

भा० कृ० सां० अ० सं०  
सांख्यिकीय सूचना-पत्र  
I. A. S. R. I.  
STATISTICAL NEWSLETTER

Volume-VII

October-December, 1981

Number-IV



भारतीय कृषि सांख्यिकीय अनुसंधान संस्थान  
( भा० कृ० अ० सं० )  
लाइब्रेरी एवेन्यू, नई दिल्ली-110012

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## प्राक्कथन

यह भा० कृ० सां० अ० सं० सांख्यकीय सूचना-पत्र का अट्ठाइसवां अंक है। इसमें इस संस्थान की अक्टूबर-दिसम्बर, 1981 की तिमाही गतिविधियों से सम्बन्धित जानकारी का विवरण दिया गया है।

मुख्य भाषा है कि यह सूचना-पत्र कृषि अनुसंधान सांख्यकीविदों तथा अन्य प्रयोक्ताओं के लिए लाभदायक सिद्ध हो रहा है। इसके अगले अंकों में सुधार लाने हेतु मैं किसी भी प्रकार की टिप्पणियों और सुझावों का आभार सहित स्वागत करूंगा।

मैं संस्थान के उन सभी अधिकारियों तथा उन सदस्यों का आभारी हूँ, जिन्होंने भा० कृ० सां० अ० सं० सांख्यकीय सूचना-पत्र के इस अंक के लिये अपेक्षित सामग्री प्रदान की है।

मैं श्रीमती कुसुमलता, श्री फणीन्द्रपालसिंह, श्री सोमदत्त और श्री अनिलकुमार भल्ला का भी आभारी हूँ जिन्होंने इस सूचना-पत्र के संकलन एवं मुद्रण में अपना भरपूर सहयोग दिया है।

**प्रेमनारायण**

निदेशक

भारतीय कृषि सांख्यकीय अनुसंधान संस्थान  
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## P R E F A C E

This is the twentyeighth issue of 'IASRI Statistical Newsletter' and covers the activities and allied information in respect of this Institute during the quarter Oct.-Dec., 1981.

I hope this News-letter has been proving useful to the Agricultural Research Statisticians and other users. I would welcome and appreciate any comments and suggestions for its improvement in the subsequent issues.

I am thankful to all the officers and the staff of the Institute who supplied the requisite material for this issue of the "IASRI Statistical Newsletter".

I am also thankful to Smt. Kusum Lata, Shri Phanindra Pal Singh, Shri Som Dutt, Shri Anil Kumar Bhalla for the help rendered in compilation and printing of this Newsletter.

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DIRECTOR

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## 1. FERTILISER RESPONSES TO GRAM AND OTHER PULSES IN CULTIVATORS' FIELDS

With the increasing adoption of Modern Technology to agriculture, the foodgrain production in the country has made rapid strides which has won international recognition. However, the over all production of pulses has more or less stagnated during the past decade, the average annual production fluctuating around 11 million tonnes. Though, the pulses production in some States like Rajasthan, Madhya Pradesh, Maharashtra and Orissa has made notable advances, there has been sizable fall in its production in States of Uttar Pradesh, Bihar, Haryana and Punjab. The regions where pulses production declined steeply are those which have been benefited by green revolution to a high degree. This can be seen from the table below :

Table : 1 Changes in the Average Annual Area and Production of Pulse Crops.

<i>States</i>	<i>Average annual area under Pulses crops ('000 ha)</i>		<i>Average Annual production of Pulses in ('000 tonnes)</i>	
	<i>1967-68 to 1969-70</i>	<i>1977-78 to 1979-80</i>	<i>1967-68 to 1969-70</i>	<i>1977-78 to 1979-80</i>
Rajasthan	3205	3525	1158	1581
M.P.	3977	4642	1689	1876
Maharashtra	2410	2770	845	1028
Orissa	787	1532	379	682
U.P.	4052	2964	3305	2093
Haryana	1110	984	1042	812
Bihar	1646	1381	1133	665
Punjab	506	378	395	287
All India including others	21979	22968	11404	10842



With the increase in the population, the per capita availability of the pulses has shrunk by more than 20%. There is not much scope in augmenting the supply through imports as the international trade in pulses is negligible as compared to cereals, cotton, oilseeds, etc. As the average Indian diet is mostly vegetarian, stepping up of the pulse production in the country is essential to maintain the nutritional standard. In view of this urgency, emphasis on the experiments of pulses is being given in agricultural research and development programmes. In the present study, an attempt has been made to examine the scope and extent of increase in the pulse production through fertiliser application. The data used relate to the experiments on Cultivators' Fields under the Coordinated Agronomic Research Programme. The bulk of the experiments conducted were on Bengal Gram (Chana); other important pulses such as Blackgram (Urd), Greengram (Moong), Redgram (Arhar) and Lentil (Masoor) were also covered to a limited extent.

### BENGAL GRAM

Data in respect of 1229 experiments on Bengal Gram were available. Of these 228 related to the period 1972-73 to 1974-75, 232 experiments to the period 1975-76 to 1976-77 and the remaining 769 to the period 1977-78 to 1978-79. The average response to some selected levels of fertiliser application during these periods are indicated below :

**Table : 2 Fertiliser Response of Bengal Gram to selected levels of Nitrogen, Phosphorus and Potassium**

Period	States covered	No. of districts	No. of expts.	Average Yield in no fertiliser (control) plots (kg/ha)	Response (kg/ha) to fertiliser application at				
					$N_{20}$	$P_{40}$	$N_{20}P_{20}$	$N_{20}P_{40}$	$N_{20}P_{40}K_{20}$
1	2	3	4	5	6	7	8	9	10
72-73 to 74-75	U.P., Punjab, Rajasthan, Gujarat	5	228	674	211	109	313	265	363
75-76 to 76-77	Punjab, Raj., M.P.	4	232	871	197	195	292	389	531



1	2	3	4	5	6	7	8	9	10
77-78 to 78-79	H.P., U.P. Bihar Punjab Raj., Haryana, M.P., Maharashtra, Karnataka, A.P.	22	769	823	349	295	546	664	742

From the above table it would appear that fertiliser use to gram crop has shown an increasingly favourable trend in the successive periods covered by the study. Even though, the districts covered during the 3 periods varied, the average yield in the no fertiliser control plots did not differ appreciably during the 2nd & 3rd periods. With the fertiliser application at the level of  $N_{20}P_{40}K_{20}$ , the yield rate rose from 6.74 q to 10.37q/ha in the experiments during the 1st period, from 8.7 q to 14.0 q/ha in those during the second period and from 8.23 q. to 15.65 q/ha in those of the last period. In terms of percentage gains the increases were of the order of 54%, 61% and 90% respectively. Even at the lower level of  $N_{20}P_{20}$ , the yield rates rose 3.13 q/ha (46%) during the 1st period, by 2.9 q/ha (33%) during the 2nd period, and by 5.5 q/ha (66%) during the last period.

Fertiliser response of Crops have been known to show wide variation over different locations. Moreover it may be useful to ascertain the relative importance of the important plant nutrients nitrogen, phosphorus and potassium, as also the nature of their interaction effects. For this purpose, a close examination was undertaken on the data relating to the latest period (1977-79). The relevant results are presented in Table-3.

