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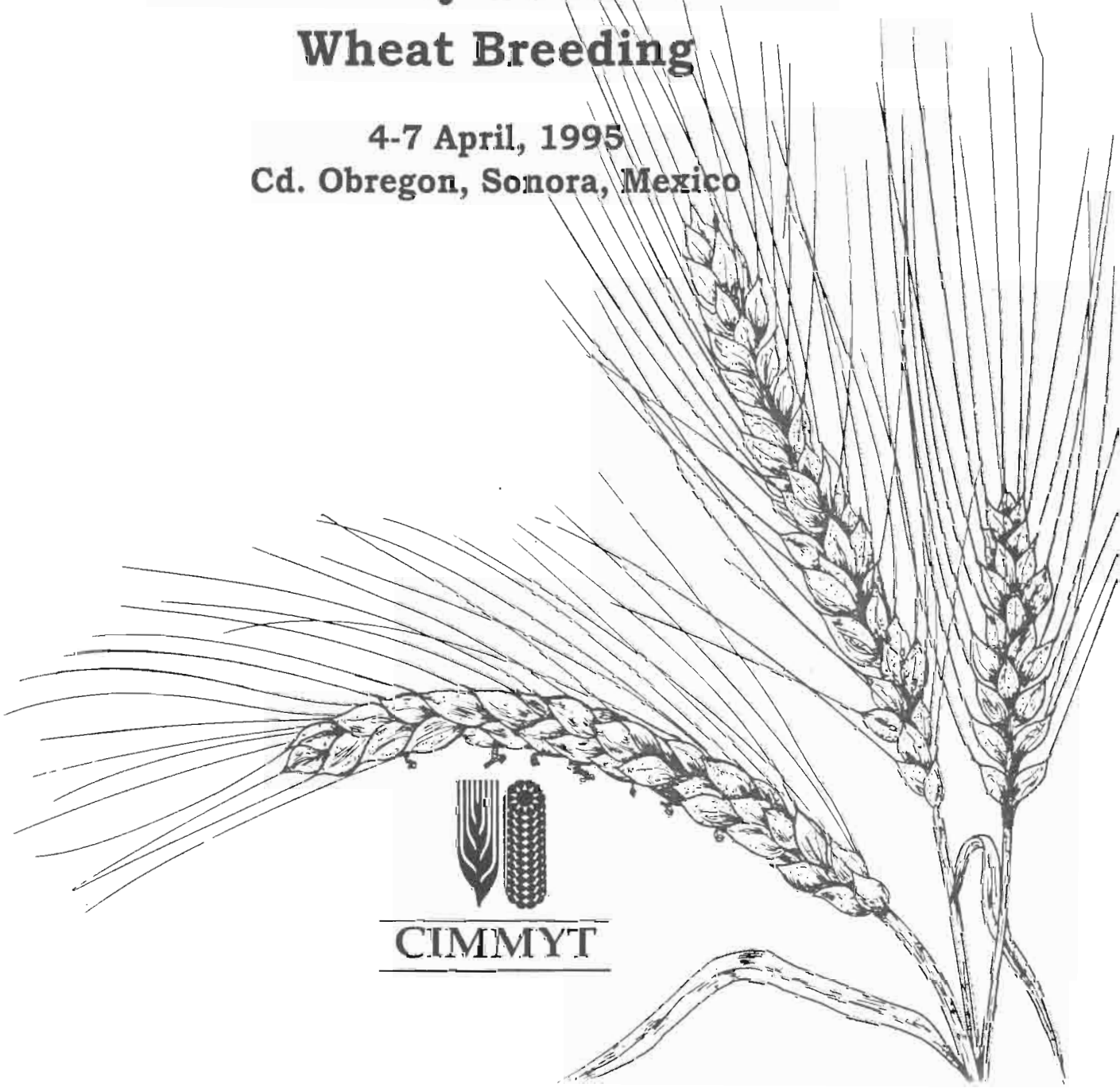
WPSR No. 38

CIMMYT/NARS Consultancy on ME1 Bread Wheat Breeding

4-7 April, 1995
Cd. Obregon, Sonora, Mexico



CIMMYT

Wheat Special Report No. 38

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Contents

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Preface

A short time before the consultancy, I came across three quotations which I think help set the tone of the meeting. Here they are:

"A strong wish of the NARS is to have a greater say in setting the research agendas of the international agricultural research centers (IARCs). The overall mission of the centers and the CGIAR is to increase food productivity and production through the NARS. However, the NARS feel that currently they do not have mechanisms for influencing the research agendas of the IARCs.

