

03541

SUMMARY RECORD

**TRAINING PROGRAM FOR IN-SERVICE TRAINEES
AT
ICRISAT**

**Training in
Crop Improvement
Crop Production and Extension Techniques
with special reference
to
Sorghum, Pigeonpea, Chickpea
and
Farming Systems**

15 September 1979 to 15 March 1980



ICRISAT

International Crops Research Institute for the Semi-Arid Tropics

ICRISAT Patancheru P.O.

Andhra Pradesh, India 502 324

C O N T E N T S

		Page
Training Program	..	3
Season and Rainfall	..	4
Trainee Experiments	..	7
Syllabus	..	13
Special Training Programs	..	15
Seminars	..	20
Educational Tours	..	23
Library, Book Supply & Films	..	25
Staff List	..	25

TRAINING PROGRAM

The post-rainy season program this year commenced with 22 in-service trainees from Thailand, Kenya, Nigeria, Sudan, Afghanistan, Sri Lanka, Bangladesh, Fiji and India. We had trainees for the first time from Fiji and Afghanistan. This is the first time we had a regular six-month training program in pigeonpea breeding with 7 trainees. There were two trainees for chickpea breeding, five for sorghum improvement including one in cereal entomology and one in cereal pathology, seven in farming systems and one in crop production techniques.

A pre-training evaluation was conducted to identify training needs of the individuals with reference to the stated objectives in their training proposals. As a result, basic skills in land measurement, calibration of seed, fertilizer and other chemicals, germination tests, soil sampling and familiarity with locally available seed material and fertilizers were given by conducting field practicals and laboratory exercises. Overview talks on the ICRISAT farming systems program and crop improvement in sorghum, pigeonpea, chickpea and groundnut were arranged. Beginning lessons on experimental design, layout of demonstrations, trials, and research techniques were given in the first eight weeks. Discussions and field visits on crop husbandry in SAT India, South-East Asia, Africa and Middle East countries with special reference to the climatic conditions in the respective countries and the post-monsoon season in India were organized. The trainees were encouraged to select and develop experiments and trials which they would conduct during this season. They conducted 13 experiments on sorghum, 7 on pigeonpea and 2 on chickpea. The trainees in the farming systems worked with scientists in the intercropping, agro-climatology, soil fertility and land and water management sub-programs. Four trainees worked for a short time in the groundnut program. One trainee worked with the cartography technicians using her country (Thailand) data to develop climatological maps. One trainee in cereal entomology worked on testing color traps for attracting sorghum shootflies. Another person studied the effect of chemicals on the pod setting of male sterile pigeonpea lines. In addition, varietal, fertilizer or plant density trials or a combination of these factors were studied on sorghum, pigeonpea and chickpea.

After establishing their field trials, the trainees were assigned to their chosen areas of specialization. In general they attended field work in the forenoons and laboratory and lectures in the afternoon. They participated in the seminars, workshops and other meetings of scientists on the campus.

There was a study tour for about 12 days in January-February, 1980 to acquaint them with the cropping systems in the post-rainy season, the water management programs, seed production and processing, extension and crop production programs in the States of Andhra Pradesh, Karnataka, Maharashtra and Goa, visiting agricultural research stations, universities, command area development projects, and farmers' fields.

The break-up of the training period is given below

	<u>Days</u>
Total duration of the course (September 15 to March 15)	183
General orientation, evaluation etc.	4
Training at ICRISAT Center	107
Study tour, field trips	15
Saturdays, Sundays and other holidays	57

The bio-data of the trainees are given in Table 2.

SEASON AND RAINFALL

This is the second year of developing a post-rainy season six-month training program for a sizable group commencing from September 15, 1979. The field intended for planting the post-rainy season crops of sorghum and pigeonpea was not free till end of November. The field was disked and laid into narrow ridges (0.75m) in the third week of November. Fertilizer was applied and sorghum was planted on November 23 and pigeonpea on 27th. Irrigations were given on November 25, 26, December 13, 14, January 3 and February 9. Intercultivation and refreshing ridges were done on December 5, hand weeding and thinning were done from December 19 to 27th. Endosulphon was sprayed on December 20 and January 25 to control stem borer and defoliating caterpillars. There was severe shootfly damage in almost all plots except M 35-1 (Maldandi) and SPV 86 in spite of Feurodon granules application in the seed furrows prior to sowing.

The weather conditions after November were generally dry with relative humidity about 60% up to end of January. Hours of bright sunshine were more than 8. Open pan evaporation gradually increased from 4 mm to 10 mm a day by the end of February '80. The wind speed was about 8 KM/hr. The maximum temperature ranged from 35.4 to 24.9° and the minimum ranged from 23.5 to 11.0° during the period under review. Rainfall record from September 16 to February 29 is given below.

Table 1. Rainfall recorded in mm during the post-rainy season 1979-80

Period	Normal	1979-80 (Actual)	1978-79 (Actual)
September 16-30	181*	268.5	36.7
October	67.0	20.0	70.5
November	23.5	80.1	11.0
December	6.0	-	1.0
January 1980	5.5	-	-
February	11.0	-	41.0
March	12.5	NA	-

* for full month. NA: Not available.