### Response to Nitrogen

It may be seen that response to application of Nitrogen at 20 kg/ha varied generally from 1.5 to 4.5 q/ha. There were, however, 3 districts namely Bharatpur, Alwar and Ujjain where very high responses of 9.5, 8.0 and 5.6 q/ha respectively were obtained. In 5 districts namely Hamirpur, Jaunpur, Sawai Madhopur, Ajmer and Chickmangloor, the response to 20 kg N/ha was very good being in the range of 3.6-4.8 q./ha. In seven districts namely, Hazaribagh, Ferozepur-Faridkot, Bundi, Chittorgarh, Sagar, Sangli, and Medak, the response was moderately good ranging between 2.4 and 3.6 q/ha. In 6



districts namely Kangra, Hissar, Satna, Amravathi, Nanded and Bider, the range of response was between 12.2 and 2.4 q/ha. Gulbargha was the only district where the response to 20 kg N/ha was less than one quintal per hectare.

### **Response to Phosphorus**

Response to phosphorus was studied at the two levels 20 kg and 40 kg  $P_2O_5$  respectively per hectare. The highest response to the lower level of phosphorus application was obtained in Jaunpur and Kangra (about 4.25 q/ha). In three other districts namely Bundi, Sagar and Ujjain, good responses ranging from 2.4 to 3.6 q/ha were obtained. In as many as 19 districts namely Hamirpur, Ferozepur-Faridkot, Hissar, Sawai Madhopur, Bharatpur, Alwar, Satna, Sangli and Chickmangaloor, the response to 20kg  $P_2O_5$ /ha ranged between 1.2 and 2.4q/ha., and this order of response can also be considered as satisfactory at the currently high prices obtained for gram and other pulses. In the remaining 8 districts, namely Hazaribagh, Chittorgarh, Ajmer, Amravathi, Nanded, Gulbargha, Bider and Medak phosphorus response was poor being less than 1.2q/ha. The average response for the lower phosphorus level over the 22 districts covered was of the order of 1.85 q/ha.

At the higher level of 40kg  $P_2O_5$  /ha the highest response was achieved in Jaunpur (7.84 q/ha) followed by Bundi (6.85 q/ha) and Ujjain (5.03 q/ha). Good responses ranging from 3.6 to 4.8 q/ha were obtained in the districts of Bharatpur, Kangra and Satna. Satisfactory responses ranging from 2.4 q/ha to 3.6 q/ha to the higher level were obtained in 6 districts namely, Hamirpur, Ferozepur-Faridkot, Hissar, Bundi, Alwar and Chickmangaloor. In the remaining 10 districts, the response to 40kg  $P_2O_5$ /ha was relatively low, being less than 2.4 q/ha.

### **NP Interaction**

In order to examine the desirability or otherwise of the conjoint application of nitrogen and phosphorus, the differential responses of phosphorus at 20 and 40 kg  $P_2O_5$ /ha., in the absence and presence of nitrogen (at 20kg N/ha) were worked out for different districts. These are also given in Table 3. In 6 districts namely Hamirpur, Hissar, Satna, Bundi, Chittorgarh and Bider positive interaction was significant at both the levels of phosphorus while in 4 districts, namely Jaunpur, Ferozepur-Faridkot, Chickmangaloor and Sangli, the Nitrogen Phosphorus interaction was negative. At Gulbargha and Sagar, positive interaction was observed at the higher level only. In the remaining 10 districts, Nitrogen Phosphorus interaction at either level was non-significant. Taking



all the 22 districts together Nitrogen Phosphorus interaction was not significant at either level of phosphorus. The estimates of responses to phosphorus at the lower level and higher levels (averaged over the 2 levels of N) were in the range of 1.9-3.0 quintal per hectare respectively. The law of diminished return for phosphorus application has thus been clearly indicated.

#### **Response to Potassium**

Response to potassium at 20 kg  $K_2O$ /ha was the highest in Sagar (1.7 q/ha). In the districts of Ujjain, Alwar, Kangra and Bundi, good responses ranging from 1.28 to 1.43 q/ha were obtained. Moderate responses ranging from 0.6-1.2 q/ha were obtained in 7 districts, namely Jaunpur, Sawai Madhopur, Chittorgarh, Satna, Sangli, Nanded and Chickmangaloor. In the remaining 9 districts phosphorus response was either non-significant or low (less than 0.6 q/ha).

#### **Response to NPK**

Combined responses to all the three nutrients at the level of  $N_{20}P_{40}K_{20}$  were also worked for the various districts which are also presented in table 3. The districts, may be grouped as indicated below.

Response over 10 q/ha was Excellent in Jaunpur, Bundi, Bharatpur, Alwar, Ujjain

Response between 8-10 q/ha was very good in Hamirpur, Sawai Madhopur, Sagar, Satna

Response between 6 to 8 q/ha was good in Kangra, Hissar, Chittorgarh, Ajmer.

Response between 4 to 6 q/ha was moderate in Hazaribagh, Ferozepur-Faridkot, Sangli, Nanded, Chickmangaloor, Medak.

Response less than 4 q/ha was low in Amravathi, Gulbargha, Bider, on an average a response of 7.4 q/ha were obtained for the 22 districts covered.

#### **Pulses other than Bengal Gram**

Next to Bengal gram the other important pulses grown in the country are Black gram (Urd), Green gram (Moong), Red gram (Arhar) and Lentil (Masoor). These four crops together account for about one half of the pulse production in the country.

Very limited number of experiments were conducted on these crops in Cultivators' Fields prior to 1977-78. Data relating to 774 experiments con-



ducted during 1977-78 and 1978-79 were examined and the results are presented in Table 4. Of these 350 experiments were on Blackgram, 236 on greengram, 128 on Red gram and 60 on Lentil. The average yield rates of these crops in control plots as well as in plots treated with fertiliser application were generally low as compared to those of Bengal gram. The mean yield rates obtained in the un-fertilised (Control) plots were of the order of 3.5 q/ha for Blackgram and Greengram, 4 q/ha for Redgram and 5 q/ha for Lentil.

### Response to Nitrogen

Response to application of 20 kg N/ha exceeded 3.6 q/ha in Krishna on black gram, in Krishna and Sundergarh on green gram, in Medak on red gram and in none of the districts covered on Lentil. Good response ranging from 2.4 to 3.6 q/ha was obtained in Hamirpur and East Godawari on Black gram, in *Bhāroach* on greengram, in Sundergarh and Phulbani on red gram and in Kamrup and Lalitpur on Lentil. Response to 20 kg N/ha ranged between 1.2 and 2.4 q/ha in nearly one half of the total number of districts covered on blackgram and greengram. These include Kangra, Lalitpur, Agra, Farrukhabad, Satna on blackgram and Kutch, Bolangir, Medak, Khammam and Phulbani on greengram. Only Satna on redgram and Kangra on Lentil fell in this response group. Relatively low response less than 1.2 q/ha were obtained in Jaunpur, Ferozepur-Faridkot, Bider and Chittorgarh on black gram, in Bider on green gram and Gulburga on redgram. Taking together all the districts covered the mean response to 20 kg N/ha was of the order of 2.8 q/ha on redgram, 2.5 q/ha on greengram, 2.4 q/ha on lentil and 1.9 q/ha on blackgram.

