFFECTIVENESS OF AGRICULTURAL RESEARCH IN NEPAL[1/]

F.1. Background

Agriculture in Nepal has a long history as a subsistence agriculture. Farms are small and highly diversified. Animals and crops make a very tight interdependent farm enterprise. Then, as population began to increase the traditional agriculture of the subsistence system was not able to provide increased food supplies. Bringing more land into cultivation in the Hills meant farming land with greater slopes which were more fragile and subject to more erosion under cultivated conditions.

The agricultural research system was superimposed on this traditional agriculture at about the time population pressures were building. Agricultural research had its beginning as, and still is, a traditional research system. Emphasis was on discipline research for nearly 15 years when the concept of the interdisciplinary team approach to crop improvement became established in the early 1970s for rice, maize, and wheat. Specific commodity centers were established with a network of testing stations both in the Terai and in the Hills.

Varietal introductions in the 1960s by the agricultural research team provided high yielding varieties of rice from Taiwan for the Kathmandu Valley and similar improved types of wheat from CIMMYT in Mexico and India. Maize improvement followed an approach to improvement through the development of synthetic varieties from high performing introduced selections sometimes crossed with local strains for the introduction of local adaptation characteristics.

Introductions, selections under local conditions, and synthesizing varieties from adapted strains were procedures used with good effect. More recent introductions of Masuli (Mashuri from Malaysia) and new strains in the international yield trial programs from IRRI and CIMMYT have provided still greater genetic diversity and potential for production.

Varietal acceptance by farmers has been inconsistent. In Kathmandu Valley the Taiwan varieties were still spreading after 10-15 years until today perhaps 90 percent of the area is covered by these varieties. On a national basis improved rice varieties may cover 25-30% of the area. Maize is similar to rice, approximately 25-35% of the area planted to new varieties. In wheat, the area covered by new varieties has continued to spread to 85-90% of the area. Varietal acceptance for wheat is rather phenomenal with perhaps 80% of the nation's wheat planted to one variety, RR21 (Sonalika). In the Terai the percentage could be even higher for this variety.

The really phenomenal fact is that as wheat increased in area from about 100,000 ha in the mid 1960s to over 300,000 ha. in 1982-83, the yield per hectare has remained static. Perhaps in no other country could it be said that the area covered with an improved variety or varieties of a crop was so high

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[1/] Prepared by Dr. Wayne Freeman, ICP, at the request of the ICP Evaluation Team (Kathmandu, January 1983).

without having a favorable impact on productivity. Because widespread acceptance of improved varieties is almost 3 times the level of two decades ago, yet the return per unit area has remained static or decline. With the above information on wheat a newcomer might say that yields of the crop were already high and varietal change had no effect. Unfortunately, the opposite is true. Yields of wheat have remained at about 1.12 to 1.16 T/ha.

Because for this apparent stagnation in wheat yields are subject to speculation and is probably a combination of the following: a) as areas increased expansion has occurred into rainfed areas and more marginal soils; b) in one farmers without wheat growing experience are growing the crop; and c) increased cropping intensity. The latter situation is prevalent in the Terai where a rice-wheat pattern is common. On a per unit area basis, wheat yields may not have increased and rice yields may likewise be static, but total production per hectare has increased by this higher cropping intensity. This greater intensity demands more soil nutrients and as other conditions favor greater nutrient applications, yields and annual production will increase.

During the 1970s maize yields have tended to decline with large year to year variations. Rice yields during the same period have remained essentially unchanged at about 1.8 to 1.9 T/ha.

Since these crops account for 90% or more of all food grains of the country it is not surprising that planners view these statistics with alarm. Calculations and targets based on population requirements call for increases in production of different crops of 12-25% (in the Sixth Five Year Plan) yet increases are not appearing. The investment in agriculture in the public sector has increased over the various plan periods; yet production increases have not materialized. Since agriculture is charged with the responsibility of developing technology to enable farmers to meet these challenges for politicians and administrators not surprisingly say that agricultural research has not been effective and question why continued support should be given.

The young age of agricultural research in Nepal must be considered in assessing the present situation. Agricultural research was initiated in 1957. Considering the lag time from initiation of research to payoff in farmers' fields, new varieties presently going to farmers were only just beginning to be developed about 10 years ago, when the interdisciplinary teams were created for the principal crop commodity programs. Chief benefits at present are from crop varieties introduced in the late 1960s and early 1970s which have been under gradual adoption up to the present new cycle of crop varieties which have been released in the past 5-6 years.

F.2. Purpose/Role of Agricultural Research

Agricultural research is a public responsibility. The character of the average farmer resources make it obvious that there are no alternatives to public sector agricultural research in Nepal. The economic well being of the average farmer, the high percentage of the population depending upon agriculture for their livelihood and sustenance, and the level of the general economy places a heavy responsibility upon the public sector research.

The question is not one of whether agricultural research should or should not be continued but one of how it should be continued to effectively generate the necessary technologies required to increase production. Agricultural research as a public responsibility in a highly agrarian economy has a particularly difficult role.

