

**Report of
WHEAT
TRAVELLING
SEMINAR
1986**



**Pakistan Agricultural Research Council
Islamabad**

National Uniform Yield Trials

Each year a number of trials are prepared and distributed to different Provincial/Federal Cooperating Scientists for testing under different agro-ecological conditions in the country (see appendix F). The Travelling Wheat Seminar provides an excellent opportunity to all wheat scientists who are developing new varieties to assess the performance of their advanced breeding lines over a wider range of climatic, cultural, and disease conditions through broad scale testing in various agro-ecological zones of the country and also allows local research and extension workers to compare the performance of new varieties from other provinces/institutes. During 1985-86 the following trials were laid out:

- i. National Uniform Yield Trials (Normal Duration)
- ii. National Uniform Yield Trials (Short Duration)
- iii. National Uniform Yield Trials (Rainfed)
- iv. National Uniform Durum/Triticale Yield Trial
- v. National Uniform Barley Yield Trial

Breeders from different provincial/Federal institutions contributed the following number of their advanced lines/varieties to these trials.

	Bread wheat			Durum/ Triticale	Barley
	Normal	Short	Rainfed		
1. Ayub Agricultural Research Institute	5	3	3	2	4
2. Cereal Crops Research Institute, Pirsabak	3	3	3	-	3
3. Pakistan Atomic Energy Agricultural Research Centre, Tandojam	3	1	-	-	-
4. Agricultural Research Station, Bahawalpur	3	3	-	-	-
5. Agricultural Research Institute, Sariat	1	-	-	-	2
6. Univeristy of Agriculture, Faisalabad	1	-	-	-	-
7. Wheat Research Station, Rawalpindi	1	-	3	-	-
8. NIAB, Faisalabad	-	-	-	1	-

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PARC/CIMMYT Wheat Paper 86-10

**Coordinated Wheat Programme
Pakistan Agricultural Research Council,
P.O. Box 1031, Islamabad**

F O R E W O R D

The Travelling Wheat Seminar is one activity of the Coordinated Wheat, Barley & Triticale Programme of PARC which has in the past six years served a most useful purpose. Not only does it provide an opportunity to the wheat scientists to jointly assess the status of the Wheat Crop in the country but it also gives them an opportunity to observe and interview the farmers and extension workers regarding their local problems. The National Uniform Wheat Yield Trials planted in different parts of the country are also evaluated and potential varieties identified. Most of all, the seminar provides an opportunity for scientists to identify priority research areas as they relate to wheat improvement. The Wheat Travelling Seminar has served as a guiding light for other programmes to follow.

The present report has special significance in that, for the first time recommendations have been made for both policy makers and for researchers. Seed has been identified as an important factor responsible for increasing and stabilizing wheat production in the country. Weeds which cause losses of up to Rs. 120/- Crores to the wheat crop have been identified for immediate attention.

The efforts of the provincial and federal research organizations involved in the Coordinated Wheat, Barley & Triticale Programme are commendable in organizing the Travelling Wheat Seminar and presenting a most useful report.



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Chairman,
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Islamabad.

July-1986



Participants in the Wheat Travelling Seminar visiting wheat material at the National Agricultural Research Centre, Islamabad

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Summary

1. A total of 61 different scientists from 17 institutions, including ten international scientists, participated in this year's 6th annual wheat travelling seminar. Thirty four institutes, stations or government farms and 64 farmers fields were visited.

2. The tour was split into two parts to allow observations of the crop at the most appropriate crop development stages. It travelled from Karachi to Faisalabad from March 14-21 and Faisalabad to Peshawar from April 5 - 11.

3. Seed was a major problem preventing Pakistani farmers from gaining the full potential of the new improved germplasm. More efficient means are required to speed up the flow of improved disease resistant seed to farmers. One hundred and forty crore rupees loss can be expected in a moderate rust year because up to 50% of lands are growing susceptible varieties. Seed produced by the seed corporations must be of high quality. Treatment of seed from the seed corporations with available fungicides would save 28 crore rupees if it controlled loose smut at an infection level of 1%.

4. Weeds require more attention particularly in the irrigated rice-wheat and maize-wheat cropping zones. Just in the two million hectares of wheat in the rice-wheat tract weed control would save 120 crore rupees lost to weeds.

5. Site specific crop management or agronomy research must be strengthened to help exploit the genetic yield potential of the new varieties. On-farm research would help focus on-station research and provide a means of coordinating disciplines in solving farmer problems. Rice-wheat and barani areas in particular could increase production by 30-40% with better crop management.

6. There is evidence that compaction is becoming a problem because of increased use of tractors with shallow tyned implements. More research is needed on the use of better implements to correct this problem. Average increases in yield of 35% have been obtained in the barani tract of the Pothwar plateau that would translate into 60 crore rupees for this one million hectare of land.

7. Various recommendations are made to researchers. However, these differ by region and problem. Short informal planning sessions are suggested for each region to review past results and plan the next years' work.

8. Recommendations are made to the seed corporations for seed procurement. It has been suggested that Bahawalpur 79, Sonalika, Blue Silver, LU 26 and Pari 73 be phased out and/or dropped from the recommended list because of their susceptibility to disease.

9. The wheat situation is favourable throughout the country with targetted wheat acreages met, fertilizer offtake increased over last year and very favourable weather in terms of rain and temperature. The target of 13.3m tons should easily be achieved with 14m tonnes a more likely figure.

10. A meeting of the Kaghan Station management committee is desperately needed to review several issues that could jeopardize the role of this station in speeding up germplasm development in Pakistan.

11. The group visited 30 normal and 25 short duration NUWYT trials. These were handled better than last year but it was proposed that a small group of breeders visit each NUWYT trial before or after the travelling seminar next year to help in data interpretation.

12. The PARC observation nursery with 206 lines/varieties was seen at 6 of the 10 locations it was grown. The group was interested in continuing this nursery in the future.

13. Seventy-nine CIMMYT and ICARDA wheat barley and triticale nurseries were distributed this year. Since many entries are duplicated each year it was proposed that not all stations receive these nurseries each year. Sub-stations should visit the main provincial stations to select material from these nurseries.

Introduction

The sixth annual wheat travelling seminar was divided into two parts in 1986 as in the previous year. This was done to allow observations on the wheat crop at the post-flowering stages of wheat development since wheat in the Southern parts of the country matures much earlier than in the North. Thirty four scientists from 17 institutions participated from Karachi to Faisalabad (Appendix A) and 42 scientists from a similar number of institutions from Faisalabad to Peshawar (Appendix B). The participants included scientists from the disciplines of breeding, pathology, agronomy, entomology and economics representing all 4 provinces and wheat programs of the country as well as representatives from extension and seed certification. Ten international scientists participated at various times in the tour from CIMMYT, USAID, Australia, USA, Holland and Thailand. A total of 61 different scientists participated in this years tour. Several farmers, other scientists, representatives of private chemical companies and extension workers also participated at planned stops. The tour was also captured on video by consultants for future viewing.

