REPUBLIC OF TUNISIA
MINISTRY OF AGRICULTURE

NORTH AFRICA REGIONAL PROGRAM
INTERNATIONAL CENTER FOR AGRICULTURAL
RESEARCH IN THE DRY AREAS (ICARDA)

TUNISIA / ICARDA

Cooperative Projects

REPORT OF THE EIGHTH ANNUAL

Coordination Meeting

20 - 22 SEPTEMBER 1990
TUNIS - TUNISIA

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PREFACE

The Eighth Tunisia/ICARDA Coordination Meeting was held at the Institut National de la Recherche Agronomique de Tunisie (INRAT), Tunis during the period September 20 to 22, 1990.

The present document gives an abstract for this meeting and includes the highlights of the 1989/90 results of the collaborative projects on cereal improvement, food legume improvement and farming systems as well as the work plans for 1990/91 crop season. The training needs, staff higher education, workshops and professional visits in different projects are also given. Recommendations in some areas are reported.

The annual progress reports for these projects as well as the reports and publications on specific activities are produced separately and are available on request.

EIGHTH TUNISIA/ICARDA COORDINATION MEETING

SEPTEMBER 20-22, 1990

The Eighth Coordination Meeting between Tunisia and ICARDA was held at the Institut National de la Recherche Agronomique de Tunisie (INRAT) during the period September 20-22, 1990.

The program of the meeting and list of participants are presented at the end of this report (Annex 1 and 2).

The meeting went as follows:

September 20 - Opening Session

September 21 - Concurrent Sessions of the Projects
Review of 1989/90 Results and Develop 1990/91 Work Plans
- Cereal Improvement
- Food Legume Improvement
- Farming Systems Research

September 22 - Concurrent Sessions of the Projects (Cont.)

- Closing Session

- Presentation, Highlights of 1989/90 Results and 1990/91 Work Plans
- Closing Remarks.

OPENING SESSION

Dr. Mustapha Lasram, Director General, Institut National de la Recherche Agronomique de Tunisie (INRAT) chaired this session. He welcomed the participants to this important meeting from ICARDA and the national institutes involved.

He emphasized the importance of this meeting, in which ICARDA and their national counterparts discuss the findings of last crop season and develop the programs of work for the next season. He said that this year's meeting was the eighth annual meeting, though collaboration with ICARDA started about 12 years ago.

He said that the meeting this year would be a very short one as it is actually for one day and a half only. This was not enough he said for good discussions. Few years back we had three days of meetings that were optimum. He referred to discussions in previous meetings when a different format for the coordination meetings was proposed. He indicated that he realized the problem for ICARDA staff in having a three day meeting by country, but since ICARDA had developed collaborative activities in the four Maghreb countries he felt it was the right time now to think of a

single Regional North Africa/ICARDA Coordination Meeting for a period of one week to be rotated between the countries. He realized that in these meetings it would not be possible for all the national researchers of a program to travel to the country hosting the meeting but only the key researchers would participate. He thought of it as a proposed format but not the only possible way or the best one. He emphasized the necessity for increasing interaction among Maghreb programs through ICARDA in relevant areas and recommended to think about a new format for the next coordination meeting.

He praised the collaboration with ICARDA for which he used the term traditional or classical collaboration and said that it was very usefull as it helped in the research areas as well as in building up the man-power need of the country through training. He added that a new dimension started recently through regional activities. This was strengthened through Maghreb special funded projects. He referred to the Cereal and Food Legume Diseases and the Technology Transfer projects. The latter he said fitted well with our priorities in strengthening research and development in semi-arid zones. He added that both projects were so far suffering from budget limitations and wished that the funding situation would be clarified soon.

He mentioned that both the 1987/88 and the 1988/89 seasons were dry and agricultural production in Tunisia suffered tremendously. However these years were not wasted since many good lessons were learnt on the research side and genetic material tolerant to drought was selected. The 1989/90 season, which followed two dry years was also very special in various ways. It was dry particularly in the northern part of the country, known as the main contributor to cereal production. In spite of that, 1.63 Million Tons of cereals were produced. This he said was the third record crop produced in the country following the 1986/87 crop of 2.2 Million Tons and the 1985/86 crop of 1.9 Million Tons.

He mentioned that the new durum and barley varieties, Razzak and Rihane-03, respectively, did very well. The results of triticale were very encouraging and triticale could replace barley in problem areas in the north. He added that the last season was very special since cereal diseases particularly yellow and leaf rusts on wheat and barley yellow dwarf on wheat and barley were severe. He said that the report on the Cereal Disease Monitoring Nursery was very interesting since it clearly showed that diseases were important this season. He added that in the last coordination meeting it was agreed to review and synthesize the last five years research results of the cereal program and this needs to be done as soon as possible.

As for food legumes, he mentioned that the program achieved outstanding results and was expanding very quickly. At this stage there was a need to capitalize on the excellent results so far achieved and to prioritize our activities and to limit our efforts to what we could continue with our limited resources.

The Farming Systems Project he said came to an end though some work is being continued with ICARDA financial support for the last year and a half or two. Although its future was not yet clear it needed to be extended. He added that priority should be given to transfer the results obtained to development agencies so that the farming community could benefit from these results. Thus he recommended to ICARDA to consider continuing its support to the project. There was a need for the ICARDA group and the national team to discuss its future shape and duration. He reiterated that the coherence of the multidisciplinary and multi-institutional national team might be lost if the project stopped and it would be difficult to rebuild the team in the future.

He requested members of the three different groups to work hard during the coming day to come up with their work plans for the 1990/91 season for presentation in the closing session. He also requested the national coordinators to present the most salient highlights of their 1989/90 results during the closing session so as to acquaint all participants with the achievements.

He again thanked ICARDA staff for participating in this meeting and indicated that some of them were attending this meeting for the first time since he saw some new faces.

Dr. A. Kamel thanked Dr. Lasram for his statement and apologized to Dr. Lasram and the national colleagues for the short duration of the coordination meeting this year. He realized that they would have to work long hours the next day to accomplish what needed to be done in three days.

He introduced all the ICARDA staff who came from the different programs of ICARDA as well as the Head of the Germplasm Resources Unit. This he said showed the importance ICARDA attached to collaboration with Tunisia. He also welcomed the participation of Mr. Mohamed El Hadi Maatougui, the Head of Sidi Bel Abbes Station of ITGC, Algeria, to this meeting.

Dr. Kamel agreed that this year meeting was squeezed for time, however, he said that this coordination meeting showed only the formal side of the coordination as coordination was in fact in operation all the year round during the repeated visits of the ICARDA staff either from North Africa or the base programs to Tunisia and the visits of the national researchers to ICARDA. He added that now the Tunisian national researchers meet very often

with their ICARDA counterparts either here, in Aleppo or through regional activities organized in North Africa where very useful discussions take place. He said this interaction was important and thus it reduced the time required for the formal coordination meetings.

For an individual country or a regional/ICARDA coordination meeting, he said that various possibilities/models and ideas were discussed in Algeria and Morocco and that he would be circulating these ideas to ICARDA and the national scientists to get their feedback to increase the efficiency and outputs of these meetings. He said this applied essentially to what Dr. M. Lasram referred to as traditional or classical collaboration. For the special funded regional projects, however, the situation was different and regional coordination meetings were organized. He cited the examples of the first regional coordination meeting for the UNDP/ICARDA project on Monitoring of Cereal and Food Legume Diseases and Germplasm Enhancement held at ENA, Meknes, Morocco in January 1990 and the second regional coordination meeting for the same project held last July at Skikda, Algeria. He added that the third regional coordination meeting would be held in Tunisia in July 1991. He said that the second coordination meeting was organized for five days and was very successfull. He confirmed that he would be putting some ideas and circulating to ICARDA and the national researchers for feedback on their preference for organizing these meetings.

He added that the number of regional activities organized in North Africa including in-country training courses have increased every year which reflected ICARDA's move towards strengthening outreach activities and decentralization. He said that additional areas of collaboration with North Africa were identified which had increased ICARDA's interaction with the national programs in this region.

He urged the national participants to capitalize on the presence of the Head of ICARDA Germplasm Resources Unit, Dr. J. Valkoun in the meeting to initiate additional activities in germplasm collection, characterization and conservation.