First and foremost is the responsibility of generating technology to improve production and farmer welfare which requires that cultural research a) be responsive to change; and b) be able to change its own priorities; and c) change the administrative structure and linkages with other farmer oriented agencies to insure that technologies are relevant to current needs of farmers.

Evenson and others have noted the high returns from agricultural research and the need to invest more, not less, funds in research. Schultz states that "the fundamental dynamic agent of long-term economic growth is the research sector of the economy".[1/] Since agriculture predominates in the socio-economic structure of Nepal, agricultural research has a critically important role to play in national development.

Agricultural research in Nepal is young. The research leaders of today are the first cycle of agricultural scientists to be produced in this new field. The structure of the research system is still evolving in an effort to make it more effective. Yet the problems facing the research leaders, the research staff, and the research organization are some of the most difficult and complex of any country in the world.

With increases in cropping intensity, maintenance of soil fertility is critical. As farmers extend cultivation to more fragile lands the question of erosion control as well as maintenance of soil fertility is critical. Technologies that can improve production in those areas of medium and low production potential are critical to the well being of many small farmers.

To meet these challenges requires a) high quality leadership; b) an administrative structure that can be effective in utilizing scarce resources of manpower and funds; c) research programs that are sharply focused on the problems faced by the farmers and by the Nepal society collectively; and d) a team of highly dedicated and motivated scientists; and e) a technology transfer system that will make technologies and information available to large numbers of farmers.

F.3. Agricultural Research in Nepal

A. Current Structure

The structure of the Ministry and Department of Agriculture is depicted in Fig. 1 and 2 respectively. Research is subdivided in different departments and quasi-government agencies as follows:

1/ Schultz, Theodore W., The Economics of Research and Agricultural Productivity, 1981, IADS Occasional Paper.