Table 2 : Statement showing the biodata of the trainees

Sl No	Name	Country	Age (Yrs)	Qualifications	Experience (yrs)	Program of training at ICRISAT	Date of arrival at ICRISAT
1	Pote Pimpanit	Thailand	28	B.Sc (Ag)	3½	FS	22.9.79
2	Chairoj Wongwi-watchai	Thailand	36	B.Sc (Ag)	11	FS	"
3	Katin Tritrung-treekun	Thailand	34	B.Sc (Ag)	10	FS	"
4	Narong Bummerowd	Thailand	33	B.Sc (Ag)	8	FS	"
5	Miss Sumitra Maneemaroot	Thailand	29	B.Sc (Ag)	7	FS	"
6	Miss Taksina Pinsuwan	Thailand	24	B.Sc (Ag)	3	FS	"
7	John Cabbis Olela	Kenya	34	Dip in Agr.	13	CI(Cer.Ent)	15.9.79
8	Dickson King Otieno	"	28	Higher Sec.	6	CI(S)	23.9.79
9	Patrick Lusamamba	"	37	Sec. Sch.	9	CI(S)	27.9.79
10	Geraldo Panyuko Okomba	"	39	Sec. Sch.	16	CI(S)	27.9.79
11	Matute Makoge Muangalene	Nigeria	25	Vocational Trg.	2½	CI(Cer.Path)	17.11.79
12	El Tigani Siddeeg Mohamed	Sudan	35	Sec. Sch.	15	CI(CP)	24.9.79
13	Habibi Assadullah	Afghanistan	30	B.Sc (Ag)	5	CI(CP)	9.10.79
14	H M Muthu Banda	Sri Lanka	43	Dip in Agr.	16	FS	16.9.79
15	W N Illangasinghe	"	41	Dip in Agr.	21	CP	16.9.79
16	Chowdhury Doza Md Sarwar	Bangladesh	26	B.Sc (Ag)	1	CI(PP)	14.10.79
17	Kitti Wongpichet	Thailand	26	B.Sc (Ag)	3½	CI(PP)	13.10.79
18	Nirat Vanitvatna Lumlog	"	29	B.Sc (Ag)	6	CI(PP)	7.11.79
19	Hemant Kumar	Fiji	24	Dip in Agr.	2	CI(PP)	14.10.79
20	Dr.S.Venkateswarlu	India	33	M.Sc(Ag),PhD	6	CI(PP)	14.10.79
21	Anil Kumar Mishra	India	27	B.Sc (Ag)	2	CI(PP)	15.10.79
22	Jokhu Ram	India	27	B.Sc (Ag)	2	CI(PP)	14.10.79

NOTE. FS: Farming Systems; CI(S): Crop Improvement - Sorghum;
 CI(CP): Crop Improvement - Chickpea; CI(PP) : Crop Improvement - Pigeonpea;
 CP: Crop Production.

The trainees laid out 10 sorghum trials on BA3A field on a randomized block design (6 x 4) with 6 treatments. Each experiment was 18 m x 32 m with 4 rows of 7 m length in a plot. Except in the fertilizer trials, a general fertilizer rate of 100-17-0 of N-P-K was applied as ammonium sulphate/urea for nitrogen and super phosphate for supplying phosphate. Diammonium phosphate 18-20-0 was also used. One fertilizer-cum-plant population trial on sorghum was conducted with 12 treatments and 4 replications under the guidance of the scientists in the farming systems research program.

Six pigeonpea experiments were planted on BA3A field in a randomized block design (6 x 4) with 6 treatments. Each experiment was 18 m x 20 m with 4 rows of 4 m length in a plot. Fertilizer was applied at the rate of 18-20-0 for 3 experiments while the other three had no fertilizer.

Two chickpea experiments were planted in the breeding program by the two trainees in BT3 field screening varieties for early planting.

Details of trainee experiments follow:

Table 3 Trainee Experiments 1979-80

Crop: Sorghum

Soil Type: Vertisol (BA3A)

Sl. No.	Name	Country	Pro-gram	Title of Experiment	Design	Land Ma-nagement	Treatments	Fertiliser application		Date of sowing
								Rate	Date	
1	Dickson King-Otieno 79151	Kenya	CI	Varietal trial	RCBD 4 Reps 6 Treat	0.75 m ridges	CSH 8R M 35-1 CS 3541 E 35-1 Moguthi SPV 86	N-P-K 100-17-0	22-11-79 28-12-79	25-11-79
2	Patrick Lusamamba 79152	"	CI	"	"	"	M 35-1 SPV 86 CSH 1 CSH 7R CSH 8R CSH 5	"	22-11-79 28-12-79	"
3	Gerald P. Okomba 79153	"	CI	"	"	"	SPV 86 CSH 1 E 35-1 CSH 8R CSH 7R M 35-1	"	22-11-79 31-12-79	"
4	Matute Makogo 79154	Nigeria	Cereal Path.	"	"	"	E 35-1 R 16 CSH 8R CSH 7R CSH 1 CSH 5	"	22-11-79 28-12-79	"

Soil Type: Vertisol (BAJA)

Crop: Sorghum

Pl. No.	Name	Country	Pro-gram	Title of experi-ment	Design	Land Ma-nagement	Treatments	Fertilizer application		Date of sowing
								Rate	Date	
N-P-K										
5	Pote Pimpanit 79155	Thailand	FSP	Yield trial	RCBD 4 Reps 6 Treat	0.75 m ridges	M 35-1 SPV 86 CSH 8R CSH 1 E 35-1 CSH 5	100-17-0	22-11-79	25-11-79
6	Katin Tritrungkreekun 79156	"	"	"	"	"	M 35-1 SPV 86 CSH 8R CSH 5 CSH 6 CSH 7R	"	23-11-79 28-12-79	"
7	Narong Bummerond 79157	"	"	Population trial with 2 sorghum varieties	"	"	CSH 8R, SPV 86 <u>Population levels</u> 100,000 150,000 200,000 plants/ha	"	22-11-79 28-12-79	"
8	Sumitra Maneenaroat 79158	"	"	Fertilizer trial with 2 sorghum varieties	"	"	CSH 8R, SPV 86 <u>Nitrogen levels</u> 50, 100, 150 kg/ha with 17 P	--	22-11-79 28-12-79	

Crop: Sorghum

Soil Type: Vertisol (BA3A)

