BANGLADESH-ICRISAT COLLABORATION IN CHICKPEA IMPROVEMENT

COMPILED BY
JAGDISH KUMAR, SR. CHICKPEA BREEDER

VOL. II OF II

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BANGLADESH AGRICULTURAL RESEARCH PROJECT

US-AID PHASE - II

PULSES IMPROVEMENT

AT

HE BANGLADESH AGRICULTURAL RESEARCH INSTITUTE

PRESENT STATUS AND PROJECTIONS FOR FUTURE WORK

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BANGLADESH AGRICULTURAL RESEARCH COUNCIL
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CONSULTANCY REPORT ON THE PULSES IMPROVEMENT
PROGRAMME OF BARI

JAGDISH KUMAR

II SUMMARY

I. The terms of reference for this consultancy included: planning and execution of pulses experiments at Ishurdi and other stations, providing training in the selection, hybridization and conduct of trials; multiplication of seed, compilation and analyses of data for 1983-84 and 1984-85 pulses experiments, writing annual reports and planning future work.

II. The main achievements of the pulses improvement before this consultancy programme were: the collection both locally and internationally, of about 4000 germplasm accessions of six pulse crops (khesari, lentil, chickpea, mashkalai, mungbean and pigeonpea) and the evaluation of some of these, release of one variety of mung bean (Mubarik) and identification of one of maskhalai (Baromashi), establishment of pulses quality and breeding laboratories and some facilities for research at Joydebpur, identification of eight low neurotoxin strains of khesari and determination of training needs (nine scientists were sent for M.Sc. and Ph.D studies on pulses).

III. Frequent changes in scientific staff, and absence and non-utilization of storage facilities resulted in the loss of important breeding and germplasm materials, so much so, that less than 2000 strains were available in 1984-85. There was no breeding effort in any pulse crop. Facilities for pulses research at the regional stations were non-existant.

The highlights of the 1984-85 work are:

At the end of 1984-85 season proposals were submitted for the release of four new varieties of pulses [BARI mung 1-3 and BARI Sola-1 (chickpea)] to the National Seed Board of Bangladesh. The mung strains were introduced by Dr. Kaul. Enough breeders' seed of each of the strains was multiplied for the BADC to take up the foundation seed programme in the next season if these are released. There were nearly perfect plant stands in pulses experiments conducted in 1984-85 at the RARS Ishurdi. The highest yields obtained with minimum inputs were; 2500 kg/ha for Khesari, 2250 kg/ha for lentils and 3500 kg/ha for chickpeas. Some promising results include; identification of promising strains of chickpea (10), Khesari (9), lentil (9), mash (4) and mung (4) for their final evaluation in 1985-86 before the best ones are promoted to the farmers field tests.

I worked with the Pulses Improvement Programme of the Bangladesh Agricultural Research Institute specifically as follows:

1. Assisted in the:

   i. expansion of the breeding programme,
   ii. rejuvenation, evaluation and cataloguing of khesari, lentil, chickpea, mung and mash germplasm,
   iii. planning germplasm collection of rabi pulses in Bangladesh through ICRISAT cooperation in March/April 1985. This project collected 280 strains,
   iv. introduction of 284 strains of lentil, 551 of chickpea and 10 of mungbean in 1984-85 and establishment of contacts for introduction of germplasm of khesari, mashkalai and cowpeas,
   v. identification of 30 YMV tolerant (field conditions) strains of mungbean and eight wilt resistant strains of chickpea, and
   vi. determination of inheritance of photoperiod insensitivity and seed coat color in mungbean.

2. Helped develop the following facilities:

   i. a cold store for pulses seeds at RARS, Ishurdi,
   ii. repair and put to use a plot thresher, seed drier, deep freezes, motor cycles,
   iii. repair of an old threshing floor,
   iv. submit a proposal for partially covered threshing floor for pulses, and
   v. planting, threshing and storage accessories,

3. Provided training in the following techniques:

i. hybridization, selection, data recording, compiling and reporting,
ii. planning and conduct of multilocational trials,
iii. standardization of experimental plots and data records,
iv. safe seed storage and hygiene, and
v. experimental field management procedures.

4. Initiated the:

i. hybridization programme, 22 crosses for the major pulse crops were successfully attempted, and
ii. evaluation of segregating generations received from ICARDA and ICRISAT (lentils and chickpea).

5. Helped develop:

i. a proposal for five year'PLAN OF WORK' for pulses improvement work by BARI,
ii. project proposals for funding of the pulses programme by IDRC and CIDA, and
iii. a proposal for a national workshop on pulses in early 1986.

6. Helped prepare the following documents:

i. annual reports of the pulses programme for 1983-84 and the breeding experiments conducted at the RARS Ishurdi in 1984-85.
ii. release proposals for mung and chickpea varieties, and
iii. audiovisual aids for pulses experiments, data and technology,

7. Assisted in the organisation of:

   i. review and planning meetings for 1983-84 rabi, 1984-85 rabi, 1985 Kharif I and 1985 Kharif II Pulses experiments

   ii. cooperation for research on mungbean with Chittagong University and chickpeas with the Jute Research Station at Faridpur,

   iii. training and visits to IARC's and strengthening cooperation with them, and

   iv. visits of scientists, extension workers and farmers to the pulses experiments,

8. Delivered seminars on the following topics:

   i. chickpea improvement work at ICRISAT, RARS, Ishurdi,

   ii. pulses breeding work of BARI, RARS, Ishurdi,

   iii. pulses improvement programme at BARI, BARC, Dhaka,

   iv. future of pulses research at BARI, BARI, Joydebpur, and

   v. breeding for disease resistance in chickpea, Dhaka University, Dhaka

9. Helped enrich the RARS library at Ishurdi

10. Specific recommendations were made for:

   i. short term goals; introduction and evaluation of germplasm, improvement in post-harvest seed storage, agronomic techniques for better plant stands, moisture conservation, plant growth etc

   ii. long term goals; breeding low neurotoxin khesari, higher yield potential, tolerance to diseases, pests and unfavourable soil and climatic factors, response to inputs, adaptation to specific cropping systems, basic research and removal of socio-economic constraints, and

   iii. long term sustained support for the pulses improvement programme at BARI,

III TERMS OF REFERENCE FOR DR. JAGDISH KUMAR

1. The consultant will be based full time at Ishurdi and will assist his BARI counterpart scientists in planning and execution of experiments and analysis of data.

2. He will provide field training in selection, hybridization and conducting of yield trials.

3. Consultant is expected to travel to other sub-stations in connection with his assignment.

4. Consultant will report to Director, BARI and Member-Director, BARC, and will work under the administrative control of Project Supervisor, IADS.

5. The IADS Crops Specialist will be his contact specialist at BARC.

6. The consultant will prepare quarterly reports of his activities for the Project Supervisor and will file a final consultancy report.

7. Consultant will help compile field data from 1984-1985 winter pulses crops and assist in the analysis of the same.

8. Consultant will help plan summer pulses breeding programme at BARI

9. Consultant will assist in the seed multiplication of selected summer pulses varieties.

IV. INTRODUCTION

The present status of the Pulses Improvement in Bangladesh was reviewed, major constraints were identified and plans were developed for expansion of the programme to meet the goals set in the National Agricultural Research Plan. This report covers briefly also the work done by the scientists of the BARI, Pulses Improvement Programme and myself during the period July 1984 to June 1985. A six-monthly report was written in December 1984 (Kumar, 1985). Informal monthly reports were sent to all concerned people. The achievements mentioned here are of the programme. However, opinions and any errors of interpretation are mine.

The pulses production and area in Bangladesh has declined over recent decades (Table-1). The decline is related to strong competition from wheat and boro rice. The gap in experimental and farmer's yields is large (Figure-1). This indicates that immediate gains may be made through improved agronomic management.

The pulses programme of BARI supported by IDRC funds and a World Bank pulses breeder was started in 1979. The leaders of the Pulses Improvement Program at ICRISAT, India; and Food Legume Improvement Program at ICARDA, Syria (GREEN AND HAWTIN, 1979) evaluated the needs of the BARI pulses programme and proposed that a sound improvement programme backed by good crop production techniques, better seeds and other inputs should aim at doubling the pulses production to over 450,000 tons in 1984-85. The statistics for the past 2-3 years are not available, but if the past trends are any indication, the production in 1984-85 is expected to be around 185,000 tons; about 15 percent lower than that for 1979-80.

Table - 1

Area and production of Important Pulses in Bangladesh 1971-72 and 1981-82

Crop	Area (H.a)		Production (Ton)	
	1971-72	1981-82	1971-72	1981-82
Khesari	95,866	90,968	76,680	62,960
Lentil	71,569	74,707	52,451	47,755
Chickpea	71,698	53,292	58,580	36,182
Mashkalai	52,650	42,759	43,638	29,038
Mungbean	18,840	15,300	13,000	7,188
Matar	23,251	11,423	17,425	7,225
Arhar	2,917	4,049	2,128	3,000
Other pulses	2,0834	21,172	15,873	8,815
Total	357,676	314,170	279,775	202,162

~~Phaseolus~~ Vigna mungo Mashkalai Blackgram

Vigna radiatus Mungbean. Greenseeded

Boromashi

T-9

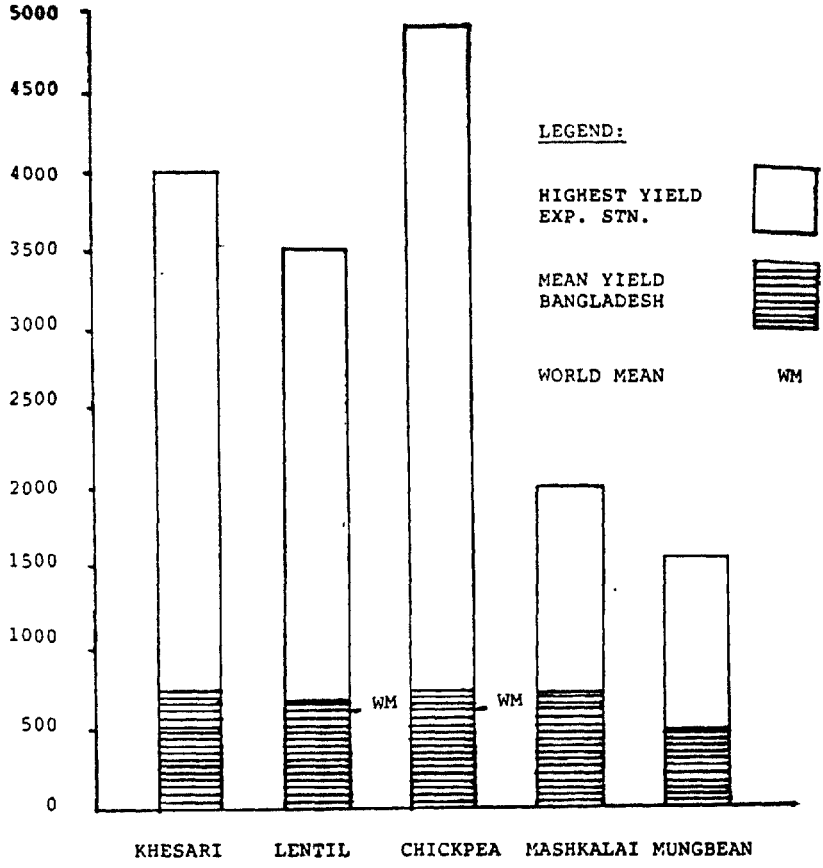

FIGURE-1 YIELD GAP IN PULSES IN BANGLADESH.

During the past five years (1979-1984) one variety of mungbean (Mubarik) was released and one of mashkalai was identified (Appendix-1). Approximately 4000 germplasm strains of khesari, lentils, chickpea, mashkalai, mungbean and pigeonpea were collected nationally and internationally. Based on a few multilocational trials some superior lines were identified for advanced trials. Priorities for research were identified. A national pulses workshop was organised in 1981. After the determination of training needs, seven scientists were sent for Ph.D and two for M.Sc. studies on pulses. A Pulses breeding and quality laboratory was established at BARI Joydebpur. Facilities for research such as threshers, balances, deep freezes, quality testing instruments and transport were procured However, regional research stations received little support.

In 1982 there were changes at the senior scientist level; the World Bank consultant left the programme, several scientists went for higher studies and the work suffered. Much of the germplasm was lost. Experimental records and literature are untraceable and continuity of the research work has not been maintained.

Most of the recommendations made in several consultancy and other reports (Green and Hawtin, 1979; Nene, 1979; Davis, 1980; Gowda and Kaul, 1982; Kumar, 1984) remain unimplemented. The orders to shift the Pulses Improvement Programme to RARS, Ishurdi were issued on August 9, 1984.

V. WHAT WAS PLANNED ?

1. Expand the Pulses Improvement Programme and review the available data since 1979 on the major pulse crops to determine whether some strains were promising and if others could be discontinued.

2. Help shift the major thrust of the Pulses Improvement Programme to RARS, Ishurdi, in the heart of the important pulses production areas of Bangladesh.

3. Organise multidisciplinary review and planning meetings for 1983-84 rabi, 1984 Kharif II, 1985 Kharif I, 1984/85 rabi and 1985 Kharif II planting seasons.

4. Develop a proposal for long-term pulses improvement programme and expand the present one to serve the needs of the whole of Bangladesh.

5. Develop proposals for funding the pulses improvement programme.

6. Assist in preparing proposals for the National Seed Board for release of promising strains.

7. Help in development of a proposal for national pulses workshop in 1986.

8. Assess the present scientific and support staff and determine future requirements.

9. Develop and utilize experimental facilities like planting harvesting and threshing equipments, storage, laboratory and field facilities at the major research stations.

10. **Standardize experimental procedures for on-station and multilocational trials of pulses and develop infrastructure to handle increased work load.**

11. **Suggest procedures to improve experimental field management** for proper conduct of trials and reduction in error variances

12. Train scientists in planning and organisation of trials, reporting of data and development of their careers. Arrange training of local scientists at IARC's.

13. Attempt hybridization and selection in important pulse crops and arrange segregating populations from IARC's.

14. Arrange more germplasm from IARC's and other countries and help in collection of local germplasm.

15. Develop inter-institutional cooperation for pulses research.

16. Write annual reports of the pulses research work for 1983-84 and 1984-85.

17. Monitor trials and help in management, data recording and selection of materials at other stations.

18. Assist in strengthening the library facilities at RARS Ishurdi.

19. Prepare audiovisual aids on pulses technology for scientists, extension workers and farmers.

36-14
1980

1984-85

VI. WHAT HAS BEEN ACHIEVED ?

1. We reviewed the available data since 1980 and for trials conducted during 1984 Kharif II, and identified mung strains 7703, 7704 and 7715 as superior. These are now awaiting release with the National Seed Board (NSB) of Bangladesh. The data for chickpea strain S-1 for the period 1982-83 to 1984-85 were compiled. A proposal for its release was also submitted to the NSB. In addition to about 35 per cent higher yield, it has larger seed (50 percent), earlier flowering, more pods per plant and and taller height than Hyprosola, the national check.

2. Multiplied breeders seed of the newly identified strains of mungbean and chickpea (about 600 kg) and for the local varieties of all pulses.

3. In lentil, khesari and maskhalai, local cultivars were the best, so all strains in the advanced yield trials upto 1983-84 were discontinued and those promising in the germplasm were promoted.

4. Additional germplasm strains for lentil (284), chickpea (551) and mungbean (10) were requested and received. More accesssions for these, khesari, mashkalai and cowpeas, have been requested from India, Thailand, IITA and IBPGR. Arrangements were made with ICRISAT, Hyderabad, to collect local germplasm of the rabi pulses in Bangladesh. This project collected 280 strains (appendix-2)

5. Most of the germplasm strains for khesari (155) lentil (400) chickpea (200), mashkalai (200) and mungbean (380) were evaluated. We have prepared working catalogues for all the above using six descriptors. The catalogues await typing. Promising materials in all crops were identified (Appendix -3).

6. The pulses programme was expanded. However, the existing variability for all crops is small and further scope of identification of elite materials in these is limited.

7. Breeding programmes in khesari, lentil, chickpea, mungbean and maskhalai were initiated. Twenty-two crosses involving local land races and introduced strains having disease resistance and other characteristics were made (Table -2). ICRISAT and ICARDA were also requested to make specific crosses for Bangladesh. The local scientists at Ishurdi and those from other stations who visited us and field staff were trained in crossing, trial management and data recording.

8. Segregating populations of lentil and chickpea were received from ICARDA and ICRISAT and useful selections were made.

9. A five year detailed'Work Plan-1984-89' for pulses was developed with the help of the Pulses Programme leader, IADS Crops Specialist, Head Plant Breeding Division and the Director General, BARI (Rahman et al. 1985)

10. Two project proposals (IDRC and CIDA) for substantial and long term support to the pulses programme for the 1986-1995 period were prepared and submitted to the authorities.

11. A short-term cold store for pulses experimental seed was commissioned at Ishurdi in April 1985. This should help in safe storage of pulses breeding and other materials. A pulses laboratory and a field room were also put to use and furniture ordered (Appendix-4).

Table-2

Crosses made, Purpose and Seeds available for the pulses breeding program at BARI in 1985-86

	Crop	Crosses	Purpose	No. of Seeds
I.	Khesari	1. 3968 x 3604	Low toxin, high yield	65 + 27[a]
		2. x Jamalpur	Low toxin, high yield	75 + 75
		3. LSD 6 x 3604	Low toxin, high yield	25 + 75
		4. x Jamalpur	Low toxin, high yield	21 + 50
		5. P-2 x 3968	Low toxin, Early Vigour	8
		6. x Jamalpur	Early Vigour, High Yield	14
II.	Lentil	1. Pabna Local x 79542	High yield	118 + 20
		2. x 79666	High Yield, Large Seed	45 + 66
		3. L-5 x 79542	High Yield	71 + 66
		4. x 79666	High Yield, Large Seed	106 + 14
III.	Chickpea	1. JG-74 x Sabur-4	High Yield, wilt resistance	16 + 11
		2. x S-1	High Yield, wilt resistance	13
		3. x Hyprosola	High Yield, wilt resistance	7
		4. Sabur -4 x S-1	High Yield	35
		5. x C-235	High Yield, tolerance to botrytis	12
		6. x P-326	High Yield	7
		7. Hyprosola x S-1	High Yield	1 + 43
		x P-326	High Yield	1 + 4

Contd....p/

Table -2 Contd

Crop	Crosses	Purpose	No. of Seeds
IV. Mungbean	1. Sona Mung x 7715	Golden Color and high yield day-length neutral (already F_2)	
	2. Sona Mung x 7703	-do- (already F_2)	
	3. 7715 x Rice bean	High yield, YMV resistance(being attempted)	
	4. 7715 x long Podded strain.	" "	
V.	1. Baromashi x MAK-2	High yield, top bearing habit(being attempted)	
	2. x MAK-3	High yield, top bearing habit(being attempted)	

[a] INDICATES SEED FOR RECIPROCAL CROSS.

12. Facilities for conducting good experiments like planting rods and field trays were made. In addition, the thresher, seed driers and deep freezers were put to use (Appendix-4).

13. Multidisciplinary review and planning meetings for pulses research were held on 19 August, 16 September 1984, and 29 January 1985 and one major review will be held in July, 1985.

14. Assisted in writing BARI pulses programme annual reports for the rabi 1983-84, Kharif II 1984 and for the pulses breeding experiments at RARS, Ishurdi, for the rabi 1984-85.

15. Procedures for experimental field management were suggested to the P.S.O. RARS Ishurdi. He discussed these in a meeting of all scientists. Some decisions like field histories, crop rotations, field levelling, fertilizer application and crop stubble management are being follwed now.

16. Improvements were made in the conduct of experiments. The experimental plot length was standardized to 4m. Non-experimental materials were planted around the experiments and inter-plot spaces were done-away with. Relatively better desigr like balanced lattice squares were introduced.

17. Excellent plant stands were achieved for all pulses experiments at RARS Ishurdi and most other stations to which we supplied experimental seed. Relatively lower coefficients of variability in the experiments were obtained. With no fertilizer and irrigation, high yields for khesari (2500 kg/ha),lentils (2250 kg/ha) and chickpea (3500 kg/ha) were obtained at Ishurdi.

18. Data recording on most pulses experiments at RARS Ishurdi and other stations was simplified and standardized. We recorded; plant stands, days to flowering and maturity, early vigour, plant height, disease and pest damage, seed size and color, and seed yield. Other data like pods per plant, seeds per pod, primary and secondary branches were not recorded unless absolutely required for a particular study. This reduced the time required for data recording.

19. Khesari strains were scored visually for their vegetative growth and identified a number of them for fodder potential.

20. Disease debris for wilt and root rots of chickpea was collected to enable the pulse pathologist to initiate artificially augmented disease screening nurseries.

21. Increased cooperation was developed or sought with IARC's; ICRISAT, ICARDA, IITA and AVRDC. We developed contacts with the Botany Department of Chittagong University who have about 1200 germplasm accessions of mungbean. We conducted an chickpea experiment at the Jute Research Station at Faridpur.

22. Invitations for the participation of Bangladesh pulses scientists to breeders meets or visits to pulses programmes at IARC's and programmes of other countries were arranged, however, only one plant pathologist could go during the last one year.

23. A proposal for holding a national workshop on pulses in Bangladesh in early February 1986 was submitted to the Head Plant Breeding Division, for submission to the IDRC.

24. Delivered seminars on chickpea breeding at ICRISAT, and on the Pulses improvement programme at BARI, at RARS, Ishurdi, BARI, Joydebpur, BARC, Dhaka and Dhaka University, during this consultancy.

25. Prepared slides, photographs and charts about the present status and new technology in pulses. These are available with the pulses programme at Ishurdi, BARI and BARC.

26. Assisted in submitting requests for 150 books, Journals and reports and in preparation of an author catalogue of about 200 books available in the library.

VII. CONSTRAINTS

1. Every five years or so the goal of doubling pulses production is announced, however, the concern and efforts to match the challenge do not exist at present.

2. No funds are available for pulses research beginning July 1985. However, the third phase of IDRC may be approved. A CIDA Project is expected. A gap in funding will adversely affect the ongoing programme and should not be allowed in the future.

3. Very limited genetic variability for pulses exists in the country and once the few strains identified in each crop are released or rejected there is no further chance for improvement unless more germplasm is introduced and strong breeding programmes are initiated. Long-term storage of germplasm should be planned to ease the pressure of rejuvenating these every year or so.

4. Scientific personnel and support staff are limited to handle these programmes in three overlapping crop seasons in one year. Although existing staffing set up indicates 35 personnel, only 21 are in position. There is no typist and no driver at the pulses headquarters. The germplasm catalogues which are ready await typing.

5. There has not been any continuity of khesari neurotoxin analysis since October, 1984, after the nine-month sabbatical of Professor Md. Hossain, who repeated analysis of 133 strains. No analysis were made of 1983-84 trials and seed for 1984-85 is awaiting analysis.

6. Although we have developed limited research facilities, there is no standby arrangement for break-downs e.g. if thresher, seed driers, cold store or, deep freezes go out of order, there can be serious damages to the materials. This has happened with the thresher and seed drier at the peak-use period.

7. There are no facilities such as typewriter, xeroxing machine, seed counter, seed barrels, furniture for laboratory, cold store and field laboratory, slide projector, numbering machines, moistureme ters, dehumidifiers etc.

8. The pulses programme has no four wheel transport at Ishurdi. This has been a serious handicap for movement on and off-station and sometimes lead to wastage of labour time. Trial monitoring could not be upto the mark. This has affected seed distribution, seed receipt and movement of staff. We could not visit Jessore for the selection of seed and the transportation of the selections to Ishurdi, by April/May. About 40 to 80 percent seed has been infested by bruchids. Some trials at Jamalpur failed and the one at Faridpur was spoiled for simila reasons.

9. Threshing facilities are quite inadequate at Ishurdi and also at Jessore. There is a great danger of loss of important breeding materials. A drying room may be necessary to handle big volumes (with threshers) at peak threshing period in March, when danger of early rains exists.

10. There are problems in coordination of the work from Ishurdi because of lack of communications. Generally, many decisions cannot be made locally. It is also difficult to follow up the proposals and commitments. For example NSB proposals for mungbean and the IDRC proposal for funding are still pending. Hardly anybody from Joydebpur participated in important pulses review and planning meetings at RARS, Ishurdi. If the pulses project is continued it will become even more necessary to import seeds, send scientists for visits, import equipment and materials and therefore, it may be more appropriate to implement the coordination from a central place.

11. Management of experimental fields should receive urgent attention. Error variances observed in the experiments can be largely accounted for by field heterogeneity and uneven gradients, which lead to variable moisture regimes, weed populations and differential treatments in the preceding season. Land levelling, uniform gradients for drainage and removal of bunds inside fields should help to promote better experimentation. Leakage of pipes and spillage of water into adjacent experiments also result in large experimental errors and therefore, doubtful conclusions.

12. The free movement of labour and the public across the farm is not desirable. In addition to danger of theft of experimental plot materials (like selfing bags in pigeonpea, edible fruits), this results in reduced labour efficiency.

13. Shortage of funds has been a serious handicap. This may be related to labour use efficiency, vehicle use and purchases. A better and timely planning of farm operations might reduce the gap. It may also be necessary for the central office to let the projects and stations know the definite fund availability and to release these in time and as per the agreements.

14. It is worthwhile to consider improvements in planning and execution of experiments. Efforts to maintain viability of seeds (post-harvest seed storage), germination and plant stands are required on the part of scientists. It will also help if they plan their leave in a slack season. Individual scientists should be accountable for experiments and their results.

15. Documentation, maintenance and proper use of all sorts of equipment is required.

16. In most station trials, high yields are obtained under largely artificial conditions. Only about 20 percent of the area in BD is irrigated, however, most experiments at the station receive irrigation. Moreover, most agriculture in Bangladesh is rice based, but experiments of the station in rabi are planted after kharif fallow. It may be worthwhile to initiate at least some experiments in khesari under relay planting conditions in rice fields. Farmers plough their land upto 10 cm depth but at research stations mold board or disc ploughs are used to the depth of about 20 cm. Experimental procedures as far as possible must follow farmers conditions and practices (Appendix-5).

17. If experimental facilities are inadequate, the number of books and Journals in the library is awefully low. While there is a paucity of books, no new journals are received, there is little effort on the part of scientists to consult books, journals or reports.

18. Funds for internal travel and procedures for outside visits need to be streamlined. As many as four invitiations for the local scientists to participate in international meets in 1984-85 could not be availed.

19. I am told 100 tons of BADC mungbean seed is lying unsold. The need for such large multiplication and reasons for no sale are not clear.

20. Prices of pulses do not match their food value in the diet, there is no Government support and therefore, glut at harvest time results in greatly reduced prices.

21. Lack of input incentives, loans good quality seeds, pesticides, and inoculum, results in lower production levels. Occasional drought during the growing season and early rains at maturity discourages the Bangladesh farmers from investing in any form in the risky rabi season pulses.

VIII. FUTURE PLANS

In the plan of work 1984-89 for the pulses Improvement Programme (Rahman et.al., 1985) details are given for the research which may be carried out for each crop, discipline and year, for the next five years. Most of the work proposed for 1984-85 (which could be done with the available facilities) has been completed. If the present constraints of funds, manpower and facilities are to continue, serious thought should be given to reduction in the number of crops on which the research should be done (Table3).

1. If the newly proposed four varieties of pulses are released, efforts should be made to supply the seed to BADC and make arrangements to multiply as much breeders seed as possible. Purify and multiply the seed of local cultivars also.