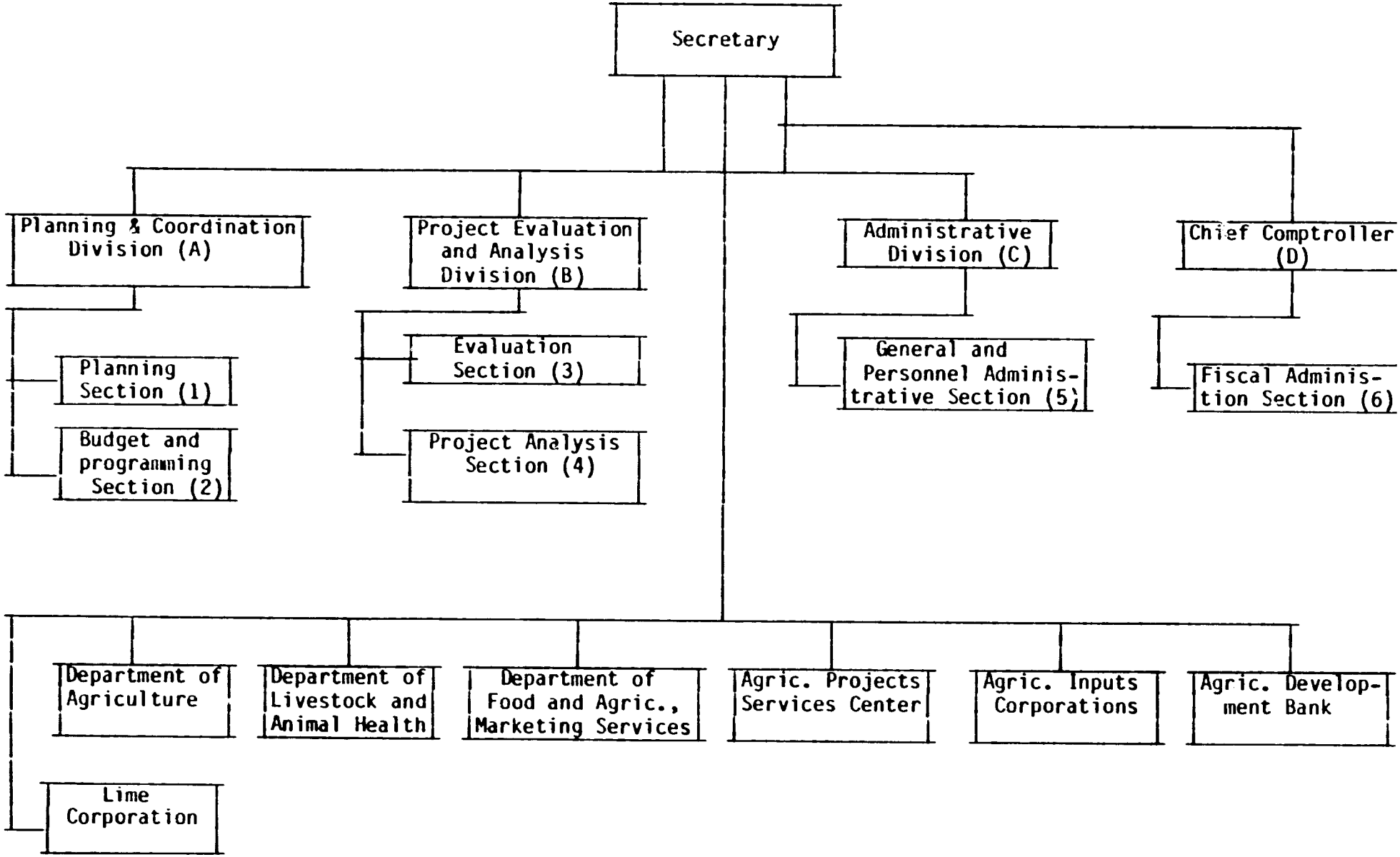
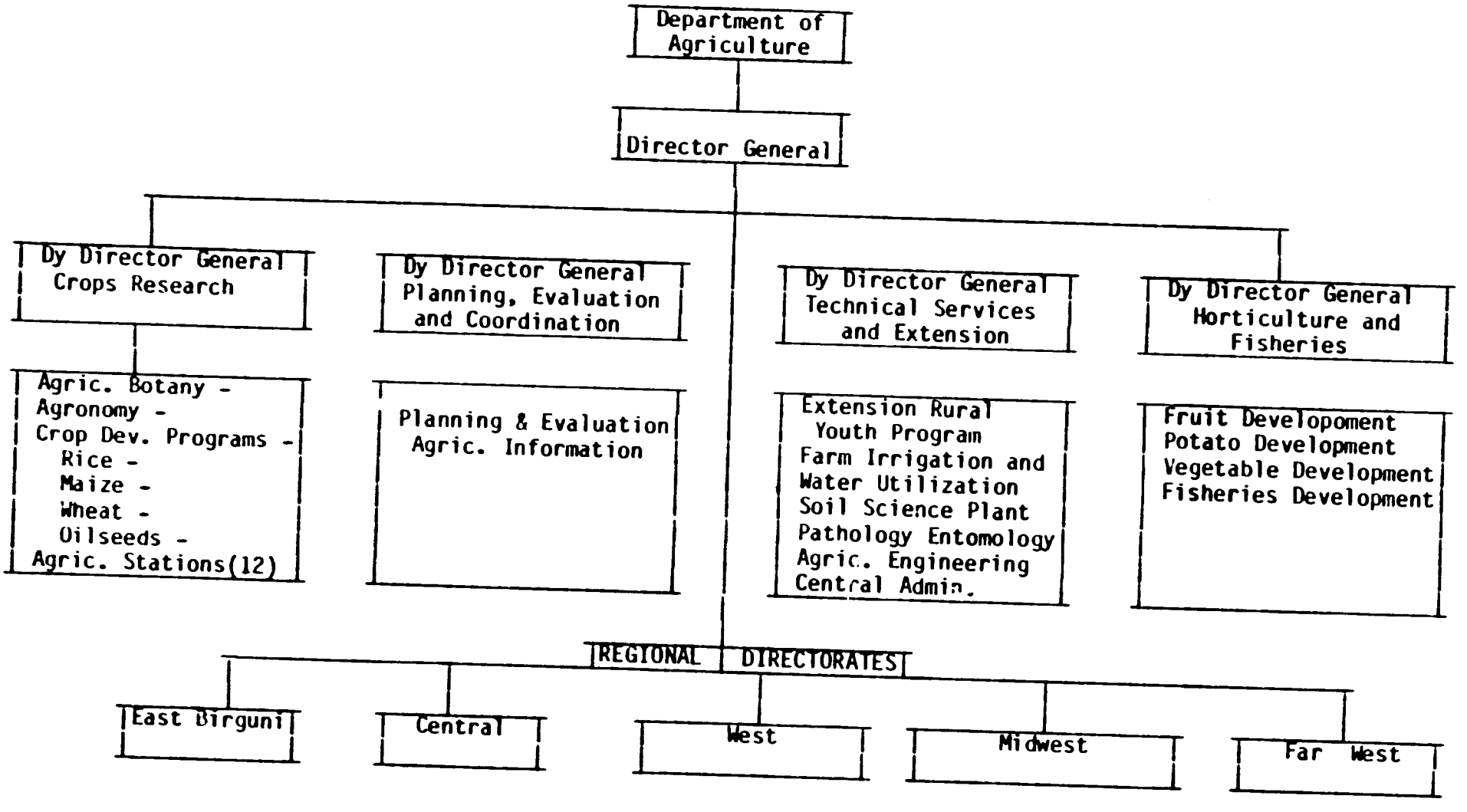

Secretary
Planning & Coordination Division (A)
Project Evaluation and Analysis Division (B)
Administrative Division (C)
Chief Comptroller (D)
Planning Section (1)
Budget and programming Section (2)
Evaluation Section (3)
Project Analysis Section (4)
General and Personnel Administrative Section (5)
Fiscal Administration Section (6)
Department of Agriculture
Department of Livestock and Animal Health
Department of Food and Agric., Marketing Services
Agric. Projects Services Center
Agric. Inputs Corporations
Agric. Development Bank
Lime Corporation