Sl. No.	Name	Country	Pro-gram	Title of experi-ment	Design	Land Ma-nagement	Treatments	Fertilizer application		Date of sowing
								Rate	Date	
N-P-K										
9	W.N. Illangasinghe 79159	Sri Lanka	CP	Fertilizer trial	RCBD 4 Reps 6 Treat	0.75 m	CSH 8R Nitrogen levels 60, 80, 100, 120, 140, 160 kg/ha with 17 P	-	23-11-79 25 & 31-12-79 27-11-79	
10	H.M.Muthu Banda 79160	"	FSP	Need control trial	"	"	CSH 8R, M35-1 No weeding Hand weeding Atrazine @ 0.5kg a.i. per ha	100-17-0	22-11-79 31-12-79	"
11	Chairoj Mongviwatchai 79161 & 79162	Thailand	"	Nitrogen and population trial under irrigated and rain-fed conditions	RCBD 4 Reps 12 Treat (32x5.4m each plot)	"	CSH 8R Population levels 60,000 120,000 180,000 plants/ha dose N levels 0, 40, 80 and 120 kg per ha with 17 P	As a single dose	23-11-79 30-11-79	79

Soil Type: Vertisol (BA3A)

Crop: Pigeonpea

Sl. No.	Name	Country	Pro-gram	Title of experiment	Design	Land Ma-nagement	Treatments	Fertilizer application		Date of sowing
								Rate	Date	
N-P-K										
1	Hemant Kumar 79163	Fiji	Pigeon pea breeding	Population trial with 2 varieties	RCBD 4 Reps 6 Treat	0.75 m ridges	Pant-A3, T-21 Population levels 100,000 200,000 300,000 plants/ha	18-20-0	23-11-79	27-11-79
2	Chowdhury Doza Md. Sarwar 79164	Bangladesh	"	"	"	"	Prabhat, Pant A2 Population levels 100,000 200,000 300,000 plants/ha	"	"	"
3	Anil Kumar Mishra 79165	India	"	"	"	"	Pant A3, UPAS-120 Population levels 100,000 200,000 300,000 plants/ha	"	"	"
4	Jokhura 79166	India	"	"	"	"	Pusa Agati, T-21 Population levels 100,000 200,000 300,000 plants/ha	No fertilizer	"	"

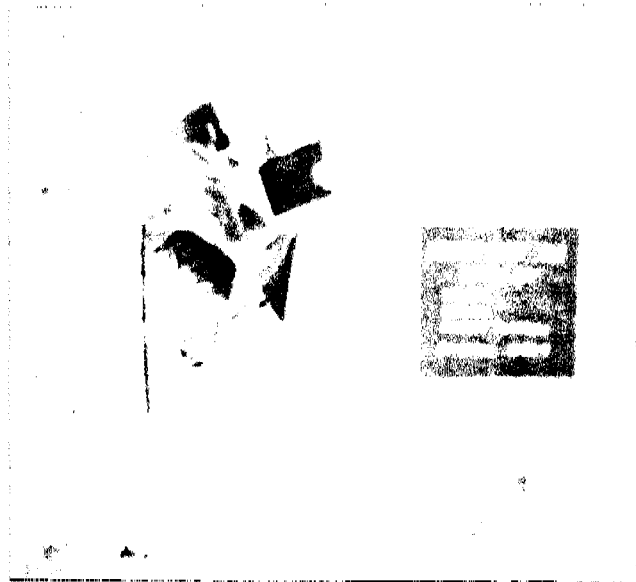
Crop: Pigeonpea

Soil type: Vertisol (BA3A)

Sl. No.	Name	Country	Pro-gram	Title of experi-ment	Design	Land Ma-nagement	Treatments	Fertilizer application		Date of sowing
								Rate	Date	
N-P-K										
5	Nirat Vanitavatana 79167	Thailand	P.Pea breeding 2 varie-ties	Population RCBD trial with 4 Reps 6 Treat ties	0.75 m ridges	Pusa Agati, Pant A-2	Population levels	No. fer-	-	27-11-79
								100,000		28-12-79
								200,000		
								300,000 plants/ha		
6	Kitti Nongpichet 79168	"	"	"	"	Prabhat, UPAS-120	Population levels	"	-	"
								100,000		
								200,000		
								300,000 plants/ha		



Matute with Dr. Diwaker identifying insect damage.



Hemant Kumar taking notes on pigeonpea plant density.



Olela and Dr. Sethu Reddy observing shootfly catch on colored traps.



Dickson and Chowdhury identifying insect damage on sorghum.



Trainees observing sorghum stemborer damage.



Katin and Patrick thinning in sorghum varietal trial.

SYLLABUS FOR LECTURES AND FIELD PRACTICALS

Each trainee's need is different, therefore, we developed a special syllabus for individuals in each of the three groups. However, some areas considered as the core syllabus to all trainees are listed below:

General

Land measurement - visual estimation compared to actual measurement. Measurement of land slope, establishing a rectangular plot, layout of experiment/demonstration plots of a given size. Calibration of seed and fertilizer per unit area and weighing fertilizer per plot and per row for application. Estimation of crop yield and techniques of sampling plots for yield estimation.

Meteorology

Weather and climate, climate of the semi-arid tropics, Indian monsoon seasons and cropping patterns. Meteorological instruments, recording weather elements - use of weather data in crop production. Rainfall patterns of Africa, and SAT, cropping patterns and selection of crop and cropping systems to fit climatic zones.

Soils

The soil-plant-atmosphere system, soil texture and structure; water and air movement; pore space and soil moisture measurement in soil profiles.

Soil types in ICRISAT center and semi-arid tropics; soil sampling procedure; demonstration of sampling techniques.

Farming Systems

Cropping systems; single or sole cropping; multiple cropping, relay cropping, mixed cropping and intercropping; perennial cropping. Plant nutrition, fertilizers and their composition, use, care in handling and nutrient deficiency symptoms.