He again thanked all the participants from the national programs and ICARDA and particularly Mrs. F. Larbi, Director of International Cooperation, Ministry of Agriculture for coming to this meeting in spite of her busy schedule and wished them all a good and successfull meeting.

With this, the opening session came to an end. Next day, researchers met in concurrent sessions for each project to review and discuss in details the 1989/90 research results and prepare the 1990/91 work plans. The second part of the last day, September 22 was scheduled for the closing session. In this session the highlights of the 1989/90 crop season's results and the work plans for 1990/91 were reported. These are presented in the following pages.

CEREAL IMPROVEMENT PROJECT

1. Participants

Mr. A. Maamouri,	INRAT	Ms. M. Cherif,	INAT
Mr. M. Deghais ,	INRAT	Mr. A. Sallami,	O.C
Mr. M. El Felah,	INRAT	Dr. A. Yahyaoui,	ESA,Le Kef
Mr. M.S. El Gharbi,	INRAT	Dr. A. Marouany,	ESA,Le Kef
Dr. M. Ben Salem,	INRAT	Dr. A. Dallali,	ESA,Le Kef
Mr. M. Mosbahi,	INRAT	Dr. S. Ceccarelli,	ICARDA
Dr. A. Daaloul,	INAT	Dr. G.O. Ferrara,	ICARDA
Dr. M. Harrabi,	INAT	Dr. M.S. Mekni,	ICARDA
Mrs. H. Amara,	INAT		

Mr. M. El Hadi Maatougui, Head, ITGC Station at Sidi Bel Abbes, Algeria, attended part of the discussion. From ICARDA, Dr. J. Valkoun, Head, Germplasm Resources Unit, Mr. J. McMahon, Deputy Director General (Operations) and A.H. Kamel also participated in part of the discussions.

2. Introduction

Mr. A. Maamouri gave an overview of the program executed this year and the climatic conditions that prevailed.

The climatic conditions during the 1989/90 crop season were difficult and unique. The season was characterized by very limited rainfall in the north west region (Jendouba, Beja, Le Kef and Siliana), floods in the center and relatively higher temperatures in winter. This favored the development and spread of some diseases including virus diseases. The temperature in May was also higher than normal which resulted in an additional stress, particularly on late planted fields in Le Kef, Siliana and other locations.

However, the overall production was good and this season experienced the third highest production ever achieved following the 1987 and the 1985 record yields. The good production of this year is the result of an unusual good harvest in areas known to be of limited contribution to the national production like Kairouan, Sidi Bouzid, Kasserine, Sousse and Mahdia. The overall production would have been better if diseases were not that severe. Fungal and viral diseases were predominant this season which affected production, particularly for barley.

Rainfall during autumn was very limited across the country. This was followed by heavy rains in December and January on the north coastal areas and the central region. Rainfall on the north western region; Jendouba, Le Kef and Siliana continued to be very limited. This was followed by a dry period till mid March. From mid March onward, good rainfall was registered on the center, the south and the coastal areas. The cereals producing zone in the north west continued to be deficient in rain. As a result of

this abnormal rainfall pattern, the germination and crop development was good in the coastal region and the west central regions, while it was poor in the north west region particularly at Jendouba and Bou Salem with the result that many farmers had sheep graze their fields at this stage.

The temperature was also above normal in winter. This helped aggravate the disease situation particularly viral diseases in wheat and barley, powdery mildew on barley, crown rust on oats in addition to Hessian fly on wheat and barley. From early May, the temperature became higher than normal which, with the disease stress resulted in drying up many late planted/emerging fields in the governorates of Le Kef, Siliana and others.

The overall production was 1.633 Million Tons of cereals. The breakdown was as follows: 897.700 Tons of durum wheat, 224.600 of bread wheat, 477.500 of barley and 33.600 of triticale. This production was harvested from 795.000 ha of durum wheat, 161.000 of bread wheat and 595.000 of barley and triticale.

As indicated earlier this good production came as a result of a record crop harvested from some governorates in central Tunisia. Examples are Kairouan, Sidi Bouzid and Siliana. The long term average production of these governorates is compared with this years production in following.

Governorate	1989/90 Production qx/ha	Long Term Average Production qx/ha
Kairouan	2.460.000	640.000
Sidi Bouzid	900.000	210.000
Siliana	2.090.000	1.370.000

The average yield (qx/ha) of wheat, barley and triticale in the different regions of the country was as shown below:

	North	Central/South
Durum wheat	13.5	10.2
Bread wheat	15.6	13.7
Barley	10.8	8.5
Triticale	21.4	-

3. Highlights of the 1989/90 Crop Season Results

Like in previous years, the cereal germplasm was grown in six stations; Mateur, Beja, Bou Salem, Le Krib, Le Kef and Tajerouine. The climatic conditions were favorable only at Mateur and Tajerouine while in the remaining four stations the climatic conditions were very unfavorable. At Beja some irrigation was given to save the material and at Bou Salem durum trials were not harvested and in le Krib none of the trials planted were harvested.

At Beja, barley yellow dwarf caused significant yield losses. Similar losses resulted from Hessian fly infestation at Beja and Bou Salem stations.

3.1. Durum Wheat

a. The newly released variety Razzak performed very well either in research stations or in commercial fields. It outyielded all other durum varieties grown in commercial fields.

b. The drought that prevailed last few years helped identifying few varieties better in yield than Razzak under drought stress conditions. However at Mateur where rainfall was not limiting these varieties yielded less than Razzak.

c. The varieties originating from ICARDA particularly the sister selections of Om Rabia which proved their superior yield potential under drought stress in the last two years were poor yielders this year. This applied in general to all the genetic material introduced from ICARDA.

d. Lines of the cross Chen "S"/Altar 84 confirmed their good yield potential for the third consecutive year. One of these lines was increased at Beja and will be yield tested coming season on farmers' fields in the favorable areas of the north.

3.2. Bread Wheat

a. Four advanced national yield trials were grown at Beja, Bou Salem, Le Kef and Mateur and nine first year national yield trials were grown at Beja. In addition, five international yield trials were grown at one or two stations. 134 lines were selected out of 415 yield tested. These were selected for drought tolerance under the conditions that prevailed this season at Beja, Bou Salem and Le Kef.

b. Nine sister lines of the cross Kauz"S" in addition to three of Chilero"S" were selected under the dry conditions of this year. These lines yielded better than Byrsa and Tanit under favorable conditions and better than Salambo under stress conditions at Beja and Mateur stations. In addition, five lines yielded same as Salambo at Bou Salem and Le Kef where drought was severe. These lines are following:

Maya 74/Bjy"S"//Arz ,T84-35-2bj-0bj (BT212)
Jun"S"//Maya/Nac ,CM78004-1bj-10bj-0bj (BT 206)
Ald"S"/Ska ,CM51979-2AP-1AP-AP-2AP-1AP-0AP (BT 322
K20/Meng/5/Sn64//Tzpp/Nai60/3/Drom/4/Ske W84/11 (BT 413)
Inia/5/Elga/Sn64/4/Tg3/Sn64//Tzpp/Nai (BT 416).

c. Screening for disease resistance was not successful for the third consecutive year due to drought. It is imperative to strengthen research on cereal diseases at INRAT since the collaboration with the other programs in the Maghreb

countries and with ICARDA did not solve all the problems for screening for disease resistance. Disease resistance is a prerequisite to variety release.

3.3. Barley

a. The barley germplasm was grown at Beja and Bou Salem stations representing the sub-humid zone in addition to Le Kef and Tajerouine of the semi-arid zone. Selection was made for yield potential as well as resistance to powdery mildew and barley yellow dwarf since both diseases were very severe this year. The variety Roho showed intermediate resistance to powdery mildew while the variety Rihane in commercial fields gave a good yield inspite of a severe attack by powdery mildew.

b. Hessian fly infestation was quite severe at Beja station. This resulted in a complete loss of some of the material grown at the station.

c. Good selection to drought resistance was made at Beja and Le Kef.

d. Fourty crosses were made at Beja to combine disease resistance (powdery mildew, scald and net blotch), drought tolerance and high yield.

e. Barley lines originating from Tunisian crosses outyielded significantly the variety Rihane. An example is the line:

Lignee 527/3/Harbing/Avt/3/Aths).

