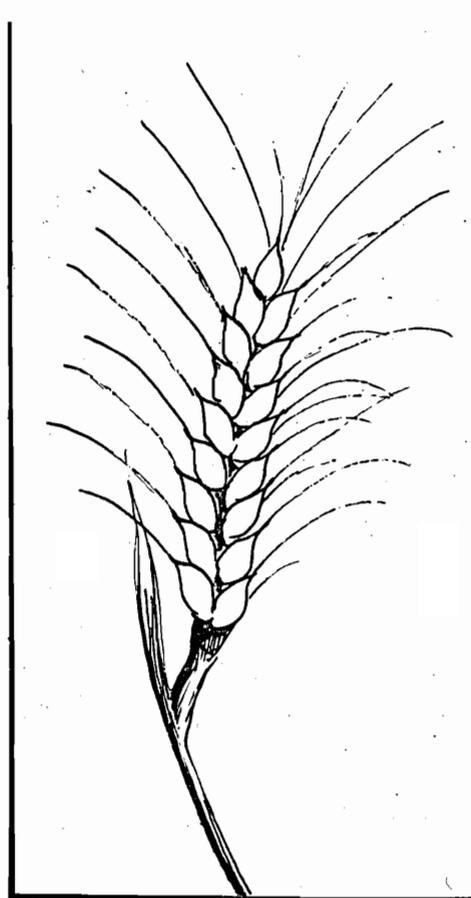


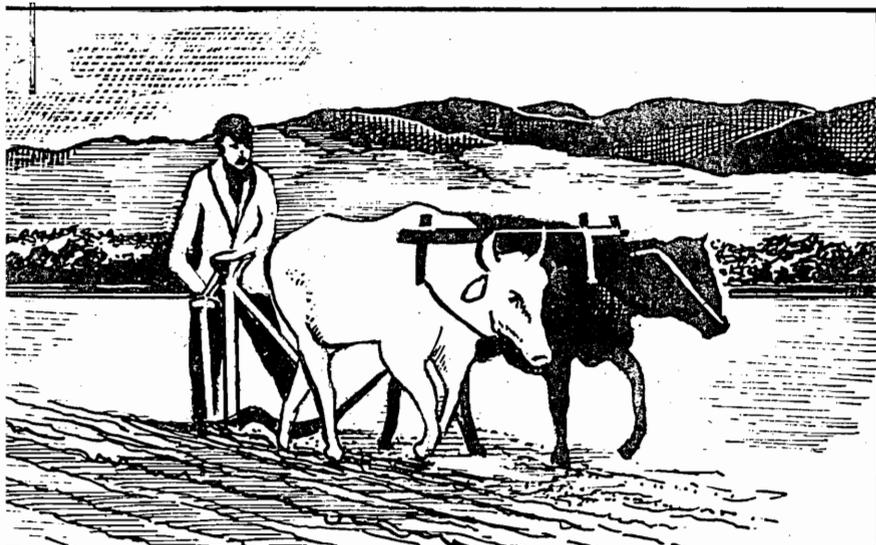
# BARANI WHEAT PRODUCTION IN pakistan



Oregon State University/USAID Team



FEBRUARY  
1973



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"BARANI" WHEAT PRODUCTION  
IN PAKISTAN

Oregon State University/USAID Team

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APPENDIX - Sample Job Description ( Turkey)

## SUMMARY

Within a 10-day period it is impossible to explore in depth all of the facets of the problem of "barani" wheat production. We have read as many reports and papers on the subject as possible and have travelled through parts of the area, visited research stations, farmers and Agriculture officials. Based on this experience we have written the following report outlining our observations and offering some suggestions.

We believe that there is a real potential for increasing wheat production in the "barani" areas of Pakistan. We believe that a program should be followed (as proposed in both USAID and GOP documents) which includes both short and long time efforts.

For the immediate future, there is little reason to doubt that much wider use of improved high yielding varieties, supplied with moderate amounts of fertilizer will not produce significant yield increases. The amounts of fertility will of course vary directly with the amount available soil moisture with the higher rainfall areas offering the greatest potential return with lowest risks. Improved practices such as deeper plowing where possible, removal of weeds, etc. should be encouraged.