2. Plan further multilocational trials of the elite materials identified in khesari, lentil, chickpea, mashkalai and mungbean.

3. Procure more germplasm, through contacts with national and international institutes. Personal visits by local scientists to bring new germplasm especially of khesari, lentil, mashkalai and mungbean should be encouraged. Bangladesh may plan to maintain over 2000 strains for each of khesari, lentils, maskhalai and mungbean in its longterm cold stores. ICRISAT can help with chickpeas, but important strains should be maintained locally.

TABLE-3

PRIORITIES IN PULSES RESEARCH

PRIORITY	KHESARI	LENTIL	CHICKPEA	MASH KALAI	MUNG BEAN	PEAS [a]	COW PEAS [a]	PIGEON PEAS [a]
GERM. COLLECTION	*					*	*	
GERM. INTRODUCTION	*	*	*	*	*	*	*	*
GERM. EVALUATION	*	*	*	*	*	*	*	*
BREEDING	*	*	*					
AGRONOMY	*	*	*	*	*	*	*	*
PATHOLOGY	*	*	*	*	*			
ENTOMOLGY	*	*	*	*	*			
WATER+FERT.	*	*	*	*	*			
MICROBIOLOGY	*	*	*	*	*			
CROPPING SYSTEMS	*	*	*	*	*	*	*	*
POST-HARVEST S.S.	*	*	*	*	*	*	*	*
NUTRITIONAL QUALITY.	*							

a. If funds and facilities permit.

4. Ensure adequate and long-term funding. Provide enough staff, and facilities like medium-term cold store, glass house, threshers, seed driers, drying rooms, planters, threshing floors, laboratory equipment and transport. Funds for travel, especially for monitoring multilocational trials and delivering and receiving seeds to and from other stations, should be provided.

5. Reinitiate analysis of neurotoxin of khesari germplasm and augment facilities to screen segregating materials.

6. Collaborate on studies on safer consumption methods for khesari with the Institute of Nutrition, Dhaka University.

7. Improve agronomic technique.

   i. Post-harvest seed storage (Appendix-6).
   ii. Seed bed preparation and soil moisture conservation in rice-based cropping systems.
   iii. Timely planting.
   iv. Placement of seed in moisture zone, line sowing behind the plough or by a seeder.
   v. Research on farmers methods of cultivation and place of pulses in cropping systems.
   vi. Weed control at least in early stages.
   vii. Removal of mineral deficiencies for phosphorus, zinc and sulphur.
   viii. Research in maximum yield potential.

8. Disease management:

   i. Survey important diseases of major pulse crops.
   ii. Screen germplasm in augmented disease screening nurseries.
   iii. Assist in screening breeding materials.

iv. Control diseases of post-harvest stored grains
v. Manipulate white fly populations to control YMV.
vi. Initiate epidemiological studies for planning long-term disease control.

9. Integrated insect-pest management:

i. Survey of important insect-pests of major pulse crops.
ii. Evaluation of methods to control them.
iii. Screening germplasm and segregating populations for tolerance and/or resistance.
iv. Development of efficient spray schedules for integrated pest management.

10. Research in biological nitrogen fixation:

i. Collection and maintenance of rhizobia strains for each important pulse crop.
ii. Search for efficient nodulating strains.
iii. Provision for multiplication of inoculum.

11. Improvement through breeding:

i. Evaluate more germplasm preferably multilocationally for identification of superior varieties.
ii. Continue hybridization for combining desired characters
iii. Collaborate with BINA for increased variation through mutations especially in lentils.
iv. Breed for low neurotoxin content, at the present yield levels.
v. Utilize rapid generation turn-over, off-season advancement (Appendix-7)
vi. Breed for tolerance to biotic and abiotic factors.
vii. Breed for high yield.
viii. Breed for response to higher inputs; water, fertilizer and inoculation.

12. Remove socio-economic constraints:

i. Adequate price guarantee.
ii. Loans for inputs.
iii. Improvement in consumer quality through processing.

13. Educate farmers and consumers that:

i. Pulses protein through cheap is good.
ii. Pulses require realatively less inputs and add nitrogen to the soil.
iii. Pulses improve soil health.

14. Routinely test advanced strains for protein content, cooking time and consumer acceptance and reject those which are below standard.

15. Identify strains of khesari and maskhalai with good fodder potential.

16. Identify short term training needs and encourage local scientists to visit IARC's to learn the latest technology.

17. Conduct research on inter-cultural operations with bullock-drawn implements and improve upon the implements used by farmers.

18. Initiate studies on flower drop, pod setting in cold temperature, tolerence to moist conditions at harvest time seed size and comparatively less production stability in chickpeas; seed size in lentil and khesari and top bearing habit in mashkalai, preferably as thesis subjects at the graduate level.

Make efforts to include pulses improvement in the curriculum of agricultural students so that they learn of the requirement and responses of pulses to the environment as compared to rice. In the latter, higher inputs almost always result in increased returns whereas this may not be true in pulses always.

19. Organise a National Workshop on Pulses to assess the present situation and plan future programme.

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APPENDIX -1

Major Achievements of the Pulses Improvement Programme of BARI, 1979-84.

1. Collection of about, 4000 germplasm strains of six pulse crops about 2000 of which had been lost by 1984.

2. Evaluation of some of these in trials.

3. Organisation of a national pulses workshop 1981.

4. Release of Mubarik, mungbean and identification of Baromashi, mashkalai and isolation of eight lowtoxin lines of khesari.

5. Development of pulses breeding, quality and field laboratory at Joydebpur and creation of facilities for neurotoxin analyses. Procurement of two threshers, seed driers, transport, deep freezes and furniture for Joydebpur.

6. Identification of training needs and personnel and their placement in Universities.

APPENDIX - 2

GERMPLASM ACCESSIONS AND EVALUATION

1984-85

CROP	GERMPLASM			
	1983	1984	1985	EVALUATED
Khesari	196	267	267	254
Lentil	1314	517	801	400
Chickpea	1311	300	650	426
Mashkalai	300	354	354	200
Mungbean	500	182	542	308
Arhar	200	12	12	12
Cowpea	?	?	50	50

IN ADDITION 280 SAMPLES OF RABI PULSES WERE COLLECTED BY BARI-ICRISAT TEAM IN APRIL, 1985.

APPENDIX - 3

List of Elite strains some of which could be Candidates for release in the next 2-3 years and numbers of useful Germplasm identified in 1984-85.

Crop	Elite Strains	Useful Germaplasm/Breeding Lines (No.)
1. Khesari	P-2, P-24, LSD - 6, 3932, 3968, PL-9, L-12, L-14	75
2. Lentils	79542, 81149, 81116, 81150, 81145, 81152, P-1464, P-1471, P-1439.	74
3. Chickpea	JG-74, ICC-9023, ICC-4920, 8585, ICCL-83150, -83151, 83153 (E-9), -82208, 83228, -83007.	Over 100
4. Mashkalai	MAK-2. MAK-3, Pant 4-26, B-23	74
5. Mungbean	MK-72, MK-73, MK-19, PAG ASA-2	30

APPENDIX - 4

List of facilities created or put to effective use at RARS Ishurdi.

	FACILITY	STATUS
1.	Cold store for Pulses Seeds 23 x 23 x 10 Cft.	New construction
2.	Threshing Floor	Repaired
3.	Pulses Field Laboratory	New Construction
4.	Planting Rods	Newly made
5.	Seed trays	Newly made
6.	Pullman plot thresher	Put to use at Ishurdi
7.	Seed drier	Put to use at Ishurdi
8.	Deep Freezers	Put to use & one to Jessore
9.	Partially covered threshing floor 60' x 20'	Tender floated
10.	Bagsealer	Put to use at Ishurdi
11.	Two Motor cycles	Put to use at Ishurdi
12.	Balance	Repaired

APPENDIX - 5

SURVEY ON PULSES PRODUCTION IN BANGLADESH.[a]

1. Department of Agriculture statistics indicates about 60 percent reduction in production of pulses from 1982-83 to 1983-84.
2. Reasons for decrease in acreage and production:
   i. Low yield potential for pulses in general,
   ii. Inclemental weather resulting in severe yield losses,
   iii. Expansion of irrigation resulting in a shift in area from pulses,
   iv. Pest attack, and
   v. Unfavourable propaganda against lathyrus.
3. 86% farmers grow pulses for consumption and sale and 27% grow lathyrus for fodder for their own cattle.
4. 76% farmers use their own seed, 22% buy from market just before planting; buying for consumption was rare.
5. Chickpea and lentil are mostly grown mixed with Mustard, linseed, barley or pea. About 70% lathyrus is grown as a relay crop after B. Aman.
6. Only about 25% farmers used fertilizer and 20% pesticides (aphids).
7. The mean yield estimates for pulses appear to be much higher than those reported by the BBS:

Crop	Mean seed yield kg/ha		
	Survey estimate	1980/81 BBS	Five Dist Area % Bangladesh.
Lathyrus	1081	701	68
Chickpea	1226	665	49
Lentil	987	599	64
Cowpea	1383	NA	

NA. Not available

[a] Khan and Khan, 1984, pulses survey in six districts, Pabna, Rajshahi, Bakergonj, Faridpur, Jessore and Chittagong of Bangladesh.

APPENDIX - 6

BRUCHID DAMAGE TO PULSES SEEDS IN FARMERS STORAGE

CROP	PERIOD STORED	PERCENT INFESTED SEEDS
Mung	6 Months	89
Lentil	6 Months	96
Chickpea	3 Months	35
Cowpea	7 Months	73

Source : Mondal *et al* 1983

APPENDIX - 7

RAPID GENERATION BREEDING SCHEME FOR RABI PULSES

YEAR - 1	FIELD	MAKE CROSSES	NOV. TO APRIL
- 1	Plastic Shelter-Lights	Grow F_1	April to July
- 1	-do- -do-	Grow F_2	July to October
YEAR - 2	FIELD	Grow F_3	Nov. to April
		Apply disease pressure	
- 2	Plastic Shelter-Lights	Grow F_4	April to July
- 2	-do- -do-	Grow F_5	July to October
YEAR -3	FIELD	MULTIPLY SINGLE PLANT FILED REJECT BAD PROGENIES	
YEAR --	FIELD	SMALL SCALE TRIALS	
YEAR-5,6	FIELD	LARGE SCALE TRIALS	
YEAR - 7	FIELD	IDENTIFY SUPERIOR STRAIN (S)	

For internal circulation only

Detailed Tour Report

Bangladesh (12-24 March, 1985)

S.C. Sethi

Itinerary

12.3.85	Hyderabad-Calcutta
13.3.85	Calcutta-Dhaka
14.3.85	Dhaka-Ishurdi
16.3.85	Ishurdi-Rajshahi-Ishurdi
17.3.85	Ishurdi-Kushtia-Fridpur
18.3.85	Fridpur-Jessore
19.3.85	Jessore-Dhaka
20.3.85	Dhaka-BARC
22.3.85	Dhaka-Joydebpur-Dhaka
23.3.85	Dhaka-Calcutta
24.3.85	Calcutta-Hyderabad

I was received at the Dhaka airport by Dr. Jagdish Kumar. The same day I met Dr. A.K. Kaul, crop specialist, and Dr. D.M. Daugharty, IADS Advisor, to Bangladesh, Dr. M.M. Rahman, Director BARI, Mr. Kamaluddin Ahmed, Member Director (crops) and Dr. Abdul Hamid, Head, Division of Genetics, BARI. I apprised them about my purpose of visit and the response was encouraging.

Next day I travelled to Ishurdi with Dr. Kumar.

Ishurdi

It is an old research station of BARI and has become the main center of Pulses Research very recently. Of the three rabi pulses, lathyrus, lentils and chickpea the first two were already harvested whereas chickpea was still green although in a late-podfil stage. The soils are rich, moisture plenty and chickpea normally puts in a good growth, sometimes excessive though. The season was dry this year and the chickpea crop was excellent with no problem of Botrytis gray mold. At places, however, it had overgrown, particularly on the lower sides of the fields.

Dr. M. Matiur Rahman, Program Leader, Pulses, conducted the field tour for me. The following trials were seen:

Determination of economic threshold of pod borer: The trial was in good stage but I could not observe much Heliothis damage. White grubs, however, was a problem in these fields. Another experiment on screening of genotypes for their resistance to

Heliothis was also in the same state.

Agronomical Trial: A trial on optimum planting date and seed rate was in progress. Staggered planting commencing from 16 October and carried upto January 1 with an interval of 15 days was done. The earlier and the later dates seemed to be affected by overgrowth and poor growth. November may be the best month and 15 November probably, the optimum date. Seed rates of 25, 35 and 45 kg/ha were being tried. Farmers however, go for very high seed rates. The reasons for these are that they broadcast the seed in paddy when it is maturing and give some tillage to over-turn and cover the seed with soil, sometimes the germinability of seed is very low owing to poor storage, seed rotting can also take place because of excessive moisture, while at other times moisture may be too low for germination.

Fertilizer Trial: Two doses of Nitrogen, 4 each of P2O5 and K2O and two of zinc. This trial had problem of collar rot. The come up irrigation was given. Variety used was S1.

Breeding trials were managed and shown by J. Kumar. A trial on 21 entries selected out of the materials received from ICRISAT from 1981 to 1984 was conducted. The best entries of each year were selected and put in this trial for test against local checks. ICCL-82208 was the best looking followed by 81248 (S1), 81203 and ICC-267. ICC-492, Hypersola, the local check had some wilt. JG-74 was free. P 326 was somewhat late, Sabour-4, ICCC-4 and C-235 were average.

Advanced generation breeding material: 32 lines selected by their scientists in Breeders meet at Hyderabad were grown and the pedigree maintained as such. JG-74 and the local checks were also included. The good plot numbers were PA02283R/4415, PA02883R/4709, PA0383R/26133, 21109, 26074, PA05383R/26153, PA05783R/27414 and ICC-9046.

Advanced Yield Trial-1: 10 entries, source ICRISAT, checks, Hypersola, Pabna local and Sabour-4, were planted in this trial. Hypersola was most affected due to wilt followed by Pabna local and Sabour-4. Entries that were good and relatively free; E9, E-24, and JG-74.

Advanced Yield Trial-2: Five entries and 3 checks mentioned earlier. Large plot size. It was a multilocation trial. S1 and ICCC 5 were good, ICCC 2, HMS 6 and G 543 were average, Sabour 4 was also showing a good growth.

Advanced Yield Trial-3: JG-74 was probably the best in this trial followed by Sabour-4, 83151 (DPWR) and P-326.

F2MLT-DS: Entry 15 was excellent, 20 very good, 11 and 12 good. On the whole a good trial.

F3MLT-DS: Entries 1 and 9 were very good in this trial, 11 and 2 were equally so whereas 7 and 4 were good to average in different

replications.

ICSN-DS: Among checks Annigeri was the best. Good entries were 20, 24, 51, 57, 44 whereas 32, 41, 1, 13, 30, 35, 31, 52, 34, and 21 were above average.

ICSN-DM: K-850 was excellent, ICCC-4 average and Sabour-4 above average. Entries with excellent podding at this stage were 31, 45, 38, 20 and 4. Other good ones were, 43, 30,22, 47, 11, and 39.

ICCT-DS: A very good trial. Entries worth noting were; ICCL-83135, 83214, 83227, 83302. K-850 was good in two and average in other two replications.

Botrytis tolerant: F4/F5 generation Botrytis tolerant lines were grown. No Botrytis problem was noted this year because the season was dry. However, the lines that showed good podding were; 800842, 800850-2, 800885-1 and-2 and 761192.

Germplasm lines: 131 lines. Some root rot appeared in this patch. Good entries ICC-2548, -192 and -12346.

Crossing Program: Parents included, JG-74, S1, Sabour-4, C-235, P-326 and Hypersola.

Evaluation of Promising Chickpea Strains-1: Plots 345, 334, 307 and 358 good, 119 & 120 wilted, 112 was relatively wilt-free whereas entries on both sides were killed.

Evaluation of Promising Chickpea Strains-2: Good entries E31/379, E34/401, E36/409, E46/488, E 58/600, and JG-74.

Preliminary Yield Trial: 25 entries trial. Promising entries were, ICCL-82001, 83002, 83003, 83007, 83228, 83150, 83213, 83136 and 83004. Some entries had wilt problem.

Bangladesh Institute of Nuclear Agriculture (BINA)

BINA is conducting research on mutation in chickpea and variety Hypersola is an outcome of that. Most of the materials in their trials is the result of their own effort, however, they had also inherited some lines from ICRISAT. Some of their trials were:

AYT: Entries 6. Hypersola early, G-292 early good, G-97 mid-late but showing good podding.

Yield trial of exotic germplasm: Materials from BINA, ICRISAT and ICARDA. ICCT-4, CIYT-16 and CAT were average to good whereas Hypersola was also average. ICCT-4 had large pods, CIYT-16 had lodged.

PYT: Assessment of M4 mutants of NaN3 treated chickpea seed

CM-59 and 16 showed good podding, Hypersola was average.

PYT: Selected exotic germplasm: Selections made from ICRISAT/ICARDA trials. ICCT-12 and 2 were excellent, CIYT-1 lodged, CIYT-6 had stand problems.

ICSN-DS: This trial was little overgrown and some entries had lodged. Annigeri also showed some lodging, JG-62 had some wilt. Good plot numbers were 113, 123, 125, 141 and K-850.

On Farm Research and Development (OFRD), Kalikapur

The new material and technology is carried at the farmers' fields through OFRD. They had some chickpea trials at a nearby village, Kalikapur. Varieties on test were S1, Hypersola, Sabour-4 and farmer local. S1 was by far the best. Some Heliothis damage was noticed in this trial.

A trial on the method of sowing clearly demonstrated that broadcasting was much inferior than line sowing behind the plough. Farmers normally plant by broadcasting the seed in paddy and use high seed rates.

Discussion with the staff at Ishurdi was useful. They expressed that ICRISAT was helpful to them in chickpea research and they look forward to more stronger links.

Rajshahi

Drive from Ishurdi to Rajshahi was through various mixed cropping combinations of chickpea with other crops, however, sole chickpea was also common. The growth was generally good but patches were too frequent. Stopped at few places, could not see much disease problem, Helipthis damage was, however, noticed.

At RARS, Rajshahi, a multilocation trial similar to the one at Ishurdi was being conducted. It was in a poor shape. Problems were uneven land, many weeds, poor upkeep etc. I was told that collar rot had appeared there earlier. The preliminary Yield Trial was also in the same condition.

Quite a few farmer fields were seen west of Rajshahi.

A field near Rajshahi town had chickpea in rice-fallows. No ploughing - poor stand, lots of weeds. Adjoining field received one turning, crop better than the first field.

In Baya village a small plot near the farm house with a good growth but few gaps. Mixed cropping with lentils, in another field with wheat, both good.

Near Baripura village. Chickpea fields all around and in various cropping systems.

1. Chickpea + linseed + barley: Growth O.K., podding good borer attack observed.

2. Barley + chickpea: Good growth, but gaps due to broadcasting.

3. Chickpea + wheat: Planted late, growth poor.

4. Wheat in this region is replacing pulses slowly.

5. Relay crop with and without tillage (1-2) showed remarkable difference. Chickpea crop would definitely need some tillage for good growth and checking the weeds.

6. A field with one tillage, sown late but was very good. Upon checking with the farmer, we came to know that he had applied farm yard mannure to rice crop. This probably conserved more moisture for chickpea and because the season was dry this plot was exceptionally good. Some disease (R. bataticola) was noticed, farmer was expecting 18 q/ha from this field.

We returned to Ishurdi in the evening as Dr. M.M. Rahman, Director, BARI was visiting chickpea fields next morning. The next day I held discussions with him and asked his opinion about ICRISAT's support to chickpea research. He gave me a very positive response and was satisfied with our approach. He, however, expressed that he looked for more stronger links with ICRISAT by way of exchange of visits, materials, and training their staff at ICRISAT. I feel Bangladesh is a country where we can make our impact felt and they duly acknowledge the source of our material.

Kushtia & Fridpur

Large area of chickpea from Ishurdi to Kushtia district. Mixed crop combinations were gram with wheat, coriander, barley and mustard. One of the farmers told that they do mixed cropping with coriander to keep the Heliothis away. The crop is totally rainfed . Farmers were harvesting chickpea crop. Podding was really good, some damage due to Heliothis was observed. They give one tillage and cannot afford more because all farmers don't have their own bullocks and they have to hire an high rents. Instead higher seed rates are used to get good stands. But these remain uneven because of three problems; poor seed storage, seed rotting due to excessive moisture, and broadcasting.

At RARS, Fridpur, there was only one multilocational chickpea trial and that too was spoiled by water-logging due to seepage from the nearby irrigation channel. Some plots were, however, good and showed excellent podding. S1 was good and Pabna local average.

Demonstration Trials at the farmers fields in a village near Fridpur were conducted nicely. S1, Pabna local, Sabour-4, Hypersola and Farmer local were grown in large plots. At one place S1 was early and good, Pabna local was late, Sabour-4 was average and had gaps, Hypersola was average to good and Farmer local was above average. At other place S1 was good, Pabna local average, Hypersola was damaged by disease (wilt) and Farmer local was very good.

Jessore

RARS, Jessore

All the trials were in a good shape, the growth was ideal. Chickpea crop was maturing and podding was excellent. At places, however, entries had put in excessive vegetative growth and at other places there were patchy stands. But on the whole the crop was impressive.

Advanced breeding lines from ICRISAT

Entries 96, planted as observation rows. About 15 tall lines also included, the expression was good. Promising entries were at plot numbers 21, 65, 100, 102, 106, 111 and 114. Among talls, entry 63 was the best.

Advanced Yield Trial-1: Again, 10 entries from ICRISAT were being evaluated in bigger plot size. Sabour-4 was average to poor, Hypersola very poor, and Pabna local was average. JG-74 was very good but in one replication it had stand problems. Entries 2 and -42 were best overall, 24 and 45 were average to good in different replications.

Advanced Yield Trial-2: One of the sites of the multilocation trial. ICCC-2 and ICCC-5 though somewhat mid-late yet seemed to be performing well, S1 had stand problems, Pabna local was average, Sabour-4 average to good and Hypersola was poor.

ICSN-DS: Planted in the first week of December, yet the trial had excessive growth; reason: one come up

irrigation and one more after one month. Among checks JG-62 was best, Sabour-4 was average to good. Annigeri was average. Entries 8, 20, 22, 23, 26, 30, 41, 50 and 59 were looking better than the checks.

Germplasm Evaluation: Materials received from ICRISAT. Among these ICC-2038, 2548, 2578, 3439, 4874 and 11529 were looking impressive and may probably have a better scope here. K-850 was average and had lodged.

Heliothis was not a problem yet an ambitious trial on control of this insect by NPV was being conducted. Yet another trial was on finding the threshold limit of this insect.

A trial on fertilizer response to N, P, K, S and Zn was in progress. No visible differences could be noticed among different treatments. Variety used was S1. Trial was very good and data will be useful.

OFRD, Bangladesh

About 15 kms east of Jessore. Harvesting was in progress and farmers had harvested most of their chickpeas. Some late sown chickpeas were still in the field and had poor growth. The normal sown crop showed good podding. One of the farmers had serious problem of Botrytis although in patches. The adjoining field was almost free. When asked, we came to know that he had applied FYM to the paddy crop and also gave one irrigation to the chickpeas. Probably the excessive moisture turned out to be suicidal for the crop.

I could see three demonstration trials of improved chickpea cultivars compared with the farmers local at the farmers' fields. In first trial farmer local was the best, Pabna local average to good, Hypersola had moisture problem in half of the plot, S1 was very good and Sabour-4 was average.

In the second field S1 looked very impressive although a part of the plot was damaged by stray cattle, Sabour-4 was very good here, Pabna local was average, Hypersola average to good and Farmer local was also good.

In the third trial Sabour-4 was very poor, Hypersola was also more or less like this, Pabna local was good, S1 was very good whereas Farmer local was also competitive.

BARI, Joydebpur

Dhaka to Joydebpur, once a good area of pulses, has no more chickpea because of the changing cropping pattern. Now it has been replaced by wheat. At BARI station very few trials of chickpea were conducted. At one stage this was the main center of activity for pulses but now Ishurdi has become the major station of pulse research and that is the reason for fewer chickpea trials here. Some of the entries in the trials were already harvested. However, it was possible to see the harvested material in the field. The Multilocation Advanced Yield Trial was conducted at this location also. HMS-6 though mid-late looked good. S1, Pabna local, Sabour-4 were harvested and of these S1 looked better.

CIYT-ICARDA

A trial an kabuli types sent by ICARDA, most of the entries were late and unadapted. However, entry 2 was early and very good overall whereas entries 4, 8 and 22 were also good.

A trial on time of sowing and seed rate was conducted by staggering the planting for 15 days from 15 October to 1st January and seed rates of 25, 35 and 45 kg/ha. The preliminary indications were that mid-November was the best planting time and 45 kg/ha was the optimum seed rate.

BARC: At BARC, I met Dr. K.M. Badruddoza, the Chairman, who just retired and will be taking up his assignment with FAO. I apprised him about my visit and had some useful discussions with him. He was of the opinion that although ICRISAT is doing fine job, yet it has to make more efforts in Bangladesh than what are there at the present. I took this point and assured him that ICRISAT will take further steps in this direction.

TOUR REPORT

BANGLADESH (12-24 MARCH, 1985)

S.C. SETHI

SUMMARY

- Pulses occupy about 5 per cent cropped area and produce 2 per cent food grains in Bangladesh.
- Most of the production of pulses in this country is contributed by rabi crops, lathyrus, lentil and chickpea and these are mainly grown in Kushtia, Jessore, Fridpur and Pabna districts.
- ICRISAT chickpea program is making an impact in Bangladesh since virtually all the material at any of the stations is originating from seed supplies made by us.
- S1, a cultivar in on-farm test is promising and has come out of ICRISAT's material, they duly acknowledge it. This is one of their future varieties.
- Chickpea crop on the whole was good this year because it being a dry year, no Botrytis incidence was observed.
- Wilt and root-rots are a general problem in the country.
- Heliothis damage was less than 2%.
- Stands are a general problem in farmers' fields because of various reseasons like seed storage, broadcasting, rotting due to excessive moisture etc.
- Dr. K.M. Badruddoza, Chairman BARC and Dr. M.M. Rahman, Director BARI felt the need for further strengthening of Pulse Program by exchange of materials, visits and training of Bangladesh staff at ICRISAT.

ISHURDI

- The major thrust of the pulses program has been shifted to more representative research station like Ishurdi. Earlier it was at Joydebpur, which is now a testing site only.
- J. Kumar is doing a fine job, all the chickpea trials were in an excellent condition here.

Some of the trials had grown excessively vegetative particularly on the lower side of the fields.

- Pabna local, Hypersola and Sabour-4 are the local varieties of which former had less problems whereas the latter two were highly susceptible to wilt.
- It seems that race situation for wilt is similar to Hyderabad as all the materials identified resistant here were also resistant at Ishurdi.
- The lines from ICRISAT giving superior performance over years were identified and put in advanced yield trials. These are being tested multilocationally in Bangladesh.
- Demonstration trial at one of the farmer fields in Kalikapur village near Ishurdi was good. S1, Pabna local, Hypersola, and Sabour-4 were sown in large plots. S1 looked best.
- Chickpea as a relay crop with rice would require some (1-2) tillage as no-tillage plot had a very poor growth.