At Beja these lines outyielded Rihane by 28%. They yielded 24.17 qx/ha compared to 18.87 qx/ha for Rihane. At Le Kef station their yield was equivalent to the ckeck variety.

f. The line Deir Alla 106//DL 71/Strain 205 inspite of its high yield potential at Le Kef was susceptible to barley yellow dwarf virus.

g. Following lines were selected as high yielders and potential varieties for release:

Ceres/Faiz ,Cor 85
Faiz/Tej ,Cor 85
Tej/Lignee 131 ,ICB 82
Ceres/Faiz ,Cor 85
Lignee 527/U566 ,Cor 84
Lingee 527/5/As 54/Tra//2 Cer/Tol I/3/Avt/Tol//Bz/4/Vt/Pro//
Tol I ,ICB 81
CI 8887/CI 5761 ,Sea.

h. Twenty seven lines were selected from international barley trials and nurseries as high yielders and resistant to diseases. These will be yield tested coming season.

3.4. On-Farm Varietal and Agronomic Trials

The work of on-farm verification/demonstration trials was conducted by the Direction de l'Amelioration de la Production of the Office des Cereales.

a. These consisted of varietal trials, seed quality (certified vs farmers seed), variety x dose of nitrate ferlitizer, P2 05 x nitrate fertilizer, source of phosphorus fertilizer (P2 05 and diammonium phosphate) and weed control trials. Durum wheat, bread wheat and barley were used in majority of these trials. The trials were conducted under rainfed as well as with supplementary irrigation.

b. Durum and bread wheat varietal trials were conducted at Mateur, Beja, Krib, Le Kef and Mograne under rainfed conditions and at Goubellat and Bou Salem with supplementary irrigation.

c. The results under rainfed conditions show that the potential durum wheat variety for release; BD101=(D68-8-61-3A/Lds 357-Tc2 x Jo"S") Karim was the highest in yield, outyielding Karim by 15% and Razzak by 5%. With supplementary irrigation it was also the highest in yield with a yield advantage of about 15% over Razzak and 30% over Karim.

d. In bread wheat, the variety Byrsa was the highest in yield with supplementary irrigation with a yield advantage of about 22% over Dougga while under rainfed conditions the yield of both varieties was similar.

e. For barley, trials were conducted at Menzel Temime, Mograne, Fahs, Siliana and Le Kef. The varieties Rihane, Roho, Tej, Tissa, Barberousse and Kef No.1 outyielded the local check variety Martin.

3.5. Tissue Culture

This activity was conducted by the laboratory of Tissue Culture at INAT. The main purpose was to identify different ways of obtaining doubled haploids from local durum germplasm. It consisted of:

- Evaluation of the national durum collection for different parameters of anther culture (in vitro),
- Test callus induction by culturing immature embryos,
- Callus induction by anther culture in durum wheat.

3.6. Cereal Pathology

3.6.1. Germplasm Evaluation

All the germplasm included in the various international, regional and national observation nurseries and yield trials was grown at Beja station and inoculated artificially by various diseases. Wheat was inoculated repeatedly by septoria and yellow rust while barley was inoculated by scald and net blotch diseases.

Six inoculations were made by septoria using isolates originating from Beja and Mateur and three yellow rust inoculations were made using the race identified from Beja. The dry conditions that prevailed this season checked the spread of both diseases after they developed satisfactorily on the spreader rows.

Powdery mildew on barley and barley yellow dwarf on both wheat and barley were very severe. This allowed a good screening for both diseases.

Two thousand barley lines were evaluated to diseases. Four inoculations were made for scald using the isolate from Beja in addition to four inoculations of net blotch using a mixture of isolates.

Out of the lines tested following entries were selected as combining multiple disease resistance and good agronomic type. These are:

- Lignee 527/3/Harbing/Avt3//Aths
  Cor 84-34-6Bj-0Bj
- Lignee 527/3/Harbing/Avt3//Aths
  Cor 84-34-16Bj-0Bj
- Roho/CRG 260
  Cor 8[illegible]-72-3Bj-10Kf-0Kf

It is proposed in the future to screen for powdery mildew and barley yellow dwarf. This requires to develop irrigation facilities at Beja to ensure a successful development and spread of the diseases.

3.6.2. Disease Monitoring

A cereal disease survey was carried out in Tunisia in April/May 1990 with the aim to identify the diseases present and determine their intensity. The survey covered wheat and barley fields grown in the northern, central and southern zones of the country. In wheat following diseases arranged in a descending order were identified. The disease incidence percent for each is indicated between brackets. Leaf rust (52%), russian wheat aphid

(45%), powdery mildew (35%), barley yellow dwarf (29%), stripe rust (26%), flag smut (17%), loose smut (11%), septoria leaf blotch (10%), root rot (7%), common bunt (5%) and tan spot (5%).

On barley net blotch was the most predominant disease with an incidence percentage of 72% followed by powdery mildew (52%), covered smut (45%), russian wheat aphid (31%), barley yellow dwarf (26%), barley stripe (9%), leaf rust (7%), scald (4%), root rot (4%) and loose smut (2%).

It is worth mentioning that Hessian fly infestation was detected in about 17% of the wheat and barley fields inspected during the survey. It is also interesting to note that the incidence of Russian wheat aphid has increased dramatically this season. This warrants special attention.

Disease samples collected during the survey are used to study the virulence spectrum of the pathogen population.

Moreover, the third North Africa/Iberian Peninsula Cereal Disease Monitoring Nursery (CDMN) was grown this year in 40 locations. These were 16 in Tunisia, 7 in each of Algeria and Morocco, 5 locations in Libya, 2 in each of Spain and Portugal and one at Aleppo, Syria. Disease informations were compiled from 18 locations and a summary report sent to collaborators. The fourth CDMN 1990/91, was also prepared and dispatched to these countries.

3.6.3. Virulence Spectrum to Barley in Some Isolates of *R. secalis* from the Maghreb Countries

Seven isolates of *R. secalis*, the causal agent for barley scald were tested for their virulence on thirteen barley lines with known genes for scald resistance. Three of these isolates originated from Tunisia, two from Morocco, one from Libya and one from Aleppo, Syria. The results showed that the isolate from Beja (Tunisia) and Ifrane (Morocco) are very similar in virulence levels. The most virulent isolate was Le Kef isolate with a disease rating of 2.75 followed by Khemisset (Morocco) isolate with 2.69. The Libyan isolate was the least virulent.

The results also show that the variety Steudelli carrying the recessive genes rh6 and rh7 was the most resistant, followed by the variety Osiris carrying Rh4. It seems that the variety Osiris carries additional genes to Rh4 since the disease rating of the seven isolates was much higher on Modoc and Forrajera both carrying the same Rh4 gene.

3.6.4. Virulence Spectrum to Barley in some Isolates of P. teres from the Mediterranean Region

Fifty nine isolates of Pyrenophora teres, the causal agent of net blotch of barley were collected from Tunisia (33 isolates), Algeria (18 isolates), Morocco (3 isolates), Cyprus (3 isolates) and Egypt (2 isolates).

The virulence spectra of these isolates were determined on a set of thirteen differential barley cultivars. The first test (33 isolates) showed four virulence types while the second (26 isolates) showed a much larger virulence group.

Only one isolate; 4I from Moustaganem, Algeria was simple and all the rest had a high disease rating of 3 and above.

None of the differential varieties tested was resistant to all isolates used.

3.6.5. Reaction of the Net Blotch Nursery (BNB) to Six Isolates of P. teres

Fourty barley lines originating from ICARDA were tested at the seedling stage for their reaction to six isolates of P. teres origination from collections made in Algeria (3), Morocco (2) and Tunisia (1).

None of the lines tested was resistant to all six isolates and many were susceptible to four or five isolates. Three varieties only were resistant to moderately resistant to four out of the six isolates used. These are:

1.	Emir/Harmal,	ICB 83-0835-4AP-0AP
2.	Atl/Arabi Abiad,	ICB 82-1005-1AP-0AP-0AP
3.	Aramir/Arabi Abiad*2,	ICB 82-1018-5AP-0AP

It is worth mentioning that Atl/Arabi Abiad, ICB 82-1005-1AP-0AP-0AP was the only variety out of the fourty tested that showed moderate resistance to the most virulent isolate 27I/88 from Morocco.