Looking further toward the future, a research and training institute for "barani" agriculture has been proposed. We believe that such a center, properly staffed and equipped can provide the technology required to reach sustained optimum wheat production levels.

We have considered several other factors required for campaigns to increase wheat production such as seed, fertilizer, extension education programs, farmer credit and others and have commented on them briefly. A plan for training and implementing a wheat production campaign is included as part of this report.

### Introduction

Since February 1969 Oregon State University, through a contract with USAID, has had a team of specialists working in Turkey to assist the GOT and Turkish farmers in their efforts to increase cereal production. The OSU team in Turkey has been engaged in developing adaptive research and extension education programs. These programs are designed to develop a system of agricultural practices including improved tillage methods for soil moisture conservation, use of improved high yielding varieties (HYVs), use of fertilizer, control of weeds and other practices which will lead to a significant sustained increase in wheat production for the Turkish farmers. Based on our experience in Turkey we were requested to review rainfed (barani) cereal production in Pakistan and, if appropriate, suggest means for improvement.

Within the time available we have reviewed several papers on the subject of barani agriculture by both Pakistani experts and study teams from other areas. We have also studied proposals and plans for programs to increase production in the barani regions.

We have travelled over as much of the region as possible to personally observe field conditions, research stations and extension education organization and operation.

With Dr. Douglas Jones we were privileged to meet and discuss problems of wheat production with many of the American technicians at AID as well as the following Pakistan officials.

1. Dr. M. Abdullah, Agricultural Development Commissioner, Ministry of Agriculture and Underdeveloped Areas, Government of Pakistan, Islamabad
2. Dr. Musehbuddin Khan, Director of Agriculture, Government of Punjab, Lahore
3. Dr. M. Maqsood, Joint Secretary (P&E), Agriculture Department, Government of Punjab, Lahore
4. Dr. Sanaullah, Director, Punjab Agricultural Research Institute, Lyallpur
5. Mian Said Khan, Director, Agriculture Research Institute, Tarnab, Peshawar
6. Mr. Y. A. Shad, Deputy Director of Agriculture, Rawalpindi

We also met and discussed wheat production problems with many other technicians at the stations.

We wish to thank all of the people we met for their hospitality and cooperation.

## I. Observations

While it is true that most of the wheat in Turkey is produced under rainfed or "barani" conditions there are many dissimilarities in climate, rainfall pattern, soil type etc. which preclude drawing parallel assumptions based largely on total amounts of annual rainfall. These differences do not preclude the applicability of certain basic concepts in cereal production but rather indicate the need for the adaptive research necessary for application of the concepts in a system which will result in increased production. For example in both Turkey and in the barani areas of Pakistan insufficient moisture during the wheat crop growth period is the major factor limiting wheat yields.

Even though as much as 40 inches of annual rainfall occurs in parts of the barani regions most of this precipitation occurs during the monsoon season when wheat is not grown. Much of the water is lost through run-off and evaporation so that during the season of the wheat growth, when much less rainfall occurs, there is actually only a small part of the total annual rainfall available for crop growth. Hence, the total rainfall is not a true indication of crop growth potential.

Only that portion of the rainfall which infiltrates and is conserved in the soil and which is available to the growing wheat crop is significant. Since available water is the chief limiting factor obviously the potential for increasing available soil moisture is greater in areas of higher precipitation. It follows then that wheat yield potentials are greater in the area of greater precipitation.

Based on our observations we believe that wheat yields can be measurably increased in the barani areas. Short term programs requiring increased inputs of improved seed and use of fertilizer should produce quick returns. For example it is most unfortunate that this year, when the rainfall is very favorable, a great opportunity is being lost because improved seed and fertilizer are not available or not being used.

We have chosen to categorize our observations of the wheat production effort in the barani areas into the following which we feel are essential:

A. Research

We feel that any program which involves expenditure of significant amounts of man power and material resources should be based on sufficient research and experience to justify a high probability of success. The ingredients necessary for increased cereal production can be broadly listed as follows.