The route taken in 1986 was similar to previous years (Appendix C) with the following additional visits:

1. The rice-wheat areas of Sind from Dadu to Sukkur;
2. The rice-wheat areas bounded by Sheikhpura, Hafizabad and Gujranwala;
3. The barani areas from the Marala barrage to Kharian north of the GT highway and;
4. The barani areas between Hasanabdul and Haripur.

This gave the participants an opportunity to observe wheat in more detail in the barani and rice-wheat cropping systems of the country.

A total of 34 research institutes, stations or government farms (Appendix D) were visited in addition to many on farm research plots and 64 farmers fields. The group also took notes and observations on national uniform wheat yield trials planted on stations and farmers fields throughout Pakistan.

The objectives of the seminar were similar to those in previous years as follows:

1. To assess the status of the present wheat crop and in particular, the distribution, yield potential and disease incidence of varieties grown in different agroecological zones of the country;

2. To observe the crop in farmers fields and interview farmers and extension workers regarding their local problems;

3. To evaluate the yield potential and disease reaction of the candidate varieties listed in the national uniform wheat yield trials (NUWYT) planted in different parts of the country;

4. To create an informal, relaxed environment in which the various wheat scientists of the country could develop a better understanding of wheat production problems and exchange ideas on improving their own research and developing better coordinated programs; and

5. To enable wheat scientists of the country to see wheat growing in other parts of their country that they have never had the opportunity to visit before.

The following pages will report the findings of this travelling seminar. It will start by presenting the recommendations for different groups of people followed by a description of the crop condition of the country and discussion on important topics reviewed during the travel.

Recommendations for policy makers

The following recommendations are made on subjects deemed important for increasing and stabilising wheat production in Pakistan:

A. Seed

Much of the research effort put into developing disease resistant, high yielding wheat varieties is being lost in Pakistan because of the inadequate and slow distribution of this improved seed at the farm level. Three aspects require high level policy decisions to right this situation:

1. Identify better, more efficient means of speeding up the flow of improved seed from the breeders to the farmers. Evidence from this seminar and from other recently conducted surveys show that 40% of the irrigated land in NWFP and Punjab is presently cultivated with wheat varieties that have been removed from the recommended lists because they are susceptible to rust (Appendix E). In Sind, the figures are between 20-25%. Even higher percentages of susceptible varieties are found in barani and upland areas of the country. Only 20% of the wheat acreage is grown to varieties released in the last five years. A conservative estimate would be a 10% loss in yield in a moderate rust year from half of Pakistans wheat acreage where susceptible varieties are grown. This translates into 700,000 tons or a loss of 140 crore rupees.

In order to speed up the diffusion of seed of new varieties at the farm level the following recommendations are made:

● Seed multiplied at the provincial seed farms should be made available to selected growers in each village for further multiplication. The farmer should be provided treated, pure and high quality seed.

● This seed multiplied at the village level should be certified but then be available for purchase to other farmers in the village. The farmers would go to the selected farmer and purchase seed directly. The seed would not be returned to the seed corporation. Any abuse by the farmer on selling the multiplied seed to other villagers would result in the removal of the farmer from the list of certified growers.

● The seed should be available in smaller packets to allow small farmers to test the new variety.

● The premium on seed should be raised to a level that encourages the interest of the private sector. At present seed from the seed corporation is subsidised to the extent that the private sector cannot compete profitably in producing high quality seed.

● The breeders should be encouraged to multiply future candidate varieties at an early stage to make sure sufficient seed is available for rapid multiplication of seed by the seed corporation when it is eventually released.

2. Ensure that the seed produced by the seed corporations is of high quality. The participants of the tour were appalled by the percentage of seed mixtures found growing in farmers fields. This was particularly evident in Sind even where farmers obtained seed from the seed corporation. Observations indicated that the Sind Seed Corporation did a good job of roguing their fields and harvesting good quality pure seed of approved varieties but somewhere in the seed processing and seed distribution activities the seed was mixed. Mixtures also occurred in other parts of Pakistan but usually as a result of farmer to farmer seed exchange.

Losses from using mixed seed are hard to assess but assuming a 20% mixture and a loss of 10% in yield because the mixed seed has a lower yield potential, a loss of 250,000 tons or 56 crore rupees can be expected. In addition, all the expenses incurred by having a seed corporation are lost.

The following suggestions are made that may lead to improvement in this sector:

● A study is needed to determine why seed from the Seed Corporations gets mixed and at what stage in the system does this problem occur. These problems should be rectified.

● More training and facilities are needed for the seed corporations of the country including the setting up of seed corporations in NWFP and Baluchistan.

● Only seed farms where good crops can be grown should be used. The Pai Seed farm at Sakrand is a very difficult station for production of good quality seed because of poor soil conditions.

● The harvest and planting of seed at the seed corporations should be mechanized with modern equipment.

3. Loose smut and flag smut are seed borne wheat diseases occurring in alarming proportions in Pakistan. They are particularly important in the Punjab and NWFP where infections as high as 15 percent were recorded. Flag smut is important in the barani areas with up to 4% levels recorded. With just a one percent loss to this disease we are looking at a loss of 140,000 tons or 28 crore rupees. If this disease is not checked even more losses will occur in future years. Since these diseases can be controlled by seed treatment the following suggestions are made:

● Seed treatment with Panoram, Baytan, Bayleton or Vitavax 75WP should be encouraged and essential for seed corporation seed. Since these chemicals can affect germination a packet of the correct quantity of the chemical should accompany the seed for mixing with the seed just prior to planting.

● Seed moving across provincial borders should be carefully monitored. Embryo tests of the certified seed by pathology laboratories should be done before shipment.

● Farmers should be shown and encouraged to use the soaking and sun drying heat treatment for control of this disease.

● Farmers should be encouraged to rogue out smutted heads from their fields and bury or burn the smutted heads at an early stage.

B. Weeds

Weeds are becoming a major problem in several wheat growing areas of Pakistan, especially the irrigated rice-wheat and maize-wheat lands. This is partly a function of increased cropping intensity combined with a scarcity of labor for hand weeding. Emphasis is needed to combat this increase through integrated weed control strategies. Farmers presently use crop rotation and preirrigation (rauni) to control weeds but future control will depend more heavily on chemical weed control. Of the 2 million hectares of wheat in the rice-wheat rotation we can expect a 15-20 loss to weeds. This calculates as 600,000 tons per year or 120 crore rupees. Other wheat growing regions may have lower yield losses but would still add significantly to lost revenue.