Figure 2


Department of Agriculture
Director General
Dy Director General Crops Research
Dy Director General Planning, Evaluation and Coordination
Dy Director General Technical Services and Extension
Dy Director General Horticulture and Fisheries
Agric. Botany -
Agronomy -
Crop Dev. Programs -
Rice -
Maize -
Wheat -
Oilseeds -
Agric. Stations(12)
Planning & Evaluation
Agric. Information
Extension Rural Youth Program
Farm Irrigation and Water Utilization
Soil Science Plant Pathology Entomology
Agric. Engineering
Central Admin.
Fruit Developoment
Potato Development
Vegetable Development
Fisheries Development
REGIONAL DIRECTORATES
East Birguni
Central
West
Midwest
Far West

1. The Department of Agriculture (DOA) has responsibility for research in cereals, oilseeds, grain legumes, cash crops, horiticultural crops, agricultural engineering, and other crop related disciplines (agronomy, botany, encomology, plant pathology, and soil science).

2. The Department of Livestock Development and Animal Health has responsibility for research in animal breed improvement, forage crops, and veterinary science.

3. The Department of Food and Agricultural Marketing Services has responsibilities for agricultural statistics on production, prices, marketing, and agricultural trade.

4. The Agricultural Projects Services Center (APROSC) has primary responsibility for project development and evaluation.

This fragmentation complicates tne problems of research administration.

Agricultural research has been delegated to 11 primary centers according to crop commodities. In addition, there are as many as 40 other farms where where trials may be conducted by programs emanating from one or more of the above centers. Most active in this respect are the crop improvement programs for rice, maize and wheat.

The cash crops - tea, tobacco, and jute have some research activity within the commodity corporations handling these crops. Cotton research and development has been recently transferred to the Ministry of Industries. However, these industrial crops may be returned to DOA.

B. Staff

Manpower requirements have been studied in detail by APROSC and projections made through the sixth and seventh plan periods (See Table 1). These summaries tend to mask the details of the magnitude of training requirements in the different categories. In the higher level category there are presently 100-125 new B.Sc. graduates being added to the annual manpower supply which will tend to meet the additional requirements as presented. New graduates are already experiencing difficulties in locating positions. Presently the manpower position in the DOA shows:

	High Level
Class I	45
Class II	99 (17 unfilled)
Class III	416
Total	560 plus 58 project posts

	Middle Level
Junior Technician	1167
Junior Technical Assistant	1634
Total	2801

The lowest percentage of filled positions is in class II and project posts. Project posts are for the life of a project and do not attract the best qualified nor do those who accept stay for long periods since they are anxious to obtain regular appointments.

Table 1

Manpower Requirements During the Sixth Five Year Plan*

Fiscal Year	Manpower Requirements		Additional Manpower Required	
	Higher Level	Middle Level	Higher Level	Middle Level
Existing*	711	2377	--	--
1980/81	917	2908	158	560
1981/82	1165	3693	251	813
1982/83	1327	4207	165	531
1983/84	1407	4461	81	263
1984/85	1543	4893	138	447
TOTAL			793	2614

* Data on existing manpwer from Sixth Plan Document; projections from Trained Manpower for the Agricultural Sector, Volume, 1981

Table 2 gives a summary of the manpower by the major disciplines. This summary includes members of these disciplines that are in the various commodity programs research stations, and discipline programs at Khumalter. The summary shows that most posts were filled as of 1980.

Table 2

Manpower Higher Level & Middle level by Disciplines*

Discipline	Approved	Filled	
		No.	%
Agronomy	104	95	81.3
Soils	31	27	87.1
Entomology	23	4	91.3
Plant Pathology	42	36	85.7
Agri. Engineering	52	40	76.9
Agri. Extension	135	129	96.0

* From Trained Manpwer for the Agricultural Sector, Volume, 1981.

Manpower development to upgrade the principal research centers and other is a continuing process. The ICP has sent 33 staff on degree programs - 4 Ph.D and 29 M.Sc. By mid 1984 all should have completed their programs and hopefully be placed in assignments related to their additional training.

C. Accomplishments

1. Technology

Significant contributions to agriculture started in the mid 1960s with the introduction of Taiwan rice varieties and other modern varieties; the introduction of maize composites from CIMMYT and India; and wheat varieties from CIMMYT and India. The systematic introduction and evaluation of varieties through international testing programs has been the chief source of new varieties. In maize, selection and recombination within composites has provided the source of improved varieties. Some synthesis of local varieties with exotic materials has produced Hetaura Composite and Ganesh 2.

Evaluations have included selections for resistance to diseases. Noteworthy have been the rust resistant RR 21 wheat variety; blast resistant Taiwan rice varieties for the Kathmandu Valley; and a downy mildew resistant maize variety (Rampur Composite) for the Inner Terai.

Germplasm collections of minor crops have enabled the identification of better varieties of lentil and chickpea. These have been multiplied and given wide distribution in the country.

Soil science and agronomy have conducted fertilizer response studies in the major crops and developed recommendations covering these crops. Soil surveys have been conducted in approximately 40 districts of the country.