3.6.6. Transgressive Segregation for Resistance to Pyrenophora teres in Barley

F2, F3 and F4 generations from crosses between six susceptible cultivars of barley to net blotch were tested at the seedling stage for their resistance to a mixture of five Tunisian isolates. F3 and F4 generations were also tested with their parents to three isolates from the Maghreb countries. Mean squares of generation effect were highly significant in the three crosses inoculated with the mixture of the five Tunisian isolates and the three single isolates from the Maghreb countries.

The frequency distributions of F2, F3 and F4 generations derived from the three crosses were continuous and showed transgressive segregation for resistance.

On the other hand, the reaction of F3 and F4 generations to the three isolates of P. teres was compared to those of their parents using the criterion of sporulation per unit leaf area.

The study showed that the number of spores produced on the F3 and especially the F4 descendants was significantly lower than those produced on the most resistant parent or on the average of the two parents.

It was concluded that useful resistance could be obtained through crossing of susceptible cultivars and selection in succeeding generations.

3.6.7. Inheritance of Resistance to Pyrenophora teres in Some Barley Varieties

Disease reactions of the parents, F1, F2 and backcross generations were determined at the seedling stage to a mixture of five Pyrenophora teres isolates from Algeria, Morocco and Tunisia according to five criteria: infection type, average lesion size, number of lesions and observed and calculated percentage of infected leaf area.

Generation mean analysis and heritability showed that resistance was epistatic and sometimes additive and dominant.

Correlation analysis showed that all criteria for resistance were correlated positively except the average lesion size and number of lesions.

3.6.8. Generation Mean Analysis of Inheritance of Resistance to Pyrenophora teres in Barley

F1, F2, F1 x parent 1 (BCI), and F1 x parent 2 (BC2) generations resulting from four crosses among seven cultivars of barley were tested at the seedling stage for their resistance to a mixture of five isolates of Pyrenophora teres. Four methods were used to assess disease resistance: Infection Type (IT), Average Lesion Size (ALS), Number of Lesions Per Unit Leaf Area (NL) and Percent Leaf Area Infected (PLAI). Gene actions were estimated by generation mean analysis on each of the four crosses and on each of the evaluation methods. Significant additive and additive x additive epistatic effects were found. Estimates of narrow-sense heritability ranged from 0 to 100% depending on the cross and on the method used. Infection type and percent leaf area infected were found to be highly correlated in all four crosses.

These results suggest that barley breeders could improve the level of resistance to P. teres by making appropriate crosses between highly susceptible barley cultivars.

4. General Remarks

a. In crop improvement, considering the difficult conditions of the last few years the released varieties of durum wheat, bread wheat and barley, Razzak, Salambo and Rihane respectively performed very well. On the other hand new promising lines were identified, these outyielded, the existing varieties grown in commercial fields.

b. Various diseases were prevalent this year and some reached epidemic proportions. This resulted in significant yield losses. Powdery mildew, barley yellow dwarf, yellow rust, septoria, leaf rust, root rot were the most important. Similarly hessian fly infestation and stem sawfly also caused measurable losses in some areas.

c. The work on cereal pathology being conducted now will help the breeders in the release of varieties resistant to the major diseases.

d. The program of on-farm trials, variety and production technology verification in farmers fields conducted by the Direction de l'Amelioration de la Production of Office des Cereales confirmed the results obtained through research. This included the results of INRAT as well as ESAK.

c. Applied research was conducted at INAT and dealt with the evaluation of national collections of durum wheat and their ability for callus formation through embryo culture and embryogenesis.

f. Discussions among researchers confirmed the importance of agronomic practices in increasing and stabilizing production.

5. Work Plan for the 1990/91 Crop Season

The cooperation between INRAT, INAT, ESAK, Office des Cereales and ICARDA will continue and be strengthened.

The inter-Maghreb countries cooperation will continue and needs to be consolidated. An annual meeting of the national coordinators in the different countries will help solve some of the difficulties encountered in these first years of cooperation.

The Cereal Improvement Project will continue for coming season along the same lines as this year, however, following areas need more attention:

a. Crop improvement and agronomic research have to be extended to central Tunisia therefore additional personnel and material support is necessary.

b. Particular attention need to be given to research programs in the north west parts of the country. The planning and execution of these programs are to be conducted as part of the national crop improvement program.

c. The recruitement of a pathologist at INRAT will help consolidate existing collaboration between the different institutes, and will assist in speading up crop improvement research.

d. Due to the importance of cultural practices in semi-arid zones, particularly in dry years, it was unanimously recommended to strengthen agronomic research.

c. The recruitement of an agronomist is an urgent priority

Proposed Training and Visits

a. Group Training at ICARDA

- Biometrical Techniques	Two from INRAT and ESAK
- Cereal Disease Methodology	One from ESAK
- Breeding Strategies for Cereal Improvement, Montpellier	Four from INRAT, ESAK, INAT
- Molecular Marker Techniques	One from INAT

b. Individual Training at ICARDA

- Store Insects	One from Office des Cereales
- On-Farm Trial	One from Office des Cereales
- Septoria Diseases	One from INAT
- Tissue Culture	One from INAT
- Statistical Analysis	One from INRAT

c. Workshops

It is proposed to organize the Regional Cereal Travelling Workshop next season in Tunisia.

d. Thesis Research

ICARDA will continue its support for on-going thesis research. It is also requested that ICARDA supports thesis research (3e cycle) at INRAT in relevant areas.

ICARDA is requested to support a short training at Settat, Morocco for a student from the Faculty of Science in Tunisia working on Hessian fly.

Budget

The operational budget allocated by ICARDA for the collaborative cereal project for coming season will be the same as this season.

Considering the high cost of repair and maintenance of ICARDA provided cars and equipments, it is recommended that ICARDA considers replacing some of these.

FOOD LEGUME IMPROVEMENT PROJECT

1. Participants

Mr. H. Halila, INRAT
Mr. M. Kharrat, INRAT
Mr. M. Laabidi, INRAT
Dr. M. Harrabi, INAT
Mr. A. Haddad, Office des Cereales
Mr. M. Jendoubi, Office des Cereales
Dr. D. Beck, ICARDA
Dr. S. Hanounik, ICARDA
Dr. L. Robertson, ICARDA
Dr. S. Beniwal, ICARDA

Mr. M.E.H. Maatougui, Head of Sidi Bel Abbes station of Algeria, Dr. A. Kamel, Regional Coordinator for North Africa, Dr. J. Valkoun, Head of Germplasm Resources Unit at ICARDA and Mr. J. McMahon, Deputy Director General (Operations) of ICARDA attended the session on discussion of 1989/90 season results in the morning of September 21. Drs. M. Lasram, Director General of INRAT, and A. Kamel also attended the planning meeting on training activities in the morning of September 22.

2. Introduction

Mr. H. Halila welcomed all the participants to the food legume group meeting especially those from ICARDA. He spelt out the program of the meeting and requested the group to come up with a work plan for the 1990/91 crop season. During the discussion, several members expressed their appreciation for the impressive job that the national food legume team was doing for the improvement of food legume and their productivity in the country.

3. Main Features of the 1989/90 Crop Season

3.1. Climatic Conditions

The 1989/90 was another dry crop season and the third consecutive dry year in Tunisia. The three main research stations at Beja, Oued Meliz and Le Kef where food legume research is conducted in the country received about 60% of the long term average annual rainfall. At Beja and Oued Meliz there was no rainfall during December, February and March whereas the temperatures during these periods were higher than normal. However, the rainfall distribution was good in the later part of the season. At Le Kef, winter was drier and spring wetter as compared with that of Beja.

This unusually drier season again adversely affected yields of faba bean, chickpea and lentil. The highest average yields in faba bean and chickpea were obtained from Beja as compared with Oued Meliz and Le Kef. However, the average lentil yields were highest (1700 kg/ha) at Le Kef compared with Beja (1200 kg/ha) and Oued Meliz (900 kg/ha).

