

PD - AAL - 460

UNCLASSIFIED
CLASSIFICATION

PROJECT EVALUATION SUMMARY (PES) - PART I

Report Symbol U-447

1. PROJECT TITLE Spring X Winter Wheat-Oregon State University (OSU)			2. PROJECT NUMBER 931-0621	3. MISSION/AID/W OFFICE S&T/AGR/AP
5. KEY PROJECT IMPLEMENTATION DATES			4. EVALUATION NUMBER (Enter the number maintained by the reporting unit e.g., Country or AID/W Administrative Code, Fiscal Year, Serial No. beginning with No. 1 each FY) <u>22-16</u> 8/17/82	
A. First PRO-AG or Equivalent FY <u>76</u>	B. Final Obligation Expected FY <u>87</u>	C. Final Input Delivery FY <u>88</u>	<input checked="" type="checkbox"/> REGULAR EVALUATION <input type="checkbox"/> SPECIAL EVALUATION	
6. ESTIMATED PROJECT FUNDING			7. PERIOD COVERED BY EVALUATION	
A. Total \$ <u>3,007,000</u>			From (month/yr.) <u>7/1/80</u>	
B. U.S. \$ <u>5,007,000</u>			To (month/yr.) <u>4/30/82</u>	
			Date of Evaluation Review <u>April, 1982</u>	

B. ACTION DECISIONS APPROVED BY MISSION OR AID/W OFFICE DIRECTOR

List decisions and/or unresolved issues; cite those items needing further study. (NOTE: Mission decisions which anticipate AID/W or regional office action should specify type of document, e.g., airgram, SPAR, PIO, which will present detailed request.)

1. Eliminate research on improvement of nutritional quality of winter wheat.
2. Establish linkages with USDA through the new project Agricultural Production Technical Assistance.
3. Keep USAID Missions informed of nursery sites and LDC cooperators in their countries.
4. Prepare popular type publications to acquaint non-professionals and organizations with the importance of the project and programs with which the project is associated.
5. Contact trained participants on an annual basis after their return to their home countries.

B. NAME OF OFFICER RESPONSIBLE FOR ACTION	C. DATE ACTION TO BE COMPLETED
S&T/AGR/AP	Continuing
OSU	Continuing
OSU	Continuing
OSU	Continuing
ST/AGR/AP OSU	March 1984

B. INVENTORY OF DOCUMENTS TO BE REVISED PER ABOVE DECISIONS

<input checked="" type="checkbox"/> Project Paper	<input type="checkbox"/> Implementation Plan e.g., CPI Network	<input type="checkbox"/> Other (Specify) _____
<input checked="" type="checkbox"/> Financial Plan	<input type="checkbox"/> PIO/T	_____
<input type="checkbox"/> Logical Framework	<input type="checkbox"/> PIO/C	<input type="checkbox"/> Other (Specify) _____
<input type="checkbox"/> Project Agreement	<input type="checkbox"/> PIO/P	_____

10. ALTERNATIVE DECISIONS ON FUTURE OF PROJECT

- A. Continue Project Without Change
- B. Change Project Design and/or Change Implementation Plan
- C. Discontinue Project

11. PROJECT OFFICER AND MOST COOPERATIVE OR OTHER RANKING PARTICIPANTS AS APPROPRIATE (Name and Title)

S&T/AGR/AP: RI Jackson	Date <u>7/19/82</u>
S&T/AGR/AP: JMYong	Date <u>7/19/82</u>
S&T/PO: F Campbell	Date _____
S&T/AGR: M Mozyński	Date <u>7/28/82</u>
S&T/AGR: A Bertrand	Date <u>7/29/82</u>

12. Mission/AID/W Office Director Approval

Signature: J.S. Robins

J.S. Robins
Director, S&T/AGR
Date: 8/17/82

Project Evaluation Summary - Part II

13. Summary

This Project was last evaluated at the Contractor's site of operation namely at Oregon State University (OSU) and its branch experiment stations in July 1980. In addition, it was determined that an evaluation at CIMMYT and one of the cooperating LDC's was needed. OSU has been working coopeatively with CIMMYT and it was decided that the team should visit the site of this joint effort. The former has been taking one half of the seed from all of the spring X winter wheat crosses made at CIMMYT. OSU has made further crosses with this F₁ material always selecting for the winter and/or faculative type wheat lines. The question has been raised several times about CIMMYT taking over the OSU Contract in one manner or another. This is addressed more fully in the Evaluation Team's Report. Suffiice it to say here that this does not appear to be a very sound solution to the problem of AID reducing its funding of this valuable research.

Tunisia and Turkey were first selected as possible countries to visit. Turkey was dropped from the schedule, primarily because of the early growth stage of the wheat at the time the evaluation was to be carried out. Tunisia was a very good choice since there was a Workshop on Cereal Production which coincided with the Team's visit to Tunisia. This Workshop was partially funded under this Contract.