To reach optimum production levels long time efforts including soil development programs such as suggested in the "barani" team report will be required, as well as developing improved tillage and management systems for wheat production.

1. Improved Varieties

We visited wheat breeding stations at Peshawar and Lyallpur where very active programs are in progress.

Several technicians at both stations who have been trained at CIMMYT or other centers of excellence are employed.

Cooperative programs are being carried forward which provide for exchange and testing of germ plasm from all over the world.

Varieties are being developed and selected for barani regions.

We believe this program is satisfactory and progress is being made.

The second stage of improved seed production, that of increasing and distributing the selected seeds is not moving as desired. Limited seed storage facilities and lack of growers capable of increasing and maintaining clean, pure seed are constraints which deserve attention.

## 2. Soil Fertility

It is clearly evident from our observations that sufficient amounts of soil nutrients are not available in many fields of wheat now growing. Wheat crops where fertilizer has been applied are superior to unfertilized fields. There is considerable published evidence that most of the soils in Pakistan are deficient in both phosphorus and nitrogen. There is a competent and active soils testing and research program in action at Lyallpur. The great majority of the research work done and in progress is on irrigated soil conditions. However, it is worth repeating that during our travel in the barani areas we observed obvious responses to application of fertilizers. It must be remembered that, when available soil water is limited, the proper application of fertilizer becomes more critical. Assuming the use of HYVs, the amount of fertilizer the crop can utilize is limited by the amount of water available. Judicious application of fertilizer, particularly nitrogen, is essential to prevent either waste of the expensive material or damage to crop, or both. Research is lacking in the use of fertilizers in the barani regions.

### 3. Plant Protection

We did not have an opportunity to obtain extensive information in this area. However, we understand that wheat seed is not treated to prevent damage from diseases or insects.

Weeds are evident in most fields in varying densities. Since some of the Brassica species are grown as alternate crops they are common competitors with the wheat crop. We understand that there is reluctance to use certain herbicides based on unhappy experience. However, there are now several materials available which are very effective and do not present the management problems previously encountered. The field of plant protection deserves greater attention,

### 4. Soil Management

We have read numerous reports concerning the problems of soil erosion, low water permeability, high water run-off, etc. and suggestions for various means of combating these problems. We agree that these amount to an enormous problem worthy of an effort and expense of equal magnitude. These are long time developments and even when accomplished will not eliminate the need for continually improving soil management techniques. The problem, simply stated, is to

get the precipitation into the soil when it falls and to conserve it for crop use at a later period. In the case of wheat this may mean over a period of several months. We were able to find virtually no research done or in progress concerning use or development of tillage methods and implements to improve water intake and storage in the barani soils. We feel this is the key to increased cereal production. Without more available water the increases obtained from input of HYVs and fertilizer will be much less than the potential benefits.

At Lyallpur the agriculture machinery division is developing a series of machines including plows, disc, cultivator, and a drill. These tools are designed to be drawn by bullock. We feel the testing and improvement of these implements is an important step in the right direction.

#### 5. Other Crops

No doubt the possibility of replacing wheat as the major crop in the barani area has been considered in greater depth than our information indicates. Nevertheless, it is worth pointing out that the wheat crop is <sup>not</sup> raised during the months when the greatest amounts of precipitation occur but several months later.

A crop which is ideally suited to growth conditions in the monsoon period and which could more fully utilize the rainfall may prove to be more profitable than continued cereal production in much of the area.

B. Extension Education

While we strongly advocate an increased effort in research, too often it becomes research for research sake, not for practical solutions to problems. Furthermore, files of scientific reports are of little value to the farmer until they are translated into meaningful, useable information. This information dissemination process is usually referred to as extension education and includes several essential factors:

1. Organization and Authority

There is an established organizational structure for extension education. This organization is the authorized agency for coordinating research programs with farmer problems and assisting farmers in adopting improved technology.