Plant pathologists have evolved protection measures for loose smut in wheat and extensive campaigns are underway to acquaint farmers in the Hills with the merits and use of Vitavax. The wheat seed distributed by AIC is treated which provides a small percentage of replacement seed. Entomologists have developed chemical control measures for the major insects in rice, maize, soybeans and for other crops where insects are critical.

2. Other Accomplishments

a) Discipline Research: The establishment of the research system on discipline lines served for a relatively short period in producing research results of benefit to farmers. This was a stage of technology introduction and evaluation. Significant progress was made in identifying new varieties of rice, maize and wheat and in developing chemical control measures for some of the major pests and diseases.

b) Commodity Research: As the research leadership sought to develop indigenous varieties and technologies they turned to an interdisciplinary structure for the major cereals and for citrus and potato. Later oilseed crops were to be organized in this same way.

The interdisciplinary teams and multilocation testing accelerated technology development by more rapid identification of varieties and varietal adaptations. Pathologists and entomologists developed screening procedures to evaluate promising varieties for some of the principal pests and diseases while soil scientists and agronomists tested these selections for response to fertilizers and under different cultural conditions. The increase in varietal releases is a consequence of the development of the commodity programs.

In the 1970s, the commodity programs established a system of on-farm trials, primarily of varieties. In maize, other types were included in clusters-of-trials. These were primarily researcher-managed trials managed from the main stations and farms.

The outgrowth of the commodity development teams has been the summer and winter crops workshops which are important communication components in the research structure.

c) Minikits as a varietal dissemination and extension system: Minikits have been an activity of the commodity research teams since 1977. These initially involved only three major cereal crops - rice, maize and wheat. As new varieties of other crops were developed as in cases of soybeans, lentiles, and chickpeas, minikits were produced for distribution.

The minikit program has been the subject of close scrutiny, the most recent being a study by APROSC. In spite of several difficulties in packaging, timely distribution, abuse of the intent and mal-distribution within districts, the minikits have been well received by farmers and have had an impact on variety change and production. The program has extended to new varieties at earlier stages of development to larger numbers of farmers than the traditional result demonstration. Follow-up monitoring has brought the research teams in contact with farmers extension workers. The feedback to research through a reporting card system has provided some evidence of farmer reaction to varieties.

Some minikit introduced varieties have spread to cover approximately 100 hectares in only two or three years in individual communities. This has amounted to as much as 70-80% of the area under a particular crop in some instances.

d) Cropping Systems Research: The inauguration of the Cropping Systems Program (CSP) in 1977 expanded the concept of the interdisciplinary team to include socio-economists at the microlevel of research on farmers' fields. On-farm testing had been on a single crop commodity basis in the past with only agronomists and occasionally other Giological scientists involved. In CSP, the total environment of a crop is considered, including the cropping pattern and general socio-economic context of the farm family.

The CSP team has developed an on-farm research methodology that has proved more effective in identifying farmer problems and designing on-farm trials which can develop technologies which will benefit and be acceptable to farmers in specific locations. CSP has identified and

tested technologies built around existing improved crop varieties and together with modest levels of other inputs. The technologies can be used effectively by all farmers in contrast to high input technologies which primarily benefit larger farmers.

e) Transferring Cropping Systems Technology: CSP methodology is being used to test technologies for production campaigns to follow. Results of pre-production verification trials (PPVTs) for Rapti Zone (RAD) and Lumbini Tubewell area indicate that the technologies provide attractive marginal benefit-cost ratios and are acceptable to farmers.

f) Production Programs: A natural outgrowth of the use of the technology has been the development of production programs, initially on a pilot scale and then to area wide production campaigns. The production block approach is effective in attracting other farmers and official attention. The existence of blocks in several areas with more than 100 farmers and covers 100 + hectares in the 1982-83 wheat season attest to the merits of production blocks. Parsa district is making tentative plans to make the production block approah district-wide in 1983.

g) Research Outreach to Support Extension: The recently created research outreach programs reflects the need to relate the research more closely to the real problems of the farmer and establish a closer linkage with the extension personnel. On-farm research from research stations will provide support and utilization of CSP methodology to make the research more appropriate than a direct commodity approach and provide linkages necessary to faciliate rapid transmission of technologies.

D. Administrative/Institutional Problems

1. Administrative

The Asian Development Bank in their draft sector study on Nepal Agriculture stated "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".

Because of organizational weaknesses and the lack of a well-defined strategy, research and extension personnel have a low morale; the role and functions of the research stations and farms are not well defined and the linkages between extension and research are unclear.

More specifically, DOA is subject to political pressures and changes in many ways. The Director General is frequently replaced and the policies and even the administrative structure of the Department are subject to change. Within DOA those responsible for administering research are burdened with day-to-day problems and political pressures so that research management occupies only a small portion of his time. Political pressures, are exerted to make DOA, AIC and ADB vehicles available to the local civil and other authorities. Because the DOA staff are subject to local civil authority, resistance would create problems for the individuals concerned.