Tillage; land preparation methods in alfisols and vertisols; implements for primary tillage, forming seed beds, local bullock drawn implements used on watersheds e.g. tropiculture with accessories.

Land survey; slope estimation; graded and contour bunds; run off plots, measurement of run off and soil loss.

Experiments on watersheds in FSRP and steps in technology.

Statistical Methods

Mathematical symbols, use of logarithms, explanation of basic concepts like population, sample, variable, frequency distribution, normal curve, measures of central tendency (mean, median, mode), dispersion, variance, standard deviation, standard error, coefficient of variability, significance tests, error, null hypothesis, standard error of difference of two means and least significant difference.

Experimental techniques, location and layout of experiments, treatments, replications, experimental error, randomization and replication, care in field operations from land preparation to harvesting, threshing and recording yield data. Experimental designs; Randomized block design and Latin square, analysis of variance; F test, 't' test and LSD, and missing plot technique. Factorial designs and Lattice designs and scientific report writing.

General Botany

Plant parts and their functions in sorghum, pearl millet, pigeonpea, chickpea and groundnut; floral morphology, anthesis and pollination, fertilization, seed development, mitosis, meiosis, microsporogenesis and megasporogenesis. Plant growth stages, yield components, developmental biology (stem, root, flower and seed) and germination of seed. Floral biology and its implications in plant breeding and production.

Crop Physiology

Basic plant processes; concepts of optimum and limiting factors; source and sink concepts - crop growth, development and yield; ideotype. Plant nutrition; physiology of plant nutrient uptake.

Crop Protection

a) Entomology: Major pests of sorghum, pigeonpea, chickpea and groundnut; pests of stored products; control of pests.

b) Plant Pathology: Major diseases of sorghum, grain legumes and groundnut.

c) International quarantine regulations.

Agricultural Economics

Social change mechanisms, prices, marketing, storage, distribution, farm budgeting techniques, determining field costs of inputs, and economic analysis of experiments for deriving farmer recommendations.

Extension Education and Communication

Concepts of extension education, meaning, philosophy, principles of extension, teaching-learning principles, characteristics of adult learners, extension teaching methods, layout of demonstrations; motivation of extension workers and farmers, diffusion and adoption process, rural attitudes and resistance to change, leadership; selection of leaders, methods of training, audio-visual aids and their role in effective communication.

ICRISAT field tours

Visit to research programs in sorghum, pearl millet, grain legumes, groundnut, farming systems, plant physiology, plant pathology, entomology and economics.

CROP IMPROVEMENT

a) Mitosis, meiosis, microsporogenesis, megasporogenesis - Mendel's laws, monogenic and digenic ratios, gene interactions.

b) Quantitative inheritance; linkage, crossing over and recombination; xenia and its significance.

Plant Breeding

a) Vegetative reproduction; sterility; environmental, morphological and generational effects; genetic and cytoplasmic-genetic male sterility; hybrids and hybrid vigour; improvement of self-pollinated crops; mass selection, pureline selection, hybridization and progeny selection; back crossing and resistance breeding; hybrid production with cytoplasmic genetic male-steriles; synthetics and population improvement; improvement of cross pollinated crops; mass selection, development of inbreds, single and double cross hybrids, synthetics and population breeding.

b) Apomixis and its importance in plant breeding; polyploidy and development of polyploids; genetic male sterility, origin, development by interspecific hybridization; inbreeding depression; different types of gene actions; general and specific combining ability and the different methods of estimation and its utilization in plant breeding.

Nursery Management

Recording of qualitative and quantitative characters; layout of experiments; selection of parent material; selfing, different methods of emasculation and crossing techniques; handling of F1, F2 and F3 progenies; maintenance problems connected with it; seed testing, processing and storage, taking observations, recording and scoring techniques for pest and disease incidence measurement of leaf area, number of leaves and tillers, handling and utilization of international yield trials.

SPECIAL TRAINING PROGRAMS

1 Crop Improvement

The crop improvement trainees had regular instruction in elementary principles of plant breeding and genetics to strengthen their field experiences. The scientific staff from sorghum, pigeonpea, chickpea and germplasm sections participated in covering the subject matter supplemented by the training staff.

Sorghum Breeding

Development of populations, mass selection, half-sib family test, full-sib family test; genetic male-steriles; hybrid seed production; transferring of male sterility into other types of sorghum; breeding for shootfly and stem borer resistance; screening for striga resistance; improvement of grain quality in sorghum, techniques of selfing, emasculation and crossing; recording data.

Mr. P. Lusamamba: Hand emasculation on sorghum plant using forceps, cross pollination were practiced on the post-rainy season trial of 1979 in field B2. The trial consists of 2 replications with 30 entries and 6 rows per plot. The objective of the trial was to identify the high yielding entries for grain and fodder, drought and disease resistance. The trial was not harvested because the crop did not reach physiological maturity till end of February, 1980.

Sorghum Entomology

Screening for shootfly and stem borer; methods of infesting the screened material with the larvae of shootfly and stem borer; identification of different species of shootfly and stem borer; rearing the larvae; mating the adults in the chamber and collection of eggs for further studies, mounting the insects on slides and examining them under microscope.

Mr. J.C. Olela: The response of sorghum shootflies, Atherigona soccata, Rond. to various colors was studied stating the objectives as follows:

- a) To test the response of sorghum shootflies to yellow, green, white, black, red and blue standard colors,
- b) To test the efficiency of the colors in attracting the shootflies at 0.5m, 1.0m, 1.5m and 2.0m heights above the ground levels.