RAJSHAHI

- Large fields of chickpea from Ishurdi to Rajshahi.
- Growth was optimum but stands were not perfect.
- Various mixed cropping combinations with chickpea were observed particularly barley, wheat, mustard, coriander and sugarcane.
- At RARS Rajshahi only two trials, AYT and PYT were grown.
- No yield data possible because of uneven growth due to soil heterogeneity. Weeds were to an alarming scale.
- Collar rot was a big problem.
- Pod borer, not much of a problem.
- Farmers used unusually high seed rates (100-150 kg/ha) to get good stands.

KUSHTIA & FRIDPUR

- Very good chickpea crop from Ishurdi to Kushtia.
- A relatively warmer region, farmers were harvesting their crop.

- Good yields 15-20 q/ha are obtained by farmers.
- Not much of disease and insect problem.
- Mixed or intercropping a very common practice. The belief is that it keeps the diseases (botrytis) and insects off.
- At Fridpur station only one Advanced Yield Trial, which too was damaged by seepage from a nearby channel through a rat-hole.
- On the whole S1, HMS-6 and Pabna local were good.
- Two demonstration trials at the farmers' fields were also seen. S1, was good in both these trials. The farmer-local was also in good competition with this variety. Sabour-4, Hypersola and Pabna local were poor to average. Hypersola was damaged by wilt in another field.

JESSORE

- Most of the chickpea harvested by farmers, only late planted fields could be seen. These did not have good growth.
- At RARS Jessore, all the trial were good, growth was ideal and material was maturing.
- In AYT-1 entries from ICRISAT were being evaluated against local checks. Entries E-42 and 2 were very good whereas checks were average.
- In AYT-2, ICCC-2 and ICCC-5 seemed to be performing well as compared to many others.
- Among advanced breeding lines from ICRISAT, entry 65, 88, 100, 102, 106 and 111 were good to very good.
- Among germplasm accessions ICC-2038, 2548, 2578, 3439, 4874, and 11529 will probably have a better scope here.
- Evaluation of chickpea strains from ICARDA: ICC-559, 476, 450, 367, 302, 217 and 211 looked impressive.
- In ICSN-DS, Annigeri was average, JG-62 very good and Sabour-4 average to good. Entries 41, 26, 20, 8, 30, 22, 59, 23 and 50 were looking better than the checks.
- Heliothis was not a problem yet an ambitious trial on control of this insect by NPV was being conducted.
- Demonstration trials conducted at farmers fields were seen. Gulti-1 seemed to be performing well. In one trial farmers local was the best.

JOYDEBPUR

- Dhaka to Joydebpur, once a good area has no more chickpea because of the changing cropping pattern.
- At BARI station very few trials of chickpea were conducted.
- In CIYT, sent by ICARDA, most of the entries were late and unadapted. However, entry 2, was early and very good whereas 4, 8 and 22 were also good.
- In AYT, HMS-6 though mid-late seemed good. S1, Pabna local, Sabour-4 and Hypersola were harvested and of these S1 looked better.
- A trial on time of sowing and seed rate was conducted, the preliminary indications are that mid-November is the best planting time and 45 kg/ha is the optimum seed rate.

PULSES IMPROVEMENT PROGRAMME
BANGLADESH AGRICULTURAL RESEARCH INSTITUTE

PLAN OF WORK
1984 - 89.

BY

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1 INTRODUCTION

Pulses occupy about 5 percent of the cropped area and produce 2 percent food grains in Bangladesh. The total area, production and per capita availability of pulses have steadily decreased over the last decade or so (Table-1). Despite corrective measures undertaken since 1979 this trend could not be halted or reversed. High yielding varieties of wheat, mustard and of some cash crops which assure high net returns to the farmer are displacing pulses from their traditional areas. Moreover cultivars, which respond to inputs are not available for pulses. Research is required for cultivation of pulses in rice based cropping patterns. Good quality seed of even the local varieties is not available to the farmers.

1 Achievements:

The coordinated pulses improvement programme initiated in 1979 and supported by the IDRC and the World Bank, identified priority areas for pulses research. The research work on six pulse crops; khesari, lentil, chickpea, mashkalai, mungbean and pigeonpea, included collection of local and exotic germplasm, its evaluation for direct use, identification of important pests and diseases, and nutrient requirements of various crops. Training needs were identified and seven scientists were sent for Ph.D. studies for breeding, pathology, agronomy and entomology. The details of achievements for the 1979-84 period are listed in Table-2. Improved varieties of summer pulses, mungbean and mashkalai were released for cultivation by farmers. Low-toxin lines of khesari and high yielding lines of chickpea, lentil and pigeonpea were identified and are being tested in advanced yield trials. Important diseases of each pulse crop were also identified. Effective strains of Rhizobia for mung and chickpea were identified. However, in the last two years some progress made in the earlier years was lost. Several scientists left the programme for training or for other reasons, sizeable germplasm was lost in all these crops. Hybridization programme which could have been initiated was not undertaken and well-knit approach involving all support disciplines could not progress. Many of the equipments which arrived were not being utilized upto the writing of this document.

2. BARI's Technical Plans:

In early 1984, BARI and BARC through the IADS procured the services of a consultant to look into the problems, achievements and prospects of pulse crops in Bangladesh and make recommendations to cover gaps in the research input. The consultant looked into several earlier consultancy reports, met with research scientists, farmers, administrators and aid agencies and submitted a report indicating that gaps existed in germplasm collection, maintenance and evaluation; use of equipment, handling of the materials at the breeding level, input of the support services and seed handling, processing and storage. He also observed that most of the production of pulses in Bangladesh was contributed by rabi crops and these were mainly grown in Kushtia, Jessore, Faridpur and Pabna districts.

Therefore he suggested that the major thrust of the pulses programme should come out of a more representative research station like Ishurdi. The Director-General, BARI accepted the recommendation and has already issued orders shifting the pulses improvement programme to the RARS, Ishurdi (Appendix-1). He has already allocated office and laboratory rooms and approved space for aircooled seed store and covered threshing floor. Taking note of the gaps in previous research effort, his orders specify that pulses improvement programme will be coordinated from Ishurdi and all support discipline scientists will be responsible to the coordinator for their work and administration. They may however, seek specific technical guidance from their departmental heads. Since cowpea is important mainly in Chittagong region, the major work on this crop will be done at the RARS, Hathazari.

II PRIORITIES

A. CROPS

1. Lathyrus

i) Consolidate quality laboratory and continue search for new low toxin lines.

ii) Adaptation tests for these lines, including in relay-cropping and no-input conditions.

iii) Hybridization of low toxin lines with high yielding strains.

iv) Initiation of programme to screen varieties for resistance to seedling blight and downy mildew.

v) Seed multiplication.

vi) Consumer quality research on safer consumption methods.

The germplasm will be screened for their neurotoxin content. The breeding material will be developed and selection will be made for low neurotoxin lines in the segregating material. In the advanced trials we will measure strains for their total biomass and seed yield and identify those which produce relatively more fodder. These will be identified for the fodder section for their evaluati

2. Lentil

i) Collection, Evaluation and documentation of germplasm.

ii) Hybridization involving local varieties and those with large seed, disease resistance and earliness.

iii) Screening for resistance to wilt, rust, bushy stunt and botrytis.

iv) Studies on inter-cropping and mixed cropping potential.

v) Collection, isolation, testing, selection and production of high N-fixation strains of lentils.

vi) Nutritional quality evaluation of germplasm and elite lines.

vii) Seed multiplication.

viii) Farmers field trials.

ix) Adaptation trial under rainfed conditions.

Hybridization work involving local and introduced strains will be undertaken for increasing variability for yield, earliness and disease resistance.

Larger trials with promising lines will be conducted at several stations to determine the adaptation of most promising lines.

Efforts will be made to assemble more variability from exotic sources, especially for disease resistance, seed size and early maturity.

Collection of more Rhizobia strains and evaluation of their effectiveness will be undertaken and inoculum of those found most effective will be multiplied.

Efforts will be made to screen germplasm and segregating material for resistance to rust, wilt, botrytis and bushy stunt under artificially inoculated conditions.

Trials will be conducted to determine phosphatic, sulphur and zinc fertilizer needs of lentils. Agronomic trials will be conducted on promising strair Farmers field trials on larger plots on the line 79542 will be conducted by the On-farm division.

3. Chickpea

i) Hybridization for disease resistance, earliness and high yield.

ii) Large yield trials will be conducted in areas of adaptation.

iii) Screening for resistance to wilt, botrytis and stunt.

iv) Agronomic studies for good germination.

v) Cropping systems, late sowing potential.

vi) Isolation, selection and multiplication of N-fixing strains.

vii) Seed multiplication and prevention of post-harvest seed losses.

viii) Study of response to zinc, sulphur and phosphorus.

Hybridization of local adapted strains; Pabna local, Sabur-4 and Hyprosola with high yielding and / or disease resistant strains like, JG-74, P-326, S_1 , C-235 will be undertaken.

Large scale trials on farmers fields for S_1 with local cultivars as checks will be conducted.

Strengthening laboratory and field screening facilities for screening against fusarium wilt, botrytis gray mold and stunt.

Collection and identification of effective strains of chickpea Rhizobia will be done; and multiplication of efficient strains will be undertaken.

Experiments to determine phosphorus and zinc nutrition of chickpea will be done. Study to determine the late sowing potential of chickpea will be undertaken.

4. Blackgram

i) Hybridization involving bearing types, earliness, resistance to YMV and high yield.

ii) Agronomic studies to determine date of planting and mixed cropping potential.

iii) Development of control measures against pod borer, leaf beetle and shoot borer.

iv) Isolation, selection and multiplication of efficient N-fixing strains of Rhizobia

v. Evaluation for fodder potential.

vi) Seed multiplication and prevention of post-harvest seed losses.

vii) On-farm testing of promising strains.

Hybridization to incorporate resistance to diseases, earliness, high fruiting capacity and day-length insensitivity will be done.

Large scale trials will be conducted for comparing superior strains with local cultivars.

5. Mungbean

i) Collection, maintenance and evaluation of more germplasm.

ii) Hybridization for YMV resistance, earliness, synchrony of podding and high yield.

iii) Development of control measures against pod borer leaf beetle and shoot borer.

iv) Collection, selection and multiplication of efficient strains of rhizobia.

v) Agronomic studies on dates of planting, mixed cropping etc.

vi) Seed production and prevention of post-harvest seed losses.

vii) On farm testing of superior strains.

Hybridization of YMV resistant strains with high yielding cultivars and will attempt to select resistant, high yielding and day-length insensitive lines for cultivation.

We will supply the nucleus seed of local Faridpur-1 and improved types; to BADC and help them produce good quality seed.

Microbiology section has already identified some effective Rhizobia strains. These will be multiplied to produce base inoculum and effor will be made to produce mass inoculum for treating seed at farmers level. More strains will be selected.

More trials will be done with mungbean.

6. Cowpea

i) Germplasm collection and evaluation.

ii) Development of plant protection measures against important pests and diseases.

iii) Evaluation for fodder potential.

iv) Collection, selection and multiplication of Rhizobia strains.

v) Seed multiplication and prevention of post-harvest seed losses.

vi) Strengthen linkages with IITA and seek their help in cowpea improvement.

Work to be done at Hathazari supported from Ishurdi. Germplasm will be collected locally and requested from IITA and Indian sources in 1984-85. It will be evaluated at Hathazari in the following season. Adequate protection from important diseases and insects will be provided.

Total biomass production and grain yield of the promising strains will be estimated and those having higher fodder production will be identified for the fodder section for their use.

Local and exotic Rhizobia strains will be collected and efforts will be made to identify the more efficient ones which will be multiplied for inoculation.

Adaptation tests will be done in areas of cultivation. Seed of improved strains will be multiplied.

7. Field Pea

i) Collection, maintenance and evaluation of local and exotic germplasm.

ii) Large scale testing of promising strains for release as such.

iii) Hybridization of promising strains/varieties with those having disease resistance and other desirable characters.

iv) Seed multiplication(breeder's seeds).

No crop improvement work has been undertaken on the field peas in Bangladesh in the past. Therefore, major efforts are required to procure the germplasm for this pulse crop.

8. Pigeonpea

i) Germplasm collection and evaluation.

ii) Emphasis on rabi types.

iii) Studies on the scope of pigeonpeas in the Barind tract as an inter-crop.

Efforts will be made to retrieve the lost local germplasm from ICRISAT. If possible attempts will be made to collect more variability locally.

B. DISCIPLINES

1. Germplasm:
   i) Collection, maintenance, evaluation and cataloguing of germplasm of important pulse crops.
   ii) Preparation of a working calalogue of the available germplasm.

2. Agronomy:
   i) Study optimum sowing dates in relation to the cropping systems for particular zones.
   ii) Study of intercropping, mixed cropping and relay cropping potential of particular crops.
   iii) Study of the requirements for inter-cultural operations.
   iv) Study of requirements for phosphatic fertilizers and need for application of zinc and sulphur.
   v) Study of the water requirements especially of the rabi pulses for maximization of production.
   vi) Study planting methods to ensure better plant stands.
   vii) Investigate relative germinability of different strains.

3. Pathology:
   i) Survey and identification of important diseases of specific pulse crops.
   ii) Development and/or adoption of laboratory and field screening procedures for important diseases.
   iii) Screening the germplasm for resistance to important diseases and identification of resistant strains.
   iv) Screening of breeding materials for resistance.
   v) Development of economic chemical, biological or management control measures especially against seed borne diseases.
   vi) Study and control diseases in post-harvest seed storage.
   vii) Study epidemiology.
   viii) Basic studies

4. Entomology:
   i) Survey and identification of important pests of specific pulse crops.
   ii) Development of laboratory and field procedures for screening.
   iii) Identification of sources of resistance.
   iv) Screening breeding materials.
   v) Development of integrated pest management measures against insect damage to minimize and use sprays at the most appropriate time.
   vi) Study and control damage in post-harvest seed storage.

5. Microbiology:

i) Collection and identification of Rhizobia for specific pulses.

ii) Selection of the most effective strains.

iii) Multiplication of the effective strains and development of effective seed inoculation methodology.

6. Post-Harvest Seed Technology:

i) Develop procedures to dry seed to desired levels of moisture.

ii) Study the post-harvest losses and develop procedures to reduce these.

iii) Develop proper seed storage facilities with lower costs.

7. Breeding:

i) Identification of local or introduced strains for direct use as varieties.

ii) Initiation of hybridization programmes in most pulse crops to incorporate disease resistance, earliness and high yielding ability into the local land races. Development of low neurotoxin strains in khesari.

iii) Combine resistance to major diseases of a particular crop.

iv) Conduct multilocational trials.

v) Produce breeders seed of local and improved cultivars.

vi) Assist seed multiplication agencies to produce high quality pure seeds of the improved strains.

vii) Organise symposia and workshops for exchange and dissemination of improved technology.

8. Quality:

i) Screen khesari germplasm for low neurotoxin.

ii) Screen breeding materials for low neurotoxin and high protein and amino acid balance.

III NET WORK OF PULSES RESEARCH STATIONS:

Four major research centres have been identified to conduct research on pulse crops. These are Ishurdi (headquarters), Jessore, Joydebpur and Jamalpur. In addition cowpea research will be conducted at Hathazari. Other stations will be sub centres and will conduct adaptive trials (Figure-1). Basic facilities which were developed in phases I and II of IDRC under a World Bank consultant at Joydebpur will also be developed at the major stations and efforts are already under way at Ishurdi.

IV FACILITIES AND CONSTRAINTS:

The coordinated programme was initiated in 1979 and an attempt was made to procure and establish research facilities. However, the growth has been rather lopsided.

Facilities were built at Joydebpur and the regional stations received very little support. Compared to the required staff position shown in the next section, presently only one PSO (breeding), one SSO (breeding) and four SO's (breeding) are involved in the pulses research (Table-3). The support disciplines nominated scientists to work on pulses only as a part time activity and therefore, these crops received less than the required support. The following facilities exist at Joydebpur and regional stations:

A FACILITIES:

1. Joydebpur

i) SO's and office space for them-3
ii) Well equipped pulses quality laboratory-1
iii) Good space for pulses field laboratory.
iv) Deep freezers-3
v) Seed storage bottles & boxes
vi) Seed driers-4
vii) Threshers-3
viii) Vehicle-Pickup - 1
Motor cycles - 3
Cycle - 1
ix) Typist - 1
x) Peons - 4
xi) Walk-in cold chamber - 1
xii) Seed storage room - 1
xiii) Balances - 4
xiv) Type writer - 1
xv) Photo copy machine - 1
xvi) Fieldman - 1
xvii) Furniture
xviii) Experimental space
xix) Driver - 1
xx) Bag sealers - 6

2. Ishurdi

i) PSO (Pulse breeding) - 1
ii) SO (Pulse breeding) deputed and office facility-1
iii) Fieldman small field laboratory -1
iv) Fridge - 1
v) Steel Almirah - 1
vi) Book Steel Cabinet - 1
vii) Mettler Balance (2 kg.) - 1

ix) Poly Bag Sealer - 1
x) Measuring Tape - 1
xi) Power Tiller - 1

3. Jessore
i) One fieldman with office facility -1

4. Jamalpur
i) SSO - 1
ii) Fieldman - 1

B. Constraints

Ishurdi (Head quarters

i) Air Cooled seed store [1, 3]
ii) Threshing floor (partially covered) [1, 3]
iii) Deep freezers [1, 3]
iv) Seed drier [1, 3, 4]
v) Threshers [1, 3]
vi) Seed storage bins and plastic boxes [1, 3, 4]
vii) Typist
viii) Type writer
ix) Office and laboratory furniture [1]
x) Cyclostyling machine
xi) Vehicle
xii) Driver
xiii) Motor cycles [1, 3, 4]
xiv) Seed counter
xv) Projector, camera
xvi) Mettler balance [1]
xvii) Moisture meter
xviii) Sprayers -6 [1, 3, 4]
xix) Dusters [1, 3, 4]
xx) Polythene packets, envelopes [1, 3, 4]
xxi) Petridishes and other glass ware [1]

xxii) Tapes, Ropes [1, 3, 4]

xxiii) Almirahs, Book racks [1]

xxiv) Books and journals [1, 3, 4]

vv) Scientists and field staff [1, 3, 4.]

xvi) Field note books [1, 2, 3, 4]

Note : Superscripts indicate requirements at the other assigned stations as follows:

1. Jessore
2. Joydebpur
3. Jamalpur
4. Chittagong.

C BASIC REQUIREMENTS

The foremost requirement is for the trained staff. Seven scientists are currently on study leave. There is a serious paucity of the staff at the grass root level i.e. fieldmen and field assistants who will maintain the programme. The present staff, required number and gaps are listed in Table-3. While some of the staff are required immediately, others could be recruited in due course of time.

Construction of air conditioned seed stores for breeding material at Ishurdi and Jessore are necessary to prevent losses of valuable ~~breeding~~ materials as have occurred in the past.

Development of programmes in support disciplines; pathology, agronomy, entomology, microbiology and quality may be done in such a way that they have relevance to the breeding programme and they become part of a broader crop improvement effort on pulses.

Other facilities and constraints have been mentioned in an earlier chapter which may be considered when developing facilities at the main and sub stations.

V Detailed Yearwise Programme of Work.

1984-85

1. Collect more germplasm of khesari, lentil, pigeonpea, pea and cowpea. Request important germplasm of these & chickpea, mashkalai, mungbean from India, ICRISAT, AVRDC and ICARDA.

2. Evaluate important available germplasm of khesari, lentil, chickpea and cowpea and collect data on important characters for a catalogue.

3. Initiate limited hybridization work in khesari, lentil and chickpea to incorporate, earliness, disease resistance and large seed into the local types. In khesari hybridization will involve low neurotoxin lines.

4. Conduct adaptation tests for promising strains in each crop.

5. Conduct on-farm trials for S_1 a promising strain of chickpea.

6. Survey to monitor important diseases of pulse crops in major pulse growing areas.

7. Screening of chickpea germplasm and breeding material against wilt and root rot and botrytis gray mold. Development and adoption of screening methods in laboratory and/or field against important diseases of pulses.

8. Initiate studies on seed-borne nature of important diseases and develop measures to control them. Study of diseases of post-harvest stored pulses.

9. Studies on sowing dates to fit pulses in cropping systems.

10. Conduct experiments to determine potential of pulses in intercropping and relay cropping.

11. Determine zinc and sulphur needs of important pulses.

12. Studies to ensure better plant stands.

13. Survey important pests of pulse crops.

14. Conduct experiments to determine an efficient schedule for spraying.

15. Control of pests of stored pulses.

16. Collection and selection of efficient strains of Rhizobia.

17. Multiplication of effective Rhizobia strains of chickpea and mungbean.

18. Develop proper seed storage facilities at Ishurdi, Jessore and Joydebpur.

19. Study ways and means to reduce post-harvest seed-losses.

20. Produce small quantities of breeder's seed of the important local varieties and other improved cultivars. Assist BADC to produce pure seed of the improved cultivars of pulses.

21. Organise review meeting of 1983-84 pulses experiments and hold discussions to plan 1984-85 work. Write the report of work for 1983-84.

22. Write up a detailed plan of work for 1984-89.

23. Continue screening khesari germplasm for low neurotoxin.

1985-86

1. Collect more germplasm and continue evaluation for use and developing a catalogue.

2. More hybridization work involving sources of resistance identified by local pathologists. Attempts to make three-way and double-crosses to incorporate resistance to more than one disease.

3. Arrange more segregating material from ICRISAT, AVRDC and ICARDA for chickpea, mungbean and lentils, respectively.

4. Grow F1's of the crosses already made in 1984-85.

5. Screen more germplasm and segregating material against important diseases for which facilities will become available.

6. Conduct adaptation tests for more promising materials identified for each crop from germplasm or advanced segregating material received from International Institutes.

7. Arrange to supply (chickpea) S_1 seed to BADC for multiplication and more on-farm tests.

8. Arrange on-farm tests for promising lines identified in other pulses e.g., line 79542 in lentils.

9. Continue studies on seed borne diseases, develop and improve facilities for other diseases.

10. Continue work on identification of sources of resistance to insect pests and timing of sprays.

11. Continue surveys on important diseases of pulse crops.

12. Continue experiments on sowing dates, mixed, inter- relay cropping.

13. Continue experiments on zinc, sulphur & phosphorus.

14. Continue studies on ensuring better crop stands.

15. Continue efforts to reduce seed losses in stores due to insects and diseases.

16. Continue collection, selection and multiplication of efficient Rhizobia strains.

17. Provide breeders seed of important local and improved varieties of pulses to BADC and assist them in producing foundation and registered seed.

18. Organise review meeting for 1985-86 and planning for 1986-87 experiments.

19. Continue screening khesari germplasm for low neurotoxin.

1986-87

1. Evaluate more germplasm and develop a preliminary working catalogue.

2. More hybridization work-single, three-way and double-crosses. Initiate back crosses (if necessary) to improve land races for important simple characters.

3. Receive more segregating material from AVRDC, ICRISAT and ICARDA.

4. Grow F_1's and screen F_2's for specific diseases as planned.

5. Screen more germplasm against important diseases.

6. Conduct adaptation tests for promising material from advanced generation material found suitable from international institutes.

7. Arrange to supply of 79542 lentil seed to BADC for multiplication and more on-farm tests. Similar arrangements for lines in khesari, mungbean, mashkalai & pigeonpea.

8. Continue on-going studies in pathology, agronomy, microbiology and entomology.

9. Assist BADC in producing foundation, registered and certified seed of various local and improved varieties and supply breeders seed of these.

10. Initiate screening segregating populations of khesari for low neurotoxin.

11. Organize review and planning meeting.

1987-88

1. Prepare a working catalogue of available germplasm of all important pulse crops.

2. Continue hybridization to incorporate important characters and combined resistance. Continue back crossing.

3. Receive more material from International Institutes.

4. Grow F_1's and screen F_2's for specific and multiple disease resistance. Selection of individual plants and progenies.

5. Conduct adaptation tests for promising material.

6. Supply to BADC breeder's seed of new and old strains for producing foundation seed. Assist them in producing foundation registered and certified seed. Train BADC staff and SMS in seed production technology.

7. Write up results of ongoing studies of pathology, agronomy, microbiology and entomology. Modify old studies according to requirements.

8. Continue screening segregating populations of khesari for selection of low neurotoxin plants and lines.

9. Initiate basic studies in genetics and breeding.

10. Organise a review and planning meeting and a workshop on pulses improvement work in Bangladesh.

1988-89

1. Continue hybridization as required.

2. Receive more material from International Institutes.

3. Grow F_1, F_2, F_3 and F_4 generations. Screen for one or more diseases. Select plants and progenies for agronomic traits.

4. Conduct adaptation tests for promising material.

5. Supply breeders seed and assist BADC in producing certified seed.

6. Receive feed-back information from farmers on improved cultivars and technology and modify research objectives.

7. Write up reports of the studies concluded in various disciplines.

8. Continue experiments as required in various disciplines.

9. Continue search of low neurotoxin lines from segregating materials of khesari.

10. Organise planning and review meetings and follow up action in the next five year plan.

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Table-1 : Area and production of various pulse crops in Bangladesh 1971/72 and 1981/82.

CROP	Area (acres)			Production (tons)			Mean yield kg/ha
	1971-72	1981-82	%	1971-72	1981-82	%	
Khesari	234,790	224,690	29.0	76,680	62,900	31.2	703
Lentil	176,775	184,525	23.8	52,451	47,755	23.6	650
Gram	171,095	131,630	17.0	58,580	36,18.	17.9	690
Mashkalai	130,045	103,615	13.6	43,638	29,038	14.4	690
Urd	46,535	37,190	4.9	13,000	,188	3.6	477
Motor Field ea)	57,430	28,215	3.6	17,425	,225	3.6	643
ermar (geempea)	7,405	10,000	1.3	2,125	3,000	1.5	753
Other kabi pulses	31,018	32,095	4.1	11,50	8,81	4.4	
Hari pulses	15,315		2.0				
Total	883,335	776,000		279,775	202,000		

(Source : Agril. Year book of Bangladesh, 1982, BBS).

Mean pulses yields kg/ha.

69/70	70/71	71/72	72/73	73/74	74/75	80/81
870	870	820	770	810	790	700

2 Maund = 1 kg

Mean yields taken = 650 kg/ha (BBS)

BBS 82 Khesari

	Sowing	Harvest	Seed/acre	Fert	kg
Khesari	Oct-Dec	Feb-Mar	12-15 kg	Urea	3
				TSP	5
				MP	2
Khesari	Oct	March-April	10-12 kg	Urea	8
				TSP	4
				MP	20

1 Long Ton = 1.01605 metric tons

Table-2 : Achievements in pulses varietal improvement, 1979-1984

		Total Germplasm 1984
1. Mungbean	: 500 germplasm were evaluated and one variety ~~in the~~ 'MUBARIK' has been released.	542
2. Blackgram	: 300 germplasm evaluated and one variety ~~in the name of~~ 'BARCMASHI' has been released.	354
3. Khesari	: 1[illegible] lines have been tested and eight low toxin lines have been identified.	267
4. Chickpea	: 1311 germplasm and advanced lines ~~have been~~ were tested and one promising line S_1, ~~has been~~ was identified.	665
5. Lentil	: 1314 germplasm/lines were tested and one line, 79542 ~~look~~ appears promising for Ishurdi area.	801
6. Pigeonpea	: 200 pigeonpea lines ~~have been~~ were introduced from ICRISAT and four short durated dwarf lines were identified. These are:- ICPL-2, ICPL-4, 78012 and 78013.	12
7 Cowpea		(Hortapet) 50
8 Field pea		

Table-3 Staffing Pattern for Pulses Research Center, BARI
1984-85 to 1988-89.