If A.I.D. funding were to terminate, all of the training for participants from LDCs would be eliminated. Without funds, OSU would not continue its collaborative effort with the LDCs of providing the nurseries and compiling the information gained from the best results. CIMMYT is dependent upon OSU to provide the winter wheat parents for the initial crosses. It is from this hybridization program that CIMMYT has made great strides in developing lines of spring wheat. CIMMYT would have to seek another source of winter wheat germ plasm if OSU were not to continue its present contract.

If the grant to OSU is extended for five years, there would be an additional number of students from the LDCs trained which would enable the countries to expand their current wheat research programs. A continuation would also provide for the nurseries to be sent out for evaluation. More and better germ plasm would be made available to the breeders in the national programs. Nearly all agricultural research programs have a relatively long time frame, and this is particularly true of breeding activities. The next five years should provide more than twice as much germ plasm as the first five years.

The project is basically a research project and should be continued in the same manner and not changed to technical assistance. There is a need for on-going research for graduate students and if the project becomes a technical assistance project, this component would be lacking. Without research there would be no material to provide to the LDCs in the way of nurseries and germ plasm.

The project is a research project and therefore should be in S&T/AGR's portfolio and funded by S&T/AGR. There are at least 25 LDCs which receive the Screening Nurseries and these are not limited to one regional bureau.

The Screening Nurseries are sent to the following developing countries:

<u>Country</u>	<u>Number of Nurseries</u>
Afghanistan	2
Algeria	1
Argentina	1
Brazil	3
Chile	3
Colombia	2
Ecuador	2
India	2
Iran	1
Iraq	1
Jordan	2
Korea	1
Lebanon	1
Libya	1
Morocco	1
Nepal	1
Pakistan	1
Peru	1
Syria	1
Tunisia	1
Turkey	7
Uruguay	1
Yemen	1

The Team recommended that the Project should be continued not on a three year extension, but rather on a five year basis. This longer timeframe would permit time in which to plan a Graduate Training Programs and to plan for and attract a top quality staff. Further more, it would enable the project to more fully contribute to institutional development in poor and middle income countries.

One of the major problems in the LDCs is the lack of trained agriculturalists and the lack of support for those who are employed in agriculture. OSU is well qualified to train Graduate Students in wheat improvement and has made considerable progress in training LDC students.

14. Evaluation Methodology

The Evaluation Team included Mr. Robert Morrow, Acting Chief, Agriculture Development Division, Near East Technical Support Office, and Dr. Virgil Johnson, USDA Regional Wheat Breeder and Professor of Winter Wheat Breeding, University of Nebraska. Mr. Morrow has had considerable experience in agricultural development in the LDCs. Dr. Johnson is one of the foremost wheat

breeders in the U.S. and has considerable experience with wheat improvement programs in the LDCs. The Team was accompanied by Dr. Warren Kronstad (in Tunisia) and Dr. Willie McQuiston, the Project's Principal and Co-Principal Investigators from OSU. The AID Project Manager, Dr. R. I. Jackson also accompanied the Team.

The Workshop held in Tunis provided the Team with an excellent opportunity to learn of the problems resulting from low yielding wheat varieties and to meet with several of the Tunisian cooperators working with OSU. Some of these cooperators have been trained at OSU.

The Team had the opportunity to observe the Winter X Spring Crossing Nursery at CIMMYT and see farmers' fields of spring wheat in Mexico. In Tunisia, the Team spent two days in the fields observing research trials and farmers' fields of winter wheat. The Team's Evaluation Report is attached.

15. External Factors

The Project has excellent linkages to other wheat programs which greatly improved its effectiveness in improving winter wheat in the LDCs. These linkages include cooperative efforts between OSU and CIMMYT as well as to national programs. Continuation of the training programs, both graduate and non-degree, have helped to fill the need for expanded training.

16. Inputs

Participation as well as interest by LDCs and CIMMYT have been quite good. In addition, through the cooperative effort with CIMMYT there has been a very significant input into the Project as noted above.

17. Outputs

LDCs have been supplied with the International Winter X Spring Screening Nursery by OSU. Each nursery contains 250 entries and was distributed to 98 cooperators in 48 countries and 84 percent of the cooperators either returned data or explained why no data were collected. This indicates the high level of interest in evaluating winter X spring wheat germplasm and contributing information as part of an international effort to improve yield potential and stability.

It takes several generations of crossing and selection to obtain wheats which are agronomically acceptable and resistant to the major wheat diseases. The outputs are on target and need no revisions at this time.

The training program at OSU is carried out in a very satisfactory manner. There are always more applications for training than the project can fund. The Workshop is an excellent example of one form of training.

18. Purpose

The Project purpose is:

"To make available to the LDCs high yielding, nutritious varieties of wheat with multiple resistance to moisture and temperature stresses, diseases and insects, together with improved practices for cultivation."