"In addition, almost all of the NARS representatives with whom I have spoken expect the IARCs to aim at upstream research--not blue-sky types of research, but upgraded forms of the kinds of research that the NARS are capable of doing. This is to ensure that the NARS and the IARCs do not duplicate work, which would put NARS in an unfair competitive position. Among the NARS, the perception persists that in many cases the IARCs do the kind of work that the national systems can perform with equal proficiency. This is putting NARS scientists into disadvantaged positions.

"In this very context, there is increasing talk of the devolution of work to those NARS that can be called 'strong.' Some of these strong NARS feel that devolution of work is impractical if it is done without devolution of resources. The strong NARS might have scientific capabilities, but they still need resources to tackle problems."

Source: V.L. Chopra, Director General, ICAR. Address to the CGIAR Mid-Term Meeting, New Delhi, May, 1994.

"We recommend, therefore, that CIMMYT and the NARS subscribe to a vision that they might jointly redesign their wheat breeding programs with the goal that the CIMMYT program and the NARS programs will function as a single interconnected collaborative Wheat Breeding Program for the Developing World. The Program should provide maximum independence and service to individual NARS, but it also should enable all members to help each other with services they can best provide.

"This proposed Wheat Breeding Program for the Developing World is visionary and can never be realized in full because of differing national goals and international rivalries. But we believe that to have the vision and to work towards it with hopeful resolution is better than to do nothing."

Source: J. Axtell, D. Rasmusson, D. Marshall, M.V. Rao. and D.N. Duvick. External Review of the CIMMYT Wheat Genetics Improvement Subprogram, 20-25 March, 1994.

"A final question that is left unanswered by these results (the Byerlee, Maredia and Bohn analysis described in the 1992/1993 World Wheat Facts and Trends) is: What is the optimal strategy for CIMMYT in terms of the type of product and how should decisions at the intemational level be made? if NARS make decisions on the basis of the availability of spillins from the IARC (like CIMMYT), then many are investing too much in a technology development capacity (e.g., in wheat breeding). On the other hand, if IARCs make decisions taking NARS's technology development capacity as fixed (i.e., often weak, not improving. thus needing IARCs to continue 'gap filling'), then IARCs with resource constraints may be investing too much in applied research versus strategic research that would have an even higher payoff.

"One important additional consideration is that an IARC can usually not operate in isolation. To develop widely adapted and useful technologies requires an extensive network of testing, and in practice this is provided by NARS. Thus complementarity is fostered not only by joint decision making on the types of products by each party, but also by the fact that, in practice, most products are developed jointly."

Source: D. Byerlee. On the Comparative Advantage of International Agricultural Research. Paper prepared for an ICRISAT Workshop, 14-16 December 1994.

R.A. Fischer
Director
Wheat Program

Introduction

Through the mechanism of internally managed external reviews (IMERS), all activities of the Wheat Program were reviewed in the period 1990-1994. In general, this was a satisfactory exercise, except that we felt NARS input was inadequate. Thus, we decided to have a CIMMYT/NARS consultancy in 1995 rather than begin to repeat the IMERs. The consultancy was focused on ME1 bread wheat breeding, a target comprising over 40% of developing world wheat production and our major research activity. The dates 4-7 April were chosen for the consultancy, and the venue was our training facility at CIANO, Cd. Obregon.

We decided to invite NARS breeders more or less in proportion to the importance of their country to MEl (and ME5). Letters went out in late January to NARS directors (see copy of form letter in Annex 1), and they chose which breeders would fit the slots allocated for their country. We paid all their expenses (as visiting scientists) and encouraged the breeders to stay on for a few days after the consultancy to select materials from our germplasm and to inspect our field research more closely. Note that our invitation letter asked each country to prepare a written country report, but not a presentation. However, no papers either from CIMMYT or NARS were distributed beforehand.