Creating and filling posts in DOA are continuing problems. The Ministry of Agriculture may approve a post, but further approval is required from the Ministry of Finance, the Department of Administrative Management and the Public Service Commission. Limitations on filling posts with temporary appointments means that a vacated post (as for instance, when an officer goes on study leave) could remain unfilled for two years or more.

Donor funded projects often call for regular posts, but these are approved only for temporary positions since the employment span visualized is no more than the life of the project. Project with limited time span have a double penalty. Existing rules deny training opportunities to go abroad to temporary appointees. Posts are temporary and generally do not attract the best quality people generally.

The system of promotion within DOA is slow and cumbersome. At the higher level only three levels of gazatted posts exist Class I (highest), II, and III. Promotion between classes often takes many years (16 years or more is not uncommon). Educational qualifications including degrees, are often discounted especially if the degree granting university was not on the Public Service Commission's list. The promotion system lacks objectivity and is subject to pressures and manipulation. "Fighting for promotion" is not an idle expression, but is literally, if not physically true.

Research personnel charged with programs should fall in a logical, organizational framework where the lines of administration are fairly clear cut from the Director General and Deputy Director Generals, to Division or Section Heads or Commodity Coordinators. With the growth of DOA, the responsibilities of the administrative staff have increased without an increase in personnel. The number of Deputy Directors has not changed DOA was created. The line functions from these Deputies have multiplied as the activities have expanded.

Deputies have disproportionate responsibilities. The Deputy Director General for extension is also Deputy Director for services. "Services" include some divisions at Khumalter which have a research as well as and a service function, but only the latter is emphasized in the administrative structure. These are line activities of the research system and should be recognized as such within the organizational structure.

2. Support Services

Certain non-line functions of DOA (including experiment station operations, equipment operation and maintenance, laboratory equipment maintenance, building and grounds operation and maintenance, building and grounds operation and maintenance, library services, and statistical advisory services) cover the main support services which enable the research staff in the line function units to operate effectively.

These services are essentially lacking or only marginally recognized. Equipment in need of reapir may remain idle for months before spares are obtained. Operators are often poorly trained. Thus, the

life expectancy of equipment is less than half what could be expected with normal operation and maintenance. Equipment more often does not "wear" out, it is "mismanaged" out.

3. Impact of These Problems

Given these problems, it is not surprising that the morale of research personnel is low one may ask whether the societal structure of Nepal is conducive to the creation of a research organization that will overcome the worst of these features and allow other modifications and changes as further experience or time makes changes desirable and necessary. The caste system; the concept that an education removes an individual from the manual labor category; and the emphasis on survival of the joint family rather than the survival of society are a few of the factors that militate against sustaining an agricultural research system that can develop new technologies and transfer them to farmmers.

The weakness of the extension system and poor research/extension linkages have been blamed for slow transmission of technologies to farmers. Existing weaknesses are not structural since the extension and research services are within the same department (DOA). Present efforts to improve the extension services and linkages indicate that these problems are recognized and that something is being done to try to correct them within the existing system.

These issues affect the utilization of manpower; research funds; the transmission and utilization of technologies; and the benefits to farmers and society as a whole.

Since agricultural research and development are clearly public sector responsibilities, and government must address these problems. Given the necessary "political will" the research organization can contribute more effectively to the improvement of production and welfare for which purpose the research system was created in the first place.

E. Possible Improvements

1. Institutional Improvements

Three institutional structures or modifications could be considered as a basis for improving research administration.

a) The Existing Framework retains research and extension in the same department. Natural linkages could be strengthened by specific research outreach activities of the research stations which would involve the extension staff in the field evaluation and farmer recommendation stages. Modifications and realignments of disciplines and commodity programs will be necessary to recognize the role of Farming Systems Research as the ultimate research approach, incorporating component technologies from whatever source into a research system to solve farmer problems on the farmers' fields and under their circumstances.[1/]

[1/] Farming Systems will be used in this section. Experiences to date have been crop focused, but cognizant of other components in the systems.

This framework could be the best for serving the needs of small farmers. Technology development and transfer are in the same administrative unit, DOA. Linkages are required with the Department of Livestock Development and Animal Health to properly address farming systems. This could be through their Division of feed and forage development as a part of the on-farm research team.

b) A Semiautonomous Research and Development Institution would provide some degrees of freedom in personnel policy, fiscal policy and research direction; as well as some insulation from political pressures. Programwise, research objectives and approaches could be the same as in a) above. With the necessary stress on production a built-in research/extension linkage is a necessary part of this option to insure a smooth transfer of technology from the research to production programs.

c). Transfering Research to the IAAS would remove it from immediate pressures and facilitate addressing longer range problems and goals. This teaching/research linkage would keep teaching staff and students up-to-date and aware of farmer problems. Extension education would have a close linkage with research in this situation but not necessarily with extension workers.

Hopefully, researchers would be removed firm political pressures. Employment policies and opportunities for scientific recognition might be improved in the academic community. However, a better scientific atmosphere and more productive research could have a negative effect or a more slow-paced positive benefit on benefits to farmers themselves if the research orientation does not remain focus on this client group.