See Team's Report - Project Design Issues.

19. Goal/Subgoal

The project goal is:

"To increase quantity and nutritional value of food crops in developing countries." The goal statement appears to place more emphasis on nutritional value than is actually being done. This is partially a result from the collaborative effort of AID's former project with the University of Nebraska on Wheat Quality. Since this project no longer receives support from AID, the Project focus is more narrow in this regard. This is addressed in the Team's Report.

Nevertheless, progress toward the goals has been substantial although there has not yet been time for the real impact of the Project to be felt at the goal level. Not only has there been notable success in identifying varieties and lines with greater yield potential, but also where wheat can now only be marginally grown. Both will contribute to goal achievement in the near future.

20. Beneficiaries

The immediate beneficiaries of this Project are the wheat research workers in the LDCs. It has been noted above the improved wheat crosses and breeding material have been supplied by OSU to these LDC research workers. The eventual beneficiaries will be the farmers in the LDCs when improved varieties are available for their use.

Through the training provided and the linkages and networks established under this Project, LDC Wheat Research Workers will be better qualified to carry out their work and contribute more substantially to overall wheat improvement efforts. As evidenced from the above discussion and the Team's Report, the benefits are already beginning to flow to these beneficiaries.

21. Unplanned Effects

None at this time.

22. Lessons Learned

The success achieved to date shows clearly how projects such as this one benefit all parties involved, in addition to achieving the purpose and objective for which it is explicitly designed. CIMMYT benefits as a result of OSU's testing wheat lines for disease resistance. It also benefits from the information compiled from OSU's nurseries in the LDCs.

OSU is to be complimented on the way it handles its Graduate Students and trainees under the Program and the way contact is maintained between the students and faculty after they complete the education/training and return home. Students are considered full participants in the research undertaken. This not only gives them invaluable experience in how to do applied research but also makes them excellent cooperators when they return, contact is maintained with most of them, through the yearly visits of the OSU staff members and the Workshops. The lasting relationships that result do much to improve the level and quality of wheat research throughout the world.

Genetic stock, experimental lines, disease and insect resistant populations, and research information are exchanged with other organizations engaged in international activities to insure rapid progress in the improvement of wheat.

23. Special Comments and Remarks

Its noted in the previous sections, the project has continued to progress well, with performance more than satisfactory. The Project implementation has been smooth, timely and effective, with results generally exceeding expectations.

However, there are matters that need to be addressed. Although these are largely external to the project itself and relate to issues that go beyond its scope and purpose, they are also concerns that cannot be ignored. In fact, this Evaluation was specifically charged with commenting on some of these, particularly the need to make recommendations regarding termination/extension of the Project.

The problem is that, regardless of how successful the Project is, or continues to be, the underlying need for it will continue the need for development of improved varieties which are resistant/tolerant to diseases/insects, better adapted to less favorable environments and/or potentially capable of higher productivity. The question becomes, when and in what way does AID cease to support such efforts and/or shift such support to other projects. The issue is not unique to this Project; AID is funding numerous projects which have this ongoing need characteristic. This matter has become more critical as AID's research/development resources continue to decrease and the share of its R/D budget needed to continue the funding of this category of projects expands.

One of the points presented to the Team addressed in the Scope of Work for the Evaluation was to examine the possibility and probability of CIMMYT contracting directly with Oregon State University for these project services. The Team was unanimous on this point and agreed that it was not likely nor very feasible for CIMMYT to take over Project funding and management. The Team went further and suggested that the OSU contract should be for five years instead of the usual three in order for OSU to be able to plan more efficiently for the Graduate Training component as well as to be able to retain a very qualified staff.

Attachment:
Team Evaluation Report

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ISN 15478

1319421/17

Spring X Winter Wheat

Team Evaluation Report

Dates and Places:

March 30 - April 2, 1982
CIMMYT, Obregon, Mexico

April 12 - April 16, 1982
Tunisia

Team Members

Dr. Virgil Johnson, USDA
Mr. Robert Morrow, AID

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I. EVALUATION OBJECTIVES AND ISSUES

The central objective of the evaluation were twofold: (1) determine if the project is fulfilling the purpose of providing plant breeding material to wheat breeders, training personnel to carry on wheat development programs and to develop international institutional linkages to maintain and facilitate wheat development programs; (2) if the purposes are being met (or not being met), the evaluation team was charged with making recommendations as to a project extension or other disposition of the project. If a follow-on set of activities were to be recommended financial and contractual arrangements would necessarily need to be discussed.

Other issues, common to most evaluations, were to (a) assess adequacy of the project design, (b) determine if the management support was appropriate - both from AID and by contractors, (c) ascertain if there were any particular unforeseen factors associated with the project and (d) identify interesting lessons to be learned from the project which might assist AID, or others, in programming and management of similar type projects or development endeavors.