2. Personnel

In the Punjab province alone there are roughly 2600 extension technicians. These workers vary in training from the doctorate through M. S. and B. S. level to secondary schools

plus 2 years special training. We believe that these technicians are dedicated and serve to the best of their ability. To our knowledge there are few if any technicians who are trained and experienced in dryland wheat production. Such training would be minimum required insurance for a successful effort to increase "barani" wheat production.

### 3. Extension Support Functions

Personal contact, supported by visual aids and field demonstrations are the proven methods to induce farmers to accept different technology. This requires material support and transportation. Our belief is that the extension service is restricted by lack of mobility and resources and cannot perform to its capability.

#### C. Farmer Support Functions

We have heard that "barani" farmers are eager to accept innovations and new technology. We have heard that "barani" farmers resist change because they dare not risk failure. No doubt both situations can be substantiated. We believe that the rapid spread of the so called "Green Revolution" amply demonstrates that change can be induced, given the proper conditions.

For the "barani" farmers to increase wheat production a few essentials must be provided:

1. The materials of production must be available.

This means improved seed, fertilizer and equipment. While in some areas these commodities are fairly widely used we believe that the supplies of both are definitely inadequate.

2. In order for these materials to be available at the proper time, distribution and transportation systems must be established and functioning. Again we believe the system to be inadequate.

3. Many small farmers may not be financially able to procure the seed and fertilizers required to participate in the benefits of the improved technology. Where needed, a realistic credit system must be developed.

## II. Suggestions

Perhaps since our experience here is limited it would be more appropriate to raise questions rather than offer suggestions. Our purpose is to raise the issues for discussion and appropriate action. The items will be taken in the same order as discussed under observations.

## A. Research

We strongly endorse the proposal to establish a Research and Training Institute for "barani" agriculture. Giving due credit to the fine work already in progress on other stations we believe that only an additional effort oriented specifically to the problems of "barani" conditions can provide the desperately needed technology to assist "barani" farmers.

### 1. Improved Varieties

Continuing, increased support for the active wheat breeding programs now in progress must be provided. Increased efforts to field test selected varieties under farmers conditions should be encouraged. Where needed, improved seed storage facilities and any other materials should be provided.

Systems to more rapidly increase selected varieties for distribution to farmers must be improved and enlarged.

Two approaches which may be considered are: Contracts with selected farmers might be negotiated. These farmers would be supervised and assisted by the wheat breeders so that weeding and roguing required to produce clean, pure seed are accomplished. This method keeps seed production in the private sector and encourages development of the industry.

More qualified technicians to inspect and assist in seed production will be required. Secondly, the proper authority of the GOP would operate seed increasing stations and conduct the entire operation. This could be on leased or government owned property. While this system does, in effect, put the government in competition with the farmers it can insure seed supplies. Both these systems have been practised in Turkey. Again an increased number of technicians will be required.

We did not observe any evidence of a seed testing and certification service. This service if not available should be initiated for all crops as a government function. The importance of clean seed of high viability cannot be over emphasized.

## 2. Soil Fertility

It is our opinion that a soil fertility research program specifically designed for barani areas should be initiated as part of the "barani" research and training institute. It may be possible for technicians now working in irrigated areas to conduct this program. If not, then qualified technicians must be provided to pursue this phase of the research program. It must be remembered that the amount of available water determines

the "useful" amount of fertilizer the plant can assimilate. The vagaries of rainfall, both in time and amount, cannot be eliminated from "barani" wheat production. Hence, the requirement for research and the knowledge required of farmers to result in judicious use of fertilizer exceeds that of irrigated areas where a simple recipe type approach may be successful. Experiments to determine type of fertilizer, optimum time of application and rate of application under varying amounts of available soil moisture must be performed.

For example, it has been determined that diammonium phosphate and other phosphate fertilizers which release relatively higher amounts of free phosphoric acid can be detrimental to seed germination and emergence. This is particularly true when soil moisture is marginal at time of germination. Such a moisture condition is encountered much more often in "barani" conditions than in irrigated areas where water can be controlled.