Although this option might be rejected effort should be made to include IAAS as a part of the research system to gain the benefits of the research capabilities of the IAAS staff.

Despite merits of options (b) and (c), improvements within the existing institutional structure can provide the necessary focus on farmers and production so that adjustments can be made in staff requirements personnel policy, budgets, program, and support services.

2. Research Management

Planning cells at the ministerial and department level should i) oversee the needs of research; ii) chart institutional structure that can be developed; and, iii) delegate responsibilities and the freedom needed to carry out programs. Functions of the two planning cells should duplicate one another. This will require attention to personnel policies that will serve the research system, staffing to administer and execute research programs, and a system of support services that will enable the research teams to be effective.

At the DOA level, a project system should be established which will provide:

a) A complete description of the research activities and operators;

b) Clear definitions of the units of work or program performing units, as a basis of program planning, for establishing research priorities, budgeting and accounting;

c) A record of objectives and plans of work, for the guidance of research staff;

d) A basis for direction and management of research with a maximum delegation of responsibility for performance; and

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

3. Support Systems

Support systems include experiment station operations, experiment station development, physical plant operations and maintenance including (central repair shops and parts store), library services, statistical services for experimental design and analysis, and information services.

The administrative services should include budgets and accounts, planning and evaluation, centralized procurement to handle all project procurement including specifications for global tenders and other foreign purchases.

4. Personnel Policies and Staff Development

Vital to improving the research system is a continued upgrading of the research staff. Present capabilities may serve an adaptive research program, but the second and third generation problems which will come as productivity begins to increase will require a higher research capability. A strong staff development program is required and personnel policies adjusted to achieve more productivity from existing staff.

Personnel policies should to recognize socio-economics as a component of research. Currently, socio-economics research is very weak in DOA. Most socio-economists are in APROSC on the Departmental Food and Agricultural Marketing. Yet the scope for socio-economics research in these organizations is limited because of present objectives and structure. Likewise support service personnel require a status commensurate with their value to the research and development system. Personnel policies based upon merit (including both academic achievement and on-the-job performance), as well as location of service, and which allow timely vertical promotions within programs for the deserving will improve morale among research and extension staffs.

Outside academic programs are commonly viewed as not providing the executed benefits to Nepal. The selection of candidates for training can be improved by screening a competitive basis and thus providing training for those most competent. Trainees should sign service bonds commiting themselves to service following the academic period. Effects should be made to identify what trainees will be doing on their return so that they are quickly integrated into the system in a fashion that makes good use of this expensive training.

Identification of candidates early in a given project will provide incentives for better performance before and after training. GTZ's manpower development efforts in the DOA should be coordinated with support from other donors.

The concept of pool officers which would enable projects to be served by staff on regular appointments would provide a greater level of stability of service and would reduce the amount of staff time lost in exploring other job opportunities.

5. Program Direction and Needs

a) Linkages between Farming Systems, Commodity and Discipline Research: Probably the greatest overall research program need is to assimilate the multidisciplined commodity programs and the single disciplined division research programs into the farming system research context to better serve small farmers.

Significant progress is being made to incorporate these activities at the farm level. Research outreach as a concept has been practiced by CSP for the past six years and to a lesser extent by commodity programs through FFTs and minikits. CRS/FSR is a basic step to approaching problems of small farmers which has been used by CIMMYT and IRRI effectively in their on-farm research programs. It is unique to Nepal's concepts regarding research in farmers' fields. Studies which provide an understanding of farmers before designing trials for their fields is an essential prerequisite of on-farm research and the necessary staff must be trained and deployed to pursue on-farm research on this basis. Research outreach as a support to extension presupposes a definite linkage with extension. This linkage can be strengthened and made effective by defining the role of both research and extension personnel as they work together with farmers in their fields.

b) Institutionalization of CRS/FSR: CSR/FSR is not yet an institutionalized component of the agricultural research system. More agronomist are required to enable a more comprehensive approach to farming systems. Socio-economics perspectives are critical to the understanding of the small farmer and his/her circumstances; the design of relevant farming systems research; the critical analysis of agronomic technologies; and monitoring production. A change in job description of research agricultural economists, change in discipline (faculty) classification and the creation of a cadre of socio-economic scientists at Khumaltar and the research stations concerned with research outreach appear to be the minimum that this research component demands. Delinking socio-economists from extension, statistics, macro-economics, or marketing service functions will be essential to enable the change of attitude toward the discipline in general.

c) Grain Legume: The scope for grain legume crops to contribute the improvements in pattern production are just now beginning to be explored. Some of the improved legume varieties are providing production improvements of small volume but of tremendous effect on the marginal benefit-cost ratios because of the price differentials of the marketable product.