The following suggestions are made to help alleviate this problem:

● Scientists and extension workers must update their knowledge in weed science in order to provide the necessary knowledge to farmers on how to control weeds.

● The private chemical companies must be involved more extensively in promoting these products and demonstrating their proper use to farmers.

● Efforts to speed up the registration of useful products is needed to encourage the private companies to participate in upgrading weed control skills.

● The availability of the proper chemicals and equipment must be made at the farm level on time.

● Weed science should be promoted as an important discipline in University, College and training institutions.

C. Crop management research

There is a need to exploit the full genetic yield potential of the new wheat varieties through better crop management. Agronomic research in the various agroecological situations in which wheat is grown is needed to identify production constraints and to develop sound economic recommendations that can be adopted by farmers and so increase productivity. The average per acre yield of wheat is only 1.7 t/ha. Evidence from on-farm research in the rice-wheat area and higher rainfall barani areas indicate that yields 30-40% more than average are well within farmer resources. The problem is to identify what are the major reasons for less than potential yields.

Unfortunately, the disciplines needed to collaborate or focus on these issues are relatively weak, and isolated from other disciplines. Agronomic research is mostly station based and not focussed on the problems of farmers.

The following suggestions are made:

● Develop incentives to promote capable manpower to work in teams (biological and social) on a blend of onfarm and focussed on-station crop management research in specific agroecological zones. The development of the new agronomy sub-stations in the Punjab would be ideal focal points for developing a model to improve this area of applied research. Single commodity research stations such as the cotton research and rice research stations should be strengthened to look at cropping systems and annual increases in productivity.

● Adaptive research should have a closer link with crop management research to prevent duplication of effort and to focus their work on activities that lead to increase in productivity in specific areas. It may be better for adaptive research to be

part of research rather than extension.

● Universities should have closer linkages with research stations to provide enthusiastic manpower through students to help conduct the research needed to answer the questions raised by specific on-farm research.

● Decentralise research so that all levels of scientists are free to interact in developing research priorities for specific areas. It is important to develop research priorities for each major area rather than general experiments for all regions. Informal planning sessions to review previous results and future strategies are essential for efficient planning.

D. Tillage research

Evidence is available that with the increased influx of tractors and the use of the shallow tined cultivator, problems of soil compaction are developing especially in the barani tract. Evidence is available that yields in barani areas can be increased on average by 25% by deep moldboard ploughing, that this practice is not needed every season and that the cost is less than conventional methods. On the one million ha of barani land in the Punjab this would mean an increase in yield of about 300,000 tons or 60 crore rupees at no additional cost and with benefits for following crops. This benefit is particularly beneficial in dry years because moldboard ploughing results in better rooting and therefore better moisture and nutrient availability. The following is needed:

● A more extensive testing of the effect of moldboard ploughing in irrigated and rainfed areas of the country by concerned scientists. The agricultural machinery scientists should take the lead. The objective would be to answer the questions of where benefits occur, cost and frequency of operation. Soil scientists and other scientists should also undertake research to quantify and explain the reasons for the accrued benefits.

● Banks and the private sector should be encouraged to make available a suitable reversible moldboard plough to farmers. Custom operators should also be encouraged and given help to obtain equipment and train their operators in the proper use of these implements.

● Demonstrations of the benefits of better primary tillage should be given to farmers through extension.

Recommendations for researchers

The wheat research opportunities in Pakistan differ by region and therefore specific prioritized research plans should be developed for each region. In order to do this specific

informal planning sessions should be held well before the next wheat season to discuss previous results and plan future research. There should be separate meetings for breeding/pathology and agronomy. They should be held in a comfortable location away from any interference. Concerned scientists should prepare presentations of past results to be given the first day followed by a second day to plan the next seasons program. The following list of researchable issues are listed by disciplines:

A. Breeders

- Develop varieties for specific major cropping patterns around their stations. This will include more emphasis on varieties for late planting following cotton, rice and sugarcane. A nursery should be planted late in December to evaluate material for heat tolerance and highest yield.

- Develop varieties for rainfed conditions by screening material under limited irrigation or under moisture stress. This can be done at irrigated as well as rainfed stations since stations like Bahawalpur and those in the Sind receive little rain.

- Breeders should ensure that all potential NUWYT entries are passed through the national disease screening nursery (NWDSN) before inclusion in the NUWYT trials.

- Seed of varieties that have good potential for future release should be multiplied at an early stage to ensure sufficient seed is available with the seed corporation when it is released.

- It would be beneficial to have an exchange of germplasm through the NWDSN within the region (S.Asia and SE Asia). Good candidate lines should be sent to CDRI for inclusion in the NWDSN. This will be tested in Nepal, Bangladesh, Thailand, Kenya, Turkey and possibly India. Similarly, materials from these countries will be exchanged through a CIMMYT regional nursery.

B. Pathologists

- More data is needed to evaluate the residual effect of Baytan and Bayletan applied as a seed treatment on the control of rust in wheat. Data from Faisalabad indicates that this treatment protected WL 711 from rust up to early grain filling. If these results are confirmed this may provide a cheap means of controlling rusts, smuts and bunts. This could be tested by superimposing treatments in farmers fields in a similar manner to superimposed herbicide trials.

- More studies are needed on the importance of yellow dwarf virus in wheat. This disease was seen in higher

proportions this year.

- Aphids are becoming more important and an entomologist should be assigned to study this pest especially in relation to barley yellow dwarf.

- Emphasis should be placed on identifying sources of genes for rust resistance so that breeders can include them as parents in their crossing programs.

- Only sites where the susceptible check is prone to rust attack should be used in calculating the rust coefficient of infection.

C. Agronomists and soil scientists

- More emphasis is needed on strengthening crop production research at the farm level in order to better focus on-station research. Scientists need to keep in mind the cropping pattern, soil type and access to irrigation in selection of sites.

- The disciplines of agronomy (soils, irrigation, physiology, weeds, machinery) should better coordinate their efforts to solve farmer problems.

- Fertilizer experiments should emphasise response curve designed trials on land representing early and late planting, good and poor water supplies, different soil types, and different previous crops.

- More research is needed on tillage throughout the country to determine whether the continued shallow ploughing with a shallow tyned cultivator is causing compaction problems and loss of yield.

- More training and research is needed on the use of herbicides and other cultural methods for weed control. The grassy weeds, *Avena fatua*, *Phalaris minor* and *Lolium sp.* are becoming serious constraints to wheat production.

D. Extension

- Discussions should be held to consider the pros and cons of joining adaptive research with research. This would provide the manpower necessary to strengthen the weak link in research of applied on-farm crop management research.