### 3. Plant Protection

Disease and insect resistance are integral and vital parts of a successful plant breeding program. The plant breeding programs now in progress are screening varieties for

resistance to the major diseases of the area. However, there are diseases, and insect pests often affecting the seed or the emerging seedling which are most successfully controlled by treating the seed with chemicals before planting. If seed treating services are not available research to determine the benefits derived from this process should be undertaken.

It has been clearly demonstrated that competition from weeds can decrease wheat yields severely depending upon the number and species of weeds present. It has also been demonstrated that yield reductions from competition for water and nutrients occurs early in the crop development cycle. Removing weeds after they have grown to sufficient size for animal feed decreases weed seed potential but does little to increase wheat yields. The yield decrease has already occurred because the moisture taken up by the weed deprives the wheat plant of that moisture at a most critical time.

Research to determine the most economical and successful means for control of weeds should be initiated. The use of herbicides, while not proposed as a panacea for weed control, should not be avoided on the basis of past experience.

New materials are available which are safe for other nearby crops and offer broader spectrum weed control. Mechanical means and hand labor must continue to be considered primary means of controlling weeds. Weed control is one of the most effective and economical means to increase wheat production. Only research can determine the simplest successful systems for their control.

#### 4. Research in Soil Management

Total rainfall in many of the barani areas is adequate to support annual cereals production. However, the seasonal pattern of precipitation does not coincide with the wheat plant growth requirements. Therefore the need for research in soil moisture conservation has been stressed in a series of reports made available to the OSU team. The most recent reports are "Resource Management for the Rainfed Region of West Pakistan, Volume 1 and 2 May 1968 - February 1969," the Barani team report, September 1972 and the USAID Mission to Pakistan report "Framework for a Detailed Action Program for Barani Agriculture Development, dated December 31, 1972. From these reports and our observations, while traveling

through the barani areas, it appears that soils are relatively deep, from 3 ft. to 30 ft. or more, and generally have little discernible structure. While we noted serious erosion occurring over large areas, it appeared that there were substantial areas of deep soils, capable of producing high yields. It appeared also that the cultivated soils in those areas were low in organic matter, probably due to the continuous clean cropping system, shallow tillage, and livestock feeding patterns.

Crash programs carry inherent risks. Without sufficient information based upon research, we feel that deep chiseling large acreages could be a high risk venture. Studies to determine residual effects of such treatments on soils, including possible development of saline layers, should precede any large scale efforts. This does not indicate that tillage deeper than the traditionally quoted "3" should not be done nor that a large number of small trial demonstrations should not be established. Trial demonstrations should be conducted in cooperation with soils specialists.

First priority for research is the development of a system which will conserve the moisture that falls during the Monsoon season. Initially research needs to be conducted in the area of

tillage practices and types of tillage implements with special emphasis towards bullocks drawn and mini-powered equipment.

Specifically, such research should include replicated trials which can produce statistically viable data upon which to base further work and recommendations for demonstrations on farmer's fields. In order to carry out a research program we feel the following list of equipment and expertise is required.

A. Machinery for Research

1. Deep tillage machinery

- a. Tractors with sufficient power to handle deep tillage operation with matching equipment listed below.
- b. Chisel-sweep plow with rod weeder attachment
- c. Sub soiler (tool bar type)
- d. Sub soiler, rotary type
- e. Mold board plow
- f. Offset disc (22-24" discs)
- g. Tool bar with attachments for deep and shallow tillage.

2. Secondary tillage machinery - for mulching and weed control.

- a. Sweep-rod weeder combination, as (b) above
- b. Spike tooth harrow (adjustable)
- c. Skew treader
- d. Rotary hoe (new John Deere version)
- e. Rod weeder (Calkins, with duck feet)

3. Garden type tillage tools (mini-powered)

The possibility of using garden type powered tools, which are common in Japan and Europe, should be explored. One set of equipment for research purposes would suffice.

4. Transportation

In our work in Turkey we have found that performing a tillage operation at the proper time is of utmost importance. We have also learned from experience that for a researcher to be able to function he must have complete control of his own set of equipment. In addition he must be able to transport his equipment to sub-stations or on-farm locations when needed. If the technician must depend upon other agencies or farmers for equipment and transportation he is deemed to frustration and failure.