3.2. Biotic Factors

Wilt in chickpea was observed as a serious problem at many locations in addition to the research station. Rust was observed in faba bean and lentil in serious proportions both at the station and in farmers' fields. It was a first report of rust on lentil in the country. Also, downy mildew was recorded for the first time on lentil at Beja research station. The red-flowered Orobanche was again observed at the research station and in farmers' fields in Beja and Bou Salem areas of the country. Stem nematode (Ditylenchus dipsaci) in faba bean was observed more frequently in farmers' fields this season and root-lesion nematode (Pratylenchus sp.) in chickpea was detected for the first time in the country. Also, faba bean crop in Beja area and the Cap Bon was affected by stem-borer (Lixus algirus).

4. Highlights of the 1989/90 Crop Season Results

4.1. Breeding and Pathology

Faba Bean

a. Despite the drier season, yields of faba bean were satisfactory. The yield trials mean for large-seeded faba bean was 2712 kg/ha for Beja and 2157 kg/ha for Oued Meliz. For small-seeded faba bean it was 2719 kg/ha for Beja and 2625 kg/ha for Oued Meliz. Some lines yielded more than 3000 kg/ha. In general, yields were 15-20% higher at Beja than that of Oued Meliz mainly due to higher rust infection at the latter site.

b. Results over the last six years confirmed the superiority of Reina Blanca (large-seeded) that provided an average of 9% yield advantage over the checks. Over the last three dry years (1988-90) three large-seeded faba bean lines, viz., S82113-8, 80S 80028 and S82033-3 provided 18-20% yield advantage over the checks. Among the small-seeded lines, FLIP 83-106B (medium-seeded) was better over checks during 1987-90 crop seasons providing 8% average yield advantage.

c. Eighty single plant selections were made for agronomic traits from F5 and F6 segregating populations for further evaluation in the 1990/91 crop season.

d. Purification of the local faba bean populations continued in the field screen cages. Some of these lines tested in the preliminary yield trial showed promising yields.

e. For chocolate spot resistance, several lines viz., B8811, B8822, B88140 from FBICSN, and M82009-36-1, M82009-36-3, M82009-37 and S83075-7 from the chocolate spot F5 and F6 segregating populations were identified. For ascochyta blight resistance, lines A8817, A88304, A8835 from FBIABN, and M82009-

36, S83108-28, S86101, S86107 and S86111 from ascochyta blight F5 and F6 segregating populations nursery were identified. For rust, no line showed resistance at Ras Rajel station.

f. For Orobanche, no line from a set of resistant lines provided by ICARDA and tested at Beja showed any resistance. This was due to the presence of a red-flowered Orobanche which is different from the white-flowered O. crenata for which these lines possess resistance. This needs further perusal.

Chickpea

a. A number of chickpea lines outyielded the local check at the three locations; Beja, Oued Meliz and Le Kef.

b. In general, the newly released varieties performed well. However, ILC 3279 (Chetoui) suffered from drought.

c. Two chickpea lines, FLIP 84-92C and FLIP 84-79C continued good performance with better yields over the checks.

d. Some good material with large seed size, good level of resistance to ascochyta blight and mechanical harvest attributes has been identified.

e. A number of F6/F7 progenies were selected for dual resistance to wilt and ascochyta blight, better yield and erectness. However, their seed size and earliness need to be improved.

f. For the wilt resistant variety Amdoun-1, four tons of seed was produced for the farmers in wilt-infested areas.

g. Results from the sowing date x chickpea genotypes with different wilt reactions showed no yield advantage in early planting of late-wilting chickpea genotypes. The results clearly showed the necessity of resistance to wilt for obtaining good yield levels in chickpea.

h. A new rating scale for ascochyta blight of chickpea was developed. The scale uses linear infection index and proved to be more appropriate for genetic studies than the 1-9 scale.

i. Biotechnology work was initiated to explore the possibility of using the pathogen toxins in disease screening work.

Lentil

a. Lentils showed good performance in sub-optimal conditions at Le Kef. FLIP 88-51L provided maximum seed yield of 2450 kg/ha.

b. Results confirmed previous years' data for the need to popularize lentil in the drier areas of the northern part of the country.

c. Results of the limited surveys indicated that seed size may not be used as a strong criterion for selection in the evaluation of local lentil collections. It was interesting to find that small-seeded lentils are consumed in the central and southern parts of the country.

d. Lentil line 78S26002 confirmed its yield superiority across locations and is being considered for release for cultivation by farmers.

4.2. Agronomy and On-Farm Trials

a. Weeds in all food legume crops caused seed yield losses of up to 80-90% and thus clearly showed their importance in depressing yields of these crops.

b. Two hand-weedings provided good weed control. Results from on-farm trials showed its superiority in weed control over the farmers' practice which was not effective. This confirms results of the previous seasons.

c. Early planting of lentil did not have beneficial effect during the drier season of 1989/90. However, early planting of chickpea continued to provide exceptionally good yields (10-fold increase) compared to spring planting.

d. Low plant density and narrower inter-row spacing tended to provide yields in the drier crop season confirming previous results.

e. A clear need for Rhizobium inoculation in chickpea in the non-traditional chickpea areas was established. However, no effective response to Rhizobium inoculation was obtained in faba bean, chickpea and lentil in the traditional areas.

f. Results of on-farm trials showed that early planting combined with higher plant density and weed control doubled yields of faba bean, chickpea and lentil compared to farmers' practice.

g. Among the new lentil varieties, ILL 4606 performed best by providing 30% yield advantage over the farmers' check. In chickpea, Kessab (FLIP 83-46C) and FLIP 84-92C performed exceptionally well in both winter and spring plantings.

5. Work Plan for the 1990/91 Crop Season

5.1. Breeding and Pathology

Faba Bean

a. Evaluation of advanced and selected faba bean material through advanced and preliminary yield trials at Beja and Oued Meliz.

b. Growing selected F6 and F7 lines in field cages and continue purification of local and introduced faba bean material.

c. Pathogen characterization of *Botrytis fabae* using faba bean differential lines and the detached-leaf technique.

d. Preliminary screening for *Botrytis* and rust at Ras Rajel under natural disease situation.

e. Screening for resistance to *Botrytis* and *Ascochyta* under artificial inoculations at Tunis including FBICSN and FBIABN.

f. Screening for *Orobanche* resistance at Beja and development of an *Orobanche*-sick plot at Beja.

g. Study behavior of some faba bean lines to two types of *Orobanche* (white-and red-flowered types) through pot experiments.

h. Study distribution of the two types of *Orobanche* in the country whenever feasible.

i. Attempts will be made to develop a nematode-sick plot for large-scale screening.

Chickpea

a. Evaluation of selected and introduced material from ICARDA will continue at Beja and Oued Meliz with focus on *Ascochyta* resistance and good seed size.

b. Continuation of selection in segregating material for dual resistance to wilt and ascochyta blight by focussing on good seed size and attributes for mechanical harvest.

c. Study an integrated approach to control ascochyta blight using genetic resistance, agronomic practices and fungicides at Beja.

d. Prerelease seed multiplication of FLIP 84-92C and FLIP 84-79C.

e. Growing the regional trial on chickpea elite lines.

f. Inheritance study on ascochyta blight using linear infection index (through a graduate student).

g. Initiate work on biotechnology aspects of the wilt fungus by exploring the use of toxin in the disease screening work.

Lentil

a. More emphasis will be laid on lentil research and development in Le Kef area.

b. Continue selection for high yield and erectness.

c. Growing the regional trial on rust-resistant lentil lines based on their reaction in Morocco.

5.2. Agronomy

a. Last year's trials on date of sowing, population density and weed control will continue at Beja and will be extended to Oued Meliz.

b. Investigate the need for inoculation in new chickpea and lentil growing areas utilizing the soil-core technique.

c. In cooperation with ICARDA, screening of Tunisian and ICARDA *Rhizobium* strains for symbiotic effectiveness in released and new promising varieties. Initially will use ICARDA's greenhouse N-free aseptic system. Then, a similar set-up will be attempted at INRAT. A *Rhizobium* strain for chickpea will be selected for inoculation trials.

d. The *Rhizobium* inoculation study on bean will continue under field conditions.

5.3. On-Farm Trials

a. Same as in 1989/90. An improved variety with its production package will be included to compare it with farmers' variety. Inoculation treatment will be dropped till better strains are identified.

b. Economic analysis of on-farm trials will be done to study economic impact for farmer recommendation.