### Response to Phosphorus

Response to Phosphorus at both the levels tries, namely 20 kg and 40 kg  $P_2O_5$ /ha were lower than the nitrogen response at 20 kg N/ha in almost one half of the districts covered on blackgram, greengram and redgram. This was the situation in respect of all the three districts covered on lentil. Mean response over the districts covered on these crops also indicated similar pattern. Districts showing good response to phosphorus application were Satna and Krishna on blackgram, Krishna on greengram, Medak and Phulbani on redgram and Lalitpur on Lentil. In all these districts response to 40 kg  $P_2O_5$ /ha exceeded 2.4 q/ha. Phosphate response at either level was low in the districts of Ferozepur-Faridkot, Kangra, Farrukhabad, Bider and East Godawari on



blackgram, in Bharoach, Kutch and Bider on greengram, Gulbarga and Sundergarh on redgram and Kangra and Kamrup on lentil. In all these districts response to 40kg  $P_2O_5$ /ha without nitrogen was 1.2 q/ha or less. Pooling over the districts covered the mean response to phosphorus on blackgram, greengram and lentil was of the order of 0.8-0.9 q/ha for the lower level (20kg  $P_2O_5$ /ha) and about 1.5-1.7 q/ha for the higher level. Red gram response was better, being about 1.5 and 2.4 q/ha for the two levels of phosphorus application.

### NP Interaction

For bulk of the districts covered, on blackgram, greengram and lentil NP interaction was absent. Pooled results over the districts covered also indicated similar pattern. However, Significantly positive NP interaction was observed for all the districts covered on redgram. The higher response to phosphorus when applied over nitrogen at  $N_{20}$  was well marked, particularly at the higher level of phosphorus application. When averaged over the districts covered response to phosphorus at 40kg  $P_2O_5$ /ha over 20kg N/ha was of the order of 3.2 q/ha as against nearly 2.4 q/ha obtained for the same level of phosphorus applied without nitrogen. At the lower level of 20 kg  $P_2O_5$ /ha the difference in response to phosphorus when applied with and without nitrogen was of the order of 0.4 q/ha (average over the districts covered).

### Response to Potassium

Good response of 1.2 q/ha or more was obtained for the application of 20kg  $K_2O$ /ha over  $N_{20}P_{40}$  in the districts of Satna on blackgram, Sundargarh and Krishna on greengram as well as on redgram. In other districts response to potassium was generally low. Taking the districts covered together the response obtained was of the order of one quintal per hectare on redgram and 0.5-0.6 q/ha on other grams were obtained

### Combined Response to NPK

Combined response to  $N_{20}P_{40}K_{20}$  exceeded 8 q/ha in Krishna on black gram and green gram and in Medak on redgram. Moderate to good responses ranging between 4 and 8 q/ha were obtained for bulk of the districts covered under these crops. Low response (less than 4q/ha) was obtained in Ferozepur-Faridkot, Bider, Kangra, Agra and Chittorgarh on blackgram, Medak, Bider; Bharoach, Cutch and Khammam on greengram, Gulbarga on redgram and



Kangra on lentil. When pooled over the districts covered the mean response to fertiliser application at  $N_{20}P_{40}K_{20}$  was as high as 7 q/ha on redgram as against 4.3-4.8 q/ha on blackgram, greengram and lentil.

### Overall Conclusion

The current study clearly establish the high prospect for stepping up the pulse production in the country. Application of fertiliser at  $N_{20}P_{40}K_{20}$  can almost double the yield rate of the crops covered.

Another important conclusion is the need of nitrogen application (at a nominal dose of 20 kg N/ha to pulse crops, even though these crops are nitrogen fixing legumes.

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Table 3 District-wise Estimates of Fertiliser Responses of Gram in Cultivator's Fields 1977-79

State	District	No: of expts.	Av. yield in unfertilized plots	Response to N <sub>20</sub>	Response to Phosphorus				Response to K <sub>20</sub>	Combined Response to N <sub>20</sub> P <sub>40</sub> K <sub>20</sub>	S.E. of Response
					at P <sub>20</sub>		at P <sub>40</sub>				
1	2	3	4	5	Over N <sub>0</sub>	Over N <sub>20</sub>	Over N <sub>0</sub>	Over N <sub>20</sub>	10	11	12
Himachal Pradesh	Kangra	22	518	142	425	453	403	402	134	678	54
Uttar Pradesh	Hamirpur	25	1042	383	140	202	283	449	67	899	24
do	Jaunpur	29	1320	448	427	334	784	675	71	1194	32
Bihar	Hazaribagh	77	459	292	92	92	176	180	53	525	12
Punjab	Ferozepur-Faridkot	55	926	316	230	138	267	205	43	564	25
Haryana	Hissar	29	1144	155	152	186	274	369	54	678	21
Rajasthan	Sawai Madhopur	12	1273	416	142	196	247	309	98	823	52
do	Bundi	18	1023	357	344	404	685	762	128	1247	31
do	Chittorgarh	15	813	278	80	174	188	274	77	629	33
do	Bharatpur	18	1230	941	219	218	473	390	48	1379	54



Table 3 (Contd.)

1	2	3	4	5	6	7	8	9	10	11	12
Rajasthan	Ajmer	11	928	448	96	98	200	228	17	693	71
do	Alwar	30	856	801	189	172	324	295	137	1233	32
Madhya Pradesh	Sagar	30	1512	356	245	266	196	326	171	853	64
do	Ujjain	59	1191	558	303	301	503	469	143	1170	18
do	Satna	56	606	177	180	368	388	573	102	852	18
Maharashtra	Amravati	57	462	158	70	35	94	79	30	267	16
do	Sangli	59	608	292	198	116	196	197	95	584	16
do	Nanded	9	276	230	105	119	139	138	94	462	62
Karnataka	Gulburga	46	530	91	99	117	88	187	5	283	18
do	Chickmagaloor	39	598	393	171	66	276	80	82	255	33
do	Bidar	38	577	125	62	176	89	202	16	343	16
do	Medak	35	217	324	106	100	160	149	38	511	20
Over districts covered		769	823	349	185	197	295	315	78	742	8

Table 4 District-wise Estimates of Fertilizer Responses of Pulses Other Than Gram in Cultivators' Fields, 1977-79

State	District	Number of expts.	Av. Yield in unfertilized plots	Response to $N_{20}$	Response to phosphorus				Response to $K_{20}$	Combined response to $N_{20}$ $P_{40}$ $K_{20}$	S.E. of Response
					at $P_{20}$		at $P_{40}$				
1	2	3	4	5	Over $N_0$	Over $N_{20}$	Over $N_0$	Over $N_{20}$	10	11	12
BLACK GRAM (URAD)											
Himachal Pradesh	Kangra	10	292	152	57	64	89	108	102	362	21
Uttar Pradesh	Hamirpur	19	360	269	72	74	167	162	24	455	17
do	Jaunpur	13	533	102	98	158	196	273	38	413	54
do	Lalitpur	30	457	232	94	100	204	160	96	488	18
do	Agra	23	395	148	83	92	148	157	32	337	16
do	Farrukhabad	20	328	130	51	89	115	206	5	341	16
Punjab	Ferozepur-Faridkot	54	320	98	58	77	95	107	8	213	8
Rajasthan	Chittorgarh	9	250	101	73	125	104	174	55	330	18
Madhya Pradesh	Satna	31	303	171	164	173	295	300	128	599	14



Table 4 (Contd.)

