Consultancy and Advisory Services

Consultancy/ Advisory Services Provided

- Sh. Rakesh Kumar, Ph.D. student from Department of Animal Breeding, CCS HAU, Hissar was advised on the analysis of data pertaining to an experiment conducted with 100 genotypes/hybrids of field pea conducted in a simple lattice design at 5 environments. He was also advised on obtaining the genetic parameters *viz.* genotypic variance, phenotypic and heritability coefficient. For this purpose the procedure developed under the project "A Diagnostic Study of Design and Analysis of Field Experiments" was used. He was also advised on the stability analysis, path analysis and genetic divergence analysis.

- For the **task force on balanced use of fertilizers**, fertilizer response ratios were obtained using the data pertaining to an experiment conducted to find out the response of nitrogen (N), phosphorus (P) and potassium (K) under different sub agro-ecological zones/ NARP zones under the aegis of Project Directorate of Cropping Systems Research, Modipuram 1999-2000. The experiment is being conducted with following five treatments:

Treatment Number	Treatment Details
T_1	Control
T_2	Recommended Dose of N
T_3	Recommended Dose of NP
T_4	Recommended Dose of NK
T_5	Recommended Dose of NPK

Data generated from this experiment for the years 1999-2000, 2000-01, 2001-02 and 2002-03 has been used for the computation of 8 different fertilizer response ratios *viz.* N over control; NP over control; NK over control; NPK over control; P over N; P over NK; K over N; and K over NP. Response ratios for cereals, pulses, oilseeds and foodgrains at state and country level have been evaluated for different nutrients and their

Table 1: Response ratios for different crop groups (All India)

Crop groups	Area 000 ha (2000-01)	Average control yield (kg/ha)	% Increase in yield due to							
			N	NP	NK	NPK	P over		K over	
			Over control				N	NK	N	NP
Cereal	99757	1803	8.56	8.97	8.66	8.63	10.02	11.29	9.16	10.85
Oilseed	23250	897	8.53	5.19	6.91	5.37	4.48	5.48	6.02	7.88
Pulses	20026	586	8.11	7.53	8.97	7.12	7.22	5.95	12.09	5.32
Foodgrains		**1485**	**8.50**	**8.15**	**8.42**	**7.89**	**8.73**	**9.60**	**9.06**	**9.59**

Table 2: Percentage increase in yield for different crop groups (All India)

Crop groups	Area 000 ha (2000-01)	Average control yield (kg/ha)	% Increase in yield due to							
			N	NP	NK	NPK	P over		K over	
			Over control				N	NK	N	NP
Cereal	99757	1803	46.76	74.27	65.80	96.34	18.38	18.09	12.74	12.51
Oilseed	23250	897	30.74	63.39	50.59	87.57	24.02	24.17	14.62	14.48
Pulses	20026	586	33.38	99.24	58.08	116.97	48.23	37.75	18.62	9.70
Foodgrains		**1485**	**42.28**	**75.99**	**62.25**	**97.80**	**23.48**	**21.83**	**13.87**	**12.44**

combinations and response ratio at country level are as given in Table 1.The percentage increase in yield were also obtained and are given in Table 2. The response ratios, percentage increase in production due to a specified micro-nutrients over and above the recommended dose of NPK have been obtained using the data from the experiments conducted to study the effect of removal of certain location specific constraints in improving the productivity of major crops and cropping systems under existing farmers' field conditions since 1990-2000 (PDCSR, Modipuram).

- Sh. Naval Kishor Sepat, Ph.D. (Agronomy) student was advised on the analysis of yield data pertaining to an experiment conducted to study the direct and residual effect of organic amendments and levels of NPK on soil health and productivity of rice-wheat cropping system. The experiment was conducted using a split plot design with four main plot treatments as control, green manure/ green leaf manure, FYM @ 10 t/ha and crop residue @ 5 t/ha. The sub plot treatments for kharif rice were control (no NPK), 50%, 100% and 150% recommended doses of NPK each replicated twice in a main plot. For rabi wheat, there were 7 distinct treatment combinations viz. control, residual effects of

treatments applied as 50%, 100% and 150% NPK to kharif rice and direct application of 50%, 100% and 150% recommended doses of NPK to rabi wheat crop. The analysis was carried out using the concepts of contrast analysis.