5.4. Proposed Training and Visits

Short Courses

1.	Biological Nitrogen Fixation	March 3-14, Aleppo	1 INRAT
2.	Insect Control in Food Legumes and Cereals	April 21-May 2, Aleppo	1 INRAT
3.	Biology and Control of Orobanche	April 21-May 2, Aleppo	1 INRAT
4.	Breeding Methodologies in Food and Feed Legumes	May 5-16, Aleppo	1 INRAT
5.	Molecular Marker Techniques	Nov. 3-14, Aleppo	1 INRAT 1 INAT
6.	Faba Bean Improvement	April 22-May 3, Douyet Morocco	1 INRAT
7.	Winter Chickpea Technology Transfer	1 week, Tunisia	10
8.	Workshop on Disease Survey Methodology	3 days, Morocco	1 INRAT 1 INAT
9.	Wilt/Root Rot Fungi Identification	1 week, Morocco	1 INRAT 1 INAT

Individual Training

1.	Field Techniques in BNF	2 weeks, Aleppo	1 O.C
2.	Mechanical Harvesting	2 weeks, Aleppo	1 O.C
3.	Disease Field Inspection in Seed Production	2 weeks, Aleppo	1 O.C

Special Course Request

Biometrical Techniques and Computer Application (In-country)	2-12 July Tunisia	10

Visits

National Scientists to Aleppo

1. President Director General of Office des Cereales, Director General of INRAT and Director of INAT. Dr. A. Kamel to look at its feasibility.

2. Four scientists: Senior Breeder, INRAT
   Agronomist, INRAT
   Senior Pathologist, INAT
   On-Farm Trial Specialist, Office des Cereales.

ICARDA Scientists

1.	Karl-Heinze Linke	For *Orobanche* work
2.	Douglas Beck	For Microbiology work
3.	From the Region	As per needs

English Language Course

One INRAT

Seminar/Conference

One scientist

Regional Travelling Workshop

1.	Specialized Travelling Workshop	One week May, Morocco	3 (Breeders, Patholgists)
2.	Disease Survey in Algeria	One week, May-June, Algeria	1-2 (Pathologists)

Graduate Training Program

As emphasized in the past, there is a need to support this activity. To be followed up by ICARDA's Regional Food Legume Scientist.

FARMING SYSTEMS RESEARCH PROJECT

1. Participants

Mrs. R. Khaldi,	INRAT	Mr. L. Tounsi,	OC
Mr. M. Kaabia,	INRAT	Mr. Bouchendira,	ESA, Kef
Mr. H. Mellouli,	INRAT	Mr. M. Mejri,	CTV, Goubellat
Mr. M. Mezni,	INRAT		
Dr. G. Khaldi,	INRAT	Dr. M. Djemali,	INAT
Mr. H. Seklani,	INRAT	Mrs. H. Amara,	INAT
Mr. A. Ghayadha,	INRAT	Dr. M. Zouaghi,	INAT
Mr. L. El Echi,	INRAT	Dr. A. M'Hiri,	INAT
Mr. H. Ghodbane,	INRAT	Mr. F. Ben Jeddi,	INAT
Mr. M. Essamet,	INRAT	Dr. M. Jones,	ICARDA
Mr. A. Hammami,	INRAT	Dr. R. Tutwiler,	ICARDA
Mr. Haj Brahim,	INRAT	Dr. A. Matar,	ICARDA
Mr. Bel Haj T. Abderrahmane	INRAT	Dr. S. Christiansen,	ICARDA
Mr. B. El Hadj,	INRAT	Dr. T. Treacher,	ICARDA
Mr. Ben Dhia,	OEP	Mr. A. Mazid,	ICARDA
Mrs. M. Zitouni,	OEP	Dr. A.H. Kamel,	ICARDA

2. Introduction

Mrs. R. Khaldi, the project National Coordinator thanked all participants from ICARDA and Tunisia who attended the presentations and discussions of the project.

The eighth coordination meeting she said, was an excellent opportunity to discuss the project results and exchange ideas. During two days various presentations were made* and many results were discussed. These dealt with the research conducted within the project to integrate the livestock, cereal and forage components of the farming systems at Goubellat with the aim to improve production.

The project is currently at its third phase; the testing phase. This was preceded by an experimental phase which started from 1987/88 crop season.

The objectives are:

1. Continue testing the farming systems research approach with a closer integration of the researcher, the farmer and the extension agent.

2. Test the results obtained achieving higher production

3. Economic analysis of the techniques proposed

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* Program of the presentations attached

Following findings were tested in farmers fields and proved to increase production in the previous phase:

1. Improve sheep flock management through prophylactic measures, feeding and selection in the flock.

2. Improve the existing cropping system based on the traditional cereal-fallow rotation through replacing fallow by medics and applying phosphate fertilizer to the fallow.

3. Use of the dual purpose barley variety Tej to increase barley and forage production.

4. Soil and water conservation on slopes through cultivation of the fallow on contour lines, planting forest trees and forage shrubs.

5. Economic studies aimed at:
   - Characterize farmers practices
   - Economic evaluation of agronomic trials
   - Study the economic impact of the improved techniques

The above mentioned package was tested within a cereal-fallow rotation as an alternative to the traditional rotation.

The effect of the proposed alternatives was studied on following:

- Yield components of barley and wheat
- Dry and green matter production
- Water and soil erosion
- Water table in the soil
- Grazing days
- Net benefit

The effect of these improvements was tested in two different sites, a slope and a plain.

3. Research Program of the 1989/90 Season and Highlights of Results

The presentations given the first day of the meeting were complementary and they reported the good results obtained.

3.1. Climatic Conditions

The 1989/90 crop season at Goubellat was relatively favourable. Total rainfall was 393.6mm compared to 260mm in 1988/89, 249mm in 1987/88 and 422.5mm as the 30 year's average.

The rainfall was 412.5mm on the plain at Khacheb and 360.0mm on the slope at Grem. In two locations at Cheikh El Oudienne the rainfall was 371.0mm and 414.4mm. This shows the big variation in rainfall in a relatively small area.

3.2. Improving Cropping Systems for Cereals

3.2.1. Durum Wheat

In the improved cropping system the yield of the durum wheat variety Karim was 14.0 qx/ha while in the control plots of the farmer it was 8.09 qx/ha. Straw yield in the improved system was 160 bales/ha compared to 28 bales/ha in the traditional one.

Seed yield of Karim following a phosphorus fertilized fallow was the lowest among all treatments. The amount of 100 kg/ha of P2 05 given to wheat following a phosphorus fertilized fallow particularly in a dry year might explain the low yield obtained.

3.2.2. Dual Purpose Barley

Tej, the barley variety selected by the project showed higher tillering capacity and number of productive tillers as compared to the check variety used by the farmer. This was the case on the plane as well as on the slope and in all the cropping systems tested. Majority of the farmers use the barley variety Martin which proved to be of poor performance as a dual purpose variety.

The biological yield of the variety Tej following grazing was significantly higher than the yield of non grazed barley. The total production exceeded sometimes 45.0 qx/ha as compared to 30.0 qx/ha for the non grazed plots.

An estimation of the forage value/ha showed that grazed barley irrespective of the preceding crop produce an amount of forage unit (FU) exceeding in some farmers fields 4000 FU/ha against about 1500 FU/ha for the control variety.

3.2.2. Comparison Between Traditional, Phosphorus Fertilized and an Improved Fallow Grown to Medic

The cultivation of fallow on contour lines reduced the vegetation density. The reduction was 26.5% than the check plot. This might be the result of embedding the seed of spontaneous species through cultivation.

The vegetation density was in general much lower on the plains than on slopes. It was 48% in the control plots as compared to 41% in the phosphorus fertilized ones.

Scarifying the soil on the plain increased the vegetation density by 13% while it had no effect on the slope.

Growing medics on plains was better than on slopes. The number of medic plants/m2 was 2192 in the plain as compared to 1634/m2 on the slope.

Green and dry matter production in the first cut was significantly higher during 1989/90 crop season than the two previous crop seasons. This was more than 4.5 tons/ha in the phosphate fertilized fallow plots and in the medic planted plots grown in the plain. Both the green and dry matter production on the plain was higher than on the slope. This difference was evident only in the first cut.