We were fortunate that due to strenuous efforts by our Training Office (which handles visiting scientist matters) and our outreach scientists, and despite the short notice (these days eight weeks is short notice), all NARS invitees (a total of 27) attended the meeting (see list Annex 2). There was also full participation from CIMMYT scientists (Annex 2). Dr. J. Dubin was absent because of a family emergency. All NARS visitors elected to stay in Cd. Obregon for several days after the consultancy in order to inspect nurseries and make selections.

Meeting structure

We had some difficulty arriving at a program and format which, on the one hand, brought NARS breeders up to date on the full range of our activities bearing upon the subject and, on the other, permitted early NARS input. The final meeting program (Annex 3) was in fact modified as we proceeded. The first day was dedicated to CIMMYT presentations

and a field trip. The morning of the second day was insufficient for the NARS to complete a list of priorities and recommendations in their closed session, although the day before a brief questionnaire (Annex 4) had been distributed to facilitate this process (completed copies are on file in the Wheat Program office). The whole afternoon of the second day was therefore devoted to brief presentations from each NARS represented (12 countries excluding Argentina). It turned out that almost all countries were prepared and desirous of doing this. Papers had also been prepared by all countries. These were distributed, and a full set has been lodged in the CIMMYT Library.

We then moved back to the posted program for the third day of CIMMYT presentations on breeding support. NARS scientists showed a lot of interest in this, especially the presentation on biotechnology. NARS recommendations were discussed later that day and the next morning; this had been set back in the program in order to have the statement typed and distributed beforehand (see p. 4). Much of the discussion related to clarification and amplification of the issues; some drifted into the area of CIMMYT's response to the issues identified by NARS. This is reflected in the final proceedings and recommendations statement (see p. 6), a document which was refined during the last day, retyped several times (thanks to Alma McNab and Miguel Camacho), and ratified by all NARS participants before they left Mexico. The final morning also saw presentations and discussions on international nurseries, outreach consultancy, IPR, plant quarantine, and collaborative arrangements.

Concluding commentary

All NARS participants felt the meeting was very useful. The structure certainly left plenty of time for discussion (no more than 50% of the meeting time was taken up by formal presentations). Useful suggestions and strong support for existing activities at CIMMYT were forthcoming. For example, the scientists did want to see training restored and more attention focused on breeding support research, and did want to see us continue or expand in areas of cropping system sustainability, something not even on the agenda but raised by them! Useful feedback was given, especially in the area of International Nurseries. We were pushed hard on applications of biotechnology to wheat breeding. The extra time NARS visitors spent at CIANO permitted further valuable interactions and certainly gave them a very thorough look at our materials in the field.

The meeting did not, however, move far down the path of forging a new global breeding partnership, with new collaborative efforts and devolution of some activities to NARS. This was a challenging recommendation made in last year's review of our Genetic Improvement Subprogram and placed before the NARS scientists at the outset of the consultancy (see Preface). It may have been possible to have forced more serious consideration of this challenge if the materials presented at this year's meeting had been written up and circulated well beforehand, with the assumption that people would come fully briefed on the current situation. If, as well, a neutral facilitator had been engaged for the meeting with the objective of encouraging discussion on possible new and better ways of doing things, then more progress towards new collaborations might have been made.

However, it should also be recognized that NARS scientists operate under various pressing limitations (lack of funds, bureaucratic controls, structural instability, neglect of agriculture, civil strife) in their home countries, and it is hardly surprising they are reluctant to want to change the status quo vis à vis wheat breeding, a system that has served them well. Innovations in the system will, I am afraid, have to continue to come largely from CIMMYT, or high up in the NARS, provided, of course, they do not become ways for NARS leaders to avoid dealing with some of the basic limitations their own scientists face.

R.A. Fischer
Director
Wheat Program

Proceedings and Recommendations of Discussion amongst NARS Representatives regarding Their Priorities and Expectations from CIMMYT*

NARS representatives assembled on afternoon of April 5th, 1995, and forenoon of April 6th, 1995 (see list of participants in Annex 2). The group unanimously agreed on Dr. J.P. Tandon to chair the deliberations and act as spokesman for the group.

The NARS participants expressed their deep sense of appreciation for the CIMMYT efforts on germplasm enhancement and distribution, assistance on human resource development, and information exchange with CIMMYT and amongst NARS. The NARS expressed their desire for the continuation and strengthening of these ongoing efforts and hoped the IPR will not hinder the cordial functioning and free flow of material between CIMMYT and NARS. In order to strengthen the efforts of CIMMYT, the NARS members met separately to identify their priorities so as to guide CIMMYT's efforts further. This may assist CIMMYT in investing its resources in new emerging areas.