The experiments were conducted in randomized locations in sorghum fields at ICRISAT and showed that standard green coated with tangle adhesive, with fishmeal as a major attractant, at the lowest height, captured the largest number of flies throughout the three experiments. Green was further compared with a non-colored trap as the control in three other experiments and it maintained superiority of about 21% over no color.

The visual stimulus of the sorghum shootfly can well be used in field populations dynamics. Population dynamics are best examined on the basis of the total number of adults captured and is sufficient to follow the progress of egg laying. The data obtained will help in knowing the pest intensity and hence decide whether or not any control methods or operations are worth employing.

Sorghum Pathology

Identifying visual symptoms of downy mildew, ergot, smut and moulds; microscopic examination of moulds, smut and downy mildew infected plants; techniques for inoculation; screening for disease resistance; handling of a disease nursery, artificial culturing of fungus in growth media.

Mr. M.M. Matute: Field and laboratory screening was carried out for sorghum grain mold resistance. Inoculum for field screening was multiplied on autoclaved sorghum grain. Scoring for grain mold incidence was done on a 1-5 scale, where 1=no mold and 5=severe mold. Inoculum grown on toothpicks was used to screen for charcoal rot resistance. Disease notes were taken on standard rating scales for sorghum downy mildew and leaf diseases. Studies were conducted on various pearl millet diseases on screening techniques for resistance.

Pigeonpea Breeding

Importance and adaptation of pigeonpea - taxonomy and distribution - morphological variations, floral biology and breeding systems - pests and diseases - screening and breeding for grain yield for pests and diseases - screening and breeding for physiological photoperiod sensitivity. Waterlogging and salinity tolerance - quality improvement.

Dr. S. Venkateswarlu: Effect of different chemicals like Ethrel, choline chloride and gibberellic acid in different concentrations in bringing about seed setting when sprayed on the genetic male-steriles of pigeonpea was studied to ultimately utilize the technique as a contrivance to perpetuate the male sterility. In general viable pollen was not produced with any of the chemicals studied. Burning symptoms on the leaves of plants treated with the chemical 'Ethrel' were noticed. The very small pods formed with the treatment GA (125 and 150ppm) and choline chloride (400 to 600 ppm) did not produce any seeds. The profuse flowering observed with the chemical choline chloride (400 and 600 ppm) needs further confirmation and merits consideration.

Chickpea Breeding

Importance and adaptation of chickpea types, production systems and utilization - origin distribution and taxonomy of chickpea and related species - genetic resources, collection and preservation - morphological variations - floral biology and breeding systems - screening and breeding for grain yield, pests and diseases - screening and breeding for physiological photoperiod sensitivity, water logging and salinity tolerance - quality improvement.

Mr. Habibi Assadullah & Mr. El Tigani: Two varietal trials of chickpea with 64 entries in each were conducted in 8 x 8 triple lattice design to identify the high yielding varieties. Data on the characters like days to 50% bloom, plant height, number of primary and secondary branches, pods/plant, seeds/pod, grain weight and days to maturity were recorded.

Farming Systems and Crop Production

In addition to regular field observations in the experiments, the trainees were encouraged to study the experiments in the farming systems program (Table 4). Depending on their individual interests, they observed experiments in soil management including soil moisture studies, fertility management, land and water management including field preparations, cropping systems, and use of bullock-drawn implements.

Table 4 : Special Training in the Farming Systems Program

<u>Name of the trainee</u>	<u>Subject Area</u>
1. Pote Pimpanit	Pigeonpea genotype evaluation for inter-cropping system.
2. Katin Tritrungkreekun	Effect of moisture regimes in intercropping.
3. Sumitra Maneemaroot	Below ground partitioning of component crops in intercropping.
4. Narong Bummerowd	Growth and development of sorghum under differential profile moisture stress.
5. W N Illangasinghe	Timing of supplemental irrigation for chickpea, sorghum and safflower.
6. H.M. Muthu Banda	Exercises in land surveying.
7. Taksina Punsivan	Studies on crop weather interactions in sorghum. Thailand Climatology maps.
8. Chairon Wonwiwatchai	Response of groundnut to spraying of iron salt during different growth stages.

In order to develop abilities to plan, organize and supervise intensive extension programs, a series of lectures were arranged from senior staff of the State Agricultural Department. The topics covered were: intensive development projects, seed farms - seed production, multiple cropping programs; fertilizer use and organizing needed infrastructure, movement etc., and quality control.

Theory classes were also conducted covering the following topics:

1. Soil productivity and soil fertility; plant nutrient elements; essentiality of nutrients; nutrient absorption mechanisms; plant nutrient deficiencies and their symptoms.
2. Soil testing - collection of samples - tools for sampling - laboratory analysis and standards - use of soil test values for fertility evaluation.
3. Soil reaction - significance of soil pH in crop growth.
4. Nitrogen; nitrogen content in soils; gains and losses of nitrogen fixation, azofication, addition by rain, addition through manures and fertilizers; forms of soil N-nitrogen transformations in soils, immobilization, mineralization - losses of nitrogen; nitrogen management in soils.
5. Nitrogen fertilizers; content and usage; slow release nitrogenous fertilizers; nitrification inhibitors; residual effect of nitrogenous fertilizers, crop response to various sources of fertilizer N.

6. Phosphorus - Phosphorus problems in soil fertility; forms of uptake role in plants, deficiency symptoms; phosphorus fixation in soil, factors affecting P fixation, effect of soil pH and P fixation.
7. Soil water - functions - structure and related properties of water - factors affecting soil moisture retention - forces acting on soil moisture; Soil water energy concepts - Methods of expressing energy levels - classification of soil moisture - methods of soil moisture estimation.