- Extension should not grow the same experiments throughout their province but should plan demonstrations appropriate to the farmer problems in each district.

- Varieties zoned as susceptible to disease should not be grown in areas where they are known to be susceptible. This could provide a nucleus for an epidemic in a favorable year for rust.

National Uniform Yield Trials

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- iii. National Uniform Yield Trials (Rainfed)
- iv. National Uniform Durum/Triticale Yield Trial
- v. National Uniform Barley Yield Trial

Breeders from different provincial/Federal institutions contributed the following number of their advanced lines/varieties to these trials.

	Bread wheat			Durum/ Triticale	Barley
	Normal	Short	Rainfed		
1. Ayub Agricultural Research Institute	5	3	3	2	4
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4. Agricultural Research Station, Bahawalpur	3	3	-	-	-
5. Agricultural Research Institute, Sariab	1	-	-	-	2
6. Univeristy of Agriculture, Faisalabad	1	-	-	-	-
7. Wheat Research Station, Rawalpindi	1	-	3	-	-
8. NIAB, Faisalabad	-	-	-	1	-

One of the most important objectives of the Travelling Seminar is to visit and evaluate some of the National Uniform Yield Trials (NUYT) planted in different parts of the country. The group visited thirty national trials of normal duration and 25 short duration trials. The quality of these trials was better than last years and most of these had been laid out according to the plans/instructions. However, some observations were made which need to be considered for further improvement of the national testing programme.

i. The group found some trials not planted according to the randomized plan and instructions. These trials would thus have to be excluded from the final compilation of results.

ii. Some breeders in the provincial institutes do not plant all the sets themselves and send some of these to the other sub-stations. The group visited some trials at sub-stations and adaptive farms which were not properly planted/managed. It was suggested that the concerned cooperating scientist must make frequent visits to these trials particularly at the time of planting and harvesting for meaningful and reliable evaluation.

iii. The group felt that detailed observations about all the trials need to be collected by visiting these locations at least once to decide what to keep and discard. It was suggested that a team of three or four scientists should visit all the sites before or just after the travelling seminar to make a comprehensive report that can be used at the time of data analysis to help interpret the data.

iv. Loose smut in the trials was found to be a serious problem. It was decided that for the next year all seed in the NUYT will be treated with fresh and effective fungicide.

v. Attempts should be made by the breeders to include only good varieties/advance lines in the national trials otherwise real objectives will not be achieved. The material should voluntarily have passed through the National Wheat Disease Screening Nursery.

PARC observation nursery

To provide a broad base of desirable germplasm for wheat breeders in the country, the NARC wheat Programme, during 1985-86 sent out ten sets of an observation nursery to various breeders in the country, comprising of very promising germplasm. This nursery included lines/varieties selected/developed at NARC and will provide an opportunity to the breeders at different institutes/stations to select the material which adapts well under different climatic conditions within the country. A total of 206 varieties/lines were included in this nursery. During the Travelling Seminar, the group of wheat scientists visited this nursery at six of the locations and found that it was managed in an excellent way by all the cooperators. In spite of seed treatment with fungicide loose smut was observed in some of the

lines in this nursery. The group suggested that the seed in future be treated with an effective fungicide. Keen interest was shown for continuation of the such germplasm by the different programmes for deriving the maximum benefit out of the promising material generated by different programmes.

International nurseries

For the 1985-86 season 79 CIMMYT & 70 ICARDA Wheat Barley and Triticale nurseries/trials were being evaluated by the wheat scientists at various institutes/stations in the country (appendix G and H). The Travelling Seminar visited these nurseries/trials at all major stations. The breeders were found to be satisfied with the availability of this wide germplasm base, from which selections were being made and crosses attempted. However, it was felt that the different programmes were being swamped by nurseries thus draining the resources of these programmes. Simultaneously, the real benefits from these nurseries were not being derived. Nursery requests for 1986-87 indicate that the various breeding programmes request a large number of nurseries each year from ICARDA and CIMMYT. As the contents of the nurseries do not change drastically every year, it would be advisable not to repeat the same nursery at one location. It was thus suggested by the group that most of nurseries be planted at the main wheat stations and breeders at the sub-stations can visit and select the material from their main stations.

WHEAT VARIETY RECOMMENDATIONS FOR 1985-86

1. ARZ The variety has shown good resistance to rusts but is susceptible to flag smut hence seed treatment is recommended.
2. Bahawalpur - 79 These varieties have become susceptible to stripe and leaf rust and need replacement by suitable short duration varieties.
Blue Silver
Sonalika
3. Indus - 79 The variety has shown susceptibility to both stripe & leaf rust. Its behaviour is being watched.
4. Khyber-79 It has good resistance to stripe rust but susceptible to leaf rust. Therefore, needs replacement by any of the newly approved normal duration varieties.
5. LU-26 This variety is susceptible to stripe and leaf rust & needs replacement by any of the newly approved &/or resistant

medium duration varieties.

6. Lyallpur-73 It is susceptible to stripe & leaf rust, loose & flag smut besides susceptibility to complete bunt and needs replacement.
7. Pak-81 Recommended throughout the country as a normal duration variety. However, Karnal bunt has been noted on it this year in NWFP. Therefore, cultivation of this variety may also be supplemented by other resistant normal duration varieties from among the newly approved ones.
8. PARI-73 Highly susceptible and has been observed to be susceptible to both leaf & stripe rust. Needs replacement by other existing resistant & or newly approved varieties.
9. Pavon It is resistant to leaf rust. It's large cultivation in Sind & plains of Baluchistan should be supplemented by other resistant varieties among the newly approved ones for diversity.
10. Punjab-81 Resistant to leaf but susceptible to stripe rust. It is recommended for cultivation in Southern Punjab, Sind & Lower Baluchistan along with any of the newly approved medium duration varieties.
11. Z.A-77 It is susceptible to rusts and needs replacement by other resistant & any of the newly approved normal duration varieties.
12. Zarghoon-79 These are susceptible to leaf rust but since this rust is not a problem in the uplands of Baluchistan, their cultivation may be continued.

II. Varieties Recently Approved

1. Barani - 83 Resistant to stripe rust but gives variable reaction to leaf rust. Flag smut has also been noted. Can serve as good replacement for Lyallpur-73 in the rainfed areas of Punjab, NWFP and Baluchistan. Prone to shattering.

2. **Faisalabad-83** Variable in rust reactions with low intensities to leaf rust but resistant to stripe rust. Can serve as good replacement for Blue silver, Sonalika & Bahawalpur-79.
3. **Kohinoor-83** Has good resistance to both leaf and stripe rust. Suitable for general cultivation throughout the country as normal duration variety.
4. **Sarhad-82** Has good resistance to leaf rust but susceptible at low intensity to stripe rust. Can be recommended for cultivation as normal duration variety for diversification.
5. **Sind-81** The variety has shown susceptibility to both stripe & leaf rust. It's behaviour is being watched.