After detailed discussions, the broad areas of concern were identified. Each country was requested to identify the 10 most important issues of their concern. The summed up information showed that the following issues are of larger concern to most of the NARS.

L Thrust areas

1. Development of high yielding heat tolerant germplasm with superior bread making qualities, short duration, and lodging resistance.
2. Research on nutrient use efficiency.
3. Exchange of NARS improved material.
4. Supply of CIMMYT segregating material (F_2 onwards).
5. Research on sustainability and eco-friendly intensive cropping systems.
6. Research on heat tolerance, development of synthetics and transgenics

IT. Other issues of concern were identified as:

1. Development of hybrid wheat.
2. Research on foliar blights.
3. Irrigation systems.

• First draft. See the final version on page 6.

4. Training on biotechnology.
5. Understanding stripe rust virulence patterns and distribution.
6. Developing networks on heat and salinity tolerance studies.
7. Improving grain size and protein content.
8. Increasing the level of cold tolerance, waterlogging tolerance, and quality for flat bread in the gennplasm distributed.

III. Human resource development for NARS programs

The group unanimously recommended:

1. Revival of a minimum number of 25 young scientists as trainees per year.
2. Keeping in view the cost of living escalation, there is a need for an upward revision of the prevalent fellowship rates for trainees, visiting scientists (short duration, long duration), and consultancies.
3. The review meeting between CIMMYT and NARS should become a regular feature every two or three years.
4. For quick infonnation exchange, nursery and trial data should be computerized by NARS/CIMMYT.
5. Concern was expressed on the delay in the supply of multilocation nursery/trial data, which is coming in the way of an effective use of the infonnation.

IV. Visits

The group also expressed deep desire in the following items:

1. More visiting scientists from NARS to CIMMYT.
2. Organizing regional training programs and consultancies.

The meeting concluded with a vote of thanks to CIMMYT for involving NARS in the prioritization of its research efforts.

Final Proceedings and Recommendations of Discussion among NARS and CIMMYT Scientists regarding Their Priorities for ME1 Breeding and Related Activities

NARS representatives assembled on the afternoon of April 5th, 1995, and forenoon of April 6th, 1995 (see list of participants in Annex 2). The group unanimously agreed on Dr. J.P. Tandon to chair the deliberations and act as spokesman for the group.

The NARS participants expressed their deep sense of appreciation for CIMMYT's efforts on germplasm enhancement and distribution, assistance on human resource development, and information exchange with CIMMYT and amongst NARS. The NARS expressed their desire for the continuation and strengthening of these ongoing efforts and hoped IPR will not hinder the cordial functioning and free flow of materials between CIMMYT and NARS. In order to strengthen the efforts of CIMMYT, NARS members prioritized their needs so as to guide CIMMYT's efforts further. This may assist CIMMYT in investing its resources in new emerging areas.

After detailed discussions, broad areas of concern were identified and are enclosed (see p. 4). Each country was requested to identify the 10 most important issues of their concern, and issues of concern to the largest numbers of nations were taken as the highest priorities. Later a joint discussion between NARS and CIMMYT scientists was held on the afternoon of 6th and morning of 7th April in order to add detail to NARS suggestions.

The following summary of suggestions intends to highlight the need for further strengthening of efforts without in any way diluting the ongoing research on issues already prioritized by CIMMYT:

L Major thrust areas

1. Development of high yielding heat tolerant germplasm with superior bread making qualities, short duration, and lodging resistance. Genetic resources should be explored, for example, to improve lodging resistance. Testing sites for lodging should be identified. The meeting endorsed the need for a special project to analyze the genetic basis of lodging resistance and its efficient exploitation by breeders.

For further delineating genotypes for yield potential, sites other than Obregon should be explored. The meeting endorsed the concept of multilocational yield testing of advanced lines (PC) outside of CIANO.

2. Research on nutrient use efficiency

Both crop management and breeding research should focus on this problem. with special emphasis given to crop management.