A 1-1/2 or 2 ton truck equipped with a Schwartz roll-back hydraulic bed is a priority item for moving equipment from station to sub-station or farmer fields.

5. Pesticide application equipment ( sprayers, dusters etc.) 3 point hitch mount.

6. Fertilizer Spreaders - (a) We recommend Barber, metered feed for field trials. (b) Hand operated spreader for small plots will also be needed.

7. Grain drills - (a) Deep furrow drill with fertilizer attachment. (b) Disc drill with fertilizer attachment.

8. Small plot combine harvester (self propelled)

B. Technical Assistance

1. As mentioned earlier, we believe animal powered equipment deserves a concentrated research effort. A set of implements has been developed at the Lyallpur station. This effort should be supported and increased. However, the critical factor is the testing and evaluation of these tools under dryland field conditions.

Technical advice in this area of machinery development and testing is essential.

2. If the training sector of the proposed Agriculture Research and Training Center is to become functional in the near future a qualified advisor with experience in dryland cereal production will be required. There is little expertise in this area in-country. (See attached job description for similar National Wheat Research and Training Center in Turkey, Appendix A).

3. An advisor with research experience in soil management and water conservation problems will be required to initiate and supervise research in these critical areas.

4. It appears to us unfortunate that Pakistan is apparently not participating in the technological advancements in the fields of pest and weed control which have been so important for increased production in other areas of the world. Technical advice in the field of agriculture chemicals for weed and pest control is needed.

We believe that with assistance in the fields of machinery development and testing, soil fertility, soil management and water conservation, education and training, plant protection and weed control to complement the wheat breeding programs now in progress a complete cereals production team

would be assembled. Such a group could function as an integrated team. The advantages of this approach are self evident.

#### 5. Other Crops

In spite of the fact that wheat is the traditional crop and is a staple food in barani areas, when considering the indefinite future the possibility of producing other crops capable of much more efficient utilization of the limited soil moisture and better adapted to the monsoon rainfall pattern should not be excluded. The possibility of greater economic return as well as increased nutritive values, particularly in protein, from such crops as soybeans should be explored. Would tomatoes for world tomato paste market purchase more wheat than is produced? Research can provide some of these answers.

#### B. Extension Education

##### 1. Organization and Authority

Based on our brief exposure we offer no suggestions for reorganization or changing lines of authority in the extension program. Some proposals have been listed in the "barani" report and the Resource Management For Rainfed Regions of West Pakistan, report.

## 2. Personnel

We feel that, for a successful effort in wheat production in barani regions, a training and education program would be indispensable. This should include both academic and practical field training in "barani" cereal production. Every effort should be made to develop a closer association between research and extension technicians.

## 3. Extension Support Functions

Without adequate financial and material support training of extension technicians will not be productive. Adequate salaries, per diem and travel expenses must be forthcoming. Reference is made to the Resource Management for the Rainfed Region of West Pakistan report, volume 2 Extension (out-of-school education), pages 111 through 114.

Prior to the initiation of a wheat campaign trained personnel must be available. They must be confident in their ability to do the job required, have adequate teaching aids for educating the farmers, be mobile. Advisors are necessary to back-stop the training, education and research programs until enough qualified technicians can be developed to fulfill their roles of responsibility.

The extension worker who is well trained and experienced, has access to educational material, is mobile and has confidence in himself and his program will produce positive results.

C. Farmer Support Functions

We believe that when the advantages of improved technology are clearly evident farmers will change from traditional practices. We also feel that many marginal operators may be willing but unable to adopt improved practices because the required resources are beyond their capability to procure. Therefore, it may be imperative for government agencies to help these farmers help themselves.

1. We believe it is entirely appropriate for the GOP to insure that required inputs of improved seeds and fertilizers are made available to farmers at realistic prices. This means that these commodities may have to be bought or produced and distributed by government agencies. Seed production as described earlier is an example of this service,

Private enterprise should be encouraged, but where such institutions do not provide the required materials GOP agencies should intercede.