II. PROJECT GOALS AND OBJECTIVES

The following statement and logical framework matrix specify the purposes to be achieved by the project.

GOALS AND OBJECTIVES

To assure that LDCs, where winter wheat is a major food grain, can obtain and effectively take advantage of the latest improved winter wheat varieties and technologies suitable for increasing yields of high quality grain, especially on small farms and in environmental conditions which are now marginally productive. In particular, this overall goal includes the following specific objectives:

1. Develop and maintain a germ plasm bank for superior winter wheat cultivators for hybridization.
2. Create greater genetic diversity for improvement of winter and spring type wheats.
3. Improve nutritional quality in winter wheat.
4. Apply suitable selection pressures to identify superior winter wheat germ plasm with improved yield adaptation and disease resistance.
5. Disseminate early generation breeding stocks to selected LDC cooperators for further selection.
6. Distribute superior agronomic lines and fixed varieties to all cooperators.
7. Determine those attributes necessary in winter wheat cultivars to insure soil erosion control, productivity and stability in concert with improved dryland cultural practices.

8. Train scientists who have responsibility for adaptive research.
9. Establish new relationships and expand existing ones between LDC agencies and institutions, U.S. universities, USDA, USAID Missions, CIMMYT, FAO, foundations and international centers.

III. EVALUATION METHODOLOGY

The evaluation followed standard methodology of (a) reviewing documentation relevant to the project, (b) ascertaining progress by analyzing reports, observing plant material in the field, (c) interviewing project personnel, farmers from the U.S. and developing countries and wheat program personnel in developing countries and (d) arriving at conclusions and recommendations by final discussions between team members and project staff.

1. Principal Material Reviewed

- The Project Paper
- Contracts with Oregon State University
- Annual Reports
(which lists distribution of breeding material, staff trained and linkages developed with the world wheat development community)
- Prior Evaluations
- New Proposal for Extension of Activities
- Master Data Book, a compilation of field results and characteristics of specific new wheat lines

2. The list of names of principle contracts are attached at the end of this report.

3. A list of countries which had spring x winter wheat nurseries in 1981 is also attached.

IV. ASCERTAINING PROGRESS

A. SITE VISITS

The evaluation team, and project staff, visited field work (wheat breeding and agronomic trails) at CIANO a major Mexican national research station near Ciudad Obregon, Mexico from March 30 through April 2. This site visit enabled the team to observe the specific spring x wheat breeding efforts and to see how this project efforts fits into the CIMMYT program, and the Mexican national program. The site visit also enabled the team to discuss wheat production with Mexican farmers and a group of Oregon wheat farmers, who contribute directly to the wheat improvement program in Oregon and who were visiting the same experiment station and farms in Mexico as was the evaluation team.

The second set of sites visited were in Tunisia where the team attended a wheat production seminar and visited field trails of Beja, Le Kef, and two sites near Kesserine, Sbeitia, Rohia, Maktar, Silliana.

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project: _____
From FY 76 to FY 82
Total U. S. Funding _____
Date Prepared: _____

Project Title & Number: **IMPROVEMENT of Winter Wheat for Developing Countries Based on Hybridization of Spring x Winter Forms**