- A second order response surface design for 4 factors each at 4 equispaced levels in 80 design points has been suggested for an experiment related to development of rotating screen grader for selected orchard fruit crops (Ber, Lemon and Aonla) planned to obtain the optimum combination of levels of rotating speed, diameter of screen, input and length of screen at Division of Agricultural Engineering, Indian Agricultural Research Institute, New Delhi.
- Dr. Ravinder Kaur, National Fellow, IARI, New Delhi was advised on fitting of exponential decay model and interpretation of results.
- Dr. S.C. Dube, Senior Scientist, Division of Pathology, IARI, New Delhi was advised on the use of multiple comparison procedure.
- Dr. B.S. Tomar, Senior Scientist, Division of Seed Technology, IARI, New Delhi was advised on the analysis of data of the experiment conducted to study the effect of season, planting time and plant density on seed yield and quality of cucumber. The experiment was conducted in factorial randomized

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complete block design (4 dates of planting and 4 plant densities in 3 replications). The experiment was conducted in two seasons viz. spring summer and kharif to study the seasonal variation in seed yield and its quality. Observations were recorded on the following characteristics: days to first female flower, number of fruits per plant, fruit weight, fruit length and number of seeds per fruit, seed yield per fruit, seed yield per plot, 1000 seed weight, germination %, root length, shoot length, seedling length and seedling dry weight. First, the data were analyzed for each of the characters and for both the seasons separately. Error variances were tested for heterogeneity and data of both the seasons were analyzed as per procedure of analysis of groups of experiments.

- In the meeting of the Committee constituted to finalize the Bt. cotton entries into AICRP, discussions were held on the problem of using randomized complete block designs in the agricultural experiments. As a follow up action, scientists from Division of Crop Improvement, Central Institute of Cotton Research, Nagpur, were advised on the designing of four experiments to be conducted with cotton varieties. First two of these experiments are to be conducted to morphologically characterize varieties and hybrids with respect to about 45 morphological characters both qualitative and quantitative and document the database as a part of DUS test for PVP.

Design 1a: α-design for v = 70, b = 20, k = 14; A-efficiency:0.9826; Plot Size: 2.7 × 4.8 m^2

	Replication I					Replication II					Replication III					Replication IV			
B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19	B20
1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
6	7	8	9	10	9	10	6	7	8	10	6	7	8	9	7	8	9	10	6
11	12	13	14	15	12	13	14	15	11	14	15	11	12	13	13	14	15	11	12
16	17	18	19	20	19	20	16	17	18	20	16	17	18	19	17	18	19	20	16
21	22	23	24	25	25	21	22	23	24	23	24	25	21	22	24	25	21	22	23
26	27	28	29	30	27	28	29	30	26	29	30	26	27	28	30	26	27	28	29
31	32	33	34	35	33	34	35	31	32	32	33	34	35	31	35	31	32	33	34
36	37	38	39	40	40	36	37	38	39	37	38	39	40	36	38	39	40	36	37
41	42	43	44	45	44	45	41	42	43	45	41	42	43	44	43	44	45	41	42
46	47	48	49	50	48	49	50	46	47	49	50	46	47	48	47	48	49	50	46
51	52	53	54	55	52	53	54	55	51	55	51	52	53	54	54	55	51	52	53
56	57	58	59	60	59	60	56	57	58	58	59	60	56	57	60	56	57	58	59
61	62	63	64	65	63	64	65	61	62	62	63	64	65	61	64	65	61	62	63
66	67	68	69	70	70	66	67	68	69	68	69	70	66	67	67	68	69	70	66

Design 1b: α-design for v = 70, b = 28, k = 10; A-efficiency: 0.9785; Plot Size: 2.7 × 4.8 m^2