2. The responsibility of these agencies is fulfilled only when the required commodities are available at the farm.

Supply centers and distribution services must be developed which are capable of moving these materials in timely fashion. Similarly, at harvest time crops must be handled efficiently.

### 3. Financial Support

It is probable that many farmers of very limited means are unable to finance the resources needed for increased production.

The GOP should arrange, through whatever means are most desirable, credit programs which will make the production inputs available to all farmers. It is possible that only government agencies can arrange for the flexible credit programs necessary.

When all these elements of research, education and available resources are brought together substantial wheat increases are assured.

### III. Action Plan Proposals

It has been pointed out in the USAID Mission to Pakistan Report dated December 31, 1972, titled "Framework for a Detailed Action Program for Barani Agriculture Development" that (1) "technical services to advise farmers and to demonstrate improved farming practices are inadequately trained, equipped and staffed," (2) that "not enough is known about the resource based of barani agriculture," (3) that "the transfer of know-how to farmers for on-farm application of such practices will require substantial numbers of well-trained and qualified technicians," (4) that "clearly, research into barani agricultural problems has been neglected, and (5) that "if such a program is to be successful it will require a major long term funding commitment and will probably necessitate significant staffing additions and adjustments. Based upon the statements, with which we agree, we offer the following possible plans:

#### Plan I - Minimum Effort

With the addition of small amounts of resources and large amounts of encouragement the use of HYVs and fertilizers will slowly increase. Over a period of years wheat production will be increased. We believe this to be a waste of valuable time and resources.

## Plan II - Distribution of HYVs and Fertilizer

A campaign could be initiated relatively soon using the inputs of fertilizer and high yielding varieties. A sizeable number of qualified advisors could be made available prior to the beginning of a campaign. These advisors could be assigned to work with several local technicians in specific areas. Following seeding of the crop the services of most of these advisors could be ~~determined~~ <sup>terminated</sup>. A few would remain until harvest to do follow-up work and evaluate results. This method was successfully used in the Turkey, "Mexican Wheat program. Such a campaign would be based almost entirely on the distribution and use of HYVs and fertilizers. No doubt significant increased production of wheat would result.

The magnitude of this plan is limited only by the number of qualified foreign advisors and in-country technicians available and by budget constraints. This assumes that seed and fertilizer would be available.

We feel the returns from this effort will be limited unless:

1. Adequate technical US advisors are available to initiate training of local technicians.
2. A campaign is planned well in advance.

3. Materials are available at the locations when needed. In addition to fertilizer and HYVs this should include materials for the educational campaign at the village level, such as slides, daylight screens, projectors, generators, flip charts, handouts, etc., transportation and adequate staff to realistically follow up the initial efforts.

4. Simultaneously, research is initiated. With adequate backup support from US advisors the research program can serve an excellent medium for training.

Plan III - Developing Research and Training Institute to Complement Plan II

Maximum Effort

This plan could include Plan II as the first action. In addition it advocates the development of a Barani Agriculture Research and Training Center. This coincides with GOP Ministry of Agriculture proposals and should be started as early as possible.

Such an institution if properly organized and staffed would satisfy the following needs:

A. Research Component

1. It would provide a base for the much needed research and technicians could be trained through the research program as it is being conducted.

2. It would provide a much stronger link between research and extension than is now evident.

3. Some phases of research could be conducted in both the irrigated and barani areas using the same personnel, for example, weed control, fertility, breeding, and plant pathology.

4. Research personnel could be used during certain periods of the year for training extension personnel. In addition to such training, research personnel working through previously trained extension specialists will have the opportunity to enlarge their scope of research to on-farm conditions. This aspect is extremely important.

5. A research and training center provides a chance for institutional development, bringing research, applied research and extension education together.

The following factors are deemed critical to the success of the research component:

a. Equipment must be available for research. This does not represent huge sums of money but needs to be adequate so that a thorough and effective job can be accomplished to get the answers in the shortest possible time.

b. Emphasis is placed on research practices and equipment which would have the greatest effect on soil moisture conservation during the time when the moisture is available.

c. Technical assistance is available to assist in improving animal powered equipment. This equipment needs to be tested and refined by those conducting the tillage research. Close coordination between tillage research and equipment development is necessary.