Position	Ishurdi.	Jessore.	Jamalpur.	Joydebpur.	Hathazari.	Faridpur.	Rajshahi.	Total	Existing[1]	Gap.
Project Director (CSO)	1	-	-	-	-	-	-	1	-	1
Sub total (PD)	1	-	-	-	-	-	-	1	-	1
SO: (Br.)	2	1	1	-	-	-	-	4	2	2
(Path.)	1	-	-	-	-	-	-	1	-	1
(Agron.)	1	-	-	-	-	-	-	1	-	1
(Ento.)	1	-	-	-	-	-	-	1	-	1
Sub total (PSO)	5	1	1	-	-	-	-	7	2	5
SSO: (Br.)	3	1	-	1	1	1	-	7	7	-
(Path.)	-	1	1	-	-	-	-	2	-	2
(Agron.)	-	1	-	-	-	-	-	1	-	1
(Ento.)	-	1	-	-	-	-	-	1	-	1
(Micro.)	1	-	-	-	-	-	-	1	-	1
(Bio.)	-	-	-	1	-	-	-	1	-	1
Sub total (SSO)	4	4	1	2	1	1	-	13	7	6
SO : (Br.)	3	2	1	1	1	1	1	10	10	-
(Path.)	1	-	-	1	-	-	-	2	-	2
(Agron.)	1	-	1	-	1	-	-	3	-	3
(Ento.)	1	-	1	-	-	-	-	2	-	2
(Micro.)	-	-	-	1	-	-	-	1	-	-
(Bio.)	-	-	-	-	-	-	-	-	-	-
Sub Total (SO)	6	2	3	3	2	1	1	18	10	8
Ce. Asstt.(All Sec.)	4	2	2	-	1	-	-	9	5	4
Field Man(All Sec.)	3	2	2	2	1	1	1	12	5	7
Lab. Tech.(All Sec.)	2	1	-	1	-	-	-	4	-	4
Sub Total(SOS)	9	5	4	3	2	1	1	25	10	15
Accountant	1	-	-	-	-	-	-	1	-	1
Clerk/Typist	2	-	-	1	-	-	-	3	-	3
Driver	2	1	1	1	-	-	-	5	-	5
Misc.	2	1	-	1	-	-	-	4	6	+2
Grand Total	32	14	10	11	5	3	2	77	35	42

1. These number have been indicated in the recent reorganisational set up, which is being done at BARI and are not necessarily in position. Infact one PSO, one SSO and three SO's are on pulses work and seven scientists are doing Ph.D. and two M.Sc.

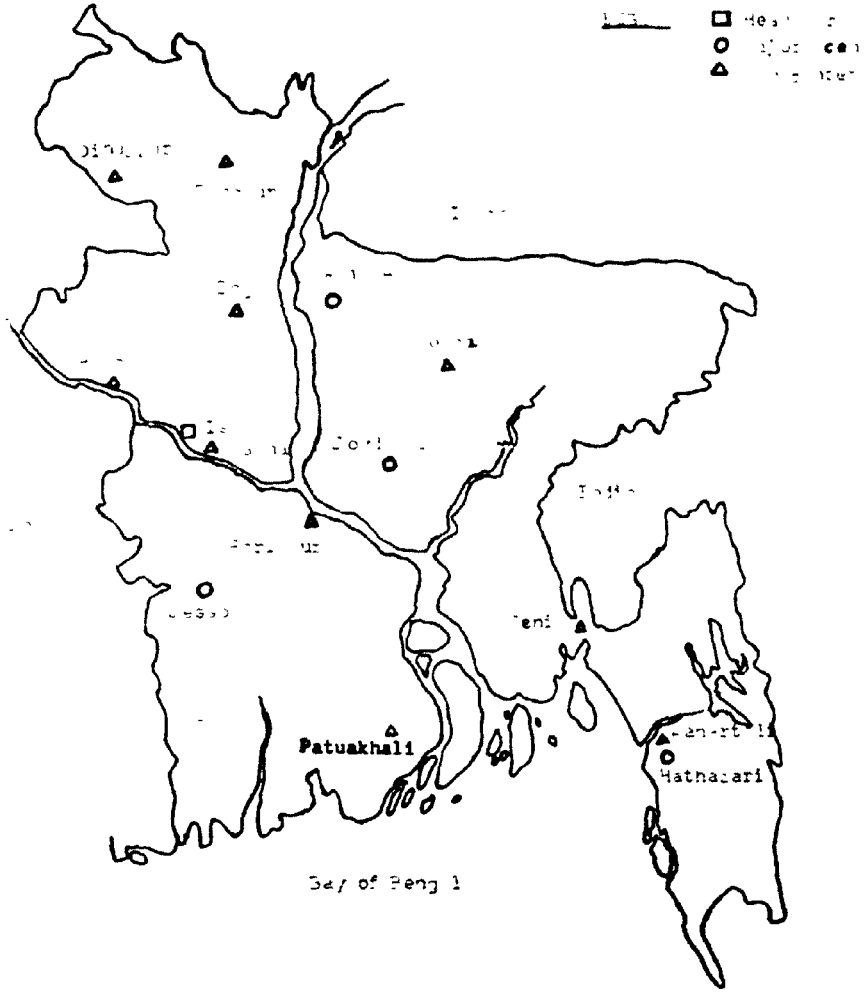

Figure 1. Map showing location of pulses research stations in Bangladesh

No.PA/T/BaRI/107
Dated : 11 August,1984.

OFFICE ORDER

Keeping in view the national requirements of research for pulses improvement and in conformity with the avowed policy of taking the applied research activities to the centre of concentrated cultivation of a particular commodity, the following orders are issued for immediate execution :

(1) The Regional Agricultural Research Station, Ishurdi will serve as the primary centre for applied research on pulses. Accordingly the responsibility of all on-going applied research programmes be shifted to the RARS, Ishurdi. This, however, will exclude works on collection and preservation of genetic resources, quality testing and other researches of fundamental nature, embracing all disciplines, relevent to the need of the applied research programme. These activities will be performed at the Headquarters, Joydebpur.

(2) Dr. Mahbubur Rahman, PSO(Pulses) will be the Technical Programme Leader for pulses improvement research. He will be accountable to the Head, Plant Breeding Division and the Director (Research) at the headquarters for the technical programme. Research programme development and planning shall be done at the regional level with the assistance of the 'Think-Tank' at the headquarters. The programme will be reviewed from time to time by interdisciplinary task forces, and approved by the Director General on the recommendation of the Central Programme Review Committee. The Technical Programme Leader shall work through the CSO, RARS, who is his local administrative boss.

(3) The broad administrative and financial policy guidelines will be given by the Headquarters. The Head, Plant Breeding Division will submit the break-up of funds for the programme and according to this break-up funds will be released by the headquarters to the CSO, RARS, who shall make them [illegible] Technical Programme Leader in [illegible] on

Leader, Head of Plant Breeding Division and Director (Research) for their information. Under no circumstances, the CSC, BARC, shall divert the funds of this programme to other programmes.

(4) While the pulses out-reach programme will receive emphasis at Jessore, Jamalpur and Faridpur, various sub-stations will continue conducting routine experiments and varietal testing as required. The requirement of various stations in this regard will be reviewed and necessary steps taken.

(5) While the FeC (Pulses) at Ishurdi will act as the Technical Programme Leader, the Head, Plant Breeding Division will exercise full monitoring and evaluating authority in implementing the technical programme and managing financial and administrative matters as delegated by the Director General, BARI. All research programmes of pulses to be undertaken by the various divisions will have to be in conformity with the plan of work recommended by the Central Review Committee and approved by the Director General, BARI.

(6) Under the new arrangement, necessary adjustments in manpower placement will be made. A memorandum on manpower distribution will be issued soon. Interdisciplinary task forces will be constituted at various locations depending on programme needs.

(7) All technical assistance and advisory services provided by various funding agencies, channelled through BARC, will have to conform to the procedures outlined in this and subsequent memoranda regarding strengthening pulses programme.

(8) The Head, Plant Breeding Division will take necessary follow-up measures to implement the order.

Director General
Bangladesh Agricultural
Research Institute.

Distributions

1. [illegible], FAO/UNDP Consultant, Pulses.

CONSULTANTS' REPORT

PRESENT STATUS AND RECOMMENDATIONS FOR FUTURE WORK FOR RESEARCH IN CHICKPEA, LENTIL AND PIGEONPEA IN BANGLADESH

Bangladesh Agricultural Research Council
and
International Agricultural Development Service,

15 January - 5 February 1984

Dhaka

CONSULTANT

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CONSULTANCY TO IADS/BARC PULSES PROGRAM

JANUARY 15 - FEBRUARY 5, 1984

I was invited by the Bangladesh Agricultural Research Council(BARC) through the International Agricultural Development Service (IADS) to evaluate and report on the status of Pulse crops improvement work in Bangladesh with the following terms of reference:

"He will examine the Pulses Improvement Programme at BARI and visit the following stations:

Joydebpur, Ishurdi, Jessore, Chittagong and Jamalpur.

He will recommend on action programme in consultation with the Crops Specialist on Chickpea, Lentils and Pigeonpea crops.

Consultant will evaluate the progress made in the BARC supported coordinated pulses programme and recommend future course of action.

He will submit a consolidated report on the status of research preparedness and future course of action on all major pulse crops."

CONTENTS

1. SUMMARY[1]

1. There are five important pulse crops in Bangladesh; khesari, lentil, chickpea, mash kalai and mungbean. Some work is being done on pigeonpea. Recently promising cultivars have been identified or released in each crop. More work on high yielding and disease resistant cultivars is needed.

2. Only a few staff are involved in pulses research. They are talented. Some other staff are under training. Most staff could benefit from practical training on specific pulses at international institutes. Efforts may be made to rebuild the programme before trained staff returns.

3. Very limited germplasm is available for the pulse crops. Major losses of germplasm and breeding materials of chickpea and lentil occurred recently. These should be avoided. More germplasm may be collected from local and exotic sources for direct agronomic evaluation and possible release for immediate gains.

4. Frequent transfers of staff have resulted in discontinuity of work and loss of valuable breeding materials. National agricultural set up and international aid agencies may ensure continued and long sustained efforts for crop improvement work.

5. In general there is a paucity of literature. Books, Journals, symposia and workshop proceedings, consultancy reports, disease hand books, bulletins, newsletters, annual reports from international research institutes may be procured for central and sectional libraries.

6. Funds for travel by scientists to various stations and farmers fields are limited. More funds for such travel and to attend symposia, workshops etc may be ensured.

7. Some farmers in Kushtia, Faridpur and Jessore grow very good crops. Presently a socioeconomic survey is being done. This survey may help in knowing problems and may give clues for proper management.

8. There appears to be a general delay in planting of rabi pulse crops. In general pulses do not respond to fertilizers. Zinc deficiency is fairly common in Bangladesh. Experiments to determine planting dates in relation to paddy cropping systems may be done.

[1] Please see appendix-1 for abbreviation details.

9. Stubbles from previous crops should be removed to prevent damage by collar rot (Sclerotium rolfsii). In addition important diseases of pulses crops may be identified based on previous reports. Information is that, stunt, fusarium wilt and botrytis gray mold in chickpea, bushy stunt, root rots and rust in lentil, seedling blight in khesari, yellow mosaic virus in mashkalai and mungbean and sterility mosaic in pigeonpea are important in Bangladesh. Work on these may be started.

10. Heliothis can cause damage. Integrated pest control may be worked out for timing sprays at most beneficial stages.

11. Greater emphasis is needed to develop high yielding, disease resistant and stable genotypes which have similar maturity pattern as the local land races. Hybridization between high yielding exotic strains and local cultivars may be undertaken as soon as possible. A multidisciplinary team approach may be adopted.

12. Remnant seed of all important breeding materials should be retained in cold store until the following season's harvest is in, as an insurance against crop failure or loss of seed in the laboratory.

13. Presently seed viability of chickpea and lentil is poor, may be because of excess seed moisture and bruchid damage. Post-harvest seed handling and seed storage requires urgent attention. Air conditioned and insulated seed stores may be provided at important pulses research stations.

14. Seed purity of pulses leaves much to be desired. Mixtures were seen in all rabi pulses. No efforts were being made to produce selfed pure seed of pigeonpeas, an often cross-pollinated crop. Breeders and research insititutions may be entrusted to maintain pure seed.

15. Only a limited good quality seed is available to farmers. BADC, breeders and administrators may discuss and implement ways and means of providing good quality seed of all improved cultivars.

16. A well equipped pulses quality analysis laboratory has been established by the IDRC at the BARI. Samples for protein and amino acids are analyzed. Khesari is screened for neurotoxin. A low neurotoxin strain 3968 was identified. More work may be undertaken to identify more low neurotoxin strains.

17. Equipment already available should be documented and put to proper use. As the work is strengthened more equipment like seed planters, threshers, driers, storage materials, and field supplies should be procured.

18. Basic studies to investigate greater adaptability of khesari and lentils than chickpeas may be done. After collecting background information, an appropriate research project for chickpea/lentil may be developed to produce genotypes which could replace khesari in the long run.

19. Contacts with international institutes may be strengthened further. Efforts may be made to simplify the procedure to receive seed materials in a short-time. Presently it takes two months or more and the delay often results in lower seed viability.

20. Finally, a number of consultancy reports on improvement of pulse crops in Bangladesh are available. The BARC and the aid agencies may identify areas of interest and support a long-term pulses improvement project.

II. INTRODUCTION

Rice is the major food of Bangladesh. Pulses complement the diet of her population by providing good and relatively low cost protein. The per day per capita availability of pulses in Bangladesh is 8 g as against the estimated minimum of 28g and optimum of 65 g (Khan, 1983). The 1980-81 production of 208000 tons (Agricultural year book of Bangladesh, 1982) needs to be doubled by 1984-85 to provide minimum requirement of 454, 000 tons (Green & Hawtin, 1979). Obviously this task is very difficult. However, substantial increases in the production can be made by developing good cultivars and proper management practices in the existing cropping systems.

Khesari, lentil, chickpea, mashkalai and mungbean are the most important pulse crops. BARC initiated a coordinated project on pulse crops in 1978, which has the overall responsibility for conducting research on these crops. A consultant pulses breeder was appointed with the help of the World Bank. IDRC funded the pulses project and provided physical facilities for research work. Two experts on pulses improvement helped to plan the program (Green & Hawtin, 1979) and made recommendations on priorities of research for the next five years. I quote the most important conclusion from their report:

"Our conclusion is that it is imperative to study the cultural practices used by the farmer to learn if, within his capabilities, modification can be made which will result in higher yields. Relatively small changes in techniques (eg. the use of Rhizobial inoculation placed phosphate fertilizer, disease and pest control, line sowing, correcting mineral deficiencies) may result in substantial yield increases". This appears to be as relevant today as it was five years ago.

The pulses programme has made good progress since then. Varieties of summer mung (Mubarik), mashkalai (T-9) and of chickpeas (Hyprosola) were released and in khesari, lentils and pigeonpeas have been identified. The estimated benefit from the two summer pulses may be already worth Tk. 33 million (Gill, 1983). However, there is much scope for improvement in the major rabi pulse crops. Development of superior cultivars and management practices require greater emphasis.

A short consultancy like this one cannot be expected to investigate the agricultural system for particular crops in totality. But one word of caution is in order. It is customary to recommend high fertility doses on rice crops but this especially nitrogen can be harmful to pulses. So scientists must communicate with the needs of both crops in mind. Mutual crop relations are the key. An attempt has been made to look at the problems of pulses production from a technical view. Examples taken are to illustrate the system rather than to pinpoint deficiencies in individuals and/or groups.

Finally my own experience with only chickpea may have a limited application to the other pulse crops. Therefore, I have tried to discuss the particular problems with as many concerned people as possible to make generalisations relevant.

III. PRESENT STATUS OF PULSES RESEARCH

Five pulse crops are important in Bangladesh. These are, khesari, lentil, chickpea, mashkalai and mungbean. Some work is being done on pigeonpea also. The research work is carried out at the BARI, Joydebpur, which has its regional research stations at Jamalpur, Ishurdi, Jessore and Chittagong. Work on mutation breeding is done at the INA, Mymensingh. Agronomic investigations are also carried out at the BAU, Mymensingh. I visited the pulses research stations and farmers in the major pulses areas and met over 50 scientists to discuss the pulses improvement programme (Appendix I).

During my travel through various regional stations and farmers fields, I did not find any serious problems except poor stands with the rabi pulses - khesari, lentil and chickpea. Some farmers in Pabna, Bogra, Jessore, Kushtia and Faridpur, grew very good crops. The poor stands were perhaps due to low seed rate, damaged seed (bruchid infestation), low seed viability (storage problem) or damage by Sclerotium rolfsii (collar rot). Through reports I learn that at later stages, the crops of lentil and chickpea may be affected by botrytis gray mold and the former also with rust. At this stage I found little damage by Heliothis pod borer.

Two consultancy reports (Green and Hawtin, 1979; Gowda, 1982) on pulses work and several trip reports on chickpea improvement in Bangladesh by various ICRISAT Scientists (Nene, 1980; Kumar, 1980; Gowda, 1981; Nene, Smithson and Reed, 1981; Smithson, 1982; and Singh 1983) are available which refer to the development of breeding materials during various stages of the programme. A book on "Pulse Crops in Bangladesh" was published recently by Gowda and Kaul (1983). These formed important sources of information for this consultancy.

A. STAFF, TRAINING AND LITERATURE

1. Staff: Presently the greatest problem is a lack of experienced staff. Only one member remains from the staff I visited in 1980. He is leaving shortly for his Ph. D. studies. Others have either been transferred or are doing their studies. Dr. Kaul, who coordinated the activities upto 1982 has only very limited time for pulses work. There is one SSO (now being transferred to genetic resources) and four SO's at Joydebpur, one SSO at Ishurdi and one SSO at Jamalpur to look after the breeding work.

2. Training: Pulse crops require different techniques for hybridization, maintenance and evaluation. Their agronomy is much different than for rice. A person trained at ICRISAT for identification of diseases of chickpea and pigeonpea now works with potato. It is necessary that staff working with these get short term training at national and international institutes to learn various techniques.

3. Literature: During my visit to various places I found limited literature especially on pulse crops. There are not enough books, journal reports and bulletins. Vast amount of literature for example on chickpea and pigeonpea (ICRISAT) and lentil (ICARDA) which is supplied free of cost is not available even with the PSO's There are annual progress reports of various desciplines, newsletters, proceedings of workshops and symposia, manuals, booklets on diseases and pests which have been supplied to the various scientists from time to time but are not available. Thus the scientists have no ready sources for consultation. Even the reports of specific consultants on pulses are not available.

B. GENETIC RESOURCES

A limited number of accessions both local and exotic are available mainly at BARI (Appendix II). The collections for khesari, mashkalai and mungbean are rather small and are unlikely to have enough variability. In lentil and chickpea, variability can be requested from ICARDA and ICRISAT. Present stocks of 5-10 g per accession are insufficient. About 40 per cent of the chickpea germplasm was lost this year alone because of seed handling and storage problems. Poor germination was common on almost all stations and resulted in the loss of valuable materials. However, plant stands of local cultivars were normal.

C. AGRONOMY, PHYSIOLOGY AND MICROBIOLOGY

One of the practices by farmers is that they grow pulses in relatively poorer soils partly to avoid excessive vegetative growth. However, in most research station trials in Bangladesh some fertilizer had been added even in good and fertile soils so that there was overgrowth. At some stations there were trials for studying N, P, K, Zn and Mn uptake. In general zinc is deficient in Bangladesh soils and this could be applied. Other fertilizers especially N should be added with caution, lest the crop might overgrow. Late rains in the season had delayed planting of pulse crops in general this year. However, it was noted that some chickpea and pigeonpea were planted as late as early January at the research stations. It appears these will produce little yield. Experiments on planting dates of these crops may be done to determine optimum time. Relatively early plantings may be advisable to escape rains during harvest. However, planting must fit the rice cropping pattern.

Irrigation procedure at research stations may be improved. Presently flooding of uneven fields leads to water stagnation and seed rotting. If the land is properly levelled and bunds are made to hold water in smaller strips, more even distribution of water can be assured. Excess water can cause harm because chickpea and pigeonpea cannot tolerate water logging.

Farmers do not irrigate their fields. However, sprinkler irrigation was given 2-3 times at the BADC farm at Amjubi. They had good crops of Hyprosola and a kabuli type chickpea L-144. The soil was sandy loam and chickpeas showed moisture stress. They were planning more irrigation which was advisable. The crop was well grown. There was a small patch with root rot, and also nematode damage.

CIDA is funding a large project on pulses and oil seeds in BD and in pursuance of that a team had gone to survey the Socio-economic constraints for pulse crops production in Bangladesh. I had discussions with Drs. Sharofat Hussain Khan and Ahmad, survey team members. They observed that irrigation by shallow tubewells is pushing the pulses out of Rajashahi and Bogra areas, although it is uneconomic to produce other crops. These types of surveys may lead to important clues for planning research programmes for developing risk efficient genotypes.

We also saw pulses being grown in mixed cropping. This practice is useful in areas with uncertain moisture conditions and results in better land utilization.

There was good nodulation in some plants which were uprooted. However, it appears that there is limited data to assess the status of Rhizobia in Bangladesh soils.

D. CROP PROTECTION

I did not observe any serious disease or pest problem in any one of the three rabi pulses. Earlier in the season Sclerotium rolfsii caused damage to trials at most situations. I observed chickpea stunt and occassional, fusarium wilt in chickpea and a virus problem in lentil. Reports indicate that botrytis gray mold becomes a problem later in the season. Efforts may be made to train people in identification of these diseases and adopt screening facilities available with ICRISAT. Already a chickpea wilt sick plot is developed at BARI, where ICRRMN was being screened. The material was planted on 12 November and JG-62 had already started wilting. There was no appreciable wilting in other lines as yet.

I did not think that ascochyta blight is a problem in Bangladesh but Dr. Shaikh at Mymensingh told me that disease appears there. Dr. Nene also did not report this disease during his travels in 1980 and 1982.

E. CROP IMPROVEMENT

The Bangladesh environment is unique because winter rains and drought are periodic risks to rabi pulses production. Excess moisture may cause over growth and favour disease development. Focus should be placed on utilizing local germplasm adapted to multiple stresses and disease resistance. Therefore, it is necessary that the local programme develops breeding and disease screening capabilities.

Breeding Material: At present the breeding effort is limited to only selection. There is limited germplasm for each crop. Germplasm and breeding material for chickpea is received from ICRISAT and for lentil from ICARDA. Most of these are unsuitable to the Bangladesh conditions. Breeding materials from ICARDA may have different photoperiodic response in Bangladesh as these are grown in summer there.

Most of the materials in advanced yield trials at different locations on khesari (5), lentils (5) and chickpea (9) were later in maturity than the local checks. Therefore, efforts will have to be made to breed materials which are suitable and are stable across locations.

Generally conduct of trials at all the research stations was good. However, there were problems with germination at Joydebpur, Ishurdi, Jamalpur and Jessore. They informed me that the seed viability was poor. Several trials from Joydebpur, all trials from ICARDA and some from ICRISAT did not germinate. Reason for poor germination of ICARDA seed was not known. ICSN-DS and ICRRWN supplied from ICRISAT this year emerged alright.

Presently the seed is kept in paper or polythene bags in ambient conditions in the laboratories. In addition to bruchid infestation this may also result in higher seed moisture per centage than is desirable. In fact seeds of all pulses except khesari were either infested or had bruchid eggs.

I could see polythylene bottles of different sizes in the laboratory for seed storage but were not used. I was told that IDRC had funded the pulses project earlier and they had supplied various materials for use. It now appears that the staff does not have experience of using these facilities.

In a breeding programme the breeding material may be lost because of several reasons. As an insurance against this remnant seed is kept in cold storage, which may be discarded after the harvest from next season is available. This practice may be encouraged to avoid future losses of superior breeding lines.

I have listed the physical facilities available at different stations, mostly at Joydebpur (Appendix III). Most of these facilities were created by Dr. A.K. Kaul, a World Bank Pulses Breeder, at BARI during 1979-1982. The funds for these were provided by the IDRC. However, most of these are not being used at present.

Research facilities for pulses at Ishurdi, where improvement work may be shifted are non existant. They will need insulated seed storage room, deep freezers, seed driers, balances, seed storage bottles, planters (?) covered crop work area and threshing floors. Present facilities are almost all utilized by wheat, which matures at the same time as rabi pulses.

F. SEED PRODUCTION

It appears that most of the farmers depend for the seed supply of pulses on local market sources. Commercial storage facilities may not be ideal for proper seed viability and may encourage bruchid infestation. Poor seed could be the cause of thin plant stands on some farmer fields. The BARC and BADC may discuss ways and means for providing good quality seed to the farmers at proper time. The responsibility for breeders' seed of all cultivars may be entrusted to respective breeders and the Institutes. Further multiplication should have some check by these breeders to maintain purity of the certified seed.

Seed Exchange: The pigeonpea materials for rabi were supposed to be planted before October 15 but mostly on research stations these were planted in the middle of December and were looking aweful. However, October planted pigeonpeas at Joydebpur, especially ICPL-4 and -268 may produce respectable yields. Major source of chickpea material is ICRISAT. This year we supplied several trials and promising lines. The material was sent from our Delhi office on October 12, 1983 but I was told that this was received at Ishurdi on December 18 only and planted on December 24. The germination was alright but the material is unlikely to perform well. The trials should be repeated next year. The International Chickpea Adaptation Trials at Ishurdi and Jamalpur and ICARDA F_1 and large seeded trials at Jamalpur did not germinate at all. I do not know what caused this. Urgent attention is required to expedite the seed material release so that it is received in time and in good shape. Unfortunately it is not possible for ICRISAT to dispatch the material before beginning of October because our international nurseries are finalized in mid September.

G. CONSUMER QUALITY

The quality laboratory is well equipped. They have grain protein analyzer, amino acid analyzer, incubator, microbalance and other required equipments. They are doing useful work on screening khesari strains for low neurotoxin percentage. They have already identified a few such strains. Dr. M. Hussain from BAU is currently spending a six month sabbatic to work on low neurotoxin lines in khesari.

They also determine protein per centage in some of their improved materials. A high protein strain Hyprosola was released by INA, Mymensingh. However the strain has smaller seed size, which may account for its high protein percentage.

IV RECOMMENDATIONS

The research work should be restricted to the major pulse crops; khesari, lentil, chickpea, mashkalai and mungbean, unless there appears a possibility of pay-off from one of the minor pulses. A multidisciplinary team of scientists should work together to develop improved cultivars and practices for Bangladesh conditions. Survey should be done to know major constraints to pulses production.

A. STAFF, TRAINING AND LITERATURE

There is an urgent need of more scientific and support staff in breeding, pathology agronomy, entomology and germplasm. Each important station should have staff members in these disciplines and efforts may be made to encourage scientists to continue in their field of research.

Staff may be sent for short-term training to the international institutes. This is particularly necessary for scientific officers in breeding, pathology, agronomy, entomology and germplasm. It may be ensured that a person after receiving training continues to work in the same specialisation.

The literature on the major pulses may be procured and made available in central and sectional libraries. Many workshop and symposia proceedings, bibliographies, newsletters, annual reports and disease handouts are supplied by the international institutes like ICRISAT, free of cost. These could form an important source of information. Also consultancy reports are important compilation of information. All this literature should be documented for easy access by the scientific staff.