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Program or Sector Goal: The broader objective to which this project contributes:</p> <p>To increase quantity and nutritional value of food crops in developing countries.</p>	<p>Measures of Goal Achievement:</p> <ol style="list-style-type: none"> 1. Significant increase in per capita production of major food crops in LDCs. 2. Improvement of nutritional quality of major LDC food crops. 	<p>MEANS OF VERIFICATION</p> <ol style="list-style-type: none"> 1. Official production and population statistics (FAO, Foreign Agricultural Service estimates). 2. Nutritional quality surveys in LDCs. 	<p>IMPORTANT ASSUMPTIONS</p> <p>Assumptions for achieving goal targets:</p> <ol style="list-style-type: none"> 1. LDCs will actively attempt to expand food crop production. 2. Nutritional quality can be improved without major constraints on yield.
<p>Project Purpose:</p> <p>To make available to LDCs high-yielding, nutritious varieties of wheat with multiple resistance to moisture and temperature stresses, diseases and insects, together with improved practices for their cultivation.</p>	<p>Conditions that will indicate purpose has been achieved: End of project status.</p> <ol style="list-style-type: none"> 1. New, superior varieties available to farmers in LDCs. 2. Research and development activities in wheat effectively assumed by LDC agencies and international institutions and linked by communications network. 	<ol style="list-style-type: none"> 1. Publication and reports of LDC governmental agencies; on-site inspections of seed supply. 2. On-site inspection and review by AID/W personnel and consultants. 	<p>Assumptions for achieving purpose:</p> <ol style="list-style-type: none"> 1. Solutions can be found to major constraints. 2. Agriculture extension services are able and willing to promote proven practices. 3. LDC research institutions develop adequate capabilities.
<p>Outputs:</p> <ol style="list-style-type: none"> 1. Identification of superior germ plasm. 2. Incorporation of desirable traits into broadly-adapted varieties suitable for LDC use. 3. Evaluation of improved varieties and practices in LDCs. 4. Training of LDC personnel in wheat research. 5. Establishment of effective linkages with LDC agencies. 	<p>Magnitude of Output:</p> <ol style="list-style-type: none"> 1. Not quantifiable. 2. At least 2 superior varieties for each major agroclimatic region. 3. At least 1 test location in each major winter wheat growing LDC. 4. Total of 10 LDC trainees completing training. 5. Linkages with 2 international centers and at least 5 LDC institutions. 	<ol style="list-style-type: none"> 1. Reports by contractor. 2. Reports by contractor, USAIDs, LDC cooperators, and international agencies. 3. Same. 4. Contractor reports. 5. Contractor reports, communications and reports from LDCs and international agencies. 	<p>Assumptions for achieving outputs:</p> <ol style="list-style-type: none"> 1. LDCs and USAIDs will request technical assistance; research findings will be available. 2. Cooperation of LDCs. 3. Interest and resources exist in LDCs. 4. Collaboration of international institutions. 5. Sufficient interest among LDCs and qualified personnel.
<p>Inputs:</p> <ol style="list-style-type: none"> 1. AID/W provides financial support and project guidance. 2. Contractor provides qualified personnel and backstopping facilities. 3. Participating personnel and cooperation provided by 1) LDCs, 2) USAIDs, and 3) international organizations. 	<p>Implementation Target (Type and Quantity)</p> <ol style="list-style-type: none"> 1. AID/W funding at approximately \$310,000/year. 2. 24 worker months/year technical personnel; adequate laboratory facilities; 10 or more acres field research area. 3. Not directly quantifiable. 	<ol style="list-style-type: none"> 1. AID/W records. 2. Contractor reports, on-site inspections. 3. USAID reports, on-site verification. 	<p>Assumptions for providing inputs:</p> <ol style="list-style-type: none"> 1. AID/W funding will be available on schedule and in quantity agreed upon. 2. Contractor will have necessary qualified personnel; university facilities will be available to project. 3. International organizations, USAIDs, and LDCs will have personnel and resources to support this activity.

The Tunisian visit provided an excellent opportunity to see the results of project trained personnel at work at the experiment station on work with cooperating farmers.

B. REVIEW OF REPORTS

The distribution of plant material, lists of trained staff, publications, "linkage development" and other verifiable indicators of progress were well documented in the annual reports. The types of reports are listed in Part III page 2.

C. EXPERT OPINION

A noted, "world class", expert in wheat development participated in the evaluation as the specialists to review the appropriateness of methodologies employed in the project and achievements of the project, the usefulness of results and effectiveness of the institutions and personnel involved with respect to financial outlays and years of effort. The results of this investigation are set forth in the next session.

Evaluation Report
V. A. Johnson
AID Project 931-0621 (Oregon State University)

Project Design

Current Appropriateness of Project

The purpose of the project, to improve winter wheat for developing countries based on hybridization of spring and winter wheat forms, follows the rationale that new gene pools in wheat must be created if higher yields are to be achieved. It has been assumed that spring x winter wheat forms have become genetically isolated from one another as a result of several decades of hybridization within each form with relatively little hybridization between the two forms. It is perceived that massive systematic hybridization of winter with spring wheats will lead to new gene pools to serve as the genetic basis for significant further yield increases in both spring and winter wheat forms. The concept and rationale of this approach are fully as appropriate and sound scientifically and practically at this time as they were when the project was initiated in 1976.

It must be borne in mind that six years in winter wheat breeding is a very short period of time for evidence of projected yield increases to be obtained. Winter wheat varieties normally require a minimum of eight years for development and ten to twelve years is a more normal time span. This results from the difficulty of advancing hybrid winter materials by more than a single generation each year because of vernalization required by the winters to induce seed production. By contrast, spring wheats, with no such vernalization requirement, can be advanced by two or more generations per year resulting in a development period that may be only half as long as that of the winter wheats.

Validity of the approach is well supported by accumulated evidence among spring forms out of the OSU-CIMMYT spring x winter hybridization system. The spring forms consistently exhibit yield superiority over currently grown spring wheats in the range of ten to fifteen percent. If such yield advantage can be measured in the spring lines from the project, similar yield advances can be reliably projected for the winter wheat out of the project. Theoretically, if large yield advances occur in the spring forms, they should occur as well in the winter forms from the project. Preliminary performance data from the winters bear this out.

Algeria currently has two experimental lines from the spring x winter program under seed multiplication. It is anticipated that the seed will be distributed to Algerian farmers during the next two years. The lines which show a ten to twenty percent yield advantage over currently grown Algerian varieties, can be expected to occupy one half of the four million hectares of wheat on the high plateau of Algeria. Morocco also is currently multiplying seed of two lines resulting from spring x winter crosses.