Miss. P. Takshina: Sorghum modeling experiments were conducted to collect relevant crop, soil and weather data to develop models for quantifying crop response to environment for yield prediction. There were two genotypes M 35-1 and CSH 8-R in three replications in one field of 0.5 ha and one genotype CSH 8-R with five row spacing treatments (30, 60, 90, 120 and 150 cm) and five replications in another field of 0.5 ha. She participated in the field operations such as experimental layout, sowing, irrigation and plant population counts etc. She also collected data on dates of each leaf emergence, date of full expansion of each leaf and date of senescence and gained in measuring leaf area and photosynthetically active radiation (PAR) by using the instruments such as leaf area meter and pyranometer respectively. She learned to identify critical growth stages such as panicle initiation, anthesis and physiological maturity. In addition, she tabulated data collected from experiments on the computer.

Mr. Chairaj Won wiwatchai: (i) A field trial on sorghum was planted with the objective of finding out the response of sorghum to different plant populations and N levels under irrigated and non irrigated conditions. Due to very heavy infestation of shootfly when the crop was 2-3 weeks old, we could not maintain the population densities as desired and the trial was abandoned. However he was trained in field layout, fertilizer calibration, application, sowing, thinning etc. He took the final plant population count at the 6 week stage and also recorded the insect damage at this stage.

(ii) He was regularly visiting a collaborative groundnut expt. of soil fertility & chemistry and groundnut breeding groups in the Vertisol. Four genotypes of groundnut were grown with an objective of finding out the extent of loss due to iron chlorosis which is a major problem of groundnuts in vertisols. Two iron salts namely ferrous sulphate and sequestrine were planned at 25 days interval as foliar sprays. The first spraying was done on 18th Feb. He associated himself in the preparation of 0.5% solutions of these two salts as well as spraying @ 500 l/ha. Ways to identify the iron chlorosis of groundnuts in the field was noted. Root grub damage as well as tikka disease of groundnuts were observed.

(iii) Another collaborative trial on millet in alfisol was also observed. This is an omnibus trial of agroclimatology, environmental physics and soil fertility & chemistry. The main objective was to find out the response of millet to N levels under different moisture regimes. He observed the use of the neutron probe for estimating the moisture in the field, took soil samples from different depths for lab analysis before irrigation and observed the preparation of soil samples in the laboratory for soil N estimation.

SEMINARS

The trainees attended relevant seminars given by both ICRI SAT scientists as well as visiting scientists.

Seminars were given by the trainees after carefully studying a selected research article published in a standard journal. A list of seminars presented by them is furnished in Table 5.

During the first week of March, individual seminar presentations were organized to facilitate graphic summarization and oral presentation of the research work done by the trainees and discussion by the group. A research report was submitted by each trainee after the seminar.

Table Schedule for Seminars

Sl. No	Name	Title of research article	Author/s	Date for Seminar
1	Pote Pimpanit	Intercropping groundnut and soybean with cotton	P.K. Patel et. al.	10.1.1980
2	Chairat Kongwa Watchai	Note on the effect of nitrogen and plant density on rain fed sorghum in mar soil of Bundelkhand region of Uttar Pradesh	O.N. Mehrotra et. al.	"
3	Narong Bumrerd	Further studies on seed testing procedures for pinto seeds	M.M. Verma & N. Arora	"
4	Taksina Panrwan	Multiple cropping on uplands with pinto as main crop.	M.A. Rao & M. Prasad	"
5	John Cabbi Colela	Species of shoot flies reared from sorghum at Patancheru, Andhra Pradesh, India	L.C. Davies & K.A. Seshu Reddy	"
6	Patrick Luamamba	Studies on flowering in the parents of three sorghum hybrids	A.K. Kunjamma & K. Meenakshi	"
7	Habibi Asadullah	Relationship between grain and biological yields in chickpea (<u>Cicer arietinum</u> L.)	S. Lal	"
8	H.M. Mithu Banda	Correlation studies in paddy (<u>Oryza sativa</u> L.) Research note	K. Premkumar et. al.	"
9	Chowdhury Bora Md. Sarwar	Floral biology of pigeon pea	S. Prasad et. al.	"
10	Nirat Vanitvatna Jumlog	Pretreatment studies in blackgram (<u>Phaseolus mungo</u> (V. 19) to improve germination	K. Subburamu & K. Sridhar	"
11	S. Venkateswarlu	Radiosensitivity and frequency of chlorophyll mutations in pigeonpea	S. Venkateswarlu et. al.	"
12	Katin Intrung treekun	Effect of different plant densities on sunflower varieties in red loam soils.	M.A. Salam et. al.	11.1.1980
13	Miss Sumitra Maneemaroot	Preliminary observations on comparative efficiencies of new insecticides and standard insecticides for control of cotton boll worms.	L.H. Mulchandani, et. al.	"

Contd.

Sl No	Name	Title of research article	Author/s	Date for Seminar
14.	Dickson King Otieno	Grain yield of sorghum as affected by row spacing and plant densities under rainfed conditions in rabi season	S. S. Bhalerao & S. D. Choudhary	11.1.80
15.	Gerald P. Okomba	Influence of nitrogen fertilization on reproductive phase of cultivated sorghum 'CSH 1'.	L. Venkateswarlu et al.	11.1.80
16.	Matute M. Muangalene	Investigations on the biology and control of <u>Sclerospora graminicola</u> on Bajra	S. S. Bhat	"
17.	El Tigani Siddeeg Mohamad	Evaluation of soybeans for high germinability and field emergence.	D. K. Tiwari et al.	"
18.	W. N. Illangasinghe	Effect of storage on germination of sorghum seed treated with Carbofuran.	R. D. Chundurwar & R. R. Karanjkar	"
19.	Kitti Wongpichet	Evaluation of root characteristics in grain sorghum	Abd-Elatif M. Nour & D. I. Weibel	"
20.	Hemant Kumar	Chemical weed control in rainfed peanuts.	B. R. Hedge et al.	"
21.	Anil Kumar Mishra	Out-crossing and isolation in pigeonpeas	R. P. Ariyana-yagam	"
22.	Jokhu Ram	Heterosis in different parental combinations in chickpea (<u>Cicer arietinum</u> L.)	A. K. Mandal & P. A. Bahl	"