B. GENETIC RESOURCES

The present efforts on maintenance and evaluation of germplasm may be strengthened. A new building being constructed at Joydebpur is expected to provide seed storage and handling facilities. Efforts may be made to acquire more variability from outside sources and evaluation done for agronomic adaptation and direct release in Bangladesh.

Germplasm evaluation may be done in regions of actual use. Once reasonable number of entries are available, a working catalogue can be prepared for the benefit of scientists. Separate staff is needed for this. When the evaluation work is over, the staff could do basic studies on plant characters of economic importance.

C. AGRONOMY, PHYSIOLOGY AND MICROBIOLOGY

Efforts may be made to learn more from farmers of Jessore, Kushtia and Faridpur, who grow good pulse crops. As far as possible experimental station practices should immitate farmers methods. A better judgement is required for the use of irrigation and fertilizers especially nitrogen. Zinc status of soils may be studied.

It is necessary to fit pulses with the rice cropping pattern. Therefore, experiments on planting dates and spacing are necessary. The plant stands were generally poor. Whether line sowing and uniform depth of planting could be recommended may be investigated! Finally large demonstration trials of improved cultivars and practices should be done in farmers fields.

Lentil and khesari are relatively more tolerant to excess moisture than chickpeas. This may be because they have smaller seeds. Lentil also has a waxy seed coat and khesari has dormancy. These could result in better germination in the two crops. It also appears that these crops have lesser pseudoflowers than chickpea. Basic studies on these physiological processes may be useful to search for such characteristics in the latter.

Presently there appear to be no basic studies of applied research. It is necessary to identify germplasm which remain compact and are capable of podding under humid conditions. Problem of flower drop in pulses may also be studied and selection may be done for genotypes with relatively low flower drop.

Work on nitrogen fixation by Rhizobia may be initiated and if innoculation can help increased nitrogen fixation then efforts should be made to produce and supply inoculum to the farmers.

D. CROP PROTECTION

Some of the diseases like collar rot (Sclerotium rolfsii) could be reduced by proper management practices. If previous crop stubbles are removed the damage can be less. This can help in better plant stands in the field.

Fusarium wilt of chickpeas is seed borne. However, if the seed is treated with Benlate-T the pathogen is eradicated. Seed treatment can be used to prevent seed dissemination of the pathogens. Seed treatment may help to prevent damage by other pathogens in the initial stages.

Field and laboratory facilities to screen pulses against important diseases should be developed. A fusarium wilt sickplot is already available. It may be necessary to screen materials against botrytis gray mold, stunt, rust etc.

Once the screening facilities are available breeding material may be screened to develop combined resistance against say wilt, stunt and botrytis gray mold in chickpea.

Presently one can suggest only integrated pest management for Heliothis can be a problem sometimes. If proper schedule for spraying is developed, damage may be minimised.

E. CROP IMPROVEMENT

In chickpea cultivars which can germinate well in excess or limited moisture and which are resistant to root rots, chickpea stunt and botrytis gray mold are needed. Local land races germinate well under adverse situations and are flexible in their maturity. Crosses involving these with strains resistant to diseases and having higher yield potential may be made and selections should be done locally. The segregating populations should be exposed to important diseases. This may result in selections having higher yield and stability of performance. Similar approach may be adopted for other pulses.

National set up and international agencies may find it worthwhile to draw up a longterm pulses improvement project, ensure enough funding and provide a continued and dynamic leadership for research on these crops.

I have made a list of chickpea materials and other promising entries identified as elite since 1979. Some of these were lost, e.g. line 81001 in lentil, and chickpea lines listed in Table 1 of Gowda (1982). Efforts should be made to acquire as much seed of these from ICRISAT and other sources. These materials may be planted in observation rows or trials at important stations for pulses and selections will be made for larger trials in the following season. Similar excercise should be done in other pulse crops especially lentil and khesari to identify the promising materials from previous years. Presently chickpea segregating populations for botrytis gray mold are available from ICRISAT. These should be utilized before crosses with local material become available.

Improved cultivars were released or identified in all important pulse crops. This is a good development. Mubarik in mungbean, T-9 in mashkalai and Hyprosola in chickpea were released. A low toxin strain 3968 in khesari, S-1 (ICCL-81248) and several mutants in chickpea, 79592 in lentil and four strains in pigeonpea (76012, 76013, ICPL-2 and ICPL-4) are performing well and may be released in the near future. Efforts should be made to grow these in demonstration plots.

More work on low neurotoxin lines is needed in khesari as it appears to be the most stable pulse crop. I saw some bees visiting the khesari flowers and wonder if they cause any cross-pollination. Mr. Dozza has observed two plants in two different lines of khesari which had male sterility. I suggested that these may be maintained by pollinating with sister plants. Male sterility may be useful in increasing variability in this crop.

F. SEED PRODUCTION

Seed production, handling and storage require greatest attention, as benefit of the improved cultivars and cultural practices cannot be reaped if the seed supplied to the farmers does not germinate or is of doubtful purity.

BARC, BADC and international aid agencies may get together and implement an efficient seed production system for all improved pulse cultivars. This should involve responsibility of the breeder to provide breeder's seed. The foundation seed should be produced under the breeder's supervision and certified seed by appropriate agencies. At all stages proper seed drying, handling and storage should be ensured.

At ICRISAT the season at harvest is dry and seed is properly dried and then put in bags. Moisture per centage is well below 14%. Thousands of samples which are harvested and threshed are kept in crop work area/laboratory until all harvesting is finished. Then the seed is cleaned, weighed and stored in cool and dry store in plastic jars or bottles (temp. about 20°C). More important material is put in cold store (temp. about 4°C). We put napthalene balls in most of the material and all material is occassionally fumigated. Care is taken that old and new material is not mixed and bruchid infestation is not there. All bulk material is stored in tightly sealed drums. A similar procedure could be adopted at BARI.

G. CONSUMER QUALITY

The quality laboratory is well equipped. They may take up work on consumer quality of prerelease materials in all pulse crops. Work on screening for low neurotoxin strains in khesari should be continued both in germplasm and breeding lines.

V CONCLUSIONS

The Pulses Improvement Program of BARC funded mostly by IDRC, World Bank and USAID and previously headed by Dr. A.K. Kaul has resulted in the release and/or identification of cultivars in all important pulse crops in Bangladesh. However, transfer of all staff including Dr. Kaul has resulted in substantial loss of valuable germplasm and breeding material.

It may be necessary to sum up by saying that research infrastructure had been built for pulses research. It is unfortunate that frequent changes in staff particularly at the leadership level have affected the programme adversally. Bangladesh cannot afford to neglect pulses production and therefore, local research input is necessary. A person having experience with pulses improvement may be able to give the requisite leadership in terms of technicalities and help in building the programme. Furthermore, it is suggested that the main thrust of the pulses programme should come out of a more appropriate place like Ishurdi where more facilities should be developed or shifted. A sub-station may be retained at Joydebpur.

The programme is in urgent need of trained staff, coordination, physical facilities and literature. Hybridization involving local land races and disease resistant high yielding strains has not yet been initiated. Facilities for screening the breeding material locally for disease resistance are needed. Post-harvest seed handling and storage should be given first priority as there is frequent loss of breeding material. Collection of more variability should be done. Work on agronomy of these crops should be taken up immediately. Finally a coordinated continued long sustained support both financial and technical is needed from national and international agencies.

JK/gs
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VI. ACKNOWLEDGEMENTS

I take this opportunity to thank Drs. K.M. Badruddoza and K.U. Ahmad of BARC and Drs. D.S. Athwal and D.M. Daugherty of IADS for seeking my services to report on the Pulses Improvement Programme of the BARC. Drs. L.D. Swindale, J.S. Kanwar, Y.L. Nene and J.B. Smithson of ICRISAT administration very kindly allowed me to take up this consultancy. I am thankful to them. It is my pleasure to thank Dr. Matlubur Rahman, Director and Dr. A. Hamid, Head, Division of Genetics, BARI for allowing me to discuss with their staff. I acknowledge the contribution of more than 50 scientific administrators, scientists and others of BARC, IADS, BARI and its Regional Research Stations at Ishurdi, Jamalpur and Jessore, and BADC, BAU and INA (Appendix I) who gladly shared their experiences with me. I would particularly thank Mr. M.B.H. Sikder, S.S.O. Pulses, Dr. Matiur Rahman, P.S.O. Pulse Breeding, Ishurdi and Mr. Abid Hussain S.O. Breeding, for their assistance. The latter two also accompanied me on outstation trips. I wish to thank Mr. R. Stanley of IADS for logistic and other support and Dr. J. Hunt for making useful suggestions during the preparation of this report. Finally I am grateful to Dr. A.K. Kaul, Crops Specialist, IADS for making all arrangements for this consultancy and for my orientation.

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Appendix-I

PLACES VISITED AND PERSONS CONSULTED:

Bangladesh Agricultural Research Council, USAID, IADS, Dhaka

Dr. Kazi M. Badruddoza, EVC, BARC
Dr. D.M. Daugherty, IADS Leader
Dr. A.K. Kaul, Crops Specialist
Mr. Kamal Uddin Ahmad, Member-Director-Crops
Dr. (Mrs.) Joanne T. Hale, USAID, Dhaka
Dr. Mannan Chowdhury, Director (IPSU)
Dr. D.T. Krigsvold, Consultant IADS, Pathology
Mr. D.N. Sharma, Agricultural Engr., IADS
Dr. M.H. Khan (PSO) Crops, BARC
Dr. Ahmad Hussain, Director Training, BARC
Dr. Davy, Training Officer, IADS

Bangladesh Agricultural Research Institute, Joydebpur

Dr. Matiubur Rahman, Director, BARI
Dr. M. Abdul Hamid, Head Division of Genetics
Mr. M.B.H. Sikder, Incharge Pulses Section
Mr. Abid Hussain, S.O., Chickpea breeding
Mr. Habibur Rahman, S.S.O., Plant Pathology
Mr. Dozza Sarwar, S.S.O. Lentil breeding
Mr. Ali Hussain, S.O.
Ms. Fatima Khatun, S.O. Mungbean breeding
Mr. Osiqul Haque, P.S.O., Plant Pathology
Mr. W. Zaman, S.O., Khesari breeding
Dr. Sharofat Hussain Khan, Principal, PGI
Dr. M.A. Wahab, P.S.O. Research

Bangladesh Rice Research Institute, Joydebpur

Dr. Hasanuz Zaman, Director

BARI Regional Agricultural Research Station, Ishurdi

Mr. Asharful Islam, P.S.O., Station Incharge
Dr. Matiur Rahman, P.S.O. Genetic Resources - likely to be breeding
Mr. Joinal Abedin, S.S.O., Agronomy
Mr. Naresh Chandra, S.O., Breeding wheat

BARI Regional Agricultural Research Station, Bogra

Mr. M.M. Bhuiyan, S.S.O., E&RP & Incharge
Mr. Abul Hashem, Subject Matter Officer, Gabrali Upzila
Christian Reformed World Relief Committee, Bogra
Mr. R.A. Goni, Field Asstt.

Bangladesh Agricultural Development Council (BADC)

Mr. Nazrul Islam, Agronomist, Incharge, Vegetable Farm, Amjubi
Mr. M. Haque, Asstt. Director, BADC, Dilkhusa, Dhaka

BARI Regional Agricultural Research Station, Jessore

Mr. Md. Yusuf Ali, S.O. E&RP
Mr. Abdul Majid Fieldman, Pulses
Mr. Rustom Ali, S.O. Plant Pathology

BARI Regional Agricultural Research Station, Jamalpur

Mr. Ali Ahmad, P.S.O., Wheat breeding
Mr. Abdul Khyar, P.S.O, Production
Mr. A.R.M. Saydur Rahman, S.S.O. breeding
Mr. Tim Kelley, Associate Agronomist, Production
Mr. B.K. Saha, Phos

Bangladesh Agricultural University, Mymensingh

Dr. Lulufer Rahman, Head Genetics & Plant Breeding Dept.
Dr. A.M. Shamsuddin, Head Agronomy Dept.
Mr. A.U. Sarkar, Agronomist
Dr. M.A. Karim, Agronomist
Dr. Shahe Alam, Soybean Breeder
Dr. M. Hussain, Biochemist, presently at BARI, Joydebpur

Institute of Nuclear Agriculture, Mymensingh

Dr. A.J. Miah, Director
Dr. M.A.Q. Shaikh, Head, Division of Genetics
Mr. M.R.I. Khan, S.S.O. Breeding
Mr. A.D. Bhuiyan, E.O.
Mr. Hyder Ali, Field Asstt.

Ministry of Agriculture, Dhaka

Mr. Annisuzamman, Secretary, Ministry of Agriculture

Others:

Dr. H. Bremmer, FAO, Dhaka

APPENDIX II

Pulse Crops Germplasm in Bangladesh

Crop	Total No. of Accessions	Institute	Origin
Khesari	196	196 BARI	188 local 8 Exotic
Lentil	1314	1215 BARI 99 INA	190 Local
Chickpea	1311	991 BARI 317 INA 3 BAU	140 Local
Mashkalai	300	BARI	96 Local
Mungbean	500	BARI	
Pigeonpea	200	BARI	21 Local

For internal circulation only

DETAILED TOURING REPORT
Bangladesh - 15 to 26 March 1983
ONKAR SINGH

Objective

The purpose of my visit was to see as much of the chickpea growing areas of Bangladesh as possible, to see the condition of the crop in farmers' fields, to see the breeding materials in trials at research stations, and to have discussions with the scientists working in chickpea improvement programs.

Itinerary

14.3.83	Hyderabad-Calcutta	By air
15.3.83	Calcutta	
16.3.83	Calcutta-Dhaka	By air
17.3.83	BARC Dhaka, BARI Joydebpur	
18.3.83	Dhaka-Mymensingh-Dhaka	
19.3.83	Dhaka-Ishurdi	
20.3.83	Ishurdi-Rajshahi-Ishurdi	By road
21.3.83	Ishurdi-Jessore	
22.3.83	Jessore-Faridpur-Dhaka	
23.3.83	Dhaka-Joydebpur-Dhaka	
24.3.83	Dhaka-Jamalpur-Dhaka	
25.3.83	Dhaka-Calcutta	By air
26.3.83	Calcutta-Hyderabad	By air

16-17 March - BARC, Dhaka and BARI, Joydebpur

On arrival at Dhaka, I was disappointed to learn that Dr. A.K. Kaul, who was supposed to arrange my visit to various places in Bangladesh, was out of station and nobody knew what arrangements had been made. I met then with Drs. K.M. Badrudozza and Motlebur Rahman, Executive Vice-chairman and Member Director, respectively, of BARC and discussed about my proposed itinerary and finalized the arrangements. Then I drove with Mr. D.N. Sharma to BARI, Joydebpur, and met with Drs. S.H. Khan and M.A. Wahab, Head of Plant Breeding Division and Principal Scientific Officer (Pulses), respectively, at BARI, and further discussed and finalized my program as suggested earlier by Dr. Badrudozza.

At BARI, the pulses improvement program started only in 1979. Prior to 1979 it was a part of oil seeds improvement program. The research projects on pulses are being supported by IDRC in addition to BARC. There is an additional support from FAO for pigeonpea improvement program in North Bangladesh. Other organisations involved in research and development of pulses are Bangladesh Agri. Development Council and, Extension and Research Project for On Farm Trials. Total area under pulses in Bangladesh is around 0.3 million acres and chickpea is the third most important pulse crop after Lathyrus and lentil.

Due to heavy rains previous night and continuous drizzling, the fields (about 6 acres under chickpea) were flooded with water and it was not possible to see the experimental plots.

18 March - Dhaka-Mymensingh-Dhaka

Accompanied by Mr. B.H. Sikdar of BARI, we drove to Mymensingh in a jeep provided by BARC.

Main crops rice, wheat, sugar cane, lentil (harvested), Lathyrus and mustard. Occasional fields of groundnut, banana and chickpea. Large areas under jute-crop germinating. Chickpea crop mostly at late pod-fill stage with good stands and reasonable growth. The crop almost free from Botrytis but Alternaria spots present on leaves. Stunt serious in some fields but not in others. Little problem of Heliothis. Most of the uprooted plants showed good nodulation. Previous night's rains gradually decreased towards Mymensingh.

Mymensingh. Bangladesh Institute of Nuclear Agriculture

Being Friday it was a holiday in Bangladesh and the Institute was closed. We met Dr. M.A.Q. Shaikh, Head, Division of Plant Genetics, at his residence and he readily agreed to our request to show us the chickpea experiments. Mr. A.D. Bhuiya and Mr. M.R.I. Khan joined us later in the fields.

Most of the experiments had good stands but excessive vegetative growth resulting in high incidence of Alternaria and Botrytis causing flower drop. Few plants affected by root rot and stunt. Heliothis negligible.

Germplasm - 139 accessions planted in pots as well as in the field. Good growth but less fruiting. Accessions, G-117, -121, -128, -195, -202, -211 and -216 appeared better than others.

Hyprosola mutant - The mother variety Faridpur-1 and Hyprosola mutant derived from it were planted side by side for comparison. The mutant appeared early and showed better fruiting than the mother variety.

M_2 populations - To increase the seed size of and to bring earliness in Hyprosola its seeds were treated with sodium azide and M_1 derived M_2 progenies were planted in the field for screening. Because of the high incidence of leaf diseases there was no pod setting and consequently there appeared no variation for earliness or seed size. There was some variation for disease incidence which could be escape as well.

F_3 MLT-DS - Good stands but excessive growth. Plants in several patches severely affected by small leaf virus. No fruiting at all even in Hyprosola, the check cultivar. No possibility of any good results from this trial.

ICSN-DS - Very good stands but excessive growth. The crop was late with little fruiting. Some problem of Alternaria. Plot numbers 102, 128, 129, 142, 151, 168 and 180 appeared as good as the local check Hyprosola. Rest of the material was relatively late.

CAT - Good trial with reasonable growth and stands. Good fruiting in most of the lines. There was a switch-over between Annigeri and K-850 in all the reps. and labelling was corrected, otherwise the trial was uniform and will provide good comparisons. ICCC-4, ILC-519, K-850, Rabat, and L-550 appeared better than others. Annigeri was poor.

F_2 Population - Twenty six F_2's in 3 to 5 rows plots and unreplicated with JG-62 and Hyprosola as checks. All excessively grown and affected by Botrytis and Alternaria. Hyprosola appeared best in the lot.

Yield trial of mutants - Five mutant lines along with Hyprosola as a check with three reps. Reasonable growth and stands. Two mutants, G-296 and G-300, looked better than Hyprosola in respect of earliness and fruiting.

Microplot yield trial - Twenty entries including 10 mutant lines, 7 lines selected from material supplied by ICRISAT, and 3 checks. The trial was planted in a field with relatively light soil and therefore the growth was not excessive. Reasonably good stands with good fruiting. No ICRISAT line was earlier than the two mutants, G-294 and G-299. But four ICRISAT lines, G-96, -97, -138 and -201, showed better fruiting than rest of the material and appeared to be a promise for future.

Then I had a brief discussion with Dr. Shaikh. He agreed with my observations that small seeded and early cultivar is required in Bangladeshi conditions and that a breeding program involving local cultivars is essential to breed material for local conditions. Regarding the participation in Breeders' Meet, Dr. Shaikh pointed out that he requires the invitation to reach him at least 2-3 months in advance to enable him to finalize the arrangements.

19 March - Dhaka-Ishurdi

Accompanied by Mr. Mumtazul Haque (Sr. Sc.Officer, BARI) the journey was performed by road and river ferry. From Joydebpur to Aricha Road it was mainly the forest area dominated by Jackfruit. Along Dhaka-Aricha road it was mainly wheat and onions area. Lathyrus very important in some areas and being harvested. Other important crops were rice, tobacco, linseed, sweet potato , groundnut and chickpea. Sugarcane also important in irrigated areas (mainly tube wells). Occassional fields of vegetables such as tomato, brinjal, garlic etc. Mustard and linseed already harvested. Chickpea mostly sole but occassionally intercropped with wheat and linseed.

After the river ferry from Nagabari to Ishurdi it was mostly upland and dry area. Main crops wheat, onion, Lathyrus and chickpea. The latter quite important area wise, mostly sole but also intercropped with linseed, wheat and barley. Both sole and intercrop of chickpea well grown and healthy with good stands. Little problem of leaf diseases and Heliothis. Vegetative growth and fruiting more balanced in intercrop compared to sole crop. No pigeonpea, perhaps harvested already.

20 March - Regional Research Station, BARI, Ishurdi

Met Mr. Ashraful Islam (Officer-in-charge), Dr. Matiur Rahman (SSO) and

Mr. Obaidul Islam (SSO). Mr. Sadiq Ali (SSO), who received training in pathology at ICRISAT and used to work on pulses, had been transferred to potatoes.

Total farm area 143 acres but under chickpea only one acre. The expts. were planted after mid-November and in December. There were only few experiments but crop was very good without showing any excessive growth with good stands and fruiting and nearly mature. Only traces of Botrytis and Heliothis but serious stunt in one experiment.

Preliminary yield trial - Five entries - S_1(Ex-ICSN 81248), S_2 (Ex-ICSN-81248), Hyprosola, Pabna local, and a market collection - planted on 15 November in RBD with 3 reps. Excellent trial with very good stands and fruiting at late pod-fill stage. Both selections, S_1 and S_2,were early and looked very promising compared to the other three entries. Selection S_2 which was earlier than the local check could well be the future variety in Bangladesh. It possessed all the three qualities which, I thought, were required for a good cultivar in Bangladesh i.e. earliness, small seed and high yield.

ICSN-DS - The trial was planted late on 12 December (spacing 50 x 10 cm) because of the late receipt of seeds. Uniformly good stands and very well balanced growth. Most of the lines podding very well and almost free from disease. Good comparisions could be expected from the trial. Ent # 18 appeared most promising. Entry Nos. 9, 36, 38 and 50 were also early with good fruiting. Other goodd looking entries were 1, 12, 35, 51 and 53. Entry No.23 was late and 41 multiseeded.

Screening for Botrytis resistance - Twelve accessions planted at 50 x 10 cm on 7 December for screening against Botrytis. The season being relatively dry there were no signs of Botrytis and the crop was healthy. Among the 12 lines, ICC-4065 and Pb, 7 appeared agronomically superior over others. Also there was some damage by Heliothis.

Evaluation of Local Market Collection - Seeds collected from local market planted in about half an acre for deriving single plant progenies. The plot were severely affected by stunt and small leaf viruses. As expected, there was apparent genetic variation for various morphological and other

agronomic characteristics including nodulation but nothing looked very spectacular. Not much problem of diseases or Heliothis.

Agronomy Trial - The main objective of this trial was to see whether soil fertility could be maintained/improved by following chickpea - sesame-blackgram crop rotation. The local chickpea cultivar, Pabna local, planted with various combinations of Nitrogen, Phosphorous, Potash and Sulphur. It was the first year of experiment and the crop looked quite good.

Regional yield trial of pigeonpea - Four entries, ICPL-2, -4, 76012 and 76013, planted late on 1st November due to late arrival of seed in 6 x 4m plots and at 30 x 15 cm spacing with five replications. Both stands and growth were poor but fruiting was good. ICPL-4 appeared slightly better than others. ICPL-2 was late in those conditions.

Ishurdi appeared to be the most ideal place for breeding chickpeas in Bangladesh. It falls in a comparatively drier zone and has got good soil. But there was a lack of qualified staff, and people working on chickpea were not enthusiastic because of poor coordination from BARI headquarters after Dr. A.K. Kaul left for BARC. It was suggested that one of their staff should consider receiving training at ICRISAT.

In the afternoon we drove towards Bogra and then to Rajshahi to see more of chickpea crop in the farmers fields. This region appeared to be the second most important area after Jessore and Faridpur with regard to chickpea production in Bangladesh. Here, the chickpea is generally planted after rice. After examining several fields that were planted in mid-November to early-December, we found no serious problem of diseases and pests. There appeared to be more Heliothis damage in late sown crop. The crop was well grown with good nodulation in most of the fields and being harvested at several places. In one field near Rajshahi, there was no fruiting in the crop and it looked stunted. The reason could not be ascertained. Chickpea will remain as an important pulse crop in this region.

21 March - Ishurdi-Jessore

Tobacco, sugar cane, Lathyrus and wheat were the main crops followed by chickpea, onions, linseed and banana. Large areas under chickpea near

Jessore. Chickpea crop generally well grown and at late pod-fill stage. Stunt appeared to be the main problem in this area although Fusarium, Sclerotium and Rhizoctonia were also present. I was told that Heliothis generally causes severe damages in this area but this year it was negligible. Chickpea intercropped with wheat appeared to be the best cropping system as a result of reduction in damages caused by Heliothis and other leaf diseases.

21 March - Regional Research Station, Jessore

Met with Dr. Ali Hussain, Sr. Scientific Officer and Incharge of station, and Mr. Anwar Karim (SSO, Agronomy) who was looking after the breeding materials in the absence of a breeder and who showed us around the field.

ICSN-DS - The trial was planted on 2nd December in 3 rows of 4m long. Stands were good but in general the vegetative growth was too excessive perhaps due to basal application of 20 kg N 40 kg P_2O_5. There was a very high incidence of Botrytis and Alternaria causing flower abortion. Almost no fruiting in most of the entries. Little problem of Heliothis. Small leaf virus also appeared in a few patches. Entries at nos.1, 4, 27, 35 and 55 showed very poor germination. Entries that looked little better and earlier than others were: ICCL-82208, -82215, -82227, -82230, 82108, -82214, and -81237.

ICCT-DS - Entries in this trial had 3 rows of 4m length planted 40 cm apart in 4 replications on 2nd December. The crop conditions were same as in case of ICSN and no comparisons were possible. ICCC-36 and BG-246 appeared highly susceptible to leaf diseases. ICCC-8, -35 and -36 and BDN 9-3 were having atleast some pods despite a very high incidence of leaf diseases.

Agronomy trial - Mixed cropping of chickpea with mustard and varying levels of P_2O_5 and seed ratios under rainfed conditions. It was the first year of experiment and chickpea plots with mustard (already harvested) appeared to have less diseases and more fruiting than plots having pure stands of chickpea.

Regional yield trial of pigeonpea - Same trial as at Ishurdi but planted on 9 October at normal planting time. All the four entries except ICPL-4 were already harvested. ICPL-4 was also mature and ready for harvest and

Also I could see a pheromone trap installed in one of the chickpea fields. The man who takes the insect counts was not available to give any information on this. Jessore is the most important district with regard to chickpea area and production but unfortunately there were least research efforts on chickpea improvement at this station.

22 March - Jessore-Faridpur-Dhaka

Almost same cropping pattern as between Ishurdi and Jessore till Aricha Road. I could see some pigeonpea along the roads and railway tracks. Botrytis appeared to be the most common disease of chickpea and pigeonpea followed by stunt and sterility mosaic respectively. I was told at Jessore that there might be a few experiments on chickpea and pigeonpea at Agri.Ext.Tr. Institute, Faridpur, but I found none

23 March - BARC, Dhaka and BARI, Joydebpur

In the morning, I visited BARC headquarters at Dhaka and met with Drs. K.M. Badrudozza and A.K. Kaul and told them about my impressions gathered during last few days. It was felt that there was a lack of coordination in the research efforts being made to improve the pulses in various regions of Bangladesh. BARC is attempting to coordinate the research on pulses and Dr. M.A.Q. Shaikh of Institute of Nuclear Research, Mymensingh, was likely to be given the responsibility to coordinate the chickpea research activities. It was pointed out by Dr. Kaul that among the rabi pulses, chickpea is the third most important crop but area under pulses, in general, was on decline as farmers have been shifting to rice and wheat wherever irrigation has been extended. But it was agreed in general that chickpea will remain an important rabi pulse in Bangladesh and there was a need to replace the existing low yielding and susceptible cultivars with improved genotypes. Dr. Badrudozz appreciated ICRISAT's efforts in cooperating with various chickpea improvement programs in Bangladesh and expressed the need to strengthen these efforts further. He was particularly keen to know whether ICRISAT can help in formulating projects on dryland farm management for the development of relatively dry areas of Northwest Bangladesh by providing necessary training and expertise in these fields. My suggestion that mixed cropping of chickpea with cereals or linseed may help in reducing the disease and pest incidence was very well received by Drs. Badrudozza and Kaul and they emphasised the need to popularise this practice.