		Replication I							Replication II							Replication III							Replication IV				
B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19	B20	B21	B22	B23	B24	B25	B26	B27	B28
1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
8	9	10	11	12	13	14	9	10	11	12	13	14	8	11	12	13	14	8	9	10	12	13	14	8	9	10	11
15	16	17	18	19	20	21	17	18	19	20	21	15	16	16	17	18	19	20	21	15	18	19	20	21	15	16	17
22	23	24	25	26	27	28	27	28	22	23	24	25	26	24	25	26	27	28	22	23	23	24	25	26	27	28	22
29	30	31	32	33	34	35	35	29	30	31	32	33	34	31	32	33	34	35	29	30	33	34	35	29	30	31	32
36	37	38	39	40	41	42	37	38	39	40	41	42	36	41	42	36	37	38	39	40	39	40	41	42	36	37	38
43	44	45	46	47	48	49	49	43	44	45	46	47	48	47	48	49	43	44	45	46	48	49	43	44	45	46	47
50	51	52	53	54	55	56	53	54	55	56	50	51	52	56	50	51	52	53	54	55	55	56	50	51	52	53	54
57	58	59	60	61	62	63	61	62	63	57	58	59	60	62	63	57	58	59	60	61	59	60	61	62	63	57	58
64	65	66	67	68	69	70	66	67	68	69	70	64	65	67	68	69	70	64	65	66	70	64	65	66	67	68	69

Design 2: α-design for v = 84, b = 24, r = 4, k = 14; A-efficiency:0.9830; Plot Size: 2.7 $\times$ 4.8 m²

	Replication I						Replication II						Replication III						Replication IV				
B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19	B20	B21	B22	B23	B24
1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
10	11	12	7	8	9	9	10	11	12	7	8	7	8	9	10	11	12	12	7	8	9	10	11
16	17	18	13	14	15	17	18	13	14	15	16	13	14	15	16	17	18	15	16	17	18	13	14
21	22	23	24	19	20	24	19	20	21	22	23	19	20	21	22	23	24	20	21	22	23	24	19
26	27	28	29	30	25	30	25	26	27	28	29	25	26	27	28	29	30	29	30	25	26	27	28
32	33	34	35	36	31	34	35	36	31	32	33	31	32	33	34	35	36	35	36	31	32	33	34
41	42	37	38	39	40	42	37	38	39	40	41	37	38	39	40	41	42	38	39	40	41	42	37
45	46	47	48	43	44	46	47	48	43	44	45	43	44	45	46	47	48	44	45	46	47	48	43
54	49	50	51	52	53	53	54	49	50	51	52	49	50	51	52	53	54	52	53	54	49	50	51
60	55	56	57	58	59	56	57	58	59	60	55	55	56	57	58	59	60	58	59	60	55	56	57
62	63	64	65	66	61	64	65	66	61	62	63	61	62	63	64	65	66	63	64	65	66	61	62
70	71	72	67	68	69	68	69	70	71	72	67	67	68	69	70	71	72	72	67	68	69	70	71
77	78	73	74	75	76	75	76	77	78	73	74	73	74	75	76	77	78	78	73	74	75	76	77
83	84	79	80	81	82	80	81	82	83	84	79	79	80	81	82	83	84	81	82	83	84	79	80

Design 3: α-design for v = 28, b = 12, r = 3, k = 7; A-efficiency: 0.9603; Plot Size: 2.7 $\times$ 6.0 m²

	Replication I				Replication II				Replication III		
B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12
1	2	3	4	1	2	3	4	1	2	3	4
5	6	7	8	6	7	8	5	7	8	5	6
9	10	11	12	10	11	12	9	12	9	10	11
13	14	15	16	15	16	13	14	14	15	16	13
17	18	19	20	19	20	17	18	20	17	18	19
21	22	23	24	24	21	22	23	22	23	24	21
25	26	27	28	28	25	26	27	27	28	25	26

Design 4: α-design for v = 14, b = 6, r = 3, k = 7; A-efficiency: 0.9684; Plot Size: 2.7 $\times$ 6.0 m²