1	2	3	4	5	6	7	8	9	10	11	12
Karnataka	Bidar	38	284	110	71	119	89	157	13	180	15
Andhra Pradesh	Krishna (Rabi)	80	474	548	147	218	270	338	198	934	11
	East Godawari (Rabi)	23	195	272	64	14	73	72	73	447	23
	Over District Covered	350	349	194	86	108	154	184	52	430	7
GREEN GRAM (MOONG)											
Gujarat	Bharoach	26	408	239	23	40	84	61	44	344	94
do	Kutch	20	529	217	36	24	75	24	40	301	21
Orissa	Bolangir	33	150	158	132	184	188	272	48	478	26
Andhra Pradesh	Khammam	52	290	200	80	55	121	101	51	352	16
do	Medak	11	179	142	82	88	141	147	0	287	22
Karnataka	Bidar	35	292	102	63	122	103	166	31	299	17
Orissa	Sundargarh (Rabi)	35	391	377	80	138	192	223	127	727	27
do	Phulbani (Rabi)	14	297	175	106	116	237	188	33	396	14
Andhra Pradesh	Krishna (Rabi)	10	459	677	133	145	290	314	133	1124	39
	Over districts covered	236	333	254	82	101	159	166	58	478	13

Table 4 (Contd.)

1	2	3	4	5	6	7	8	9	10	11	12
<b>RED GRAM (ARHAR)</b>											
Orissa	Sundargarh	25	457	277	0	113	84	205	135	617	22
do	Phulbani	24	290	347	290	185	245	317	73	737	15
Madhya Pradesh	Satna	15	306	208	141	191	239	301	30	539	19
Andhra Pradesh	Medak	18	393	497	284	382	509	603	170	1270	50
Karnataka	Gulburga	46	606	74	52	96	103	166	102	342	15
Over districts	covered	128	411	281	153	193	236	318	102	342	15
<b>LENTIL (MASOOR)</b>											
Himachal Pradesh	Kangra	11	284	152	75	74	115	111	16	281	22
Assam	Kamrup	24	559	283	67	22	131	65	78	426	14
Uttar Pradesh	Lalitpur	25	710	287	119	185	269	278	69	634	16
Over districts	covered	60	518	241	87	94	172	151	55	447	10



## 2. EXTENT AND INTENSITY OF FERTILIZER USE ON HYV VIS-A-VIS RECOMMENDED LEVELS.

Of the different components of new technology, high yielding variety seeds are no doubt basic to increased crop production, but these can help only when other inputs are applied in optimum or near optimum quantities. One of these crucial inputs is the chemical fertilizers. It would, therefore, be of interest to investigate the extent and intensity of adoption of fertilizers by farmers growing high yielding varieties of seeds vis-a-vis the recommended levels. The results of such a study would help in identifying the areas where cultivation of HYV is practised under unfertilized condition as also the areas where doses of chemical fertilizers are applied below the recommended levels and thus need special attention for the popularization of fertilizer use for exploiting the full potential of HYV seeds.

The above aspects were studied for HYV rice with the help of data collected under the project 'Sample surveys for methodological investigations into high yielding varieties programme' during the year 1977-78 and are briefly discussed in the present article. The data were available for 24 districts spread over 10 States viz.; Guntur, Chittoor, Karimnagar (A.P.); Sibsagar (Assam); Saran, Champaran, Monghyr (Bihar); Ambala (Haryana); Shimoga, Kolar (Karnataka); Trichur (Kerala); Bilaspur (M.P.); Bolangir, Cuttack (Orissa); Amritsar, Patiala (Punjab); Coimbatore, Madurai (Tamil Nadu); Meerut, Moradabad, Varanasi, Gonda (U.P.) and 24-Parganas, Midnapur (W.B.).

### Application of Nitrogen

The entire area under HYV rice received nitrogen in the six districts of Champaran, Monghyr, Coimbatore, Madurai, 24-Parganas (Aus) and Midnapur (Aus & Aman). In the remaining districts except for Bolangir and Sibsagar (Autumn & Winter) the proportion of HYV rice area receiving nitrogen was also quite high being in the range of 89 and 99 per cent. In Bolangir, Sibsagar (Autumn) and Sibsagar (Winter) only about 57, 36 and 18 per cent of the HYV area received the application of nitrogen.

The doses of nitrogen applied were close to the recommended levels in the five districts of Guntur, Coimbatore, Madurai, Midnapur (Aus) and Bolangir (see table). Of the remaining districts except for the districts of Champaran, Varanasi, Sibsagar, Cuttack, Bilaspur and Gonda, the doses of nitrogen applied were slightly below the recommended level in 7 districts being 72-86 per cent of it and of a low order in another 7 districts being 55-66 per cent of it. In Champaran, Varanasi, Sibsagar and Cuttack the doses of nitrogen applied



were much below the recommended level being about 33-45 per cent of it and of a very low order in Bilaspur and Gonda being only about one-fourth of it.

#### **Application of Phosphorus**

Use of phosphorus was reported in 90 per cent or more of the area under HYV rice in Shimoga, Guntur, Champaran, Madurai, Kolar and Coimbatore. In the remaining districts the proportion of such area rather varied widely being in the range of 56-86 per cent in 6 districts and 35-52 per cent in another 6 districts while in the rest of the 5 districts of Cuttack, Sibsagar (Autumn & Winter), 24-Parganas (Aus), Meerut and Moradabad such area was very low being about 25 per cent or less.

The doses of phosphorus applied expressed as a proportion of the recommended level varied very widely over the different districts. The doses applied were close to the recommended level in Bolangir, Patiala and Coimbatore and moderately close to recommended level (80-90%) in 4 districts (see table). Of the remaining districts, in 4 districts the doses applied were about 70-77 per cent of the recommended level, in 8 districts 54-66 per cent of it and in 5 districts 42-50 per cent of it while in the rest of the two districts of Champaran and Bilaspur the doses applied were nearly one-fourth and one-fifth of the recommended level.

#### **Application of Potash**

Application of potash was reported in 70 per cent or more of the area under HYV rice in Madurai, Sibsagar, Coimbatore, Kolar, Trichur, Champaran and Midnapur (Aman). Of the remaining districts, in the two districts of Guntur and Midnapur (Aus) the proportion of such area was about 58 per cent, in 6 districts between 24 and 48 per cent, in 5 districts between 10 and 20 per cent and in the rest of the 5 districts of Sibsagar (Autumn & Winter) Meerut, Patiala, Bilaspur and Gonda of a very low order being less than 10 per cent.

The doses of potash applied were as per the recommended level in the 5 districts of Karimnagar, Sibsagar (Winter), Trichur (Autumn), Coimbatore and 24-Parganas (Aus and Aman) and close to the recommended level in Madurai, Cuttack and Midnapur (Aus) being about four-fifth of it or more (see Table). Of the remaining districts, in 7 districts the dose applied was 50-75 per cent of the recommended level, 25-50 per cent of it in 8 districts and of a very low order in Bilaspur being only about 16 per cent of it.

Thus, from the above it is seen that as much as 82, 64 and 43 per cent



of the area under improved varieties of rice in Sibsagar during Winter and Autumn and in Bolangir respectively did not receive chemical fertilizers at all. In the districts of 24-Parganas (Aus), Moradabad, Meerut and Gonda, although almost the entire HYV rice area received nitrogen, use of phosphorus and potash was limited to 20 per cent or less of the area under HYV rice. Likewise, in Ambala, Saran, Varanasi, Cuttack and Amritsar use of phosphorus and potash was confined to 50 per cent or less of the HYV rice area. The average rates of application of N, P and K were of a very low order in the districts of Bilaspur, Gonda, Varanasi and Champaran, being less than 50 per cent of the recommended levels.