EDUCATIONAL TOURS

1. Places visited by the trainees in and around Hyderabad:

- i) Fruit Research Station, Sangareddy.
- ii) Agricultural Research Institute, Rajendranagar, Hyderabad.
- iii) Andhra Pradesh Agricultural University; Seed Testing Laboratory; Foundation Seed Production plots of sorghum, Extension Education Institute
- iv) All India Coordinated Dryland Agriculture Improvement Project, Hayatnagar, Hyderabad: research in progress on the improvement of dryland crops; improved agronomic practices for dryland cultivation, Krishi Vigyan Kendras.
- v) Seed Processing Unit of National Seeds Corporation, Lalaguda, Hyderabad: Operation of the processing unit, seed treatment and storage
- vi) All India Coordinated Projects for Improvement of Sorghum, Pulses and Oil Seeds, Rajendranagar, Hyderabad: breeding program for developing high yielding varieties and hybrids of sorghum.
- vii) All India Coordinated Project for Rice Improvement, Rajendranagar, Hyderabad: evolution of high yielding and pest and disease resistant varieties of rice.
- viii) Central Plant Protection Training Institute, Rajendranagar, Hyderabad: different types of training offered by the Institute; various plant protection equipment and the seed quarantine laboratory.
- ix) Indian Betonators Limited, Hyderabad: watershed and dairy farm.

2. Places visited by the trainees outside Hyderabad in the above tours:

Sholapur: Post-rainy season sorghum trials, watershed management trials, chickpea, pigeonpea and safflower improvement work, mulching studies, strip cropping and other agronomic studies. Screening different varieties for drought resistance.

Bijapur: Post-rainy season sorghum trials: fertilizer, varietal screening, plant densities and soil moisture management studies; water harvesting and supplemental irrigation on medium and heavy vertisols; safflower, sunflower, grain legume improvement. Hybrid seed production of varalakshmi cotton. Development of high yielding varieties and hybrids of sorghum.

Dharwar: University Campus - Study of work on sorghum in the departments of entomology pathology, extension education, striga management; coordinated trials on sorghum at Annegiri, crop rotation and intercropping trials including combination of chickpea, wheat, cotton, chilli, safflower with sorghum on the vertisols.

Panaji: Coastal area crops - rice in low lands, coconut, arecanut, cashew and mango on laterite soils; inland and coastal fisheries development.

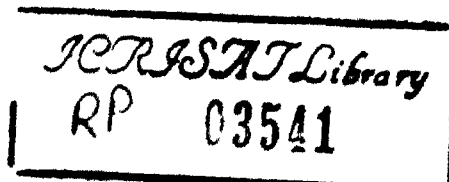


Table 6 : Educational tour of post-rainy season Inservice trainees (1979-80)

Date	Dep hrs	From	To	Arr hrs	Distance (km)
Jan 28 Mon	0800	Hyderabad (Visit Ag. Res. Station)	Sholapur	1300	305
Jan 29 Tue	0700	Sholapur (via Bijapur) (Visit Ag. Res. Station)	Hubli	2100	350
Jan 30 Wed		Visit to Dharwar University Campus/ICRISAT sorghum nursery			100
Jan 31 Thu	0700	Dharwar	Panaji	1200	150
Feb 1 Fri		Stay at Panaji - local visits			100
Feb 2 Sat	0700	Panaji	Pune	2100	420
Feb 3 Sun	1200	Pune	Aurangabad	2100	250
Feb 4 Mon		Stay at Aurangabad (Visit Ajanta & back)			350
<u>GROUP I (CROP IMPROVEMENT TRAINEES: 14)</u>					
Feb 5 Tue	1200	Aurangabad (Ellora visit) (via Badnapur)	Parbhani	2100	250
Feb 6 Wed		Stay at Parbhani - Visit University, farm/sorghum programs			
Feb 7 Thu	1000	Parbhani	Hyderabad	2100	328
<u>GROUP II (FARMING SYSTEMS & CROP PRODUCTION TRAINEES: 8)</u>					
Feb 5 Tue		Aurangabad - Ellora & back			80
Feb 6 Wed		Aurangabad - Visit seed produc- tion/soil conservation program			100
Feb 7 Thu	1000	Aurangabad (Via Badnapur)	Parbhani	1600	168
Feb 8 Fri		Halt - Visit university farm and sorghum program			
Feb 9 Sat	1000	Parbhani	Hyderabad	2100	328

Aurangabad. Visit local agriculture in the vicinity of Anwi and Khuldabad villages, sugarcane, cotton, banana, vegetables, sorghum, safflower, and chickpea.

Visited water management demonstrations in Jaikwadi project command area, grape gardens in the area, wheat and safflower under lift irrigation. Visited the Agricultural Research Station, Badnapur. Improvement work on grain legumes was studied.

Parbhani: Marathwada Krishi Vidyapeeth (Agricultural University), sorghum improvement program, foundation seed production program, seed technology laboratory, agronomy, dairy, goat rearing and home science departments, and museum.

LIBRARY WORK, BOOK SUPPLY AND FILM SHOWS

The ICRIAS library was extensively consulted by the trainees. The library is housing 13840 books, 7875 bound periodicals, 600 current periodicals, 1250 micro-documents, reprints (photo copies) of annual reports etc., and a total of 23565 materials available on the open rack system.

About Rs.1,000 worth books for personal use were supplied to each trainee on the recommendation of the scientists with whom they worked.

Films were shown on most Thursdays (8 to 9.30 pm). The films covered documentaries, feature films and educational films on subjects related to ICRIAS research programs.