Went to BARI Joydebpur in the afternoon and met with Drs. S.H. Khan and Abdul Waheb, Head of Plant Breeding Division and Principal Scientific Officer (Pulses), respectively, at BARI. Unfortunately Dr. Waheb had received his transfer order from pulses to oilseeds the same day and he looked a bit depressed but readily agreed to show around the chickpea experiments. There were about 12 expts. in all including multiplication and covering about 6-7 acres of land. The crop was planted around mid-November. In general, the crop was poor and growth highly variable. Stands were also variable due to uneven germination caused by reduced viability of seeds as a result of rainsoaking last season. The crop was mostly mature without much problem of diseases. Some damage was caused by Botrytis and Fusarium in the early stages of growth.

Evaluation of drought tolerant genotypes - 528 germplasm lines planted second year in succession. Variable growth and stands. Evaluation not possible. Later, I was told by Dr. Kaul that he made some selections out of this material last year which, obviously, had not been separately planted this year. A few early and good looking lines were: CPS-1 and ICC-1096, -5743, -5817, -8338 and -8396. ICC-8330 and -8370 were late but good.

Observation trial - Seven entries replicated three times to evaluate new selections. Though not uniform, the trial looked reasonabley good to give some comparisons. ICCC-2 appeared best in all the replications followed by H-55-61, G-543 and HMS-6. K-850 and L-550 had stand problems.

F_3 observation rows - 50 entries in 4 rows plots. Growth and stands highly variable. Comparisons not possible. Entries IC-7919 and -7921 appeared a little better than others. Early plants from many of these populations were already selected and harvested.

Ex-ICSN(1981) - 60 entries as observations rows. ICCL-81203 and -81238 were quite early and appeared most promising. I helped Dr. Waheb in selecting several other good looking and early lines and suggested to test them in a replicated trial next season.

Observation rows - Old germplasm stocks - about 75 lines. Mostly late and with very very thin stands. No selections possible.

Evaluation of extra-early lines - 30 entries, all selections from ICRISAT's material, with 3 reps. Reasonable stands but uneven growth. Entry no.25 (84P) appeared to be most promising followed by 15 (56P), 3(23P), 10(26P) and 24 (79P). This material appeared to be a promise for future.

F_4 Trial (F_3 MLT-DS of previous year) - Good replicated trial comprising 16 entries with 3 reps. Entries IC-7877 and -78546 appeared to be early maturing and best in performance.

ICCT-DS - Not a very good trial but comparisons possible. 16 etnries in 3 rows of 4m, replicated four times. Entry RSG-44 looked very good followed by ICCL-78055 and ICCC-30, both double podded. Phule G-4 was also good.

Ex-ICCT-DS - Again 16 entries with 4 reps. The trial was not so good but entry IC-73129 looked exceptionally good in all the replications. Other good entries were: IC-73111, K-850 and Phule G-4.

F_3 Trial (F_2MLT of previous year) - 50 entries with 3 reps. Good trial with reasonable stands and growth. A double podded entry IC-7971 appeared to be most promising. Other good entries were: IC-7926, -7957, -7914, -7978, -7969 and -7938.

ICSN-DS - The trial planted in a highly variable piece of land. Both stands and growth poor and variable and no possibility of good comparisons. ICCL-82219 and -81220 appeared somewhat good but then local check was also equally good.

Multiplication - Among the 12 entries multiplied, including a few ICCT-DS entries, only ICCC-2 appeared better than Sabour-4.

After seeing the experiments, I felt that although there was lot of good breeding material left by Dr. Kaul with BARI the whole thing was poorly planned and badly managed, and that there was a need to reorganise the things. This also came under discussion when I met Dr. Sharafat Khan.

He sought my advice on these points and agreed with my suggestions on the reorganisation of the whole program. He felt that there was a lack of trained staff and already five persons have been sent for higher education in India (IARI), and that ICRISAT can also help in this by providing training facilities in various disciplines.

24 March - Regional Research Station, Jamalpur

Drove in a car to Jamalpur which is about 120 km towards north from Dhaka. Almost same cropping pattern as between Dhaka and Mymensingh. Met with Mr. Ali Khan, Incharge of station, who showed me the chickpea experiments. Two of the three plant breeders were away for higher studies.

ICSN-DS - Reasonable trial with good growth, stands and fruiting and will provide good information. No problem of diseases but some damage caused by Heliothis. Entries at plot nos. 39 and 40 were most promising and early. Plot 75 good but late. There were many entries looking better than the checks providing good scope for selection.

Microplot yield trial - Twelve mutants from Mymensingh and eight lines selected from ICRISAT's material replicated thrice. G-96, -108, -298 and -302 appeared better than others.

CIYT-Kabuli - Trial from ICARDA with 24 entries in 3 reps. The trial was in a poor soil patch but stands and growth were uniform. A few early entries were already harvested. There was not much of variation among the remaining genotypes.

Entomology trial - Experiment on the effect of dates of sowing on the incidence of insect pests and grain yield. Cultivar Sabour-4 planted on 1, 8, 15, 22 and 29 November and 6 December. There appeared to be no variation with regard to Heliothis incidence across dates of sowing. Ist and 8th November plantings appeared to produce highest grain yield. There were two pheromone traps installed in these fields and highest insect count (124) was recorded on 17 March.

25 March

Left Dhaka in the afternoon, stayed at Calcutta overnight and reached Hyderabad next day morning. It was a very useful and pleasant visit

to Bangladesh after a few problems in the beginning. I am highly grateful to Dr. K.M. Badruddozza, Dr. A.K. Kaul and Mr. D.N. Sharma for making arrangements for my visits to various places in Bangladesh and for their kind hospitality during my stay at Dhaka. I am also thankful to Mr. Mumtazul Haque and Mr. B.H. Sikdar for accompanying me to various places.

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TOURING REPORT - BANGLADESH ; 19-26 FEBRUARY 1982 - J.B. SMITHSON
DETAILED NOTES

Joydebpur 20 and 24 February

Drought tolerance trial. 628 genotypes, mostly early maturing, also being screened for drought tolerance at ICRISAT by NP Saxena. In three tiers, only the first of which is sufficiently stressed, so not good screening. However, some entries look very good so will provide new range of materials for selection.

ICSN-DS. Rather variable growth and stand. Plots 101 to 112 very good. 113-122 very poor stand and moderate incidence of stunted plants, except 119, which is very good in poor area. Plots 123-151 good, except 127, which has poor stand and stunt 140, 141, and 145 with poor stand. Plots 152 to end showing signs of greater stress but uniform. ICCL-80074 (Plot 176) is godd in poor area; plot 177 - no plants.

Multilocation trial - tall. Very variable stand and moderate to good growth. Most entries rather late. IC-7573-74 (white flowered) and IC-7570-3 good in two reps. IC-7512-52 is good but intermediate duration.

Multilocation trial - very early maturing lines (MT-VEM). Set of 30 early maturing lines from desi progenies at ICRISAT in 1980-81. In six environments including late sown at Joydebpur. Has excellent growth but variable stand from very poor to good. Several entries look good but selection will be difficult. Local check ICCC-4. Seed packets and field book did not correspond.

F_2-MLT-DS Better, with uniformly good growth and less variable stand. Entries 49 and 50 - ICCC-4.

F_3-MLT-DS. Good growth and stand, will give good data. IC-78546, -7881, -7898, -7885 and -78506, excellent. Local checks 15 and 16 ICCC-4. Both common checks appear to be Annigeri here.

ICCT-DS. Growth excellent but stand rather variable. ICCC-8, ICCC-73129, 2375 and ICCC-4 (local check) are very good. BDN-9-3 and ICCC-78788 also looking well. ICC1-74633 in Rep I. has large

podded off-type which is worth harvesting separately.

Regional Yield Trial - Small. Selected from Regional Yield Trial - small in previous year. Fifteen entries. Mostly long duration such as F-61 and G-130, which had escaped rain damage. Emergence has been practically zero in most entries due to very poor seed. Only entries with full stand are ICCC-2, -4 and -5.

F_3 bulks. From ICRISAT F_2s grown at Joydebpur in 1980-81. Single rows - mainly late maturing.

Preliminary Yield Trial of Short duration-pigeonpea. Sown 15 October, 5 entries (70012, 70013, ICPL-2, and -4 and C-11) and 3 reps. 70012 and 70013 earlier than others and carries mature pods with much pod fly damage. AKK* considers increased constriction of pods around seeds may prevent movement of pod fly larva within the pod. Other entries taller and now producing pods. Much Botrytis on flowers.

Plant density trial on pigeonpea

Sown 13 October, spacings (25 x 25, 20, 15 and 10 cms) and cultivar ICPL-4. Closest spacing looks very promising.

Ishurdi

Chickpea Regional Yield Trial - Small. As at other centers extremely good growth and uniform at present, except for Rep III which has poor stand and growth at extreme end.

ICSN-DS. Excellent growth and now almost completely covered, although stand was moderate at start. Entries podding are: JG-62 and ICCL-80031, -80032, -80070, -81212, -81213, -81214, -81216, -81217, -81225, -81238, -81245 and -81248. Poor stands in ICCL-81206, 81223 and -81247. Annigeri and 81221 are tending to lodge. ICCL-81005, -81202 and -81237 are large leaved with distorted growing points as with K-850. No discards alongside plots 101 and 181.

* Dr. A.K. Kaul

Chickpea Adaptation Trial. Sown 26 November. Excellent growth. Earliest flowering is Harigantes but is only just podding - flowers have shed at first 6 to 14 reproductive nodes. The kabuli entries in particular appear to have formed many pseudo flowers - Syrian and Jordanian locals have them at first 7-11 nodes. Others have both pseudo flowers and shedding after flower opening. G-130 has poor stand. K-850 - tip distortion.

Multilocation trial of mid-tall erect types. Most entries are not podding consistently in all three reps. Best appears to be IC-7573-74.

Multilocation trial of very early maturing types. Growth and stand as for other trials. Few entries podding consistently. Those with pods are entries 4, 10, 15, 21 and 24. Seed packets and field book do not correspond.

Foliar fungicide on groundnut. Dacca No.1 RCB, 4 reps, plot size 3.5 x 4.5 m. Sown 8 November. Treatments: Benlate, Cuman L, Dithane M-45, Du-ter. Every 12 days from appearance of symptoms Cercospora or rust; at 2 g a.i./litre. Second year. Last year Du-ter significantly reduced Cercospora leaf spot but there were no significant differences in yield. This year slight symptoms of Cercospora - not yet sprayed.

Variety x plant density on groundnuts. Three genotypes: IG-8101(ex Phillipines), Dacca No.1, Red Spanish. Spacings 50 cm x 5, 10, 15 and 20 cm. giving 30, 15, 10 and 5 plants/m^2.

P trial on gram. Same trial as at Jamalpur. Pabna Local. Growth variable but no clear differences between treatments - no phosphate treatment appears to be podding better than others.

Irrigation trial on gram. From INA. Two genotypes: 'Hyprochola' (INA mutant) and local; 8 treatments and 6 reps. Excellent stand but excessive vegetative growth. Very bad Botrytis already developed in some plots.

Insecticide trial on gram. Sown 19 November. 6 treatments: Sumicidin 20 EC @ 0.3 kg a.i./ha and Nuvacron 40 EC, Bidrin 24 WSC, Diazinon 40 EC and Polytrin 44 EC @ .75 kg a.i./ha; and control. Excellent stand and growth but complete failure of podding. Little Heliothis damage.

Preliminary Yield Trial of short duration arhar. As at Joydebpur except only 4 entries: 70012, 70013, C-11 and ICPL-4. Laid out as mirror image and mislabelled. Labels rearranged. Growth and stand are not as good as at Joydebpur. 76012 and 76013 - flowering almost complete; ICPL-4 mid pod-fill; C-11 early pod fill. No Botrytis. Some pod fly.

Pigeonpea trial. 8 entries. Laid out as mirrow image and mislabelled. Labels rearranged. Growth and stand variable. Approximate scores for stand and vigor are given below:

	Stand%	Vigor	
Bahar	80	3.5	
ICPL-1	30	2	
C-11	70	4	
BDN-1	10	1	
ICPH-6	95	5	
UQP	30	0	flowering
ICP-1-6	40	3	
LRY-30	60	3.5	

5 = most vigorous

Regional Preliminary Yield Trial of Lentil. As at Joydebpur. Sown 10 November. 81001 and 79694 appear earliest and most promising. Very good growth and podding.

Multilocation Evaluation trial of lentil. 10 entries, 3 reps, plot size 4 m x 2m. Sown 7 November. 81001 and 79694 earliest. Growth and podding as above.

Observation trial of lentil. 17 entries, including most of the above. 3 reps, 5m x 3m. Sown 9 November - 81001, 79481, 79354 and 79542 promising. 79536 lodging. Good growth and podding.

Agroeconomic studies of pulse oriented intensive cropping patterns. Four rotations being tested.

1. Wheat (10 Nov.) - mung bean(7 March) - Aus rice (7 May)
2. Chickpea (1 Dec.) - Mustard + black gram(1 April) - mung (10 August)
3. Mustard(25 Oct.) - Mung (1 March)-Aus rice(1 May)-black gram(10 Aug.)
4. Mustard (25 Oct.) - aus rice (1 Mar.) mustard + mung (1 June) - mung (10 Sept).

Mustard already harvested. Heavy infestation of Orobanche. Chickpea extremely vegetative and is badly lodged due to late thinning. Wheat near maturity.

23 February - Jessore.

Chickpea Varietal Trial. Five entries ICCC-2, -4, -5, K-850 and L-550; three reps; plot size 4 m x 3m; sown 8 December.

Stand and growth very good but vegetative growth less because of later sowing. K-850 and L-550 are in mid pod fill and appear to be podding normally; ICCC-4 has many pseudo flowers and, with ICCC-2 and -5 is just beginning flowering. K-850 showing tip distortion.

MT-VEM. As at Joydebpur - sown 29 November. Excellent stand and growth, despite which podding is occurring, in contrast with Ishurdi. No obvious disease or insect problems at present.

ICSN-DS. Sown 30 November. With excellent stand and growth and well - podded. Entries 11 (ICCL-81005), -14 and -49 showing tip distortion; 13 (81201) white-flowered; 18 (81206) poor stand. In three tiers with no discards alongside 101 and 127 (Annigeri); 128 and 154 (JG-62); and 155 and 181 (G-130).

Chickpea Regional Yield Trial - Small. As at Joydebpur, sown 30 November Stand, growth and podding as above.

Irrigation Trial on gram. Sown 28 November. Sabour 4. Basal dressing 20:80:40, 3 reps; plot size 4.5 x 2m; spacing 30 x 10 cm. Irrigation treatments: none, maintain PET, 20% above PET; 70% above PET; one other not indicated but probably 100% above PET. Growth, stand and podding as above but no clear effects on growth or podding although control may be better podded than other treatments.

Fertiliser trials on gram. Two trials NPKZn and SZn. Sown 6 December Growth and stand rather variable - poor to good in Reps I and II of both trials. No clear treatment differences. Local - just flowering.

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TOURING REPORT

Bangladesh 19-26 February, 1982

J.B. SMITHSON

Objectives:

To follow up on visit of previous year in reviewing chickpea trials and commercial crop and renewing contacts with BARI.

Itinerary

19 February	Hyderabad-Delhi	IC440	0745-0945
	Delhi-Dacca	TG304	1610-1845
	Dacca-Joydebpur		
20 February	Joydebpur-Jamalpur	Road	0830-1230
	Jamalpur-Joydebpur	Road	1500-1830
21 February	Joydebpur		
22 February	Dacca-Ishurdi	BG-481	0945-1015
23 February	Ishurdi-Jessore	Road	0750-1150
	Jessore-Ishurdi	Road	1445-1855
24 February	Ishurdi-Joydebpur	BG-482	1100-1145
25 February	Joydebpur-Feni	Road	0500-1045
	Feni-Joydebpur	Road	1400-1800
26 February	Dacca-Delhi	TG404	1400-1630
27 February	Delhi-Hyderabad	IC-439	0700-0850

20 February - Joydebpur-Jamalpur-Joydebpur

Commercial crops similar to those observed in 1981 except that wheat area is considerably reduced and evidently replaced by Lathyrus and lentil in areas with limited water and 'boro' rice in irrigable areas. Rice being transplanted and Lathyrus being grazed. Lentil approaching maturity. Dolichos lablab common in compounds. No pigeonpea although there had been appreciable area 2 years previously.

Again, very little chickpea. Saw two farmers plots near Tangail in same area as last year. Both had very poor stands but growth was reasonable. Some flower abortion accompanied by fungal growth. Low incidence stunt and Heliothis.

Jamalpur. Regional station of BARI. Officer in-charge Mr. Ali Ahmed. Others, working on pulses, are Messrs Deepak Sen and Faruddin Miah.

New offices and laboratories being constructed with World Bank funds. Laboratories extremely impracticable.

Multiplications of Groundnut (Dacca No.1), lentil (Lentil-5) and Kesari (Barsal and Jamalpur) were good.

Trials included: Kesari, Regional Yield Trial and Germplasm. Latter had 69 local collections with three reps, to be evaluated for fodder production and seed yield and toxin content. Most promising is 3968 which is early maturing with toxin content of 0.5%.

Lentil Regional Trial. At 7 locations. Most promising entry 81061 Ex Ethiopia - early maturing.

Chickpea Phosphate Trial. Very small trial but with excellent uniform growth and stand. Treatments were 0, 30, 60 and 90 kg/ha P_2O_5 as TSP. Variety Sabur-4. No differences evident at this stage. Some pseudo flowers and flower abortion associated with fungal growth, perhaps Botrytis and Alternaria.

Other chickpea trials had been sown on more clayey soil and had received rain just after sowing so that stand was very poor. Growth was also not good. Variety trial from INA, (Institute of Nuclear Agriculture) Mymensingh - some entries with pseudo flowers. Also Microbiology Trial. None will give useful data.

21 February - Joydebpur.

Saw pulse trials accompanied by Drs. Avtar Kaul and C.L.L. Gowda and Qumrul Islam.

In previous year chickpea crop had been destroyed by heavy rain at pod fill and maturity and virtually no seed had been harvested. Only selections had been a few late maturing lines which had escaped damage and seed of these had given poor emergence. Nearly all the trials were therefore composed of seed from ICRISAT. All were sown after 13 November and received come-up irrigation on 22 and 23 November.

Chickpea materials. In general growth is good but stand is somewhat variable. There is a low incidence of stunt but no evidence of any other disease problem at present. All well nodulated. ICRISAT trials include F_2 and F_3-MLT-DS, ICSN-DS, ICCT-DS, Multilocation Trials of tall types and very early maturing lines from desi progenies at ICRISAT in 1980-81. The latter sown on 9th December as well as at normal time - and a set of materials for drought tolerance (NPS). BARI trials are Regional Yield Trial - Small, most entries of which have germinated very poorly; F_3 bulks of F_2 populations selected at Joydebpur in 1980-81.

Pigeonpea. Rabi pigeonpea, sown mid October, looks very good. Flowering and podding profusely. Last year gave 1400 kg seed/ha. 76012 and 76013 from Florida are highly determinate and earlier. Some pod fly damage on early pods of these but not on more recent pods. Botrytis common on flowers. Was told Maruca is main problem in kharif.

Lentil and Lathyrus. Similar range of materials as at other stations.

Detailed notes of these and other trials are attached for interested persons.

22 February - Ishurdi See report of last year. Regional Research Station of BARI. Officer in-charge Mr. Ashraful Islam. Obaidul Islam, Oilseeds and Pulses Breeder.

Chickpea Trials excellent. Sown late November and received 25 mm rain in mid December. No fertiliser or irrigation. Emergence had

been only moderate but growth is excellent and gaps have now been completely covered. Spacing is wider than recommended, with 40 cm between rows.

However, podding is yet to begin in most entries on account of flower shedding. In Harigantes in Adaptation Trial, flowering began in early January but pods are only just forming - up to 14 reproductive nodes are barren on basal branches. Botrytis not recorded, so probably physiological. In same trial, Kabuli entries, Jordanian and Syrian local carry up to 11 pseudo flowers on each branch and although recorded as 50% flowering about 1 week previously this is still not certain.

The same situation pertained in 1980-81 and seed was ultimately harvested from only K-850 and L-550, this in only small quantity. An important cause then was Botrytis. This was seen this year only in an irrigation trial supplied by the Institute for Nuclear Agriculture (INA), where in some plots, it was already severe on both vegetative and reproductive parts; and is likely to spread.

In farmers fields in surrounding areas growth was good but not excessive due to narrower plant populations and later planting. In these plots podding was generally satisfactory and it is clear that plant density and date of sowing require investigation.

A few entries in the station trials were podding including JG-62 and a number of other lines in ICSN and some in the multilocation trial of very early maturity lines (MT-VEM). In a phosphate trial there appeared to be more podding in the no phosphate treatment.

There were patches with 100% plant mortality due to wilt root rot like disorder spreading in from paths at four points in the 3rd and 2nd reps of MT-VEM. There was root damage just below soil surface but not obviously any of the common cases of wilt or root rots. K-850 was showing growing point distortion. Very little Heliothis at this stage. Nodulation good in both farmers' fields and on station.

Pigeonpea. Two trials of rabi pigeonpes varieties were not so well grown as at Joydebpur and stand was variable. No Botrytis on flowers. Some pod fly damage. One trial had been sown very late and only UOP was beginning to flower. Both laid out as mirror images and mislabelled, which was corrected.

Lentil. Looked very good with excellent stand and growth. Sown from 7-10 November. Podding well and earliest lines beginning to mature. These were showing some rust. Best lines were 81001 and 79694.

There were also few trials of groundnuts - one pathology and one variety x plant population trial. Showing slight Cercospora. We saw high infestations of Orobanche in fields vacated by mustard but the parasite has not been recorded on pulses.

23 February - Ishurdi-Jessore-Ishurdi

Wide range of crops. Wheat, rice, linseed, lentil, Lathyrus, chickpea, mustard, coriander, tobacco, sugar cane, bananas. Again, wheat acreage is reduced relative to last year and there is increase in Lathyrus and uncropped areas. Tobacco and sugarcane are important from Kushtia to Jessore. Chickpea is present throughout and occupies considerable area from Kushtia to Jessore. Chickpea preflowering to mid pod fill with good growth and podding. Low incidence of stunt and pod borer damage.

Jessore. Regional Agricultural Research Station of BARI. Officer in-charge Mr. Enamul Haq Chaudhary who was away. Shown around trials by Messrs. Abdus Samad and Anwar Karim, the latter Agronomist looking after pulses and oilseeds in addition to cereals. Station has about 50 acres of land of which 3 are in pulses.

Chickpea. Sown late November and early December and has excellent stand and growth. Spacing rather close (30 x 10 cm). Despite this, podding is better than at Ishurdi.

Trials include Chickpea Variety Trial (5 entries), MT-VEM, PYT-small, ICSN-DS, an irrigation trial and fertiliser trials. The MT-VEM, randomisation was wrong but had been corrected from the seed packets. No disease problem at present. Some Botrytis on flowers and low incidence of stunt and pod borer. Nodulation excellent. Should produce good data.

Lentil. Sown same time as chickpea and has very good growth. Earliest lines near maturity. Low incidence of stunt-like symptoms but less in 81001. In irrigation trial, irrigation has resulted in up to 30% plant mortality associated with blackening of foliage. Cause not identified but no sign of Botrytis. In trial of planting x plant density trial, mid November sowing looks best.

25 February - Joydebpur-Feni-Joydebpur

Accompanied by Drs. Kaul, C.H. Antholt, Head of Food and Agriculture Program of USAID and H. Monzano, Cropping Systems Agronomist of IADS.

Almost entirely boro rice near Dacca and between Comilla and Feni. Much of the area is uncropped in latter stretch. Between Dacca and Comilla, although there are extensive areas of wheat, much of last years acreage has been replaced by rice. Lentil and linseed are very important, both being harvested. Lathyrus only minor. Occasional field, foxtail millet. Water melon, potatoes and chillies occupy considerable areas especially nearer Comilla. No chickpea anywhere. Dolichos lablab common in compounds.

Feni. Research Station of Mennonite Central Committee (MCC). None of the senior staff were present and we were shown round the trials by a Field Assistant.

MCC are examining places of new crops and new genotypes in cropping system. They have most of the area in soybean, including INTSOY trial, their own variety trials and a variety x planting date trial.

Evidently, Bragg and Davis have given best results but there is problem of seed viability. Local, small, black seeded cultivar is not too bad in this respect. All trials had been inoculated with Rhizobium. Most of the materials were in flowering or pod fill stages and there was wide range of maturities. In planting date trial, November sown treatments of Bragg and Davis were maturing. In general, the crop appeared to be rather sparsely podded. Soybean is being used locally for dhal and there are 5 or 6 factories refining imported crude degummed soybean oil.

Preliminary Yield Trial of short duration pigeonpea. As at other locations. Four varieties. Looks excellent. Very good stand and growth. 76012 and 13 stopped flowering. ICPL-4 late pod-fill. C-11 only just beginning to pod. Pod-fly damage on mature pods. Botrytis on flowers.

Lentils. Included Regional Yield Trial - large with 11 genotypes as at other locations. Sown 11 November and earliest entries 81001 and 79543 being harvested. Stand, growth and podding very good.

Chickpe Variety Trial. Sown 3 December. Five entries as other locations. Although growth was not too excessive, the crop had lodged in the third rep and pod-set was poor due to flower abortion. Fungal growt. on flowers appeared to be Alternaria. No Heliothis damage observed.

Groundnut Variety Trial. Stand and growth very poor although crop was at flowering stage. Cercospora present. Entries were Dacca No.1, PI, Small Japan, Kedang, Senegal, 13, 20 and Local.

In Cropping Systems trial cowpea was showing severe thrips damage and there was the heaviest infestation of thrips in open flowers I have ever seen.

26 February - Joydebpur-Delhi

In morning visited MCC offices in Dacca and obtained research reports. Also visited BARI before flying to Delhi.

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For internal circulation only

TOUR REPORT OF BANGLADESH

C.L.L. GOWDA

13-21 March 1981

Objective: Visit chickpea trials and general chickpea survey in Bangladesh.

Itinerary:

13 March	Hyderabad - Delhi	IC-440
	Delhi - Dacca	TG-304
	Dacca - Joydebpur	By Road
14 March	Field visit at Joydebpur	
15 March	Joydebpur - Pabna - Ishurdi	By Road
16 March	Ishurdi - Bogra - Ishurdi	By Road
17 March	Ishurdi - Jessore - Faridpur	By Road
18 March	Faridpur - Joydebpur	By Road
19 March	At Joydebpur	
20 March	Joydebpur - Dacca	By Road
	Dacca - Calcutta	BG-491
	(Flight delayed by 2 hrs; missed flight to Hyderabad)	
21 March	Calcutta - Hyderabad	IC-269

13 March - Hyderabad-Delhi-Dacca

I was met by Dr. A.K. Kaul at Dacca airport, and we drove straight to Joydebpur. Stayed at BARI (Bangladesh Agricultural Research Institute) guest house. Met Dr. A.B. Joshi, ISNAR Consultant, who was visiting BARI on that day.