Spring x winter-derived lines show excellent promise in Pakistan -- particularly in the hill country where acceptable wheat varieties have not been available heretofore. The same appears to be true as well in Iran based on limited information coming from that country.

Winter lines from the OSU project show a fifteen percent advantage over 'Bolal', currently the best winter wheat variety on the Anatolian plateau of Turkey. It is predicted that these new lines could eventually occupy as much as two-thirds of the vast winter wheat production area in Turkey.

V. FINDINGS

A. REPORT OF THE WHEAT PROGRAM DEVELOPMENT SPECIALIST

The report of the wheat development specialists, an external evaluator, is quoted in its entirety with the exception of the author problems and issues section, which the team agrees with, but these points are incorporated and presented as the team's findings and recommendations.

Lines from spring x winter hybridization show high promise in Latin America. Winter lines from the OSU project show particular promise in the highlands of Peru where wheat must be grown successfully if the country is to achieve self-sufficiency in wheat production.

Seven spring x winter lines are under seed increase in Chile. Brazil will release a spring x winter-derived line that currently is undergoing seed multiplication. Argentina already has released a spring x winter line. Consistent with evidence from other parts of the world, these new wheats consistently show yield superiority over currently grown varieties in Latin America in the range of ten to twenty percent.

The full economic impact of this impressive number of outstanding wheats from spring x winter hybridization in developing countries cannot be assessed this soon. I believe, as a wheat breeder, that it will be enormous. Out of the program will come the full spectrum of growth habit types ranging from true winter forms through facultative or intermediate types to the spring forms that require no vernalization. Many of the LDCs have need for facultative or weak winter wheats that can be seeded in the fall and which will provide greater protection against conditions than do fall-sown spring wheats now used.

The OSU project does a remarkable job identifying such types, through its system of early selection at sites in Oregon and Turkey. Few, if any, other sites are so well suited for this purpose. Mexico cannot because its winter conditions are too mild; most other U.S. wheat areas impose a requirement of winterhardness much in excess of that needed in LDCs and would eliminate extremely valuable facultative and weak winter types.

OSU in cooperation with CIMMYT has organized the best system for identification and efficient use of the world's superior wheat germ plasm that I have had opportunity to observe and study. It has identified effective screening and selection sites and has instituted, as well, selection procedures to achieve most rapid breeding progress. Its data management

system provides for swift summarization and analysis of performance data and worldwide distribution to cooperators in LDCs and other countries. Through the screening and evaluation nurseries and by visits of OSU project personnel to these countries firm linkages have been established. The training program conducted as OSU as part of the project provides a steady flow of trained breeders and agronomists back to LDCs which assures continuation of the linkages. Finally, OSU project personnel have achieved a high level of international recognition and visibility and have gained the respect and confidence of the scientists and agricultural administrators in the wheat-producing LDCs. The importance of this to the success of the project should be emphasized.

Although much progress already has been made in many developing countries, none at this time, with exception of Turkey, could maintain effective wheat improvement programs independently of projects like that at OSU and the international centers. I believe that such national programs would flounder without continued inflow of improved germ plasm and involvement of outside groups. The remarkable progress of wheat improvement and production in Turkey, the country in which OSU has been involved the longest, provides evidence of the soundness and effectiveness of the OSU approach. Similar progress can be made in other LDCs but will require, for several years, continued assistance of the kind that the OSU project provides.

Linkages established by OSU with wheat improvement centers in developed countries are extremely important to the success of the project. Developed countries provide highly reliable data on performance and attributes of new wheat lines from the OSU project. Equally important, they provide valuable new germ plasm for use by OSU and CIMMYT in spring x winter crossing programs and they effectively use the lines from OSU to improve their own wheat production. Concern that major involvement of developed countries in the project may constitute a kind of U.S. subsidy to them really has little, if any validity. The contribution of these developed countries to rapid identification of superior wheats for the LDCs that have only limited capability to do so themselves is needed for success of the project. New higher yielding wheat varieties, whether in developed or less developed countries, contribute significantly to total world wheat production.

Methodology

Procedures used by project personnel continue to be entirely appropriate. In fact, as a breeder, I do not find weaknesses in the method employed nor can I offer suggestions for their technical improvement.

The selection priorities and sequence clearly have been designed to achieve maximum efficiency and speed in managing large numbers of breeding materials and in dissemination of information and germ plasm. As with any productive plant breeding endeavor the project activities must have continuity over time to be effective.

The water and fertilizer responsive semidwarf wheats that were the cornerstone of the "green revolution" contributed strongly to a large increase in spring wheat productivity. Since the "green revolution", what productivity in terms of

genetic potential has been on a plateau except for small advances attributable to refinements of the basic germ plasm. Another significant jump in wheat yields can be anticipated from the OSU-CIMMYT spring x winter hybridization program.