LIST OF PARTICIPATING STAFF

Administration:

I.D. Swindale	Director
J.S. Kanwar	Associate Director
J.C. Davies	Associate Director
B.F. Dittia	Principal Administrator
V. Balasubramanian	Executive Assistant to the Director
B.K. Jhori	Personnel Manager
O.P. Shori	Fiscal Manager
R. Vaidyanathan	Purchase and Stores Manager
Col. P.W. Curtis	Chief Security Officer
R. Narsing Reddy	Transport Officer
S.B.C.M. Rao	Travel Officer
A. Lakshminarayana	Scientific Liaison Officer (Visitors' services)
S.K. Dasgupta	Scientific Liaison Officer
N. Rajamani	New Delhi Office

Contd.

Crop Improvement and Production:Cereals:

L.R. House	Principal Plant Breeder (Sorghum)
M.H. Mengesha	Principal Germplasm Botanist
F.R. Bidinger	Principal Physiologist
R.J. Williams	Principal Pathologist
Aran Patanothai	Principal Millet Breeder
Bholanath Varma	Plant Breeder (Sorghum)
D.S. Murthy	Plant Breeder (Sorghum)
B.V.S. Reddy	Plant Breeder (Sorghum)
B.L. Agarwal	Plant Breeder (Sorghum)
M.J. Vasudeva Rao	Plant Breeder (Sorghum)
K.F. Prasada Rao	Botanist (Genetic Resources)
S. Appa Rao	Botanist (Genetic Resources)
N. Seetharama	Plant Physiologist
R.K. Maity	Plant Physiologist
K.V. Seshu Reddy	Entomologist
V.S. Bhatnagar	Entomologist
K.N. Rao	Plant Pathologist
S.D. Singh	Plant Pathologist
R.P. Thakur	Plant Pathologist
S.R.S. Dange	Plant Pathologist

Pulses:

J.M. Green	Principal Plant Breeder (pigeonpea) and leader
D. Sharma	Senior Plant Breeder (pulses)
L.J.G. van der Maesen	Principal Botanist
K.C. Jain	Plant Breeder (Pulses)
W. Reed	Principal Entomologist
Y.L. Nene	Principal Pathologist
L.J. Reddy	Plant Breeder (Pulses)
S.S. Lateef	Entomologist
C.L.L. Gowda	Plant Breeder (Pulses)
Jagdish Kumar	Plant Breeder (Pulses)
S.C. Sethi	Plant Breeder (Pulses)
S. Sithanantham	Entomologist
P.J. Dart	Principal Microbiologist
J.V.D.K. Kumar Rao	Microbiologist
N.P. Saxena	Plant Physiologist
I.M. Rao	Plant Physiologist

Groundnuts:

R.W. Gibbons	Principal Plant Breeder
J.P. Moss	Principal Cytogeneticist
S.N. Nigam	Plant Breeder
A.K. Singh	Cytogeneticist
P.W. Amin	Entomologist
P. Subrahmanyam	Pathologist

contd.

Farming Systems:

R.W. Willey	Principal Agronomist
J. Kampen	Principal Agronomist
G.E. Thierstein	Principal Agricultural Engineer (small implements development)
M.C. Klatj	Assistant Agricultural Engineer (small implements development)
S.M. Virmani	Principal Agro-climatologist
F.P. Huibers	Assistant Agricultural Engineer (soil and water management)
J.R. Burford	Principal Agronomist
M.S. Reddy	Agronomist
M. Natarajan	Agronomist
M.R. Rao	Agronomist
A.S. Gill	Soil Scientist
T.J. Rego	Soil Scientist
M.V.K. Sivakumar	Agro-climatologist
A.K.S. Huda	Agro-climatologist
S.J. Reddy	Agro-climatologist
P.N. Sharma	Agricultural Engineer
R.C. Sachan	Agricultural Engineer
K.L. Srivatsava	Agricultural Engineer
R.K. Bansal	Agricultural Engineer

Farm Services:

E.W. Nunn	Station Manager
D.S. Bisht	Farm Manager
S.N. Kapur	Senior Engineer
S.K. Pal	Plant Protection Officer
K. Ravindranath	Senior Supervisor (Seed Processing)
M.P. Reddy	Senior Supervisor (Irrigation)

Economics:

M. von Oppen	Principal Economist
V.T. Raju	Economist
R.D. Ghodake	Economist

Fellowships & Training:

D.L. Oswalt	Principal Training Officer
A.S. Murthy	Senior Training Officer
B. Diwakar	Assistant Training Officer
T. Nagur	Assistant Training Officer

Administration:

V.V. Ramana Rao	
P.N. Murthy	
P.S. Rao	
Mrs. Jagada Seetharaman	
M.S. Reddy	
M.A. Razzak	
K. Raghavan	

Contd.

Bio-chemistry and Common Laboratory Services:

R. Jambunathan	Principal Biochemist
Umaid Singh	Biochemist
V. Subramaniam	Biochemist
K.L. Sahrawat	Soil Chemist

Information Services:

H.L. Thompson	Principal Information Officer *
Mrs. Gloria Rosenberg	Research Editor
S.M. Sinha	Senior Artist & Printshop Supervisor
H.S. Duggal	Head Photographer
Mira Shah	French Translator/Interpreter
S. Varma	National Research Editor

Library & Documentation Services

S. Dutta	Librarian
P.S. Jadhav	Asst. Librarian

Plant Quarantine.

K.K. Nirula	Plant Quarantine Officer
-------------	--------------------------

Housing and Food Services

A.G. Fagot	General Manager (Housing & Food Services)
G.B. Gaiind	Assistant Manager (Food)
B.R. Revathi Rao	Assistant Manager (Housing)

Medical Unit:

N. Surya Prakash Rao	Medical Officer
----------------------	-----------------