3. Exchange of NARS improved material

The 1994 IMER proposal to include more NARS contributed materials in CIMMYT's international testing trials was discussed and approved. Perhaps they could be tested regionally first and then varieties that do well could be included in CIMMYT trials. Some limits may need to be placed on numbers. Inclusion in screening nurseries vs inclusion in yield trials was discussed. It was considered that the present IN code of ethics should offer sufficient ownership protection for NARS materials. CIMMYT was also asked to facilitate exchange of improved materials and released varieties between NARS.

4. Supply of CIMMYT segregating material (F_2 onwards)

This would have to be demand driven. CIMMYT needs to know which countries would be interested in this type of program. Would probably be done through formal requests.

5. Research on sustainability and eco-friendly intensive cropping systems

Concern on the part of NARS that wheat production in intensively cropping MEl systems won't be sustained. Stronger programs such as India are working on this problem, but smaller programs need help. In addition to developing new varieties that could contribute to sustainability (better disease resistance, etc.), CIMMYT has a major role in the crop management aspects of wheat sustainability.

6. Research on heat tolerance, development of synthetics and transgenics

This refers to upstream research -- cutting edge issues. NARS willing to cooperate by testing materials such as synthetics. Synthetics are now available for distribution on request. CIMMYT suggested that some of these activities could be devolved to NARS. However, NARS would prefer CIMMYT to be a facilitator in such research.

ll. Other issues of concern identified were:

1. Development of hybrid wheat

The CIMMYT external review panel did not prioritize this area of research. However, the argument for hybrids is the good possibility of getting enough heterosis. China, we learn, is investing in hybrid wheat. The recent success of India in hybrid rice and cotton indicates that this technology cannot be further ignored.

2. Research on foliar blights

Fears expressed that foliar blights will increase with conservation tillage. There's already a program at CIMMYT, but perhaps more could be invested in it. Poza Rica is not a good site for testing for foliar blights for ME 1. Test locations -- perhaps in Bangladesh, Nepal and India -- should be identified to speed up selection.

3. Irrigation systems

A need for both management practices and varieties that are more efficient at using water and fertilizer. Sprinkler irrigation systems and deficit irrigation are becoming important in some countries and may require different germplasm.

4. Training on biotechnology

A formal two-week course will be given for first time this year. Basic requirements for NARS scientists to participate in biotech training course, which emphasizes the applied side of biotech: Though a Ph.D. in molecular

biology is not required, participants should have an adequately equipped lab in home country, as well as close links to a breeding program that's interested in using these tools.

5. Understanding stripe rust virulence patterns and distribution

Suggestion that Iran could do germplasm resistance screening for other countries because they have good facilities. However, the Iranian NARS would need government approval and resources to do virulence analysis. Other suggestions: that the UK take up the role IPO used to have in doing regional disease surveys. It is anticipated that with the new project in Ethiopia regional yellow rust screening should recommence there. All approaches will need to be pursued.

6. Developing networks on heat and salinity tolerance studies

Heat tolerance is essential in ME1 environments and CIMMYT is already working on it. CIMMYT will work to bring together countries that have salinity problems, since some NARS are stronger in this respect. Salinity will be solved through better water management and drainage, but the meeting insisted that breeding had a role to play. Pakistan, India, and Egypt can provide field screening.

7. Improving grain size and protein content

Suggestion on how to do this: transfer gene from *Triticum dicoccum* for heat tolerance, and from *T. dicoccoides* for protein.

8. Increasing the level of cold tolerance, waterlogging tolerance, and quality for flat bread in the germplasm distributed

Types of cold damage were discussed extensively. Not only is there frost damage at heading in certain situations, but there can also be sub-optimal temperatures and damaging frost during the vegetative phase in northerly ME1 locations. Genetic differences exist and need to be explored by CIMMYT.

III. Human resource development for NARS

The group unanimously recommended:

1. Revival of a minimum number of 25 young scientists as trainees per year

   CIMMYT suggested that also NARS communicate this need for training to donors. The alternative of bringing more mid career scientists to Mexico was discussed and received support.

2. Keeping in view the cost of living escalation, there is a need for an upward revision of the prevalent fellowship rates for trainees, visiting scientists (short duration, long duration), and consultancies

   CIMMYT will consider this suggestion.

3. The review meeting between CIMMYT and NARS should become a regular feature every two or three years

   CIMMYT suggested ME1 meetings could be held every four years.

4. For quick information exchange, nursery and trial data should be computerized by NARS and CIMMYT

   Nurseries will now be available in electronic form. A few countries have access to Internet, and data could be made available through this route. Electronic field books were also suggested.