Following the first grazing, the percentage of non palatable plants ranged from 11 to 22% on the plain and 14 to 22% on the slope. During the second grazing this percentage increased in both the plain and the slope. This is due to the selection by the animals for more palatable species during the first grazing.

A classification of the palatability of existing species of pasture was made based on observations during sheep grazing.

3.3. Effect of the Improved Cropping System on Soil and Water Conservation

a. Effect of some cropping systems on soil erosion, run off and soil fertility.

The amount of soil erosion and run off was higher in the traditional fallow than the other improved fallow systems used and cereals.

The loss in organic matter resulting from run off was quite significant in the different fallow and cereal rotations studied.

b. Water use efficiency in the production system.

Moisture infiltration through the soil was higher and the run off was lower in the fallow plots cultivated on contour lines compared to the other fallow alternatives. However, evaporation in summer results in bringing the water table to the same level in all the four fallow alternatives studied.

For fallow plots, a second cultivation is necessary to create a mulch and preserve soil moisture.

Water use efficiency in wheat was clearly superior than in barley. The effect of water use efficiency varied from 5.8 to 10.8 kg/ha for wheat and 1.9 to 4.9 kg/ha for barley.

3.4. Economic Evaluation of Agronomic Trials Conducted on Farmer's fields

The economic analysis allows researchers to identify the improved practices that need further refinement and those that could be transferred directly to farmers.

The economic analysis showed very similar results to those obtained by agronomic research. Durum wheat grown following fallow cultivated on contour lines gave the highest economic return of 269 Tunisian Dinars/ha. This is evident as shown also by the highest yield obtained. Cultivating the fallow on contour lines help preserve soil moisture though it increases the cost of land preparation. Growing durum wheat following medic came second in rank and the net return by hectare was 264 Tunisian Dinars.

The economic return for farmers using the traditional system was much inferior to that obtained in the experiment. This was 80 Tunisian Dinars/ha, an equivalent of the price of three quintals of durum wheat.

Barley, following medic gave the highest economic return of 188 Tunisian Dinars/ha as compared to 148 Tunisian Dinars/ha for barley following the traditional fallow.

The economic return from durum wheat and barley following phosphorus fertilized fallow was inferior to those preceded by medic or the fallow cultivated on contour lines. This was also evident from the yield levels of these alternatives. This could be due to the increased level of phosphate in these plots since the same amount of phosphate fertilizer was applied to the plots for two consecutive years, and the prevaling drought of the previous season did not allow the use of the accumulated phosphorus in the soil.

The increase in animal weight was much smaller when the local barley variety was used for grazing compared to the variety Tej. This was on average 13.3 kg/ha for the first and 70.8 kg/ha for the second. This confirms that the local barley variety is not suitable as a dual purpose variety although some farmers still have sheep grazing it.

3.5. Sheep Component

Research on sheep included vaccination of the flocks and the follow up on lambing.

The timely vaccination of the sheep flocks studies helped protecting the animals against the aphtous fever which caused major losses to farmer's flocks in the region.

The lambing system followed by farmers involved with the project was determined. The lambing period at Goubellat extends from August to February with the peak being during November.

from August to February with the peak being during November. Following the research, the best period for lambing at Goubellat to increase weaning weights proved to be the months of August and February.

The average performance of the lambs born from the studied flocks was inferior to the average of the pure Barbarine breed raised in areas similar to Goubellat.

3.6. Other Activities

To allow better information dissemination and discussion of findings, various field visits were organized in which specialized researchers from INRAT and INAT participated. These visits were of utmost importance as they allowed direct contacts with the farmers.

A field day was organized March 13 to popularize with following:

- Dual purpose barley
- Medic and phosphorus fertilized fallow
- Research on soil and water conservation

Topics presented in this coordination meeting were as follows.

- Amara, H. The cereals, INAT, 9pp
- Kaabia, M. Effect of some cropping systems on soil erosion, run off and soil fertility
- Khaldi, R., Ghayadha, A. and L. El Echi., Economic analysis of the cereal trials conducted on farmers fields during the 1989/90 crop season, INRAT, 9pp
- Khaldi, R. and L. El Echi., Study yield variability and economic return of cereals by modelling techniques. INRAT, 10pp
- Mezni, M. Research on alternatives to the traditional fallow rotation through phosphate fertilizer application and growing medic, INRAT, 8pp.

4. Research Program Proposed for the 1990/91 Crop Season

During the second day of the coordination meeting, discussions focussed on the perspective of the project and the future program of work.

Two orientations were evident during the discussion.

1. On the short term, an extension of ICARDA financial support to the project was requested and accepted for the 1990/91 crop season. This will help continue the work on rotation trials particularly that during the last few years rainfall was

favourable in only one season. Economic analysis and livestock research will complement agronomic research. The financial support from ICARDA was discussed and a total budget of 20.000 US$ will be developed and sent to Dr. M. Jones for consideration.

Realizing the need for soil nutrient analysis, the researchers associated with ICARDA Soil Test Calibration Network from ENSA, Le Kef and Office des Cereales will help develop the proper recommendations for phosphorus and ammonium fertilizer applications for cereals following medic and phosphorus fertilized fallow.

2. On the long term, in order to develop a second phase for existing project or a new project, three steps were envisaged.

a. Scientists from ICARDA Farm Resources Management Program will review and comment on the final project report submitted to ICARDA and IDRC last January.

b. Develop a short summary report for the project final report. This report could be used as a base for future proposals.

c. Some ideas were given to develop a final project proposal. It was agreed to hold a meeting during March 1991 in which ICARDA and national researchers would discuss the various ideas for the project extension. One idea was to continue with the current project and proceed to the extension phase and transfer the results obtained to farmers. A second idea was to select another zone and test the methodology of research and results acquired in the current project.

Finally Mrs. R. Khaldi emphasized that the project researchers attach a considerable importance to collaboration with ICARDA and look forward to get the necessary support to allow the continuation of the research work. She indicated that the project was carried out for the last two years with limited resources compared to earlier years. The project current activities, though reduced, they include important studies on agronomic, economic and livestock research.

PROGRAM OF THE COORDINATION MEETING FOR THE FARMING SYSTEMS PROJECT

TUNISIA-ICARDA

Thursday, September 20

08:00 - 10:00	Highlights of the Project	
17:00	**Opening Session of Tunisia/ICARDA Coordination Meeting**	

Friday, September 21

09:00 - 09:20	Research on improving the traditional fallow rotation by phosphate fertilizer application and growing medic	M. Mezni M.Djemali
09:20 - 10:10	Agro-economic impact of alternatives to the traditional fallow on cereal production	H.Amara R.Khaldi H.Mellouli
10:20 - 11:00	Effect of improved production systems on soil and water conservation	H.Mellouli M.Kaabia
11:00 - 13:00	Video film presentation on the project and discussions	
15:00 - 15:20	Improving productivity of the sheep flock	M. Djemali
15:20 - 15:45	Study yield variability and economic return of cereals by modelling techniques	R.Khaldi
15:45 - 16:00	Discussion	
16:10 - 18:00	Program of research and budget for the 1990/91 crop season	

Saturday, September 22

09:00 - 12:00	Program of research and budget for the 1990/91 crop season (Cont.)	
12:00 - 13:00	**Closing Session of Tunisia/ICARDA Coordination Meeting**	

CLOSING SESSION

The closing session was chaired by Dr. Mustapha Lasram, Director General of INRAT. First the highlights of the 1989/90 season results and work plans for the 1990/91 season for each of the projects were presented by the respective national coordinator. These have been summarized in the preceding pages. Following the presentations, some discussion on technical issues and comments were made. This was followed by closing remarks by Dr. M. Lasram, Dr. A. Kamel and Mr. J. McMahon.

Closing Remarks

Dr. Lasram welcomed Mr. J. McMahon, ICARDA's Deputy Director General, (Operations), who attended part of the discussions with the various groups and was attending the closing session. He paid tribute to the national and ICARDA researchers who were able to review the previous year's results and came up with a well prepared program of work in spite of the very short time allocated this year. He reiterated that the future meetings should never be planed for less than three days or organize a one week regional coordination meeting. He said that the cereal and food legume groups were very well organized and came up with well defined programs of work for the coming season including the training needs and regional activities. For the farming systems project he requested that the final report be rewritten and finalized soon with input from ICARDA staff. Following this, a short meeting between ICARDA and the national researchers should be organized to plan what needed to be done next. He said that we should accept the fact that the first phase of the project was over and that we should decide together what needed to be done next. He reiterated that he wanted to capitalize and preserve the coherence of the multidisciplinary group of the project which took time and efforts to be developed.