The main factors limiting the fertilizer use as reported by the cultivators were lack of funds, with farmers, inadequate credit facilities, high cost of fertilizers, inadequate water supply and unfavourable seasonal/climatic conditions. There is thus a need for a detailed and intensive investigation to study these and other factors which serve as constraints to the large scale application of fertilizers at recommended levels so that appropriate remedial measures could be taken to bring the entire HYV rice area under fertilizer application which in turn will help the farmers to exploit the full yield potential of new varieties. This aspect forms a part of a survey proposed to be undertaken by the Institute during the VI Plan.

Table : Average Rates of Application of N, P and K (kg/ha) As Adopted by the Cultivators and the Recommended Levels.

State	District	Recommended levels			Average rates adopted		
		N	P	K	N	P	K
1	2	3	4	5	6	7	8
Andhra Pradesh	Guntur	80	62	0	96	41	27
	Chittoor	100	60	50	77	28	27
	Karimnagar	125	75	37	90	37	37

Table : (Contd.)

1	2	3	4	5	6	7	8
Assam	Sibsagar (Autumn)	40	20	20	14	12	13
	Sibsagar (Winter)	40	20	20	17	17	22
Bihar	Saran	75	40	25	48	24	12
	Champaran	100	60	60	46	16	14
	Monghyr	100	50	25	58	35	18
Haryana	Ambala	125	62	62	81	31	18
Karnataka	Shimoga	100	50	50	83	41	37
	Kolar	100	50	50	86	37	36
Kerala	Trichur	90	45	45	69	28	61
Madhya Pradesh	Bilaspur	150	100	37	41	20	6
Orissa	Bolangir	100	50	50	92	55	22
	Cuttak	125	62	62	43	31	52
Punjab	Amritsar	125	30	30	82	27	13
	Patiala	125	30	30	97	42	21
Tamil Nadu	Coimbatore	100	50	50	129	48	50
	Madurai	100	50	50	100	40	44
Uttar Pradesh	Meerut	100	50	40	55	28	12
	Moradabad	100	50	50	56	27	13
	Varanasi	120	60	60	52	25	22
	Gonda	120	60	04	32	*	*



Table : (Contd.)

1	2	3	4	5	6	7	8
West Bengal	24-Parganas (Aus)	60	30	30	39	19	32
	Midnapur (Aus)	60	30	30	68	19	24
	24-Parganas (Aman)	60	30	30	45	23	32
	Midnapur (Aman)	60	30	30	55	21	20

\*Estimates not presented as based on very few observations.

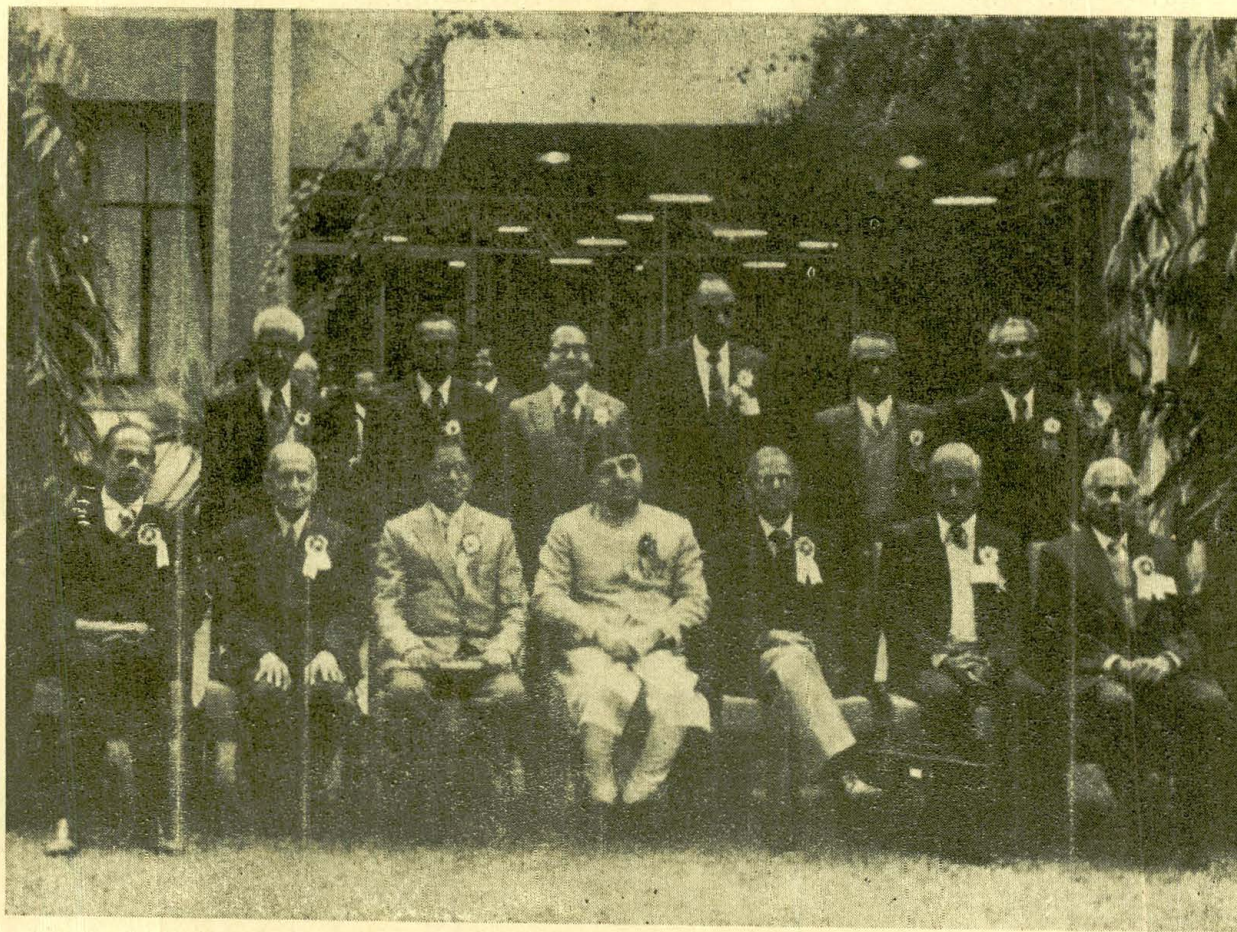
### 3. 35TH ANNUAL CONFERENCE OF ISAS ORGANISED BY IASRI

The Indian Agricultural Statistics Research Institute (IASRI), New Delhi organised the 35th Annual Conference of Indian Society of Agricultural Statistics from 28th to 30th December, 1981. Shri Rao Birender Singh, Hon'ble Minister for Agriculture and Rural Reconstruction inaugurated the Conference on 28th December, 1981, at IASRI. He was glad to know the aim and objectives of the Society and its achievements in the field of Agricultural Statistics for research and development in agriculture, animal husbandry and allied fields. In view of the significant contribution made by the Society he suggested that such non-official bodies should be encouraged for undertaking more research and developmental activities and for which the Government should provide adequate financial support. The information gap mentioned by him was a challenge to the Agricultural Statisticians.