Varietal and cultural improvements could further enhance the contribution of these crops. Grain legumes may be a minor crop compared to the major cereals, but they constitute a very significant portion of the diets of the majority of people in Nepal. The establishment of a grain legume research program on a commodity basis would give these crops level of priority that their use deserves. Varietal improvement, a range of maturities, attention to diseases and insects, and cultural practices that affect stand establishment are research areas that should be prioritized. The establishment of an oil seeds improvement program on multidiciplinary lines needs greater budgetary and manpower support.

d) Forage Crops: Livestock are an integral part of the farming system of small subsistence farmers. Improvements in forage production by better crop management will give marginal increases in feed supplies. Specific attention to forage crops; utilization of waste lands; and fodder/fuel trees will be an initial step toward improvement in the livestock component of farming systems. This will require interdepartmental coordination at the national and research site level.

e) Host Plant Resistance and Integrated Pest Management: As cropping intensities and levels of productivity increase as a result of better crop husbandry, the need for genetic resistance in the host-plant varieties as a built in plant protection will be the most economical means of combating many diseases and insects. New selections can be screened for the major pests before the varieties reach agronomics evaluation. Incorporation of host plant resistance into an economical pest management system involving limited use of other means of control will be necessary. These are second generation problems that can and must be answered by the research system.

f) Differential Crop Maturities for Pattern Flexibility: Although there is a variation in maturities of crop varieties, especially rice, the development of a range of maturities for each crop should be a priority of the commodity improvement programs. These maturity ranges could be broadly determined by the CSR/FSR teams. The commodity programs can then select varieties to fit these maturity specifications. Already, farmers are fitting shorter duration varieties of rice and maize into higher intensity patterns. The research teams need to be leading these changes rather than being followers of innovative farmers. The introduction of as many as three maturity levels in each major crop and evaluation of pattern combinations could be used to guide pattern changes.

g) Rainfed Agriculture: Rainfed agriculture is the predominant form of agriculture in the entire country. Emphasis on irrigation is important, but research under these conditions may not be providing answers to the production problems of the majority of the farmers and areas of the country. Some stages of research should be conducted under rainfed conditions so that varietal performance can be evaluated; and fertilizer levels and times of application determined; and plant protection practices determined all under the predominant, cropping patterns in each area.

h) Crop Management: Agronomy and soils are still areas of weakness in the research team and program. These scientists contribute technologies

related to crop culture, fertilizer and compost use that enable farmers to realize more nearly the potentials of the improved varieties. The use of azolla requires a special research team to determine strainal adaptations, methods of culture and utilization of azolla as an alternate source of nitrogen. Greater emphasis on legumes as alternate sources of nitrogen will require the expansion of research activities to measure the contributions, if any, of the use of there crops in farming systems.

i) The Minor Cereals: Finger millet, barley, buckwheat, and perhaps grain amaranths are important elements in the cropping patterns where they are presently grown. They are major crops for many small subsistence farmers in the Hills. Small farmers often have only upland fields while the more well-to-do farmers will have some lowlands if such exists in the area. Research on minor cereals to serve these small Hill farmers comparabl. to what exists for the major cereal crops is needed.

j) Cash crops: A "cash crop" could be livestock, livestock products, tobacco, cotton, tea, or silk etc. The FSR/CSR approach if recognizes that a cash crop is only one part in the farmers' system Research should be designed to assess enterprise interactions and determine which enterprises (cash and non-cash) provide the greatest returns and stability to the farmers' welfare.

6. Other Needs for The Research Systems

a) Manpower development: Continuation of an academic training program is essential to meet manpower requirements of the research and extension programs. Present levels of training have provided significant benefits to the research system. Higher levels of training will be required to meet the challenges of higher production and second generation problems.

b) Experiment station operations: The research system needs a national director of experiment stations. This office should include personnel for research station development, not staff deputed ad hoc from other centers. There is a need for central workshops and parts stores staffed by competent trained personnel to improve the maintenance of equipment. Central purchasing of equipment and supplies could be done more efficiently on a national basis, especially for projects that provide funds for equipment to be purchased on a global tender basis. Writing specifications and advertising should not be entrusted to personnel inexperienced in this area.

c) Physical facilities: Staff housing is a continuing need. Long range master plans for each station would be extremely useful in determining such needs. Service facilities remain incomplete at several stations. The main center at Khumaltar needs a master plan for development that can provide more laboratory space, office space, equipment maintenance and services, administration and library blocks as well as meeting hall facilities.

d) Equipment: Under utilization and poor management of existing uipment could be a serious deterrant to future donor support for equip- nt procurement. Serious assessment of repair requirements and future eds will be beneficial to the research systems. AERP has provided pport to five Terai stations. A more comprehensive review of equipment eds should take all stations, Terai and Hill, into consideration.

e) Support Services: Steps are being made to develop a library stem. Funds should be budgeted to further strengthen the library stem to make it useful to the scientific staff.

Statistical advisory services for assistance to design research and analysis and interpretation of data will greatly increase the value the research undertaken. Also, information services that actively anslate research findings into extension information require adequate nding and well trained and power.

f) Linkages with International Centers: A more formal annual plan s been proposed that would enable the centers to reach agreements with G once a year on i) attendance at seminars etc.; ii) trainees by ne and position for specific training programs; iii) trials to be nducted in Nepal; and iv) other activities in which Nepal and the nters are mutually concerned such as the rice germ plasm collection ogram and collaborative research in cropping systems and rice in the se of IRRI.