Replication I		Replication II		Replication III	
B1	B2	B3	B4	B5	B6
1	2	1	2	1	2
3	4	4	3	4	3
5	6	5	6	6	5
7	8	8	7	7	8
9	10	10	9	9	10
11	12	11	12	12	11
13	14	14	13	14	13

• Ms Poonam Singh from Division of Genetics, IARI, New Delhi was advised on the analysis of data pertaining to characterization of lentil germplasm through morphological and molecular marker. The experiment was conducted at Research Farm of Indian Agricultural Research Institute using augmented randomized complete block design with 97 accessions and 3 checks in three blocks of sizes 36, 36 and 34 respectively. The data on morphological characters viz. days to flowering, days to maturity, plant height, number of primary branches, number of secondary branches, pods/ plant, number of seeds/pod, 100 seed weight, grain yield, bio-mass score and harvest index were recorded. The data were analyzed using Statistical Package for Augmented Designs.

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- Dr. Jitendra Kumar, Division of Agricultural Chemicals, IARI, New Delhi was advised on the development of polymer based seed coats containing azadirachtin for soybean. The objectives of the experiment were (i) to prepare the seed coats incorporating azadirachtin, (ii) seed treatment and monitoring fungal growth vis-à-vis estimation of residual azadirachtin in the coats and (iii) evaluation of seed quality parameters (germination, field emergence etc.) by coating seed with polymer with and without azadirachtin. The experiment was conducted with 29 treatments (26 treatment combinations of 13 polymers with and without azadirachtin, azadirachtin without polymer, thiram and absolute control). The data on %infected seeds, %germination, %field emergence, seed vigour and soil moisture were collected over months. The data were analyzed for each month separately as per procedure of completely randomized design taking month and treatment month as covariates. The significance of differences between average of 26 treatments and thiram, absolute control and azadirachtin were tested using contrast analysis. All possible pairwise treatment comparisons were made using Tukey's multiple comparison procedure. Arc sine transformation was used for %germination, %field emergence and %infected seeds. Also advised on the determination of the diffusion exponents of the carbofuran in formulations from release data using semi-empirical power law equation and computations of half-life period. Also advised on the computation of rate of removal of the pesticide and half-life period using first order kinetics.

- Dr. Geeta Singh, Sr. Scientist from Division of Micro Biology, IARI, New Delhi was advised on the analysis of data pertaining to an experiment conducted to find out the optimum combination of time period, temperature and organisms each at four levels.

- Dr. R.K. Mahajan and Dr. Hanuman Lal Raiger from National Bureau of Plant Genetic Resources were advised on the combined analysis of data from augmented designs conducted at different locations and/or years.

Preparation of Manuals for the project entitled "Preparation of Manuals" Funded by CSO, MOS & PI, GOI, New Delhi

The objective is to write a comprehensive manual on Area and Crop Production Statistics, Animal Husbandry Statistics, Agricultural Prices and Marketing, Cost of Cultivation Surveys, Horticulture and Spices Statistics, Fishery Statistics with emphasis on their concepts, definitions and classification, sources and systems, quality standards, methodological development etc.

The following Manuals were further revised in the light of suggestions given by Editorial Committee and submitted to funding agency:

- Area and Crop Production Statistics
- Animal Husbandry Statistics
- Agricultural Prices and Marketing
- Cost of Cultivation Surveys
- Horticulture and Spices Statistics
- Fishery Statistics

Computer Services
(i) Resource utilization

The Division of Computer Applications provided computing facilities to scientists/ research workers and students to work on various computers in different labs. A break up of the time utilized in various laboratories is as given:

Laboratories	No. of user's visits	Time utilized (hrs)
ARIS-Lab. (111A)	1956	9128
Bio-Informatics-Lab. (118)	459	2389
Divisional Scientist-Lab. (129)	1180	5426
Total	**3595**	**16943**

(ii) Selective dissemination of information

Bio-informatics Centre provided services to scientists in NARS in terms of searching from the bibliographic databases. The scientists of the Institute were also provided services for colour output of certificates, cover pages and laser outputs for various documents. It received two requests from other institutes of ICAR and output of 1170 abstracts were provided to them.