14 March

Field visit at Joydebpur.

The BARI was officially opened only a fortnight ago, and the festive mood was still on. Dr. Kaul introduced me to Dr. Sharafat Khan, Head of Plant Breeding Department, and Dr. M.A. Wahhab, M/s I. Masud and O. Islam, of the Pulse Improvement Project. Later I spent the day

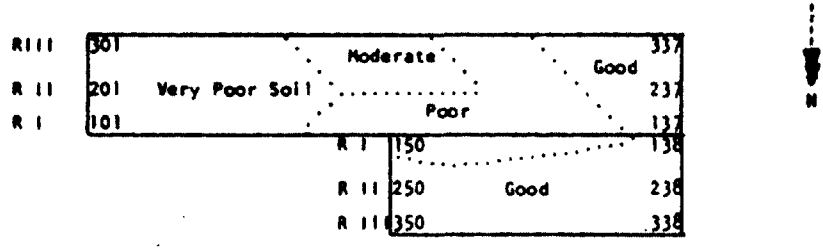
visiting chickpea trials with M/s Masud and Islam. Mr. Masud was looking after this year's ICCT-DS, ICSN-DS, F_2MLT and Regional Yield Trial (Large).

General crop condition varied from very poor to good depending on soil variation.

ICCT-DS: Sown 13 November 1980. 30 cms between rows. 40 kg P/ha added. JG-62 kept as local check. After going through the first 4-5 plots in the first replication, it was obvious that some mistake had happened in sowing. The entry in the field book and in field were not matching. I tried to straighten it out, but could not succeed because I was able to identify properly only the released cultivars such as Annigeri, JG-62, P-436 and K-850. The rest was anybody's guess. Such mistakes were in other replications also. It was suggested that I should check this at Ishurdi where another set of ICCT-DS was sent to see whether the mistake was because of wrong seed packeting by us (!), or it was an error at planting. (At Ishurdi the entries were in the correct order which indicated error while planting at Joydebpur).

ICSN-DS: Sown on 18 November 1980. G-130 was not replaced by a local check. (Although our information booklet says that this has to be replaced by a local cultivar, very few people had taken notice of it. It is better to keep empty packets so that they will be forced to put a local check.) At Joydebpur most of the well-known cultivars had a different look, and I had some initial setback in recognising them. Most of them were taller and lankier than at Hyderabad. Two entries (plot 109 and 106) were early, and pods were taken away by rhodents. Part of the field was very poor, and these lines (plot 151 to 175) may not give good yields. The nursery was split in to groups of 10 and planted after giving 1 row gap after every 10 entries. Hence plot 107, 108, 117, 118, 127, 128, 137, 138, 147, 148, 150, 151, 160, 161, 170, 171, 180 and 181 were vigorous and may give inflated yields. Also a plot of G-130 (plot 129) is doubtful. It may be a case of seed mix-up. JG-62 was very good in most of the plots. Among the test entries, plots 111, 115, 122, 131, 132, 133, 137, 138, 139, 145, 146, 151 and 176 were looking good.

F_2 Multilocation Trial: Sown on 18 November 1980. K-850 (entry # 49) and Sabour-4 (entry # 50) used as local checks 1 and 2. The experiment was planted on an area where the soil variation was at its maximum varying from very poor (15-20 cm plant height) to good (40-50 cm plant height) soil, interspersed again with moderate and poor patches. The map of crop growth indicating soil heterogeneity, is as follows:



With such differences in crop growth, it is really difficult to pick out the better crosses unless they happened to fall on good soil in all three replications. Suggest that the trial be repeated next year as F_3 test in a more homogeneous land. However, individual plants from better plots can be selected and advanced.

Regional Yield Trial (Large Plots): Eleven entries trial sown at 8 locations -- Joydebpur, Ishurdi, Jessore, Dinajpur, Pabna, Feni, Rangpura, Bogra. Plot size 6 rows x 5 m. The entries in the trial were:

1. K-850
2. L-550
3. 850-3/27 x GW-5/7 (73114)
4. H-208 x T-3 (7310)
5. JG-62 x F-496 (73167)
6. JG-62 x Radhey (73129)
7. JG-62
8. ICCC-3
9. ICCC-4
10. Annigeri
11. Sabour-4 (Check)

This trial was being conducted to identify cultivars suited to these regions so that they could be multiplied and distributed for farmer's field trials. K-850 and L-550 were good, and so were lines of 73167 (JG-62 x F-496) and 73129 (JG-62 x Radhey) (P.S.: I did not see these trials at Jessore and Bogra. Possibly they were not sent/not planted at these stations. At Bogra there was a 100 variety observation trial

Jessore did not have any trial sent from Joydebpur on chickpeas.)

In the afternoon met with Mr. Qamrul Islam and had discussions before going to field. Rice being the main crop, any other crop should fit in to the gap between two rice crops. The 'Aman' rice (both transplante and broadcast) is harvested by October-November. The land thus vacated will be used for the dry season rabi crops such as wheat, chickpea, Lethyrus, lentil, maize, linseed etc. The season is short because the farmer would like to plant the 'Aus' paddy in April. During this short season (100-120 days) temperatures are low only in December-January, and then followed by high temperatures, and rains during the growing season. Essentially then, the farmer would need a fast growing short duration chickpea to be harvested by March. From among the material sent by ICRISAT, the varieties originating from Maharashtra, Madhya Pradesh, Andhra Pradesh and Karnataka are performing well which indicates that Bangladesh needs short to medium maturity cultivars. Mr. Islam seemed to be a good worker, and he knew the material very well, and also had good knowledge of what is needed to be done in chickpeas for Bangladesh.

Regional Yield Trial (Small): Fiftyone entries. To be conducted at Joydebpur, Ishurdi and Jessore. Sown 26 November 1980. Field was comparatively better, and results should be encouraging. Among the test entries CPS-1, ICCC-1, P-436, JG-74, BDN 9-3 and N-59 were better podded than others. F-370 was having many branches, and although late it may still give good yield. P-6067, a dwarf umbrella type bushy plant, was very good, and should be followed through as it seems to be a good plant type for Bangladesh conditions. BG-203 was mid-late, but podding was good. HMS-6 was early and good. 7357-22-3-B-BH was having bold pods and podding was excellent.

Observation Trial: Hundred lines selected mostly from the germplasm sent from ICRISAT. An exploratory trial being conducted at Joydebpur, Ishurdi, Bogra and Faridpur to know adaptation of chickpea varieties in these areas. Germination not good in many entries. Seed was obtain from Ishurdi Station where rain at maturity had affected seed viability. L-550, K-850, JG-62, Annigeri and Sabour-4 were good (as checks). Yiel

data from plots having reasonable plant stand should be considered for selecting better genotypes across the four locations.

Evaluation for late sowing: In many years the field may be vacated by late November, and hence a need for identifying cultivars that will perform well when sown in December. Two trials were undertaken to screen varieties for late sowing. One was the 100 lines germplasm evaluation (also sown at normal time), sown on 4 December 1980 in 1 row plot of 4 m. Among these, JG-62, P-99, T-103, P-324, P-6067, ICC-506-EB, and H 556-1 were very good. Another was a 11-entry trial with 3 replications. Plot size 4 rows x 4 m. Entries were JG-221, JG-74, JG-62, F-61, H-223, K-850, Chafa, IC-73114, IC-73167, IC-7310, and CPS-1. The trial was good. Chafa, JG-221, K-850 and H-223 were well podded. These two trials should give a strong indication of lines that will suit late planting. This is an area which should receive more attention by the local breeders.

Other trials seen were:

1. Effect of Phosphorus on yield of chickpea conducted by the soil chemistry division. Details were not available.
2. Effect of N, P and K on nodulation and yield of chickpea. Different doses of N, P and K were given with or without Rhizobium inoculation. Land was poor, but I could not see any visible differences among different treatments.
3. One hundred and thirty two F_2 populations (sown at two places) were grown. Growth was poor because of poor soil; not much visible segregation. Sabour-4 was planted as check after every 10 rows. Suggested to bulk this season and select individual plants in F_3.
4. Twentyeight lines selected by Dr. B.A. Malik (Pakistan) were found in their consignment, and were grown. They were too late. Suggest that they send it to Dr. Malik after harvest.

15 March - Joydebpur-Ishurdi

Dr. Kaul had made arrangements for the journey by a Mazda Pickup. Dr. M.A. Wahhab accompanied me during the trip. We were delayed at Joydebpur because driver was not available until 9 a.m. We left Joydebpur around 10 a.m. Joydebpur to Dacca Contonment was mostly forest type area with Jackfruit dominating. Rice fields were in majority. After about 10 miles from Dacca Contonment, towards Arichaghat, tobacco was very common in uplands. Sugarcane with lentil or linseed in the ridges was also common. Held up at Aricha Ghat up to 1 p.m. because of long queue for the ferry over river Padma (Ganga). Three hour journey to reach Pabna district border. From Nagarbadi onwards mostly uplands. Wheat most common. Chickpea, lentil, linseed, Brassica in patches. Sugarcane and pigeonpeas occasional. It was dark by the time we reached Pabna town, hence could not visit the experiment station. Reached Ishurdi station by 6.30 p.m.

16 March -

Ishurdi: Regional Agricultural Research Station. Area: 111 acres
Persons met: Mr. Joynul Abidin, Principal Scientific Officer (PSO)
Mr. Abdul Khaleque, Senior Scientific Officer (SSO)
Mr. Abdul Rashid, SSO, Agronomy
Mrs. Munira Begum, SSO, Breeding

The research station received three heavy rains after planting rabi crops. Too much vegetative growth had led to lodging; and increased the incidence of Botrytis mould. According to Mr. Khaleque, the disease was noticed after the second rain when the plants were in flowering stage. Many entri had flowered earlier, but there was no pod set. Most flowers had dropped, possibly after the attack of Botrytis, but could be due to rain and cloudy weather also. By far heavy toll was taken by lodging followed by Botrytis mould. Early infected plots were almost wiped out by the disease, and plants were blackish.

ICCT-DS: No evaluation possible because of lodging and mould. But I checked the sowing order to see whether the mix-up of seed observed at Joydebpur could be confirmed. All the varieties were in the correct order which indicated that our seed packeting was correct, and the mistake was only at Joydebpur while planting. K-850 was heavily infected with mould. Annigeri had mild disease, but branches were barren. ICCL-78054, and -78021 were having less mould attack, and looked tolerant. These should be checked again next year.

ICSN-DS: Too much vegetative growth, lodging and heavy incidence of mould. Many entries had barren branches with a few flowers at top. No evaluation was possible.

Regional Yield Trial (Small): Lodging and mould incidence same as in others. T-3 Gwalior and NEC-900 seemed to be tolerant to mould. Similarly, ICCC-1, P-99 and JG-74 had less mould, and had quite few pods on them.

Regional Yield Trial (Large): Growth and disease same as above. L-550 was looking good, followed by K-850.

100 lines Observation trial was also heavily lodged, but disease was not much at that time. It may spread later. Pabna local, 7385-17-2-B-BH and Brown leaf were looking excellent. Some entries had very poor germination.

Overall, it was a very bad year at this station. Better to sow chickpeas a little late to reduce height. Also should avoid giving irrigation and nitrogen to chickpeas. Otherwise the situation may not improve because winter rains will upset the crop time and again.

16 March - Ishurdi-Bogra-Ishurdi

After visiting experiments at Ishurdi, left for Bogra by road. From Ishurdi to Natore (sub-division of Rajashahi District) wheat was common in uplands, while rice was cultivated in low lying areas. Lathyrus was very common, next to wheat, grown in large areas. Chickpea (sole crop) was found occasionally but chickpea/wheat and chickpea/linseed intercrops were common. Other intercrops observed were chickpea/Brassica,

Linseed/Brassica, and Lathyrus/Linseed. We recorded the following crops over a 4-mile stretch:

Wheat - 35
Lathyrus - 28)
Chickpea - 5) Total Pulses - 36
Lentil - 3)
Oilseed - 5 (Brassica and Linseed)
Vegetables - 2
Sugarcane - 4
Onion - 4
Garlic - 1

It is interesting to note that singly wheat is most common followed by Lathyrus. All pulses taken together are more than wheat fields.

Towards end of Natore subdivision, and beginning of Bogra district large areas were left uncropped after the paddy harvest. Most of these fields are uplands, and can (rather, should) be planted to crops such as chickpea or pigeonpea which can grow on minimal water requirement. I think this is an area where extension education to farmers to grow a pulse crop is much needed. In this area itself I saw examples where 'subsistence farming' was practised. In one field of 1000 sq.m. (or around that), I could see diverse crops being grown in small patches - wheat, lentil, linseed, chickpea, onion, garlic, and 2-3 vegetables. This indicates that the farmer needs the foodgrains, and will plant a crop if guidance is given.

Arrived at Bogra Research Station around 12.30 p.m.

Persons met: Mr. M.M. Bhuiya, SSO and Farm-incharge (met at Ishurdi)
Mr. R.C. Adhikari, SSO, Extension Research Project
Mr. D.J. Costa, SO
Mr. M. Rahman, SO, Potato Research Station, Chalopara.

The climate and soil of Bogra district are suitable for rabi crops. Eastern part of Bogra, called the Barind Tract, is suitable for chickpeas with its alluvial soils and low winter rainfall. Efforts are urgently needed to intensify chickpea cultivation in this tract, and possibly ICRISAT can help here than anywhere else.

The observation trial (100 lines) was planted (20 November 1981) at this station. Only sixty had good germination; others had completely failed to germinate. I was informed that the soil was meticulously prepared like a nursery bed and irrigated. The result was heavy soil compaction and poor aeration. Plants were poorly grown with 2-3 branches and 6-10 pods/plant, and 20-25 cm height (in contrast, a nearby field having chickpea in a relay crop experiment was very good. Plants had 8-10 branches, 40-50 pods/plant and 35-40 cm height). Chickpea stunt was present; and a few plots had low incidence of Botrytis. Among the entries, P-6099, B-212-1, 7381-EB, P-6264, NEC-43 and P-1774 were having moderate podding.

In an experiment of relay cropping (after paddy), chickpea looked best in comparison to maize and wheat and may give highest yield. Soybean had not germinated in this trial. This trial indicated that chickpea can be cultivated in this region without any difficulty.

Potato Research Project - Chalopara Research Station

This station is about 4 miles from Bogra Research Station and beyond the river which indicates the starting of Barind Tract. Although this is mainly for potato research, other experiments also conducted. Two experiments on chickpea were planted.

1. Experiment on seed rate of chickpea: Cultivar - Bhangura; date sown - 4.12.80; fertilizers - 80 N, 60 P and 40 K (kg/ha). Six seed rates - 15, 20, 25, 25 (broadcast), 30 and 35 kg/ha. R.B.D. with 3 replications. Crop growth was very good for such late planting. No visible difference with varying seed rates, but Botrytis mould was more evident in higher seed rate plots. Chickpea stunt present where stands were poor.

2. Next to this trial was a demonstration plot comparing three local varieties - Bhangura, Faridpur-1 and Sabour-4. Although the three varieties looked similar from a distance, their branching pattern was different.

Bhangura

Faridpur-1

Sabour-4

Both Bhangura and Faridpur-1 were 'open type' plants with more basal branching. Bhangura was more prostrate and spreading, while Faridpur-1 was semi-spreading (similar to G-130 and C-235). Sabour-4 was 'closed type' with fewer basal branches approaching the umbrella type (but quite) of Annigeri. Bhangura looked more impressive when not lodge but Sabour-4 is more stable for lodging. It will be a good idea tc test the 100 lines trial at this station to see their performance yield and lodging. Provided the rains are fewer, Bhangura types wi yield better, but with intermittent rains the umbrella type plants will be more stable. (We will send a few umbrella type, early maturing lines for testing.)

Returned to Ishurdi by evening for stay.

17 March - Ishurdi-Kushtia-Jessore

From Ishurdi up to Padma river wheat was more common, but chickpea plots were on increase. Mostly tall grown pigeonpeas ranging from ½ acre to 2 acres at some places. Heliothis attack evident by the number of bored pods. Common mixed crops were: wheat/chickpea, chickpea/linseed, chickpea/mustard. Lathyrus not common in this area. Crossed river Padma by ferry. Entered Kushtia district. Canal irrigation-cum-power project near the river. Tobacco and sugarcane common on both sides of the canal. Wheat and chickpea in higher elevations. Very little scope for chickpea to compete with tobacco and sugarcane.

Beginning of Jessore district wheat is gradually replaced by chickpea, and vast areas of chickpea could be seen. Jessore and Faridpur districts are the predominantly chickpea growing areas, and there was sufficient evidence for that. Surprisingly, Lathyrus was less in these areas. Common crop mixtures were chickpea/lentil, chickpea/linseed and chickpea/wheat. Lentil was also common as a sole crop.

Jessore - Regional Agricultural Research Station

This is a comparitively big farm with 56 acres under cultivation. Soils are loam and sandy loam. Rainfall 1400 mm. Soil pH 7.5-8.0. Important rabi crops are wheat, potato, gram, lentil, linseed, black gram and cabbage.

Persons met: Mr. Abdur Rashid, SO, Vegetables
Mr. Shahzahan Ali, SO, Entomology
Mr. Abul Hossain, SO, Farm
Mr. I.M. Bhuiyan, SSO, Entomology
Mr. Abu Bakr Siddique, SO, Breeding
Mr. Anwar Karim, SSO, Agronomy
Mr. Ali Ahmad, PSO and Farm Incharge was out of station.

Two chickpea trials for BARI were to be planted here, but I was told that no such trial was planted. There was a multiplication plot of chickpea (local variety) in about ½ acre area. Sown with one irrigation and 80 kg urea and 80 kg triple superphosphate/acre. Two heavy rains followed, and lead to excessive vegetative growth. Most part of the field was damaged by Botrytis mould. The crop had flowered normally, but no podding. All flowers had dropped. On the way the farmers fields had healthy and well podded chickpea, with incidence of Botrytis confined to areas with excessive vegetative growth in patches. In most of the experiment stations visited, people tended to give nitrogen and irrigation to chickpea. This is one reason why growth is excessive in research stations compared to farmers field. Hence, this practice should be discontinued, and the crop sown towards end of November, to get a near-normal crop of chickpea at the research stations.

In contrast to the above, there was another experiment with a good crop of chickpea - survey of insect pests of chickpea, pigeonpea and lentil. Sown 8 December 1980, local variety. No fertilizer or irrigation. Crop growth was good, and was in late flowering stage with good podding. Some plants with chickpea stunt present. Heliothis was the major pest.

Fertilizer experiment on chickpea (Soil chemistry department): Effect of N, P (two levels) and K with or without Zinc and Sulphur. Variety - Sabour-4; date sown - 11 December 1980; R.B.D. with three replications. Control plot looked better; others had excess vegetative growth. Should avoid N and irrigation for chickpea experiments.

Met Md. Azizur Rahman, SSO, Cropping System Program of Bangladesh Agricultural Development Council (BADC) who was on tour to Jessore to see on-farm trials. There are four regional research stations where the cropping system work will be initiated - Jessore, Jamalpur (Mymensingh district), Ishurdi (Pabna district) and Hatazari (Chittagong district). At Jessore they are trying 3 systems - Potato-Maize-Transplanted Aman (rice)
- Mustard-Maize-Transplanted Aman
- Chickpea-Maize-Groundnut (no rice syst

This is the first year of study in Jessore (7 villages) and he felt that the result should be encouraging to motivate farmers to diversify their cropping system from rice system.

Jessore-Faridpur

Again chickpea was more prominent, almost on equal footing with wheat. Sugarcane was more common near Jhenidah where sugar factory is located. Other crops were linseed and lentil, pigeonpea on bunds and small plots. Near Khamarkali Ghat (low lying area) rice becomes predominant. Faridpur district also had large areas of chickpea, as expected.

18 March - Faridpur

Persons met: Mr. Imam Ali, Deputy Director, BADC Farm
(Mr. Bilal Hussain, Principal, AETI, was out of station)

Met Mr. Ashutosh Sarker who was on a germplasm collection mission with Dr. Nazrul Haque (Islam?), financed by IBPGR. They had a month long plan to cover all districts of Bangladesh. In the first 10 days they had covered the districts of Jessore, Khulna and Faridpur. They are collecting germplasm for all cereals, pulses and oilseeds. We should get one set of all chickpea and pigeonpea collection (P.S: LJGM has written to Dr. A.K. Kaul to send the seeds).

The 100-variety Observation Trial was conducted at Agriculture Extension Training Institute (AETI) farm. The station had received heavy rains 3 days ago, and many entries had lodged (sown mid-November). The crop growth was better, and the cultivars were in late podding stage. Many lines had poor germination (because of rain-damaged seed from last year). Most of late maturing and 'open type' cultivars has lodged, while a few umbrella type cultivars were standing perfectly well. The following cultivars were very good in podding and had not lodged: B-110, P-272, P-4203, P-3249, P-4079, Brown leaf, 72-5 (ex-ICSN), Chafa-8-16, RPSP-451, NEC-760, L-550-2 and JG-62. Sabour-4 local had moderately lodged and was good in podding. The above mentioned cultivars should be evaluated again next year in as many locations as possible, and also used in crosses. (We will send a few crosses with these for selection in Bangladesh.)

At this station also Botrytis mould was noticed, especially in tall grown and thick canopy plots. Incidence of chickpea stunt was low. There was no damage by Heliothis, possibly because of the two insecticidal sprays given to the crop.

Faridpur being an important area for chickpea cultivation, it was surprising that very little attention being given. More efforts are needed at this location to conduct proper trials. Dissemination of research findings will be faster to reach the farmers through the Village Level Officers who are trained in nearby AETI.

18 March - Faridpur-Gaolondoghat-Arichaghat-Joydebpur

From Faridpur to Gaolondo wheat and chickpea were more common. After this wheat became predominant, and tobacco was also common. Chickpea and linseed could still be seen frequently, but pigeonpeas were occasional Small ferry crossing at Gaolondo, and a big ferry over river Padma to reach Arichaghat. Followed the same route, as on way to Ishurdi, for return journey to Joydebpur.

19 March

Discussed my tour impressions with Dr. A.K. Kaul and his colleagues, and also regarding the breeding material to be sent from ICRISAT for further evaluation.

Visited chickpea and pigeonpea pathology fields with Dr. Hamizuddin, Head of Pathology Department and Mr. Abu Bakr. Helped them in identifying diseased plants (wilt and stunt) for photographs (Photographer: Dr. Kaul). Wilt was rare, but stunt was common. The International Chickpea Wilt and Root Rot Nursery was planted in a normal field as they do not have a wilt-sick plot yet. Stunt incidence more because of abundant aphid populations on green gram or black gram.

In the pigeonpea field saw very good symptoms of witches' broom. Incidence was high. Very few plants had sterility mosaic.

20 March - Joydebpur-Dacca-Calcutta

Joydebpur to Dacca Airport with Dr. Wahhab. After reaching the airport learnt that the flight was delayed from 11.25 to 13.30 hrs. Reached Calcutta by 13.45 hrs, but the Hyderabad flight had promptly taken off at 13.30 hrs. Stayed at Airport Hotel.

21 March - Calcutta-Hyderabad

Calcutta to Hyderabad by IC-269; arrived 1555 hrs.

CLLG:alr

For internal circulation only

TOURING REPORT
Bangladesh - 13 to 21 February 1981
Y.L. Nene, J.B. Smithson, W. Reed

Objectives

To see chickpea trials and commercial crop in Bangladesh.

Itinerary

13 February	Hissar - Delhi (JBS)	Road
	Hyderabad - Delhi (WR)	IC440
	Pantnagar - Delhi (YLN)	Road
14 February	Delhi - Dacca	TG304
	Dacca - Joydebpur - Dacca	Road
	Stay Intercontinental Hotel	
15 February	Dacca - Jamalpur	
	Jamalpur - Joydebpur	
	Stay BARI guest house	
16 February	Dacca - Saidpur	By Air
	Saidpur - Dinajpur - Thakurgaon - Dinajpur	Road
17 February	Dinajpur - Saidpur	Road
	Saidpur - Dacca	By Air
	Dacca - Joydebpur	
	Stay BARI GH Joydebpur	
18 February	Joydebpur - Ishurdi	Road
	Stay BARI GH Ishurdi	
19 February	Ishurdi - Joydebpur	Road
	Stay BARI GH Joydebpur	
20 February	Joydebpur - Dacca	Road
	Dacca - Delhi	IC 303
	Stay IIC	
21 February	Delhi - Hyderabad	IC 439

13 February - Dacca

On arrival in Dacca we were met by Dr. A.K. Auckland and Dr. M.A. Wahhab, who accompanied us to the Intercontinental Hotel where we were accommodated for the first two nights. We found that our visit coincided with a meeting of the Commonwealth Ministers of Agriculture.

14 February - Bangladesh Agricultural Research Institute, Joydebpur

Met with Dr. A.K. Kaul, Pulses Breeder and Joint Leader of Pulses Improvement Project; Dr. K.M. Badruddoza, Director of B.A.R.I.; Dr. S.H. Khan, Head of Division of Plant Breeding; Dr. M.A. Wahhab, Joint Leader of Pulses Improvement Project; and, Messrs Quamdal Islam and Ashutosh Sarkar, Pulse Breeders.

B.A.R.I. has headquarters at Joydebpur, 22 miles north of Dacca, four regional research centers, (Ishurdi, Jamalpur, Jessore, and Chittagong) and 14 subcenters and has responsibility for research on all crops except rice, jute and sugar cane. It also offers graduate and post-graduate degrees in agriculture and is involved in on-farm trials and extension.

Soon after our arrival the Commonwealth Ministers of Agriculture arrived, we were introduced to these and joined them in an introductory talk, tour and field visit. BARI is relatively new with impressive buildings. Much of the land has been reshaped (by our D.N. Sharma) and although the levelling has been well done the usual problems of soil heterogeneity on newly levelled land were evident. Most of the farm is on very heavy alluvial soils with a high and sticky clay content. Recent rains had made most of the fields very wet indeed. In addition to pulses the fields were growing wheat and potatoes.

15 February - Joydebpur-Jamalpur

From Joydebpur mainly paddy area. "Boro" rice being transplanted. Clay soil - pH 5 to 6. Otherwise rice crops - type of teak, jack fruit, mango, banana, coconut.

Then into area where wheat predominates. Other crops, in order of importance - barley, panicum, lentil, broad beans (small-black seed, Heliothis feeding), potato, groundnut. Very little chickpea. Paddy infrequent - in valley bottoms only.

Farmers plot of chickpea about 12 miles east of Tangail - very wet - moderate plant and growth - early pod fill. Heliothis present in vegetative parts and feeding inside pods - not a common characteristic of H. armigera. Alternaria leaf spot and stunt - but low incidence.

Farmers plot of chickpea mixed with little lentil. Healthy and well grown with pronounced secondary branches. Low incidence Heliothis and stunt. Mid pod-fill.

Tangail - Jamalpur. Mainly wheat but also lentil, barley, chickpea, linseed.

Demonstration plot of chickpea near Jamalpur. Basal branching type possibly Radhey which has been imported by BADC. Just flowering - traces Heliothis/stunt. Well nodulated.