The above mentioned varieties were approved by VEC in 1985 but so far, these have not been approved at some of the provincial levels and the National Seed Council. Therefore, general cultivation cannot be recommended which would result in reducing their span of cultivation. It is strongly felt that such varieties once approved by VEC in a year should be simultaneously cleared at the provincial and National Seed Council for subsequent seed multiplication and use by the farmers.

Wheat Situation in the Country

Sind

The wheat crop in Sind is better than the crop in the past few years and may be the best ever. The weather has been very favorable to date with favorable temperatures during grain filling. The targetted wheat acreage of 1.03m ha's was achieved and fertilizer offtake up to February 86 was about 102,000 tons or 26% more than last years offtake. There was no serious water shortage and no prolonged load shedding as in 1985. Canal head withdrawal in Sind was slightly less than last year at 9.33 MAF by mid-January. Sind distributed 1.42 lakh tons of seed, but with the problems of mixing, this may not benefit production.

Rusts were not observed on any of the farmers wheat crops. Traces to 0.5% loose smut was observed in isolated fields of Blue Silver or in varietal mixtures. Downy mildew was found in most fields in Thatta and Hyderabad Districts. Weeds especially

Convolvulus arvensis and *Chenopodium album* were problems in many fields in Sind. Pavon was the major variety grown followed by Blue Silver and WL 711. Twenty five percent of the fields were still under local mixtures of low yielding varieties especially in the rice tracts to the west of the Indus.

The target of 2.213 million tons should be achieved although there is scope for increased production. In the rice tract there is a need for more research to develop a technology for this area.

Punjab

The wheat crop in Southern Punjab is better than last year although almost half the land is planted late in December following cotton. Temperatures, however, have been favorable for good grain filling. The rice area and barani tracts are also good with timely rains helping with timely planting. Much of the rice tract was planted by mid-December on residual moisture. Frequent rains have also favored the barani crop by supplying needed moisture and keeping temperatures low. The barani crop is two weeks later in maturity than last year and no drought occurred during development.

Wheat acreage is above the targetted 5.2m ha's mainly due to an increase in late planting in the barani tract. Fertilizer offtake was 21% higher than last years level. There was no serious water shortage or load shedding. 8.3 thousand tons certified seed was distributed and sold.

Rusts were not a problem in southern Punjab. Loose smut varied from 0.5 to 5% in isolated fields and was highest in Punjab 81 and lowest in BWP 79. Symptoms of Barley Yellow Dwarf were seen in some fields. Aphids were a problem in several fields. *Chenopodium album* and *Phalaris minor* were problem weeds in some fields.

In central Punjab, more rust, both stripe and leaf was observed especially on Punjab 81 (only stripe) Blue silver, Yecora, Pari 73 and LU26. Some plants showed signs of early infection with expected yield losses. Loose smut varied from 0.5 to 10% with an average of 1%. Powdery mildew was also seen on Punjab 81 in fields north of Faisalabad.

In northern areas, leaf rust was found on Blue Silver, WL 711 and Barani 83. C591 was found with heavy incidence of leaf rust. Moderate levels of stripe rust were seen on Punjab 81. Loose smut was worst in this area and varied from 0.5 to 12%. Weeds particularly *Phalaris minor* were severe in some plots. *Lolium sp* and *Avena fatua* were other serious weeds.

In barani areas, C591 was still found in mixtures and was susceptible to leaf rust. Lyallpur 73 was the other major variety but Barani 83 and Pak 81 were also increasing in acreage.

Loose smut was lower in incidence but flag smut was important and varied from traces to 5%. Where farmers used fertilizer barani wheat will equal irrigated wheat in yield. However, a bumper mustard crop mixed with wheat will bring down the potential yield. This important practise of mixed cropping requires more research. It is an important farmer practise for fodder production and cannot be ignored or rejected. The target for wheat in Punjab should be achieved. Potential for further increases in production will come through better crop management especially in the barani and rice tracts.

NWFP

The barani tracts of NWFP have been blessed with favourable weather. However, non-use of inputs in the these tracts has reduced the benefits from this favorable climate. The irrigated crop is good and no water shortages have been evident. Targetted area has been achieved and fertilizer offtake has increased 14% over last year but not all of this has been used on wheat.

Predominant varieties are Pak 81, Lyallpur 73 and Blue Silver but more than 50% of the area is planted to banned varieties like WL 711, SA42 and Mexipak. Light to moderate incidence of stripe rust was observed with heavy occurrences on old varieties like SA 42 and Mexipak. Loose smut varied from 1-12% which is more than in other provinces. Weeds especially broadleaf weeds were a problem in some fields.

Baluchistan

The wheat situation in the plains was favorable as in the Sind. The uplands will be visited later but late rains delayed wheat emergence in these areas. Moisture is good but late hot winds may depress yields in these upland areas. Acreage planted was below target and fertilizer offtake was 8% less than 1984 figures. Not all of this fertilizer is used for wheat.

For the country as a whole the picture looks good for a record wheat crop. Only in the uplands of Baluchistan could yields be below target. The target of 13.3m tons should be exceeded and be closer to 14m tons or more. The main problem will be the storage of this extra grain.

Kaghan summer wheat nursery

Some discussions were held with respect to this station. The following was recommended:

0 The management committee must meet to discuss the future of this station. It has not met for many years and the station is in jeopardy of not providing the needed management for the crops grown there.

● Discussions must be made with regard to the staffing of the station. The farm manager and other staff should be regularized.

● A vehicle must be given to the officer in charge to allow access to the station. The vehicle loaned by CIMMYT in the last two years is now the property of PARC.

● Discussions must be held on land allocation especially with the other commodity programs wanting to use the station for multiplication of advanced lines.

● The station should be used for developing better varieties of wheat and maize for the wheat-maize rotations of the upland areas of Pakistan.