5. Concern was expressed on the delay in the supply of multilocation nursery/trial data, which is hindering effective use of the information

   Screening nurseries were contrasted with yield nurseries. It was pointed out that data collection on the former was entirely at the discretion of NARS. But without rapid tum-around of screening nursery data by CIMMYT, it is of no use to NARS.

IV. Visits

The group also expressed deep desire in the following items:

1. More visiting scientists from NARS to CIMMYT

2. Organizing regional training programs and consultancies

The meeting concluded with a vote of thanks to CIMMYT for involving NARS in the prioritization of its research efforts.

Response to Recommendations Put Forth at the NARS/CIMMYT Consultancy on ME1 Breeding

S. Rajaram
Leader, Bread Wheat Breeding

After NARS scientists and most CIMMYT staff (base and outreach) discussed the priorities for MEl breeding and related activities, the NARS made 21 recommendations (see p. 6), many of which are already part of CIMMYT core operations. With the aim of developing several CIMMYT/NARS partnerships, I wish to further prioritize these recommendations as follows:

1. Further delineation of MEl genotypes (advanced line level) in four or five international environments (besides Cd. Obregon, Sonora) with regard to yield potential, rust resistance, and quality, to determine whether other locations can complement current testing in Cd. Obregon, Sonora; 600-1000 genotypes will be grown annually.

Partners: Zimbabwe, Chile, Egypt, Mexico, and CIMMYT.

2. Development of hybrid wheats. The CGIAR is projecting doubling productivity/production by the year 2025. The utilization of heterosis can contribute significantly to this. I believe that CIMMYT/NARS ought to further examine potential areas of cooperation.

Partners: India and CIMMYT.

3. International rust virulence survey. Rusts are among the most damaging diseases of wheat and do not respect international boundaries. In the past, assistance in doing virulence analyses has come from developed countries. However, many of these laboratories and the services they provide are fast disappearing. The alternative strategy is to bring NARS together regionally and develop joint facilities with CIMMYT's assistance. Such labs are already available but need regional focusing.

Partners: East Africa (Ethiopia), southern Africa (RSA), Middle East (Iran), the Indian Subcontinent (India), China, and Southern Cone countries (Brazil).

4. Networking for salinity. Most MEl areas are affected by salinity problems. To some extent, biologica/genetic solutions are possible.

Partners: India, Pakistan, Egypt, and CIMMYT.

5. Networking for heat tolerance. Most MEl areas are affected by high temperatures during grainfilling. A breeding and physiology partnership among the NARS is needed.

Annex 1

Letter to NARS Directors

What follows is a copy of the letter of invitation, sent out on 30 January 1995, informing NARS directors of the consultancy session and asking them to identify which breeders from their programs should attend.

Dear

Every year since the 1988 Quinquennial Review of CIMMYT, the Wheat Program has organized a minireview of one of its major activities. In 1994 we completed reviewing all our activities. While the process was generally satisfactory and the comments of reviewers useful, we feel this exercise has lacked sufficient input from the NARS. In recent years, budget constraints have limited our more traditional means of soliciting input from cooperators (visits to and from Mexico). For these reasons, we have decided to hold an indepth consultation with research partners in early April of this year in Cd. Obregon. Mexico.

In order that the consultation can really focus on issues, we will confine the subject to our major activity, namely breeding bread wheat for mega-environment one (MEl). This target environment covers all temperate irrigated wheat environments; collectively they comprise over 40% of the wheat produced in the developing world. We would like our invitees to come with ideas on and a written paper about a number of wheat issues in their country (one paper per country). We do not intend these papers to be presented formally, but we will copy and distribute them as background to the discussions. If copies of the papers could be sent ahead of the meeting it would be helpful. It is important to cover the following issues:

1. Amount of wheat area and production in MEl (=fully or partially irrigated wheat) and recent trends.
2. Biotic, abiotic, and socioeconomic constraints to higher production and their relative priorities.
3. Breeding organization and strategy, current major activities, spillovers from ME1 to other MEs.
4. Institutional factors constraining the rapid development, release, and adoption of new varieties.