Dr. Prem Narain, Director, IASRI while welcoming the Hon'ble Minister and the Delegates, highlighted in brief, the achievements made by the Institute during the last 30 years. He stated that IASRI is the premier Institute whose objective is to promote and conduct research and training in agricultural statistics in the country for improving the planning and evaluation of agricultural research and development. He emphasised that though the Institute



**35th Annual Conference of Indian Society of Agricultural Statistics**



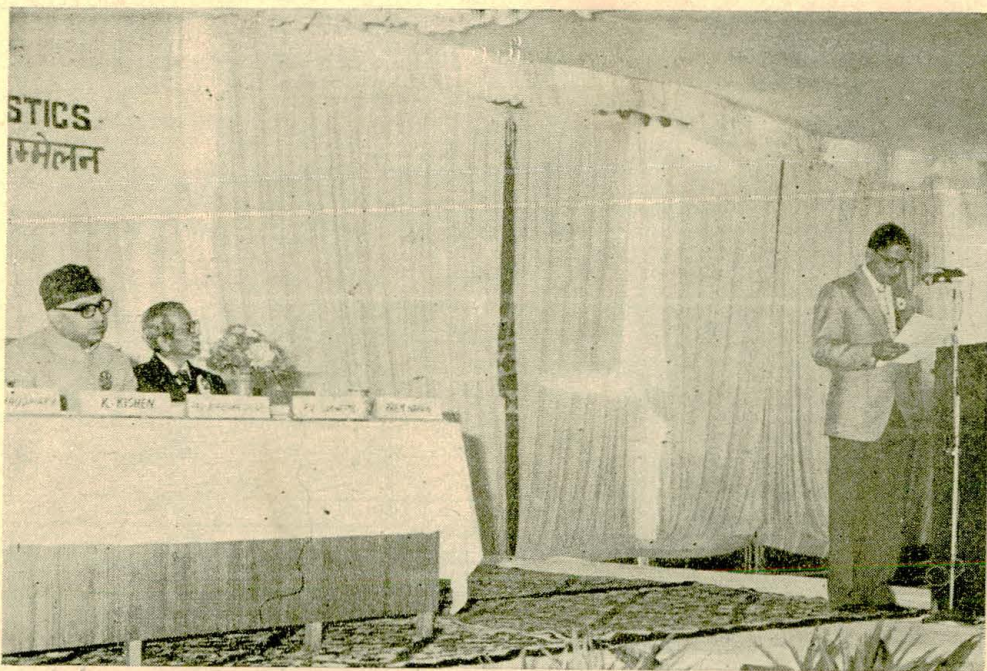
Shri Rao Birendra Singh, Hon<sup>ble</sup> Minister with the members of Executive Council of I.S.A.S.





Shri Rao Birendra Singh, Hon'ble Minister proceeding to the dias, to inaugurate the 35th Annual Conference of I.S.A.S.





Dr. Prem Narain, Director, I.A.S.R.I. welcoming the Chief Guest & delegates.



Dr. P. V. Sukhatme, Executive President I.S.A.S., giving Presidential Remarks at the Inaugural Function





Shri Rao Birendra Singh, Hon'ble Minister inaugurating the 35th Annual Conference ISAS.



Shri S. C. Chaudhuri, Vice President, ISAS proposing a Vote of Thanks to the Chief Guest and delegates.



neither evolves any high yielding varieties of seeds nor improved agricultural practices nor even superior breeds of animals, it attempts to develop Statistical techniques which could provide with powerful means for efficient planning and observational and experimental programmes as well as on unambiguous interpretation and summarisation of resulting data in the field of crop and animal sciences.

Dr. P.V. Sukhatme, Maharashtra Association for Cultivation of Science, Pune in his Presidential remarks observed that human nutrition gap in the country is exaggerated by Western Countries. He gave example of people in the North and South (Kerala) regarding their body built, food intake and working capacity and stated that though people of Kerala are short statured and take less food yet their working capacity is not less than their counterparts in the North. He stressed the need for intensive studies on nutrition and its variability.

Dr. K. Kishen, former Emeritus Scientist of the ICAR and Sessional President of the Conference gave the technical address on 'Experimental design in agricultural and animal husbandry research in India'. He stressed the need for conducting more experiments in planned manner so as to obtain maximum information utilising limited resources. A close, healthy, fruitful and harmonious collaboration between the experimenters and the statisticians in the above endeavour would be essential, he emphasised.

To perpetuate the memory of late Dr. Rajendra Prasad, the founder President of the Society, a lecture is organised every year. During the 35th Conference. Prof. N.G. Ranga, Member of Parliament, delivered the memorial lecture on "Vista for continuous surveys to monitor progress in rural welfare planning". He suggested that detailed and continuous surveys should be undertaken to assess and evaluate the success or failure of present welfare oriented schemes for the benefit of weaker sections of people in rural areas.

The symposium on "Alternative sources of energy-measurement of efficiency" was organised at the conference under the Chairmanship of Dr. P.V. Sukhatme. The need to explore and exploit alternative sources of energy to meet its increasing demand was emphasised. It was recommended that intensive studies be undertaken to develop improved techniques for production of bio-fertilizers, cheaper material for harnessing of solar energy and proper management of organic matter consisting of cow-dung, agricultural wastes, water-hyacinth, etc. State-wise and region-wise energy budgets need to be prepared



taking into account all the local resources like solar, bio-mass and animate energy so as to minimise the use of costly resources of energy like electricity and oil. Another symposium on "Assessment of impact of drought and flood" was organised under the Chairmanship of Shri Pritam Singh, of Central Water Commission. The symposium addressed itself to the task of indentifying parameters required for assessment of loss, the adequacy of the existing agency responsible for collection of such data and to suggest techniques and methodologies for assessing the losses with greater reliability and to study the correlations if any between depth and duration of floods and damage to crops and household effects.

During the period of conference (28-30 December, 1981) as many as 77 research papers dealing with agricultural statistics were presented and discussed. The conference provided a good forum for agricultural statisticians to exchange ideas in their field of research.

#### **4. TRAINING AND BASIC RESEARCH**

##### **4.1 Training**

During the quarter under report in all 40 students were admitted into various courses. 20 students into Senior Certificate Course, 7 students into Professional Statisticians Certificate Course, 8 students into Diploma in Agricultural Statistics and 5 students into Diploma in Advanced Computer programming.

The dissertation of theses of 7 students of M.Sc. (Agri. Stat.) had been approved during the quarter.

##### **4.2 Basic Research**

A model for the analysis of groups of experiments when the data do not follow normal distribution had been developed. Sampling procedures were developed for imperfect frames.

##### **4.3 Seminars**

During the quarter under review, 14 seminar Talks were delivered by

the students of the Institute on various topics of interest in the field of Agricultural Statistics. In addition to these, two seminar talks were also delivered by the eminent scientist.

<i>S.No.</i>	<i>Speaker</i>	<i>Topic</i>
1.	Dr. J.C. Gower, Principal Scientific Officer, Rothamsted Experimental Station, Harpenden, Hertz (U.K.)	(i) Multivariate Analysis in Soil Science.  (ii) Inference of various sciences on the development of Multi- variate Analysis.