Appendix A

List of Participants (First Part)

<u>Name</u>	<u>Specialization</u>	<u>Dates Participated</u>
<u>NARC</u>		
1. Dr. N. I. Hashmi	Plant Breeder	15-3-86 - 18-3-86
2. Mr. Nafees Sadiq Kisana	Plant Breeder	15-3-86 - 21-3-86
3. Syed Zahid Mustafa	Statistician	15-3-86 - 21-3-86
<u>CIMMYT PAKISTAN</u>		
4. Dr. Peter R. Hobbs	Agronomist	15-3-86 - 21-3-86
<u>INTERNATIONAL SCIENTISTS</u>		
5. Dr. Alan Roelf	Plant Pathologist	15-3-86 - 21-3-86
6. Dr. Bob McIntosh	Plant Pathologist	15-3-86 - 21-3-86
<u>CDRI</u>		
7. Dr. M. Aslam	Plant Pathologist	15-3-86 - 21-3-86
8. Dr. A.K. Khanzada	Plant Pathologist	15-3-86 - 18-3-86
9. Mr. M.A.S. Kirmani	Plant Pathologist	15-3-86 - 21-3-86
10. Mr. A.A. Hakro	Plant Pathologist	15-3-86 - 21-3-86
<u>AARI - FAISALABAD</u>		
11. Mr. A.G. Asi	Plant Breeder	15-3-86 - 21-3-86
12. M. Arshad Khan	Plant Pathologist	15-3-86 - 21-3-86
13. Dr. A. Sattar	Plant Breeder	20-3-86 - 21-3-86
14. Mr. Niaz Mohammad	Plant Breeder	20-3-86 - 21-3-86
15. Mr. Mohammad Akram	Plant Breeder	20-3-86 - 21-3-86
<u>NIAB - FAISALABAD</u>		
16. Mr. M. Siddique Sadiq	Plant Breeder	15-3-86 - 21-3-86
<u>ARS - BAHAWALPUR</u>		
17. Mr. Sarwar Cheema	Agronomist	15-3-86 - 21-3-86
<u>BARI - CHAKWAL</u>		
18. Mr. Gulzar Ahmed	Agri: Chemist	15-3-86 - 21-3-86
<u>BARANI ST. RAWALPINDI</u>		
19. Mr. Mohammad Ali Khan	Plant Breeder	15-3-86 - 21-3-86

ARI - TANDOJAM

20. Mr. Karam Khan Kalari	Plant Breeder	15-3-86 - 21-3-86
21. Mr. M. Khurshid Khan	Agronomist	15-3-86 - 21-3-86
22. Mr. Nasrullah Khan	Agri:Economist	16-3-86 - 18-3-86

AEARC - TANDOJAM

23. Dr. K.A. Siddiqui	Plant Breeder	16-3-86 - 21-3-86
24. Mr. Afzal Arian	Plant Breeder	16-3-86 - 21-3-86

ARI - SARIAB, QUETTA

25. Mr. Saleem Moughal	Plant Breeder	16-3-86 - 21-3-86
26. Mr. Saifullah Khan	Plant Pathologist	15-3-86 - 21-3-86

CCRI, PIRSABAK

27. Mr. Allauddin Khan	Plant Breeder	15-3-86 - 21-3-86
28. Mr. Buzarg Jamher	Plant Breeder	15-3-86 - 21-3-86

FSRD - ISLAMABAD

29. Mr. M.A. Salaam	Plant Breeder	15-3-86 - 21-3-86
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RRI - DOKRI

30. Mr. M.A. Hamid Baig	Agronomist	18-3-86 - 21-3-86
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ADAPTIVE RES. (SIND)

31. Mr. M. Umer Sial	SSMS	15-3-86 - 21-3-86
32. Mr. M. R. Hakro	SSMS (PP)	15-3-86 - 21-3-86

ADAPTIVE RESEARCH (PUNJAB)

33. Ch. Saifullah Khan	Deputy Director	19-3-86 - 21-3-86
34. Mr. Ghulam Rasool	SSMS (PP)	19-3-86 - 21-3-86

Appendix B

List of Participants (Second Part)

<u>Name</u>	<u>Specialization</u>	<u>Dates Participated</u>
<u>NARC</u>		
1. Dr. N. I. Hashmi	Plant Breeder	5-4-86 - 11-4-86
2. Dr. A. Majid	Agronomist	5-4-86 - 11-4-86
3. Syed Zahid Mustafa	Statistician	5-4-86 - 11-4-86
4. Mr. Mohammad Aslam	Agronomist	5-4-86 - 9-4-86
5. Mr. A. Razzaq	Agronomist	8-4-86 - 9-4-86
6. Mr. Bakht Mand Khan	Agronomist	9-4-86 - 11-4-86
7. Mr. Ikram Saeed	Agri. Economist	7-4-86 - 9-4-86
<u>CIMMYT PAKISTAN</u>		
8. Dr. Peter R. Hobbs	Agronomist	5-4-86 - 11-4-86
9. Dr. Paul Heisey	Agri. Economist	5-4-86 - 11-4-86
10. Dr. Derek Byerlee	Agri. Economist	8-4-86 - 9-4-86
<u>INTERNATIONAL SCIENTISTS</u>		
11. Dr. Dave Saunders	Agronomist	5-4-86 - 11-4-86
12. Dr. Kanok Rerkaseem	Agronomist	5-4-86 - 11-4-86
13. Dr. Ron Stubbs	Plant Pathologist	9-4-86 - 11-4-86
14. Dr. Jessie Dubin	Plant Pathologist	9-4-86 - 11-4-86
<u>CDRI</u>		
15. Dr. M. Aslam	Plant Pathologist	5-4-86 - 11-4-86
16. Dr. A.K. Khanzada	Plant Pathologist	5-4-86 - 11-4-86
17. Mr. M.A.S. Kirmani	Plant Pathologist	5-4-86 - 11-4-86
<u>AARI - FAISALABAD</u>		
18. Mr. A.G. Asi	Plant Breeder	5-4-86 - 11-4-86
19. M. Arshad Khan	Plant Pathologist	5-4-86 - 11-4-86
20. Mr. Zahoorul Haq Raja	Plant Pathologist	5-4-86 - 11-4-86
21. Mr. Khalid Ahmed	Plant Breeder	5-4-86 -
22. Mr. Ramzan Akhtar	Agri. Economist	8-4-86 -
<u>NIAB - Faisalabad</u>		
23. Mr. M. Siddique Sadiq	Plant Breeder	5-4-86 - 11-4-86
<u>ARS - BAHAWALPUR</u>		
24. Mr. Sarwar Cheema	Agronomist	5-4-86 - 11-4-86