#### B. Training Component

1. The goal of this training program is to help Pakistan achieve optimum cereal production and maximum development of the barani areas.

2. The strategy is to provide the wheat farmer of both the barani and irrigated areas with the necessary information and production resources for optimum wheat production in the shortest possible time.

3. The method is to strengthen the communication link between research and extension, and to disseminate the latest research information to the farmers.

C. Support Component

Since the formation of such an institution has been recommended by the GOP, one of the more important roles that USAID/Pakistan could play is to make sure that such a training and research institution is properly staffed with adequate technical backup support.

D. Activating Plan III

In order to get the campaign started, initial efforts could be made towards establishing a relatively small number of demonstrations in strategic areas involving key farmers. The inputs that would be recommended under these circumstances are the use of fertilizer, HYVs, weed control and where possible deep plowing, with follow-up tillage treatments for weed control to establish a desirable seed bed at the time of seeding.

Such a program, although not covering a large area, would accomplish the following objectives:

1. It would give the advisors and those who were assigned to the project some immediate experience under local conditions.

2. Although such demonstrations would not be qualified research, the results would be valuable in helping to establish the next year's research and demonstration program.

3. A number of communication and teaching aids could be developed during the course of establishing these demonstrations, such as slide sets, flip charts and other teaching aids.

4. It would establish farmer contacts and as results were visible it would generate considerable farmer interest for the next year's campaign.

5. It would give technicians some experience and training so that they could be of more assistance in training other technicians the following year.

6. It would also build confidence in the technicians so that future campaigns could be conducted with more assurance.

## APPENDIX A

### JOB DESCRIPTION FOR TRAINING ADVISOR

#### Position

Training Advisor to NWR&TC (National Wheat Research and Training Center)

#### Objective

To develop a training section in the NWR&TC capable of providing training for research and extension technicians to meet the requirements of the accelerated wheat project.

#### Qualifications of Advisor

Advance degree in agronomy with emphasis in cereal production. Working experience in research and analysis related to dryland cereals production and soil management.

Experience in developing and conducting comprehensive courses in cereal production. Fully knowledgeable in communications skills and agricultural extension methods with the ability to instruct others in their use. Ability to function as a team member with Turkish national and other professionals.

#### Job Description:

The primary responsibility will be to assist and advise the Director of NWR&TC and the Head of the Training Section of the Center in the following:

1. Develop training program plans, curriculum, and training materials, and coordinate resources to train national, regional, provincial, and county Research and Extension Personnel.
2. Plan, coordinate and conduct academic and practical field training programs.
3. Assist in developing a training center teaching staff and national specialists for Wheat Production Research and Extension.
4. Develop the capability of the NWR&TC Training Section to train cereals technicians at all levels of responsibility in the GOT and private sector, on a continuing basis. This training to include pre-service, in-service, and on-the-job-training.
5. Develop the center to a level capable of training cereals production technicians for other countries of the region.

Responsibilities:

Advise and assist the Director of the National Wheat Research and Training Center and more specifically the Head of the Training Section, in planning and implementing staff training programs as follows:

1. Develop a long range program of staff training in Cereals Research and Production.

2. Develop annual plans for specific courses and necessary budgets.
3. Develop the curriculum for Cereals Research and Production Courses.
4. Develop teaching plans for each subject course and appropriate teaching materials.
5. Train a staff of teachers for implementing the training.
6. Assist in coordinating the use of other institutional personnel as teachers and trainers when needed to supplement Training Center Staff. (Faculty of Agriculture, other Ministries and Directorates, and private sector, as examples.)
7. Develop Teaching plots at the Haymana Research Station, to provide practical field experience as part of training.
8. Help in identifying personnel to be trained and type of training necessary for each staff member.
9. Establish a system of evaluation of training program and methods to improve courses as a continuous function.
10. Make periodic reports on progress of training to appropriate authority.