#### 4.4 Hostel Activities

4.4.1 Some new students of Ph.D., M.Sc., Diploma and Certificate Courses, Joined the hostel. The strength of the hostel upto December, 1981 was as under :—

<i>Courses</i>	<i>Students</i>
Ph.D.-I year	5
Ph.D.-II year	8
Ph.D.-III year	Nil
Ph.D.-IV year	2
M.Sc.-I year	10
M.Sc.-II year	6
Diploma	6
Diploma (Computer Science)	4
P.S.C.C.	5
S.C.C.	18
Total	64



4.4.2 The general body meeting of the Hostel was held on 19.11.81 under the Chairmanship of Dr. Prem Narain (Warden). Shri V.K. Dwivedi (Ph.D. I year student) was nominated by Warden as Prefect of the Hostel for the session 1981-82. Other members of the Executive Body were elected.

4.4.3 Dussehra and Dipawali festivals, were celebrated in the hostel enthusiastically.

4.4.4 Annual Day of the Hostel was celebrated on 29.9.1981. The chief guest was Dr. R.M. Acharya, Dy. Director General (AS), I.C.A.R. A Souvenir was published on the occasion.

## 5. ADVISORY SERVICE

5.1 During the quarter under review, technical advice and guidance was rendered to research workers and students of the Research Institutes, Agricultural Universities and other research organisations in planning of their experimental investigations and statistical analysis/computerisation of their research data as also in regard to research projects referred to the Institute by the ICAR and other organisations. Some details of the technical advice and guidance given by the Institute during the quarter under review are given below in brief :-

### 5.1.1 Crop Forecasting Methodology

Shri V.K. Malhotra, Statistical Officer, Directorate of Plant Protection, Faridabad was given technical advice regarding (i) estimation of pests and diseases incidence and (ii) order statistics.

### 5.1.2 Sample Survey Methodology

Technical advice was given in Planning of survey, formulation of technical programme and preparation of proformae for "Study of performance of warabandi system of irrigation in Hissar" undertaken by Ford Foundation, New Delhi, Sept.-Oct., 1981.

Agriculture Finance Corporation (AFC) was given technical advice/guidance in the conduct of National Seed Demand Study of the NSC.



### 5.1.3 Animal Sciences :

Shri G.S. Tiwari, Chief Statistical Officer, Directorate of Veterinary Services, M.P. (Bhopal) was given advice in regard to finalisation of the schedules pertaining to the scheme 'Effectiveness of frozen semen vis-a-vis liquid semen'.

Shri U. Sud, Scientist (S-1) of Nematology, Division of I.A.R.I. was given guidance regarding the theory of Stability of population.

## 6. FIELD SURVEY WORK

### 6.1 Field Training

During the quarter under review, field training was imparted in connection with the projects mentioned below at the places shown against them.

- (i) Pilot Sample Survey to study the impact of National Demonstration Trials on crop production-Rohtak (Haryana).
- (ii) Pilot Sample Survey to study the impact of floods on agricultural production in a region of U.P.—Lucknow, Faizabad and Ballia (U P.).
- (iii) Pilot Sample Survey for developing a sampling methodology for estimation of livestock products on the basis of data collected as a part of normal work of the field agency of animal husbandry department—Hoshangabad and Patiala.
- (iv) Ford Foundation Study—Hissar.
- (v) Collection of data under National Index of Agricultural field-experiments—Patna, Lucknow and Kanpur.
- (vi) Planning of experiments, statistical analysis and interpretation of data under AICARP in (i) Humid Western Himalayan (ii) Sub-humid Satluj-Ganga Alluvial plains—Ludhiana (Punjab) and R.S. Pira (J & K)



## 6.2 Field Work Inspection/Supervision

Field work inspection/supervision was carried out during the quarter under review in connection with the projects given below in the areas/places shown against them :-

- (i) Index of Cost of production of milk in I.C.D. area—Bhopal (M.P.).
- (ii) Pilot Sample Survey to study the impact of National Demonstration Trials on crop production—Rohtak district of Haryana.
- (iii) Pilot Sample Survey to study the impact of floods on agricultural production in a region of U.P.—Lucknow, Faizabad and Ballia (U.P.)
- (iv) Pilot Survey to study the performance of cross-bred cattle under village conditions—Palampur area (H.P.).
- (v) Planning of experiments, statistical analysis and interpretation of data under AICARP in (i) Humid Western Himalayan (ii) Sub-humid Satluj Ganga Alluvial plains—Ludhiana (Punjab) and R.S. Pira (J&K).
- (vi) Pilot Survey on cost of production of Banana/Mango and its marketing practices—Surat and Bulsar districts of Gujarat State.
- (vii) Determination of constraints operating in transfer of technology for economic development of ORP villages of tribal area of district Dang (Gujarat).

## 7. ABSTRACTS OF PAPERS PUBLISHED

- 7.1 IYER, V.N., SEHGAL, D.K. AND LAL, RAMJI—A study on trend in the long term effect of continuous and phased manuring of potassic fertilizers in rice-rice rotation. *Jour. Ind. Potash, Vol. V., No. 4.*

A study on the long term effect of potassic fertilizers on rice-rice rotation based on data collected from four centres under the all India Co-ordinated Agronomic Research Project showed that wherever there was response to potassium, application of potassic fertilizers every season was not needed and it would be enough if it is applied to either kharif rice or rabi rice. A comparison of the response to potassium when applied either in kharif or rabi seasons indicated that it may be more beneficial to apply potassic fertilizers to kharif rice at Karaiyiruppu (Tamil Nadu) and Karamanai (Kerala) and to rabi rice at Mangalore (Karnataka)

- 7.2 LAL, BASANT AND BHARGAVA, P.N.—A note on qualitative-cum-quantitative design. *Jour. Ind. Soc. Agri. Stat. Vol. XXIII, No. 3, Dec. 1981.*

A method for the construction of qualitative-cum-quantitative asymmetri-



cal factorial designs for the situation where two qualitative factors are associated with one quantitative factor along with other quantitative factors. The method is illustrated by constituting a suitable design for  $2 \times 4 \times 3 \times 2$ . The method of analysis for the design is also discussed.

- 7.3 MARUTIRAM, B., NADKARNI, U.G. AND JAIN, T.B.—Sampling from fleeces for assessment of wool quality. *Jour. Ind. Soc. Agri. Stat.*, Vol. XXXIII, No. 3, pp. 43-56, Dec., 1981.

The variations in the quality of wool within a fleece and between fleeces of sheep present considerable difficulties in getting a representative sample for estimating the mean of any quality character. In this paper, the results based on the studies made at I.A.S.R.I. on the regional sampling procedure and three composite sampling procedures to get an estimate of a fleece character are discussed. The sample-sizes for regional sampling and composite sampling procedures with 5 per cent standard error of the mean are given for the two important characters viz., fibre diameter and crimps per cm.

- 7.4 PANDEY, R. K. AND SARUP, SHANTI—Changes in the pattern of land holdings in relation to productivity in india. *Ind. Jour. Agri. Eco.*, Vol. XXXVI No. 4, Oct.-Dec., 1981.

The paper aims at analysing the changes in distribution pattern of land holdings during 1970-71 to 1976-77. The effect of holding size and its distribution on crop productivity has also been analysed. Factors, e.g., application of modern seeds, chemical fertilizers and irrigation water have been included in the analysis. The study is based on secondary data. The study shows that during the study period there has been an increase in the number of holdings in all the States. Over the years, the availability of land for cultivation on an average, has declined on each holding. With a few exceptions, the proportion of marginal holdings has increased. The concentration ratios reveal that there is some improvement in the distribution of land holdings in 1976-77 as compared to 1970-71. There is some indication that as the average holding size increases the productivity would decline. The study also confirms that the holding size and higher proportion of marginal and small holdings contributed significantly to the higher cereal productivity.