5. Contacts with CIMMYT and use of CIMMYT germplasm, information, and training.
6. Opportunities for improved collaboration with CIMMYT, including:
    - modifications to International Nurseries
    - better information sharing
    - closer collaboration on appropriate issues
    - research partnerships
    - devolution of tasks
    - joint strategies on wheat biotechnology
    - modifications to improvement training
7. Other issues of general concern to wheat breeders, such as Intellectual Property Rights, ownership of genetic resources, genetic diversity, genetic vulnerability, and raising the yield barrier.

We plan to have structured discussions built around brief introductory presentations, on as many of these themes as possible. By the end of the week, we would like to come up with a clear plan of action for our future joint activities. About 15 breeders from NARS and all Wheat Program bread wheat breeding staff, and many from related activities areas, will be participating. There will also be an opportunity to visit plots and inspect the latest germplasm.

I would like to invite one experienced wheat breeder from _____ to participate in the CIMMYT-NARS Consultancy on MEl Bread Wheat Breeding to be held 4-7 April 1995 at Ciudad Obregon. We will cover living costs in Mexico as per our visiting scientist regulations. Should the invitee wish to stay longer in Obregon or to visit El Batan Headquarters, we will cover the costs for up to an additional week in Mexico. Unless stated otherwise, we will also arrange to obtain Mexican visas for invitees from overseas.

Yours sincerely,

R.A. Fischer
Director
Wheat Program

Annex 2

Lists of Participants

NARS Participants

1. Z. Ahmad, Wheat breeder, Kanpur, India
2. G.S. Nanda, Wheat breeder, Ludhiana, India
3. S. Nagarajan, Director, Directorate of Wheat Research, Karnal, India
4. J.P. Tandon, Assistant Director General, Crops, ICAR, New Delhi, India
5. M. Yunus, Wheat breeder, Hissar, India
6. P.S.L. Srivastava, Wheat breeder, New Delhi, India
7. Mohamed Salih M., Wheat breeder, Wad Madani, Sudan
8. Abdalla B. Idahmadi, Wheat breeder, New Halja, Sudan
9. AB. Shakhawat Hossain, Wheat breeder, Joydepur, Bangladesh
10. M.A Razzaque, Director, Wheat Research Center, Nashipur, Bangladesh
11. A Mustafa, Wheat breeder, Nashipur, Bangladesh
12. M. Torabi, Wheat pathologist, Karaj, Iran
13. A Akbari, Wheat breeder, Karaj, Iran
14. Ignacio Ramírez, Senior wheat breeder, INIA, Santiago, Chile
15. Jorge Nisi, Senior wheat breeder, INTA, Marcos Juárez Argentina
16. Anthony Mashiringwani, Wheat breeder, Harare, Zimbabwe
17. Mary V. Mukvavi, Wheat coordinator, Lusaka, Zambia
18. S.R. Sabry, Wheat breeder, Giza, Egypt
19. M. Morsi, Wheat breeder, Sakha, Egypt
20. R.N. Devkota, Wheat breeder, Bhairahawa, Nepal
21. I. Ozberk, Wheat breeder, Diyarbakir, Turkey
22. N.I. Hashmi, Wheat coordinator, NAQC, Islamabad, Pakistan
23. A Haider, Wheat breeder, Pirsabak, Pakistan
24. Miguel Camacho Casas, Wheat breeder, Ciudad Obregón, México
25. Emesto Solís Maya, Wheat breeder, Celaya, México
26. Jesús Reyna Martínez, Wheat breeder, Delicias, Mexico
27. Julio Huerta, Wheat pathologist, Ciudad Obregón, México

CIMMYT Participants

Administration

1. P.R. Rowe

Wheat Mexico

2. R.A. Fischer
3. G. Varughese
4. S. Rajaram
5. M. van Ginkel
6. R. Singh
7. G. Fuentes
8. J. Peña
9. K.D. Sayre
10. M. Reynolds
11. A. Mujeeb-Kazi
12. P.N. Fox
13. B. Skovmand
14. R. Villareal

Wheat Outreach

15. G. Ortiz
16. H. Braun
17. A. Morgunov
18. M.M. Kohli
19. T. Payne

Biometrics

20. J. Crossa

Applied Biotechnology Laboratories

21. D. Hoisington
22. D. González de León
23. N. Bohorova

Annex 3

Final Program

DAY 0 (Monday, 3 April)