Dr. Lasram also indicated that the three projects that were presented today though very important were not the only collaborative activities with ICARDA. Biotechnology, germplasm collection and others were examples of additional collaborative activities that we were addressing. To make the best use of the time, he requested that ICARDA participants to these meetings should be fully aware of the developments and background of these collaborative activities.

Dr. A. Kamel thanked Dr. Lasram for his remarks and indicated that the coordination meeting was as usual very rewarding. He praised the researchers for being able to attain the objectives of the meeting in a very short time. He said it was evident that both the national and ICARDA researchers in commodity programs were very well trained now for these meetings as indicated by the well-done job in this meeting in spite of the very short time given. He again apologized for organizing the coordination meeting on a Friday and Saturday which are half working days in Tunisia but hoped that the ideas he would

circulate later for the various formats of these meetings would allow more time and also avoid week ends. He commended INRAT collaboration in these projects with INAT, ESAK, Office des Cereales and other relevant institutes/organizations in the country. He noted that some activities particularly in-country training courses were proposed. These he said were not planned and funds were not allocated yet. He requested ICARDA scientists involved to discuss with their programs as soon as possible and inform him and the national programs of the outcome to take necessary action.

He fully agreed with Dr. Lasram that these projects although important were not the only collaborative activities with ICARDA. He mentioned that regional activities in North Africa have substantially increased in the last few years. He indicated that from the last coordination meeting to date, total of 16 activities with a regional or international perspective were organized by ICARDA in North Africa. These activities involved researchers either from the Maghreb countries only or with others from ICARDA region. Examples of these activities were the Barley Yellow Dwarf Virus Workshop held in Morocco, the first and the second regional coordination meetings for UNDP/ICARDA project on Cereal and Food Legume Diseases in Morocco and Algeria, respectively, the Travelling Workshop on Ley Farming/Seed Production in Morocco and Algeria, the Faba Bean Improvement Training Course conducted in Morocco, the Training Course on Techniques in Rhizobiology of Pasture and Forage Legumes in Morocco, the Field Inspection of Food Legume Diseases in Seed Multiplication in Algeria, the North Africa Cereal and Food Legume Travelling Workshops organized in Morocco and Tunisia, respectively, and the Training Course on the Agronomy of Winter Sown Chickpea organized in Morocco.

New collaborative activities with ICARDA were also started in Tunisia. Examples are the involvement of three researchers from ICARDA Farm Resource Management Program in the evaluation strategies foı supplementary irrigation training course, the impact study on the role of cereal improvement on production in Tunisia, the collection mission for cereal germplasm and the potential project with Institut des Regions Arides (IRA) at Medinine on dry land resource management and the improvement of rainfed agriculture in the drier areas.

He said that the number of trainees in ICARDA organized courses either at headquarters or in in-country courses in North Africa had increased; same was the case with the number of researchers benifitting from professional visits sponsored by ICARDA. He mentioned that from October 1989 to date a total of 24 Tunisians attended training courses in addition to 25 who participated in professional study visits. He said this number from one country only showed the importance ICARDA attached to Tunisia.

He thanked again all the collaborating researchers and wished them a good season to come.

Mr. James McMahon, ICARDA Deputy Director General (Operations), thanked Dr. Lasram for welcoming him to the meeting and said that his visit to Tunisia was to discuss with ICARDA North Africa Regional Coordinator managerial issues but was also to get a feel of ICARDA collaborative research with national programs. He said that he attended part of discussions in the concurrent sessions for the three projects and learnt quite a bit. He said he knew of miracle varieties but Mr. H. Halila introduced lentil as a miracle crop for dry areas. He said he was very happy to feel the commitment and dedication of the national researchers and was also very pleased to watch the discussion between ICARDA and the national researchers. He said researchers sometimes had different views but the discussion was very frank and professional. He congratulated Dr. Lasram and the researchers from the national programs and ICARDA for achieving the objectives of the meeting in spite of the shortage of time.

He concluded by thanking Dr. Lasram and through him the Tunisian Government for hosting the meeting, and for their continuous support to the collaboration with ICARDA and wished all the participants a good season to come.

Annex 1

EIGHTH TUNISIA/ICARDA COORDINATION MEETING

SEPTEMBER 20-22, 1990

Thursday, September 20

17:00	**Opening Session**

Friday, September 21

	Concurrent Sessions
09:00 - 13:00	Review 1989/90 Research Results and Develop 1990/91 Work Plans - Farming Systems - Food Legumes - Cereals
15:00 - 18:00	Concurrent Sessions (Cont.)

Saturday, September 22

08:00 - 12:00	Concurrent Sessions (Cont.)
12:00 - 13:00	**Closing Session** - Presentation, Highlights of 1989/90 Results and Summary of 1991 Work Plans - Closing Remarks

Annex 2

Participants to the Eighth Tunisia/ICARDA Coordination Meeting

September 20 - 22, 1990

Mrs. F. Larbi	Ministry of Agriculture
Dr. M. Lasram	INRAT
Mr. A. Maamouri	INRAT
Mr. M. Deghais	INRAT
Mr. M. El Felah	INRAT
Mr. M.S. El Gharbi	INRAT
Dr. M. Ben Salem	INRAT
Mr. M. Mosbahi	INRAT
Mr. H. Halila	INRAT
Mr. M. Kharrat	INRAT
Mr. M. Laabidi	INRAT
Mr. M. Essamet	INRAT
Mr. H. Seklani	INRAT
Dr. G. Khaldi	INRAT
Mr. Hadj Brahim	INRAT
Mrs. R. Khaldi	INRAT
Mr. M. Kaabia	INRAT
Mr. H. Mellouli	INRAT
Mr. M. Mezni	INRAT
Mr. H. Ghodhbane	INRAT
Mr. A. Ghayadha	INRAT
Mr. M. El Echi	INRAT
Mr. Bel Hadj T. Abderrahmane	INRAT
Mr. A. Hammani	INRAT
Mr. B. El Hadj	INRAT
Dr. A. Daaloul	INAT
Dr. M. Harrabi	INAT
Dr. M. Djemali	INAT
Dr. B. Thabet	INAT
Dr. M. Zouaghi	INAT
Mrs. H. Amara	INAT
Ms. M. Cherif	INAT
Dr. A. M'Hiri	INAT
Mr. F. Ben Jeddi	INAT
Dr. A. Yahyaoui	ESA, Le Kef
Dr. A. Marouany	ESA, Le Kef
Dr. A. Dallali	ESA, Le Kef
Mr. M. Bouchendira	ESA, Le Kef
Mr. A. Sallami	Office des Cereales
Mr. L. Tounsi	Office des Cereales
Mr. A. Haddad	Office des Cereales
Mr. M. Jendoubi	Office des Cereales
Mr. Ben Dhia	OEP
Mrs. M. Zitouni	OEP
Mr. M. Mejri	CTV, Goubellat
Mr. M.H. Maatougui	ITGC, Algeria

Mr. J. McMahon	ICARDA, Syria
Dr. M. Jones	ICARDA, Syria
Dr. R. Tutwiler	ICARDA, Syria
Dr. A. Matar	ICARDA, Syria
Dr. T. Treacher	ICARDA, Syria
Dr. S. Christiansen	ICARDA, Syria
Mr. A. Mazid	ICARDA, Syria
Dr. D. Beck	ICARDA, Syria
Dr. S. Ceccarelli	ICARDA, Syria
Dr. G.O. Ferrara	ICARDA, Syria
Dr. J. Valkoun	ICARDA, Syria
Dr. M.S. Mekni	ICARDA, Morocco
Dr. S.P.S. Beniwal	ICARDA, Morocco
Dr. S. Hanounik	ICARDA, Morocco
Dr. L. Robertson	ICARDA, Morocco
Dr. A.H. Kamel	ICARDA, Tunisia