CIMMYT spring wheat breeders indicated to me that the most productive new spring wheats in international trials are lines from spring x winter crosses. Their data indicate yield superiority of approximately ten percent over currently grown spring wheats. Similarly, preliminary international performance data from winter and facultative lines from the spring x winter crosses indicate comparable superiority over currently grown winter wheats. This is expected since the mixing of spring winter germ plasm should contribute as much to winter forms as to spring forms. It should be emphasized that available performance data strongly support the scientific premise on which the project initially was conceived -- namely that genetic isolation of spring and winter wheats has occurred which, if overcome, would enhance the productivity of both forms.

Validity of Assumptions

Assumptions upon which the project was designed and implemented remain entirely valid. In LDCs with which I am acquainted, wheat research and extension capabilities are improving as direct results of the OSU project. This comes mainly from the large number of OSU-trained breeders and agronomists who have returned to their respective countries and who now hold important research and administrative positions. These will continue to be key people in strengthening research, teaching and extension of LDCs along the lines of U.S. Land Grant Universities.

The status of current capability differs in each LDC as does the rate at which that capability will improve, due to internal economic and political constraints in each. Few LDCs, with exception of Turkey, have yet achieved the level of capability that would permit them to carry out effective programs of wheat improvement without continued outside assistance. The OSU project effectively provides such assistance.

Project Implementation

The OSU contract staff, particularly the project director and associate director, are highly capable and effective. They are so perceived by all of the people at CIMMYT and in Tunisia with whom we had contact and by former students in these countries. Strong support of the project by the OSU administration is evident.

The communication and linkage network developed by OSU is thorough and effective. It is one of the best that I have seen.

Support level by AID appears to be in good balance with the existing OSU capability. A possible exception may be the training component of the project. I believe that OSU has the capability to effectively provide advanced training for more LDC students than is possible with AID funds assigned for that purpose.

While significant progress has been made already, the nature of the project requires considerably longer time than the six years since initiation to achieve "end of project" status.

B. MEETING OBJECTIVES

The central objective of providing new wheat breeding material is documented in the above report and the list of cooperating countries in the 1981 nurseries trials attest to the progress having met the test of providing new material and the project's potential of significantly contributing to increases in world wheat production.

Additional objectives, which in the long run are of major importance, are the (1) training of personnel, (2) establishing links with other wheat improvement programs and (3) contributing to developing countries institutional development. In regards to these objectives the 1981 Annual Report lists fifteen students/researchers who have completed their Ph.D. or M.S. degrees with assistance from the project and thirteen who are currently in the program. The mix of students are, in the view of the team, an appropriate mix of about one third U.S. students and two thirds from poorer and middle income countries. The 1981 Annual Report lists event journal articles which project staff and students have published and nine presentations and articles which of involvement in developing linkages and in making improvement in the international wheat development network vary from (a) simple exchanges of material with, for example, England to (b) bringing in potentially very significant new material from China which incorporates the rare traits of earliness, hardiness and high productivity and to (c) rather intensive work with the Tunisian and Turkish national wheat improvement institutions. In summary all significant project objectives are in a state of being satisfactorily met.

C. PROJECT DESIGN

The evaluation team has no major concerns with the project design but has some concern - matters of degree - with two points in the design. The objectives of the project call for the "improvement of nutritional quality of winter wheat" and determination of attributes to insure soil erosion control.....in concert with improved dryland cultural practices". While it may be self-evident that these objectives are not major objectives of the project it may be worthwhile to explicitly cast them as such, or define what is meant, in any project extension, as in reality maintenance of current nutritional characteristics - coupled with increased yield would "automatically" increase nutritional well being on an aggregate basis without special efforts at selection for improved nutrition characteristics.

Given limited resources it is doubtful if any major effort should be expanded on selection lines for physiological or other characteristics just for erosion control. Finally it may be beyond the scope of the project to do very much with respect to testing production practices if that is what is implied in

this objective. Clearly the distributed lines should not, in the best of worlds, require any "special" production technology than that already potentially available to farmers, or if new techniques are required they should be identified, but this level of cultural practice identification may routinely be recorded in nursery trails rather than any implication that the project can assume support to field and agronomic trials.

D. CORRECTIVE ACTIONS TO BE TAKEN

Although appropriate technical papers have been published and linkages have been developed with wheat development organizations, the evaluation team found no "popular" type publications which would acquaint non-professional people and organizations with the importance of the project and programs with which the project is associated. One publication by CIMMYT on the importance and potentials of spring x winter wheats fails to appropriately acknowledge the AID/Oregon State University role and breeding materials developed under the project.

Greater publicity should be given to the project stressing the three roles of the project - wheat breeding, professional staff training and contribution to international institutional development and the effective and efficient use of this network on one of the world's most important crops.