6:30 - 8:00 p.m. Reception cocktail -- Motel Costa de Oro

DAY 1 (Tuesday, 4 April) (Chairperson: P.R. Rowe)

8:30 - 9:00 a.m. Brief introduction (R.A. Fischer)

Purpose of meeting: To seek NARS input
Structure of meeting
World wheat, and MEl definition and importance
Wheat Program structure and strategies
Questionnaire

9:00 - 1:00 Breeding for MEl at CIMMYT

Yield progress	(S. Rajaram)
Yield stability	(M. van Ginkel)
Yield resistance, vulnerability	(R. Singh)
Kamal bunt resistance	(G. Fuentes)
Industrial quality	(J. Peña)

2:30 p.m. Field trip in hands of
Bread Wheat (S. Rajaram and colleagues)

F2 populations, CB, advanced lines,
N trial, synthetics derivatives

DAY 2 (Wednesday, 5 April) **(Chairperson: R.A. Fischer)**

8:00 -11:00 a.m. **Closed session for NARS scientists**
(Discussion amongst NARS breeders regarding their priorities as well as expectations that their country situations place upon the CIMMYT. Spokesperson should be chosen to present conclusion to open session with CIMMYT staff.)

11:30 - 12:30 **Overall priorities -- Summary by NARS spokesperson**

2:00 - 5:00 **Discussion of issues raised by NARS**

DAY 3 (Thursday, 6 April) **(Chairperson: G. Varughese)**

Presentation and discussion of support to MEl breeding at CIMMYT and in NARS
(Brief presentations of subject by CIMMYT staff followed again by indepth discussion with facilitation and recording.)

8:00	**1. Agronomy** Efficient plot management Creating opportunities for future genetic gains in productivity	**(K.D. Sayre)**
9:00	**2. Physiology** Selection criteria for yield Selection criteria for heat tolerance	**(M. Reynolds)**
10:30	**3. Wide crossing**	**(A. Mujeeb-Kazi)**
11:30	**4. Biotechnology**	**(D. Hoisington)**
2:00	**5.IWIS**	**(P.N. Fox)**

3:00	6. Biometrics	(J. Crossa)
4:00	7. Genetic Resources	(B. Skovmand)
5:30	Carne asada at CIANO	

DAY 4 (Friday, 7 April) (Chairperson: R.A. Fischer)

Presentations and discussions of germplasm and information flows between CIMMYT and NARS
(Germplasm has traditionally been the major component of the interchange between CIMMYT and NARS. Information could play a large role too.)

8:00	1. International Nurseries Current strategies Future developments	(P.N. Fox)
9:00	2. Barriers to germplasm movement Plant quarantine, customs, and IPR	(P.R. Rowe)
10:30	3. Opportunities for collaborative activities between NARS and CIMMYT Modes of operation Suggestions arising from this meeting	(R.A. Fischer)
11:30	4. Consulting and training Role and adequacy	(M. Kohli; also G. Ortiz, T. Payne A. Morgunov, R. Villareal)
12:00	5. Final discussion and approval of concluding joint statement	

Annex 4

CIMMYT/NARS MEl Bread Wheat Consultancy Questionnaire

Country:

Annual average bread wheat production:

ME 1	(Temperate irrigated)	_____mt
MEl	(Late planted)	_____mt
ME5	(Hot irrigated)	_____mt
	Total	_ _ _ _mt

Common cropping systems: %

1.
2.
3.
4. _____

Total 100%

1. Breeding priorities? (see next page)

2. Relevance of CIMMYT Wheat Program?
   - germplasm supplied through International Nurseries
   - information (new knowledge) generated
   - information transfer mechanisms:

     training
     visiting scientists
     consultations

   - other aspects ofNARS/CIMMYT interaction

3. Ways of improving CIMMYT/NARS collaboration?

Country:
Breeding priorities:

Breeding traits* of importance		**Priority Score****	**Comments**
Yield potential related:	- Yield		
	-Lodging		
Biotic stress related:	- Heat		
	- Cold		
Abiotic stress related:	- Heat		
	- Cold		
Product quality related:	- Loafbread		
	- Flat bread		
	- Grain color		
	- Grain size		
Other traits			
Total		100	

* Add or subtract traits as you see fit.
** Each country has a total of 30 points to allocate to the various breeding traits. More points = higher priority!

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(as of July 15, 1995)

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