Jamalpur. Regional station of B.A.R.I. Officer incharge Mr. Enamul Haq Chowdhury. Stand in chickpea trials was not good. Poor germination - followed by Sclerotium rolfsii - collar rot. No sign of Fusarium wilt, traces of stunt and Heliothis. In observation trial of 100 lines, sown on 1 December, earliest lines just beginning to flower. Good lines were P-619-1, P-4203, JG-62, P-4968, ICCC 506-EB-EB and 7381-EB-EB. Others showed poor stand and/or growth. Selections made from ICSN-D8 at Ishurdi and Jamalpur in previous year had shown no germination at all.

Regional Yield Trial(Large). Eleven entries, including ICCC-3, ICCC-4, JG-62, L-550, K-850, Chafa, Annigeri, Sabur-4, 7901, 7902, 7903 and 7905. K-850 and 7905 were good but results should be interpreted with caution due to variable and generally poor stand.

Other materials were cropping systems trial of chickpea, wheat, mustard, sesamum and 'aus' rice; fertiliser trial on chickpea, both using Sabur-4; and chickpea seed increase - Sabur-4, Faridpur-1, mutant 669 (from Faridpur-1). Also C-11 rabi pigeonpea multiplication, in which Botrytis was causing flower drop (about 50%) some Heliothis, Maruca testulalis, Exelastis atomosa, blue butterfly larvae, jassids and thrips, yellow mosaic (1%) and sterility mosaic-like symptoms although the latter could not be confirmed without a microscope to identify mites. Regional yield Trial (large) of Lathyrus looked good and crop healthy.

16 February - Saidpur-Dinajpur-Thakurgaon

With Dr. Kaul flew from Dacca to Saidpur, then by road to Dinajpur. Between Saidpur and Dinajpur mainly wheat with some Lathyrus and lentil. In some areas tobacco or sugar cane are important. Much cultivation in progress for 'aus' rice and some jute. Chickpea infrequent and usually intercropped on ridges with sugar cane in furrows. Pigeonpea, large plants, common as hedge crop in compounds. Bamboo, coconut, banana, frequent.

Rajbari, near Dinajpur, is substation of BARI. Officer incharge Mr. Abu Hena Talukder, assisted with chickpea trials by Miss Farida Begum. Also met Mr. Altamash, Scientific officer, Extension and Research; Mr. Wazed Ali Shah, leaving for Ishurdi, and Miss Protima Kundu, who handles meteorology data.

Seventy-six experiments covering 7 projects. In chickpea, stands were again poor - reduced germination due to 3 days rainfall after sowing and subsequent Sclerotium, enhanced by wet conditions and paddy residues.

No Fusarium, traces of stunt and Heliothis. Stunting and reduced leaf size may be due to Zn deficiency, symptoms of which were seen in maize. Soil analysis should be done. Soils here are higher pH (6.4) and more clayey than much of Dinajpur District.

Trials included 100 line observation trial, sown 25 November and earliest just flowering but most had not germinated. Best plots were K-850, L-550 and Sabur-4. Regional Yield Trial(Large) sown 26 November but stands again variable and generally poor. Lines in order of earliness were JG-62, L-550, Sabur-4 and ICCC-4 (78 DFF). Apparent spray (diazinon) damage on K-850. Water requirement of chickpea - no irrigation, 28 + 56 days, 28 + 84 days, 28 + 56 + 84 days. K-850 sown 28 November - very poor emergence. Cropping pattern trial - wheat, mustard, gram, potato, groundnut following rice/rice. Chickpea sown 21 December - poor stand and growth - not yet flowering.

Twenty four pigeonpea genotypes ex ICRISAT in replicated trial mainly harvested. Remaining plots (760018 and 760024) showing witches broom-like disorder on regrowth. Thrips in flowers, much flower drop. Several of the pods contained podfly puparia which were black in color, markedly different from the normal brown puparia of M.obtusa. Dr. Lateef had previously reported the phenomenon of black puparia in pigeonpea pods during a tour of Assam, but the flies which emerged from these were subsequently identified as being typical Melanagromyza obtusa. Also irrigation trial on lentil and seed increase of Lathyrus (pahartali, Jamalpur, 3870) appeared good.

Agricultural Extension Training Institute, Dinajpur. Soils more sandy and with lower pH (4.8) typical of 75% of Dinajpur District. ICPL-2, -4 and -6, T-21 and BDN-1 pigeonpea, sown 26 November not yet flowering. There were few pests except for jassids, but the crop had been sprayed with diazinon. Several plants had yellow circles on the leaves which baffled our diagnostic ability. Of the cultivars, T-21 and BDN-1 looked good. Trials of forage potential of Lathyrus, mung genotypes for late sowing (27 November), K response in lentil. Breeders seed of lentil, and seed multiplication of pigeonpea, C-11 sown 27 November.

Ranpur - Dinajpur Rehabilitation Center, Thakurgaon. Sandy soil, low pH. In chickpea 100 line observation trial, stands and growth were rather better than at other centers. Sown late October and many lines had been flowering for more than one month but little or no pod set due probably to excessively wet and humid conditions as rainfall in January and February had been much heavier than normal. Botrytis causing at least part of flower drop. Rhizoctonia solani, wet root rot, causing loss of stand in some areas. Good lines include P-9803,and B-110, with pronounced secondary branching; ICC 506-EB-EB, P-3552, 7385-17-2-B-BH, NEC 355, P-9929, P-22-1 and P-108-1. P-6099, very poor.

Black gram S-1 and T-9, sown 16 October mature. Pigeonpea, sown same date, good but showing flower drop due to Botrytis.

17 February - Rajbari-Saidpur-Dacca-Joydebpur

Rajbari. ICARDA eleventh Regional trial of barley - EBYT-14 and LCB-41 drying with empty heads - take-all-like disease. Also Helminthosporium though not severe. Ratia and Conquest from India and Islampur(local) appeared good.

Dinajpur - Saidpur. Farmers plot chickpea intercropped with coriander. Early pod fill and appeared to be flowering and podding normally. Little Heliothis.

Farmers plot chickpea, intercropped with sugar cane on ridges about 80 cms apart. Mixture of genotypes mostly prostrate, basal branching, small leaved with few more erect types. Flowering just started. Little Heliothis.

Plot of pigeonpea tall, kharif sown. It had been damaged by Maruca testulalis earlier but had been left and was bearing a good compensatory flush of pods. Few podfly were seen in these pods. Botrytis on flowers was evident.

Flew Saidpur to Dacca then to Joydebpur.

On our return to Dacca we were able to meet the Minister of Agriculture, Major General (Retired) Nurul Islam. He told us of the problems that Bangladesh faced in Agriculture, with instability of production and marketing being major constraints. This year is likely to be very good for rice and wheat and a surplus is expected. Such a situation is very unusual in this country and there will be problems in marketing and storing such a crop. He told us that he requires further assistance in research on pulses and groundnuts, both of which are in limited supply. He hopes to be invited to visit ICRISAT. He told of a rather chaotic situation in pesticide marketing and distribution for earlier, insecticides had been distributed free and this lead to a great deal of adulteration and wastage. Large volumes of dangerous outdated pesticides are causing disposal problems. The pesticide responsibility has now been handed back to commercial firms who will be responsible for development, distribution and sales.

B.A.R.I., Joydebpur. In the chickpea, growth was rather variable, probably a result of soil heterogeneity. Most of the recent flowers had not set pods, probably because of the recent rains and high humidity and several of the flowers were covered with fungus (Alternaria). There were only a few Heliothis larvae, but the scientists said that they remove by hand any they see.

In ICCT-DS, growth along east side was poor i.e. beginning of the four replicates. Field plan was not available but plots 105, 106, 109 and 216 appeared very good. Many of the lines were too late for these [illegible].

In ICSN-DS, plots 107, 108, 117, 118, 127, 128, 137, 138, 147, 148, 150, 151, 160, 161, 170, 171, 180 and 181 were unbordered so yields should be treated with caution. Plot 129 -G-130 questionable - too early and double-podded. JG-62 and plots 133, 134 and 139 were noted as excellent. High proportion of late lines.

Other ICRISAT materials included 130 F_2's of which 850/CPS-1/P-378 and L-550/B-110/Annigeri combinations were good, compared with Sabur-4, the local check,which was later and poorly grown. F_3 trial had very patchy growth but 104 was segregating early plants. Selected single plants to be grown as F_3 progenies in 1981-82. Materials obtained from Hissar were much too late.

ICRISAT F_4's had been very late in 1979-80. F_5 bulks had given very poor emergence due to waterlogging this season.

Regional Yield Trial (large) - very pronounced gradient along replicates with poor growth at south will confound interpretation of results. Would have been better had replicates been 'blocked' rather than sown as strips.

Regional Yield Trial (small) - 51 entries but has in fact been sown as three separate randomised blocks and must be analysed as such as there is again a very pronounced gradient with poorer growth in the comparison of Entries 1 to 17. Most of the early entries were among these. JG-74, P-436, ICCC-1, NEC-750 and 7357-22-B-BH were excellent. Entries in order are:

BDN 9-3	BG-203	G-130
JG-74	P-324	NEC-1091
Chafa	P-1209-1	ICC 1029
N-59	JG-221	B-106
CPS-1	P-1353	NEC-974
NEC-240	BG-212	H-208
P-99	P-4083	ICCC-10
T-103	P-6067	ICCC-16
P-436	T-3 (Gwalior)	7357-22-3-B-BH
P-1081-1	P-1805	G-543
ICCC-1	F-61	HNS-4
WR-315	F-370	NEC-900
Pant G-104	H-556-1	NEC-249
H-223	NEC-850	L-550
NEC-750	P-217	K-850
K-468	JG-62	Sabur-4
Pant G-114	P-18	

Germplasm evaluation - 80 entries - mainly kabulis from ICARDA but 20 from ICRISAT germplasm. Earliest is Harigantas from Gujarat which flowered in 33 days. Very poor emergence in some plots. In 100 lines observation trial stand and growth were patchy but generally poor. Forty-one lines sent through USA from Washington were all late and straggly and obviously of little value for these conditions.

18 February - Joydebpur - Ishurdi

By road and river ferry with Dr. Wahhab. Joydebpur to Dacca/Aricha Road. Paddy area with teak plantations similar to area described on way to Jamalpur. Along Dacca/Aricha Road mainly wheat belt. Lathyrus extremely important in some areas where it occupied up to 70% of area. Being grazed by animals. Other crops are mustard, linseed, tobacco, barley, lentils, chickpea, broad beans, coriander, potatoes, sweet potatoes in approximate order of importance. Mustard most often intercropped Lathyrus, linseed and chickpea and being harvested.

Similar pattern occurs also between Nagarbari and Ishurdi. Lentils and Lathyrus frequently intercropped with linseed and barley and chickpea with barley. Linseed very important.

In a farmers plot near Pabna, chickpea intercropped with barley - poorly grown. Early pod-fill. More Heliothis larvae and pod damage than seen previously. Fungus on dead flowers with pod set generally very poor.

Ishurdi-Regional Research Station of B.A.R.I. Officer-in-charge Mr.Ashraful Islam. Station well organised and maintained. Also met Mr. Abdul Khaleque and Mrs. Monira Begum.

Chickpea trials were showing extremely vigorous and uniform vegetative growth with flowering just commencing in earliest lines. No sign of Heliothis. Botrytis grey mould was evident on flowers and severe on foliage on one early sown plot of Pabna local. Incidence is increased by too much vegetative growth which has occurred in very wet conditions encouraged by irrigation, given at 25 days after sowing.

In ICCT-DS, sown 28 November, most lines commencing flowering, including the local check, Pabna local. Tip distortion observed on some lines - K-850, 78023, 79073. Previously observed by Drs. Nene and Green but causal agent not identified - appears to be associated with K-850 but also seen on Sabur-4.

ICSN-DS, sown 1 December. Derandomised with 2 reps. and 1 row per plot. Standard checks sown only once instead of after every 10 entries. Plots 108, 132 and 139 unbordered.

Regional Yield Trial (small) - again laid down as three separate trials and should be analysed as such. Sown 27 November and earliest entries flowering. Botrytis inside plant canopy. L-550 has germinated poorly in all three replicates.

Regional Yield Trial (large) - sown 20 November. Tip distortion on K-850, Sabur-4 and ICCC-3. All lines flowering except 7909.

100 line observation trial - sown 19 November. NEC-451 compact growth. Emergence and growth excellent in plots 1 to 65, 77, 94-100. Remaining

plots - emergence absent or very poor. A trial to screen fungicides for Ascochyta blight control had been damaged by rats and had poor growth and stand. An early November sown multiplication of Pabna local showed severe Botrytis. There were other multiplications of Pabna local and one of Radhey.

Lentils included 100 entry observation trial with three replicates. Mostly ICARDA germplasm from India and Iran other ICARDA materials having proved to be too late in 1979-80. Several lines - 1705, 1706, 1708, 1710 and 1717 - had failed to germinate in all three reps. 2487 ex India was showing severe Botrytis. Trial not randomised. Also multiplication of Pabna local and L9-12 both rather earlier than the ICARDA materials.

A small trial of pigeonpea was to be harvested next day. This had been sown for the kharif and was more than 2m tall. Several pods had all of the seeds damaged by podfly (with black puparia). Bunchy growth on some terminals with yellow small, leaves was probably caused by jassids which were present in large numbers. In the evening some of the flowers were literally covered with thrips. Two plants showing typical wilt symptoms were observed.

A groundnut trial (test of fungicides against leaf spots) had many whitefly (said to be Bemisia tabaci) and some thrips. Little disease was seen.

19 February - Lahurdi-Joydebpur

Farmers plot chickpea - 5 miles SE of Aricha. Well grown, mid pod-fill but flowering poor. Botrytis on flowers and foliage and causing flower drop. Little Heliothis damage. Genotype predominantly basal branching.

Farmers plot chickpea - 20 miles from Aricha. Intercropped with mustard, poor stand but well grown. Mid pod-fill but pod set poor due to Botrytis, on flowers and foliage.

20 February

Dr. Reed visited the Entomology Division where Dr. Idris Ibn-Al-Azim is acting head during the absence of Ameerul Islam who is in the Phillipines finishing a Ph.D. on the biocontrol of stem borer. The Entomology Division has a total of 12 entomologists at the Joydebpur headquarters and other entomologists posted to the regional centers. Responsibilities are generally divided on a crop basis, but with some working on purely toxicological problems.

Heliothis armigera was not listed in any records but H.assulta was (from tobacco). Another lepidopteran borer of black gram was listed as Heliothis sp. but it looked to be most unlike other Heliothis spp. Some other insects were not correctly identified.

The Division is currently being reorganised, with movement of books and materials. The insect collection has deteriorated very badly, with most of the soft bodied insects having been eaten away, leaving a pin and label. Most of the entomologists therefore have no means of identifying their pest insects. However, two scientists have recently returned from a course at the Commonwealth Institute of Entomology, London where they learned the techniques of insect preservation and identification and so it is hoped that it will now be possible to rejuvenate the reference collection.

Bangladesh has banned DDT and some other chemicals, and several of the other cheap and effective chemicals are not available. A decision to ban DDT in Bangladesh at this time may not be in the best interests of the people for it is the cheapest and most effective pesticide where it has been overused. Bangladesh does not need to use very toxic and/or very expensive pesticides while the old cheaper pesticides are still effective.

Dr. Nene visited the Plant Pathology Division and held discussions with Dr. Hamizuddin, Acting Head, and Mr.Abu Bakr, formerly a pulse pathology trainee at ICRISAT. The work is pathogen oriented rather than crop disease orientated. The division needs considerable strengthening by way of equipments and additional training.

In the afternoon we flew back to Delhi from Dacca. We were taken to the airport by Dr. Kaul who looked after us very well throughout our stay. Dr. Kaul's enthusiasm is undoubtedly having a very large beneficial effect in advancing the pulse program in Bangladesh. We were not convinced that either chickpea or pigeonpea will become the dominant pulse in the country for Lathyrus and lentils are very popular and relatively easy to grow in the humid conditions there. However, there is obviously a ready market for our pulses and substantial production of chickpea, and we should continue to support the Bangladesh efforts.

For internal circulation only

TRIP REPORT

Trip to Bangladesh

March 16-24, 1980

Jagdish Kumar

Places visited:

- ngladesh Agricultural Research Institute (BARI), ydebpur
- ngladesh Agricultural Research Council (BARC), Dacca
- SI Regional Research Station (RRS), Ishurdi
- stitute of Nuclear Agriculture (INA) experiments anted at the Sugarcane Research Institute (SRI), Ishurdi
- RI Regional Research Station, Jamalpur
- A experiments planted at Jamalpur

Persons contacted:

BARI

Dr. A.K. Kaul, World Bank Consultant & Joint Coordinator Pulses
Dr. K.M. Badruddoza, Director
Dr. S.H. Khan, Professor & Coordinator, Pulses
Dr. M.A. Wahab, PSO, Breeder
Mr. M. Quadir, SO, Breeder
Mr. Q. Islam, SO, Breeder
Dr. Khaleque, Oilseeds Breeder

INA

Dr. M.A.Q. Shaikh, Breeder
Mr. Hyder Ali, Field Assistant

Mennonite Central Committee (MCC)

Mr. R.P. Dick

BARC

Dr. Muslehudin Ahmed, I/c Member Director

Bangladesh Agricultural University (BAU)

Dr. Z.H. Bhuiya, Soil Science
Dr. L. Rehman, Breeder
Dr. M. Karim, Agronomist

Dacca University

Dr. A.S. Islam and his students.

Ministry of Agriculture, Bangladesh

Maj. Genrl. (Retd.) Nurul Islam, Minister of Agriculture
Dr. Iqbal, Minister of State for Agriculture

BARI: RRS, Ishurdi

Dr. Ashraful Islam, PSO (Breeder)
Dr. M.A. Khaleque, SO

SRI, Ishurdi

Mr. Dilwar Hussain, Agronomist
Dr. Hamid Miah, PSO, Entomologist

BARI: RRS, Jamalpur

Mr. Fariduddin Miah, SSO, Breeding
Mr. M.D. Alamgir Miah, SO, Breeding
Mr. Surjya Kanta Saha, SO, Breeding

Summary

Coordinated effort for the improvement of chickpeas at BARI is a welcome initiative.

Chickpeas almost always follow rice so development of package of practices for this rotation is necessary.

Short to medium duration cultivars perform well in Bangladesh; this has been characterized by ICRISAT nurseries, ICCT-DS and ICSN-DS. Introduction and adoption of such cultivars should be beneficial.

With present growing conditions and management, it is unlikely that long duration desi types and kabuli types can make a headway.

Diseases identified by Dr. Nene and chickpea rust (Uromyces sp.) are a potential threat for the production of chickpeas in Bangladesh.

Training of personnel in chickpea crop improvement work is likely to prove beneficial.

Improvement in seed handling and storage facilities needs to be done.

I was invited to visit International Chickpea Nurseries and other chickpea material in Bangladesh by Dr. A.K. Kaul, Mr. Richard Dick (MCC) and Dr. M.A.Q. Shaikh (INM) to assess the varietal picture of their third important pulse crop. Dr. Kaul coordinated my trip.

We have provided 159 CB lines, 16 elite cultivars, 2 sets of ICSN-DS and 159 tall advanced breeding strains to Dr. A.K. Kaul. This material is planted at several locations. Their local cvs are Faridpur-1 and Sabour-4. They have rather limited variability in their local collections which they have collected and had planted 47 strains on their farm.

BARI-Joydebpur

They had planted 1 row each of 159 CB lines and a replicated trial of 16 elite cultivars in the last week of November. P-436, ICCC-3, Chafa, Annigeri and JG-62 appeared promising. A five-cultivar trial of strains selected from ICCT-DS sent by ICRISAT in previous years showed that two ICRISAT lines, 73167-5-3-8-BP (JH-62 x C-496) and 73114-16-2-2P-BP (850-3/27 x GW-5/7), and cultivar 850-3/27 were performing well. ICRISAT trials conducted by MCC last year showed that these yielded more than twice as much as their local cvs. Bangladesh organisations are proposing to multiply and import larger quantities of seeds of these lines. Cultivar P-324 was good but showed indeterminate growth probably because of late rains.

They have three ICARDA nurseries: Chickpea Regional Nursery (CRN), Chickpea International Screening Nursery (CISN), and F_4 yield trial. Some entries in CISN were promising but the best appearing one MEC-1091 was desi type. Most of the material was late in maturity and may not be suitable for those conditions.

In my view short to medium duration strains appeared promising, although in December 12 sown material only short duration lines showed promise. Considering the importance of rice in Bangladesh, chickpeas will almost always follow that crop in rotation. Sometimes the land is under water and is not available until very late, say early December for chickpea sowing. I discussed this with Drs. Kaul and Khan and they have agreed to conduct studies on this aspect.

As mentioned in Dr. Nene's report (January 1980) I could see zinc deficiency symptoms, collar rot (Sclerotium rolfsii), and root rot (Rhizoctonia solani) The plants having iron deficiency may have already recovered by the time of my visit.

I observed chickpea rust (Uromyces spp.) rather widely although the intensity was not high. In some cases almost half of the dorsal surface of affected lea was pink and the ventral surface full of ruptured pustules. Considering warm humid conditions in Bangladesh if maturity of the crop is delayed rust can possibly be an important disease. The disease could be seen on local and other material.

They found a very big leaved compound leaf plant in Chrysanthifolia variety from Maharashtra. It was flowering but not setting pods. By its stature it could be a polyploid. They have put one of these plants in a glass house.

Dr. Kaul arranged my meeting with Dr. K.M. Badruddoza, Director, BARI. We discussed chickpea improvement program in Bangladesh. He was quite appreciative of ICRISAT's help in this direction and assured Dr. Kaul all administrative help in his initiative for improvement of pulse crops.

Personally I feel that administrative setup for the improvement of chickpea crop in Bangladesh is good. I met several newly appointed scientific officers for pulses at various stations. However, most of them would need some exposure to a good chickpea improvement program to be more effective in their new jobs.

BARC

I was invited to attend a meeting on pulses called by BARC on March 20, 1980 under the Chairmanship of Dr. Mushlehudin Ahmed, Member Director - Crops. It was attended by the representatives of organisations involved in pulse improvement work in Bangladesh. They fixed priority in various pulse crops for identifying high yielding cultivars, management practices and prevention of losses by pathogens and pests. Dr. Kaul's proposal for allotment of US $ 200,000 for pulse research was approved. There was great debate on US $ 350,000 proposal for soybean research, which was not approved. The reason given was that soybean has much less acreage than even the minor pulses. The coordinators were asked to prepare plans for increased emphasis on high yielding cultivars, low toxin content (in Lathyrus) improved management and disease and pest resistance in Lathyrus, lentils and chickpeas. They were highly appreciative of ICRISAT's role in chickpea improvement in Bangladesh and the chairman made a special mention of that in the meeting. I assured them of ICRISAT's continued cooperation for chickpea improvement.

On March 21 I had an opportunity to meet with Maj. Gen. (Retd.) Nurul Islam, Bangladesh Minister of Agriculture, and Dr. Iqbal, Minister of State for Agriculture. Mr. Islam emphasised the need for increasing pulse production

in Bangladesh and was very happy to learn of ICRISAT's role in helping Bangladesh achieve their objective. He assured Dr. Kaul of all possible help and in fact agreed to allow large imports of chickpea seed from India, which has shown good performance in several parts of Bangladesh.

BARI-RPS, Ishurdi

The crop was in podding stage. Chickpea trials were grown in field that had been green manured in the previous season and later urea was sprayed (on chickpea crop). There was too much vegetative growth and crop had lodged. In other fields the crop growth was good. There were some symptoms of zinc deficiency. They had sprayed one half length of one row plots of a few lentil entries with 0.5% solution of zinc sulphate on the suggestion of Dr. Nene. There was some recovery in plant growth.

The ICSN-DS supplied by ICRISAT was planted as single rows in two replications, rather than two row plots as suggested by us. Most of the entries appeared good but it was too early to make a visual estimate of their performance. One hundred and fifty-nine tall type breeding lines from ICRISAT were grown here. Most of these had grown over one meter tall because of high inputs as mentioned earlier.

IRA material at BARI, RRS and SRI

They have ICCT-DS with 16 entries and 4 replications. The crop was still green. The ICSN-DS with 81 entries was planted as 5 feet rows in two replications. Dr. Shaikh was not there and I could not decode his labels. However, entry nos. 122, 124, 173, 176, and 177 were very promising. The last two were JG-62 and P-436 and appeared best. In the 118 germplasm entries nos. 91, 116, and 113 had very good podding.

I also saw sugarcane-chickpea intercropping, chickpea had very good vegetative growth. I could see rust pustules and some killing by root rot. If the crop is not affected by diseases, one could expect a good chickpea crop there. There was good nodulation of chickpeas in the intercropped area.

There was a trial at Ishurdi where plots of only desi check Faridpur-1 existed, no trace of other cultivars. I was told that the other material was white seeded and did not germinate. I enquired about the seed storage and it appeared that the seed of the white seeded cultivars was stored in tins and it could have had more moisture at harvest time which resulted in seed inviability. In Bangladesh, in general, rains come early and drying of seed properly is a problem and there appears to be considerable loss in viability of seed.

Bruchids seem to infect chickpeas in the field itself, but the major infection is in stores. I suggested naphthalene balls be put in properly dried seed.

Read a few letters from HAVR 7.09.90

BARI-RRS, Jamalpur

It is another good place for rabi pulses. There was one set of ICSN-DS and 107 other lines. Everything was planted in two replications, plot size was 1 row 5 m long. The crop was in the podding stage. Here again early entries were performing well. The date of planting was November 11.

They had planted an irrigation and fertilizer experiment with their local cultivar Sabour-4. There appeared to be no apparent effect of nitrogen. There was more rust on irrigated than on unirrigated plots.

In general root rot was a problem. Nodulation was good. Mr. Alamgir Miah informed me that he observed maximum nodulation in N20 and P_2O_5 40 doze.

INA Experiments, Jamalpur

Dr. M.A.Q. Shaikh had planted some of his mutagen treated chickpea material. The germination was very poor and plant growth was stunted.

Dr. Shaikh claims to have developed a chickpea mutant (Y rays) line from Faridpur-1, which has 4% higher protein and 19% higher yield than the parental line. The seed size appeared to be small.

Pigeonpeas: Forty-six lines from ICRISAT were grown at Joydebpur. Prabhat and BDN-1 were promising. Some plants were affected by a disease. The symptoms were: small leaves, light green in color. The leaves were thin and leathery. In some other plants leaves were chewed by insects probably hopper (green in color).

December-sown ICPL-4 had good podding and was about 25 cm tall, while June-planted was very tall and had only a few pods.

Fifteen lines which were segregating were being advanced by selecting individual plants but there was no pollination control.

Dacca University

On 23 March Dr. A.S. Islam, Professor of Botany, who had got some chickpea seed from ICRISAT, invited me to see his students' material. The material was still green. They had rather low success with seed setting in crosses. I showed them how to make crosses and explained the environmental conditions conducive for higher seed set. On the request of Dr. Islam I gave a seminar to the postgraduate students on Chickpea Breeding with special reference to Breeding for Disease Resistance.

MCC,

I was unable to visit BAU, Mymensingh and/Feni, Distt. Noakhali, where also our trials are located. Fortunately for me, Dr. M.A. Karim (BAU) and Mr. Richard Dick (MCC) were present at the BARC meeting on pulse improvement in Bangladesh and I had fruitful discussions with them.

JK:ajr