VI. CONCLUSIONS AND RECOMMENDATIONS

The evaluation team was to determine if the project is meeting its objectives and to recommend a future course of action for the project. With respect to whether the project is fulfilling its purpose of supplying superior wheat breeding lines to LDC's and contributing into their building of viable institutions the project is clearly successful. The project has not yet contributed to the overall goal of increasing wheat production but will do so in the next year or two as varieties with spring x winter backgrounds are put into production. The long run contribution to production objectives are very great - which leads to the following recommendation.

The project staff and administration at Oregon State University has submitted a three year proposal to extend the project under AID funding. The evaluation team does not feel a three year extension is appropriate for a project in which the major contributions will be forthcoming over several more years. A three year extension is not sufficient time in which to plan a graduate training program nor to plan for and attract top quality staff. A longer time frame would also enable the project to more fully contribute to institutional development in poor and middle income countries. Clearly, the wheat breeding work needs to continue for many years. The activities which the project has developed are an integral part of the international wheat improvement programs and the activities should persist over many decades. Who finances the work is a separate issue. Conceptually the work might be viewed in a manner similar to how the work at the international research centers is viewed. That is,

there need not be an expected terminal data as is the case with many bilateral development projects where the host government picks up the project activities and the financing after a period of time in which external technical assistance is not required. In the case of the project being evaluated the U.S. government is the "host country".

With respect to sources of future financing the evaluation team does not agree with a prior evaluation which recommends seeking project financing from the international community and management of the project by CIMMYT. For reasons expressed below this evaluation team recommends AID continue financing and monitoring the project.

The reasons of seeking financing from the international community are quite clear - the program is a part of the international effort so that community should pay - thus saving the U.S. taxpayer some of the financial incidence.

Probably the only practical mechanism for tapping the international community would be through the Consultative Group for International Agricultural Research (CGIAR) and in turn through CIMMYT to contract for, and manage project activities. Because the U.S. finances about twenty-five percent of CGIAR's activities directly and an additional amount indirectly through the U.S. contribution to the World Bank, FAO, and through tax preference laws for U.S. foundations, the savings to U.S. taxpayers if the project were to be CGIAR financed might be about forty to fifty percent. However, CIMMYT would require twenty-five percent overhead to administer the contract with OSU thus reducing the "savings" to somewhere around twenty-five to thirty-five percent of project costs. This is not an insignificant amount of savings if CGIAR/CIMMYT were to pick up the project as it is now designed. The problem is that CIMMYT would probably not pick up the project as is, even if the U.S. were to provide bridging financing until such as CGIAR might budget for the project. The reasons CIMMYT would not likely contract for the project as it is now designed is that they do not normally place emphasis on U.S. graduate training, nor normally contract out significant block of work to third parties in general or the U.S. institutions in particular. Even if CIMMYT might be persuaded to contract for these project activities the evaluation team believes the balance of work might suffer if CIMMYT were to manage the entire set of activities. The current division of labor between CIMMYT and OSU - with CIMMYT emphasis on spring type wheats generally and spring types coming from the OSU project and with OSU's emphasis on spring x winter breeding and on the resultant intermediate and winter types - creates a very good program balance which might be shifted unduly toward spring types with CIMMYT managing the entire effort.

In addition to the reason cited above the evaluation team believes it is a healthy professional relationship to have CIMMYT and OSU engaged in each others programs but without one or the other being in a supervisory capacity. A final reason for AID to continue financing the project is that AID can benefit by association with a successful project.

The evaluation team is not unmindful of the limits of AID's financial resources. It is also aware that it does not know all, or perhaps even a majority of AID research and development projects. The team is only sure that the project under evaluation is using tried and true plant breeding, training and institutional development techniques and that there are undoubtedly other projects in AID's portfolio which are much more experimental and which are not addressing one of the world's most important food crops.

VII. LESSONS LEARNED

In addition to the overall project findings the evaluation team believes one of the significant lessons learned is in regards to the cooperative role U.S. institutions can play in working with the international research centers. The team believes the centers are truly centers of excellence but the OSU project demonstrates that this particular U.S. institution has something of significance to offer in the international wheat program. In addition to the positive synergetic effects of the plant breeding work per se OSU's capabilities go beyond training and plant breeding. For example, the electronic data processing system designed by OSU to record the findings of breeding and nursery trial results has been adopted by CIMMYT and its EDP system.

As mentioned in the conclusions the team believes there is also a positive developmental effort for developed and developing countries to have as wide an exposure to scientists from a variety of institutions and to be trained in a variety of institutions. The team believes the U.S. institutions may have something to offer in rice and corn programs as well as wheat and AID should explore additional cooperative projects.

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Abbreviations:

INRAT: Institute National du Recherche Agronomique du Tunisie

INAT: Institute National d'Agronomie du Tunisie

ESA du KEF: Ecole Superieure d'Agriculture du Kef

MOA: Ministry of Agriculture

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