BARI - CHAKWAL

25. Mr. Noor Mohammad Zafar Plant Breeder 5-4-86 - 11-4-86

BARANI ST. RAWALPINDI

26. Mr. Mohammad Ali Khan Plant Breeder 5-4-86 - 11-4-86

ARI - TANDOJAM

27. Mr. Mithomal Bhatia Plant Breeder 5-4-86 - 11-4-86

28. Mr. M. Omar Makhdoom Plant Pathologist 5-4-86 - 11-4-86

AEARC - TANDOJAM

29. Dr. K.A. Siddiqui Plant Breeder 5-4-86 - 11-4-86

30. Mr. Afzal Arian Plant Breeder 5-4-86 - 11-4-86

ARI - SARIAB, QUETTA

31. Mr. Saleem Sheikh Plant Breeder 5-4-86 - 11-4-86

32. Mr. Mohammad Iqbal Plant Breeder 5-4-86 - 11-4-86

CCRI, PIRSABAK

33. Mr. Allauddin Khan Plant Breeder 10-4-86 - 11-4-86

34. Mr. Ali Haider Plant Breeder 5-4-86 - 11-4-86

35. Mr. Fazli Subhan Plant Breeder 5-4-86 - 11-4-86

ARI TARNAB

36. Mr. Munir Ahmed Agri. Economist 10-4-86 - 11-4-86

SWN - KAGHAN

37. Mr. Mr. Sajjad Hussain Agri. Economist 6-4-86 - 11-4-86

SEED REGISTRATION

38. Mr. Mohammad Ibrahim Plant Breeder 5-4-86 - 11-4-86

ADAPTIVE RESEARCH

39. Mr. Ghulam Jan Deputy Director 5-4-86 - 11-4-86
(Baluchistan)

40. Mr. Akram Zafar SSMS (PP) 5-4-86 - 6-4-86
(Punjab)

ARD, USAID

41. Mr. Allan C. Hankins Chief ARD, USAID 10-4-86 - 11-4-86

42. Dr. Saeed Khan Horticulture 10-4-86 - 11-4-86

Appendix C

Route taken by wheat travelling seminar in 1986

First part

March 14th	Collect in Karachi
March 15th	Karachi-Thatta-Sajawal-Hyderabad
March 16th	Hyderabad-Tandojam-Hyderabad
March 17th	Hyderabad-Sakrand-Dadu-Dokri
March 18th	Dokri-Sukkur-Kotdiji-Sukkur
March 19th	Sukkur-Rahim Yar Khan-Bahawalpur
March 20th	Bahawalpur-Multan
March 21st	Multan-Khanewal-Jhang-Faisalabad

Second part

April 4th	Assemble Faisalabad
April 5th	Faisalabad, AARI, NIAB, University
April 6th	Faisalabad-Sheikhupura-Hafizabad-Sialkot
April 7th	Sialkot-Gujrat-Phalia-Daska-Sialkot
April 8th	Sialkot-Marala-Kharian-Chakwal-Islamabad
April 9th	Rawalpindi-Islamabad-Rawalpndi
April 10th	Rawalpindi-Haripur-Burhan-Peshawar
April 11th	Peshawar-Pirsabak-Mardan-Swabi-Islamabad

Appendix D

List of Research Institutes/Stations/Govt. Farms Visited by Participants of Wheat Travelling Seminar (First Part)

1. Cereal Diseases Research Institute, Karachi
2. National Nematological Research Centre, Karachi
3. Agricultural Research Institute, Tandojam
4. Atomic Energy Agricultural Research Centre, Tandojam
5. Rice Research Station, Thatta
6. Southern Zone Agri. Research Centre, Sajawal
7. Agri Training Institute, Sakrand
8. Sind Seed Corporation, Sakrand
9. Production and Processing Seed Corporation, Hyderabad
10. Rice Research Institute, Dokri
11. Adaptive Research Farm, Larkana
12. Agricultural Research Station, Kotdiji
13. Sind Agricultural Extension and Adaptive Research Farm,
Ghotki
14. Oil Seed Research Station, Khanpur
15. Agricultural Research Station, Bahawalpur
16. Sugarcane Mill, Bahawalpur
17. Cotton Research Station, Multan
18. Punjab Seed Corporation Farm, Khanewal

(Second part)

1. Ayub Agricultural Research Institute, Faisalabad
2. University of Agriculture, Faisalabad
3. NIAB, Faisalabad
4. Adaptive Research Farm, Sheikhupura
5. Govt. Agricultural Farm, Farooqabad
6. Govt. Agricultural Farm, Gujranwala
7. Barani Agricultural Research Institute, Chakwal
8. Barani Wheat Station, Rawalpindi
9. Federal Seed Registration Department, Rawalpindi
10. National Agricultural Research Centre, Islamabad
11. Agricultural Research Institute, Tarnab
12. Agricultural University, Peshawar
13. Cereal Crops Research Institute, Pirsabak
14. Wheat Research Institute, AARI, Faisalabad
15. Italian Maximization Workshop, Gujrat
16. BARD sub-station and offices, Haripur

Appendix E

Summary of Wheat Varietal Verification Surveys in Punjab and NWFP³

Varieties	Punjab %				NWFP%
	Cotton Area ¹ Breeder ²	Farmers	Rice Area Breeder ²	Farmers	Maize Area Farmers
Released 5 Years	24.3	15.9	29.6	44.4	22.2
Old recommended	19.2	35.0	26.6	24.1	17.5
Not recommended	44.9	38.6	25.8	15.6	50.2
Mixed or don't know	11.6	10.5	18.0	16.2	9.9
Total	100.0	100.0	100.0	106.0	100.0

¹ Cotton areas of Vehari, Multan and Bahawalpur Districts, Rice areas of Sheikhpura, Gujranwala and Lahore Districts and Maize areas of Multan.

² Breeder survey done in same village as farmer interview but by visual field observations

³ Based on work done by the Wheat Research Institute and Agricultural Economics Research Unit, Faisalabad and AERU and Cereal Crops Research Institute, NWFP.

PRH: ha
WTRVSM
23-4-86

Appendix

F Distribution List NUYT - 1985-86

S. No.	Institute/Station	Normal			Short			Rainfed			NUYT/NUDYT			Barley			Total			Seeding Date
		Rs	FF	Total	Rs	FF	Total	Rs	FF	Total	Rs	FF	Total	Rs	FF	Total	Rs	FF	Total	
1.	AARI - Faisalabad	10	6	16	10	6	16	2	2	4	3	3	6	4	4	8	29	21	50	1
2.	University of Agricultural Faisalabad	1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	-
3.	NIAB - Faisalabad	-	-	-	-	-	-	1	1	2	3	3	6	-	-	-	4	4	8	-
4.	ARS - Bahawalpur	2	2	4	2	2	4	-	-	-	-	-	-	-	-	-	4	4	8	-
5.	BARI - Chakwal	1	1	2	1	1	2	1	3	4	1	1	2	1	1	2	5	7	12	1
6.	BRS - Rawalpindi	1	1	2	1	1	2	1	2	3	1	-	1	1	-	1	5	4	9	-
7.	ARI - Tandojam	4	3	7	4	3	7	-	-	-	2	2	4	2	2	4	12	10	22	1
8.	AEARC - Tandojam	2	-	2	2	-	2	-	-	-	-	-	-	-	-	-	4	-	4	-
9.	ARI-Sariab, Quetta	4	3	7	4	3	7	2	2	4	2	2	4	2	2	4	14	12	26	1
10.	CCRI-Pirsabak	5	4	9	5	4	9	3	1	4	3	2	5	3	2	5	19	13	32	1
11.	Azad Kashmir	1	1	2	1	-	1	2	2	4	1	1	2	1	1	2	6	5	11	-
12.	AZRS-D.I. Khan	1	-	1	1	-	1	1	2	3	1	-	1	1	-	1	5	2	7	-
13.	Gilgit (Rash Khan)	1	-	1	1	-	1	-	-	-	1	-	1	1	-	1	4	-	4	-
14.	PARC/NARC	2	9	11	2	7	9	2	1	3	1	-	1	1	-	1	8	17	25	2
15.	Gilgit (Dr. Zahoor)	-	-	-	-	2	2	-	-	-	-	-	-	-	-	-	-	2	2	-
16.	Dr. Avesi	1	-	1	1	-	1	-	-	-	-	-	-	-	-	-	2	-	2	-
17.	CDRI-NARC	-	1	1	-	1	1	-	1	1	-	1	1	-	1	1	-	5	5	-
18.	ACDRI-Karachi	-	1	1	-	1	1	-	1	1	-	1	1	-	1	1	-	5	5	-
		36	33	69	35	31	66	15	18	33	19	16	35	17	14	31	122	112	234	

Appendix G

Distribution of CIMMYT Nurseries 1985-86

Bread Wheat	INSTITUTES									TOTAL
	NARC	AARI	SRIAB	BWP	CCRI	CHKWAL	SIND	CDRI	NIAB	
1. ESWYT	1	-	1	-	1	-	-	-	-	3
2. ISWYN	1	1	-	-	1	-	1	-	-	4
3. IBSWN	1	1	1	1	1	-	1	-	-	6
4. DSN	1	1	1	-	2	-	-	-	-	5
5. ALSN	1	-	1	-	-	-	-	-	-	2
6. HEAT TOL SN	1	1	1	1	1	-	1	-	-	6
7. PC's	1	-	-	-	-	-	-	-	-	1
B.W. Total	7	4	5	2	6	0	3	0	0	27
Durum										
1. EDYT	1	1	1	-	-	-	-	-	-	3
2. IDYN	-	1	1	-	-	-	1	-	-	3
3. IDSN	1	-	1	-	-	-	-	-	-	2
Durum total	2	2	3	0	0	0	1	0	0	8
Triticale										
1. ITYN	1	1	1	-	-	-	-	-	1	4
2. ITSN	1	-	1	-	-	-	-	-	1	3
3. F ₂ S x W	-	-	1	-	-	-	-	-	1	2
4. F ₅ Bulk	-	-	-	-	-	-	-	-	1	1
Triticale total	2	1	3	0	0	0	0	0	4	10
Barley										
1. IBYT	1	-	1	-	1	-	1	-	-	4
2. IBON	1	1	1	-	1	-	1	-	-	5
3. F ₂ S x W	-	-	1	-	-	-	-	-	1	2
4. F ₂ S x S	-	1	-	-	-	-	-	-	-	1
5. BYDV	-	-	1	-	-	-	-	-	-	1
Barley total	2	2	4	0	2	0	2	0	1	13
Germplasm										
1. LRRM	1	1	1	-	1	-	1	2	-	7
2. K. BUNT SN	-	1	-	-	1	-	-	2	-	4
3. A1 + DR	1	-	-	-	-	-	-	1	-	2
4. IDTN	-	-	-	-	-	-	-	6	-	6
5. ISEPTON	-	-	-	-	-	-	-	1	-	1
6. F ₅ SEQUA HARINEROS	-	-	-	-	-	-	-	-	1	1
Germplasm total	2	2	1	0	2	0	1	12	1	21
GRAND TOTAL	15	11	16	2	10	0	7	12	6	79

Appendix H

Distribution of CIMMYT Nurseries 1985-86

Bread Wheat	INSTITUTES									TOTAL
	NARC	AARI	SRIAB	BWP	CCRI	CHKWAL	AZRI	SIND	CDRI	
1. RWYT	1	1	1	1	-	1	-	1	-	6
2. WON (MR)	1	-	-	1	-	1	-	-	-	3
3. WON (LR)	-	-	1	-	-	1	-	1	-	3
4. WCB	1	-	1	1	-	-	-	-	-	3
5. WSP	1	-	1	-	-	-	-	-	-	2
6. WON (HA)	1	-	1	-	-	-	1	-	-	3
7. WF ₂ (HA)	-	-	1	-	-	-	1	-	-	2
8. CQN	1	1	1	-	-	-	-	-	-	3
9. AWYT (HA)	1	-	1	-	-	-	1	-	-	3
10. W-KLDN	-	-	-	-	-	-	-	-	2	2
11. WYR	-	-	-	-	-	-	-	-	1	1
B.W. total	7	2	8	3	0	3	3	2	3	31
Barley										
1. B-KLDN	-	-	-	-	-	-	-	-	2	2
2. BYT (LR)	-	-	1	-	-	1	-	1	-	3
3. BYT (MR)	1	-	1	-	-	1	-	-	-	3
4. BON (CT)	1	-	1	-	-	1	-	-	-	3
5. BSP (CT)	1	-	1	-	-	-	1	-	-	3
6. BON (LRA)	-	1	-	-	-	-	1	-	-	2
7. BYT (CT)	1	-	1	-	-	-	1	-	-	3
8. BON (MR)	1	-	-	-	-	-	-	-	-	1
9. BSP (LR)	-	1	-	-	-	-	-	-	-	1
Barley total	5	2	5	0	0	3	3	1	2	21
Durum										
1. DYT	-	-	-	-	-	-	-	-	1	1
2. D-KLDN	-	-	-	-	-	-	-	-	2	2
3. DON (HA)	-	1	-	1	-	-	-	1	-	3
4. ADYT (HA)	-	1	-	1	-	-	-	1	-	3
5. RDYT (MR)	1	-	1	-	-	-	-	-	-	2
6. RDYT (LR)	-	1	1	-	-	-	-	-	-	2
7. DF ₂ (HA)	-	-	1	-	-	-	1	-	-	2
8. DON (MR)	1	-	-	-	-	-	-	-	-	1
9. DSP	-	1	-	-	-	-	-	-	-	1
10. DON (LRA)	-	1	-	-	-	-	-	-	-	1
Durum total	2	5	3	2	0	0	1	2	3	18
GRAND TOTAL	14	9	16	5	0	5	8	5	8	70