- 7.5 PANDEY, R.K. AND KISHORE, VIMAL—Regional shifts in crop productivity. *Capital*, June, 1981.

The paper is based on the data for different districts in Himachal Pradesh. The method of shift analysis is developed by Perloff has been used in the paper.



Based on district-wise data for the year 1960-61 and 1972-73, the shifts have been analysed. It has been concluded that during the period, 1960-61, 1972-73 yield of wheat increased by 80 per cent in Simla, Kangra and Bilaspur districts.

- 7.6 PANDEY, R.K. AND KISHORE, VIMAL—Shifts in crop productivity Variations. *Eastern Economist, December, 1981*

This study aims at comparing the yield of grains, use of fertilizers, use of irrigation, intensity of cropping in various States for the periods 1950-51, 1960-61 and 1970-71. It also aims at studying the net shifts in crop productivity and other variables mentioned above in various States. The study shows that during the period, 1950-51 to 1970-71, the technological change and development of resources in the country helped some states more [than the others. While some States like West Bengal, Kerala, Assam, J & K and U.P., which were placed within the first six States in the terms of yield in 1950-51 lagged behind during 1970-71, due to less than the average progress made by them in terms of resources. The States like Punjab, which had eighth position in 1950-51 occupied the first place in 1970-71. Himachal Pradesh gained by occupying the sixth rank in 1970-71 against tenth in 1950-51 and Tamil Nadu occupied the third rank in 1970-71 against fifth initially, in 1950-51. Differential regional pattern of growth were also observed in the case of fertilizer use, irrigation and cropping intensity.

- 7.7 PATIL, A. S. AND PANDEY, R.K.—Demand for phosphatic fertilizer. *Fertilizer News, December, 1981.*

An attempt has been made in this study to examine influence of economic and agronomic factors in determining the application of phosphatic fertilizer at the macro-level and to explore the relative contribution in enhancing phosphatic fertilizer use in different States. Time-series data for 15 states from 1955-56 to 1975-76 have been analysed. The variables studied are consumption of fertilizer, crop price ratio, proportion of irrigated area, etc. It has been observed that irrigation is the most dynamic factor for increasing fertilizer consumption. The increase in the 'real' price of phosphatic fertilizer may not effect consumption in a significant manner in almost all the States.

- 7.8 RAI, S.C.—An analysis of ordered observations in block designs. *Jour. Ind. Soc. Agril. Stat., Vol. XXXIII, No. 3. pp. 7-14, Dec., 1981.*

A method of analysis of the data which does not satisfy the requirements of analysis of variance technique, has been developed. A mathematical model



has been formulated and test procedures are discussed. In the null hypothesis we assume that the treatment ratings are equal whereas the alternative hypothesis does not make any assumption of equality of treatment ratings. The probability of treatment preference  $P (T_1 > T_2 \dots > T_t)$  involves  $\binom{t}{2}$  paired comparisons. By following the same approach we may develop the method of analysis in the similar line for incomplete block designs.

- 7.9 RAO, M.G. AND JAIN, J.P.—Effect of non-normality on response to selection in small population. *Biom. Jour.*, Vol. XXIII ; pp 487-494, 1981

The expressions for the r-th largest standardised deviate have been derived for beta, gamma, exponential and log-normal distributions. Using these expressions the intensities of selection have been computed for different parametric values of the distributions and of p, the proportion saved for samples of size upto 10 and compared with the corresponding values for normal distribution. The normal approximation to beta and gamma distributions is seen to be quite robust in predicting response to selection under moderately heavy and low cullings.

- 7.10 SARUP, SHANTI AND PANDEY, R.K.—Assessment of Regional variation in yield gap of wheat crop in India. *Agricultural Situation of India*, November, 1981.

The main aim of this study is to quantify the gap in the potential yield of wheat as demonstrated in the national demonstration conducted during 1974-75 and 1977-78 and the average yield obtained on farmers field during the period. The study also envisages to examine the causes of non-realisation of the potential yield.

The study reveals that the index of yield gap, which is defined as the percentage of un-realised yield potential, is around 70 in majority of the States while the all-India index of yield gap is about 60. Even the State of Punjab which has the highest wheat productivity in the country realises approximately two-third of the existing production potential. From this analysis, it emerges that there is still adequate untapped yield reservoir available in wheat crop in different wheat growing States of the country. The regression analysis reveals that percentage of area under HYV and level of fertilizer use contributes significantly to the potential realisation of wheat crop. From this, we can infer that while variation in production potential may be explained, in good part, due to regional differences in soil and climatic conditions, the exist-



ing yield gap, on the other hand may be attributed to the extent and level of adoption of modern technology and provision of necessary infrastructure facilities in the States.

- 7.11 SINGH, D. AND KHOSLA, R.K.—Crop pests, diseases and losses. A discussion. *Jour. Ind. Soc. Agri. Stat.*, Vol. XXXIII, No. 3, pp. 81-91, 1981

On the basis of the pilot studies made on estimation of incidence of pests and diseases and consequent crop losses, a discussion was made regarding methodology for conducting large-scale survey. Other related problems to be solved have also been enumerated for its further improvement.

- 7.12 SINGH, HAKIM AND BOKIL, S.D.—A Statistical study on buffer-stock policy.—*Jour. Ind. Soc. Agri. Stat.* Vol. XXXIII. No. 3. Dec., 1981, New Delhi.

The importance of buffer-stock operations for maintenance of price stability is generally recognised. Particularly for foodgrains and for a country like India where their production varies considerably from year to year, these operations are crucial for the health of the general economy. In relation to the buffer stocks the most important questions are those regarding their size and rules of operations, namely, rules governing addition to and releases from the stocks. The estimate of size of buffer stock necessary for success of various buffer stock policies with probability of  $P=0.90$  were brought together. The policies considered envisaged full or partial adjustment for surplus/deficit for different growth rates of demand and supply and for periods of 3, 5 and 10 years. If further data give indication of any change in parameters the method adopted in this study may be employed for derivation of results appropriate to the situation.

## 8. PAPERS ACCEPTED FOR PUBLICATION

1. AGARWAL, S.K. AND KUMAR, PRANESH—A note on Rao's inclusion probability proportional to size (IPPS) sampling scheme—*Biometrical Jour.*
2. BOKIL, S.D. AND KAUL, B.L.—Economics of marketing of apples in Hilly areas of Uttar Pradesh—*Ind. Jour. Horticulture.*
3. JAIN, J.P.—An approach for estimation of heterosis when performance of parents is not known—*Ind. Jour. Anim. Sci.*
4. KUMAR, PRANESH AND AGARWAL, S.K.—On a simple procedure of inclusion probability proportional to size (IPPS) sampling—*Biometrical Jour.*



5. KUMAR, PRANESH, AGARWAL, S.K. AND MAHAJAN, V.K.—On use of transformed auxiliary information in PPS method of sample selection.—*Biometrical Jour.*
6. KUMAR, PRANESH, KATHURIA, O.P. AND AGARWAL, S.K.—On a sampling scheme with inclusion probability proportional to size—*Math. Operation. Statistik, Series Stat.*
7. PATIL, A.S. AND PANDEY, R.K.—Demand and nitrogenous fertilizer in India—*Fertilizer News.*
8. SINGH, RANDHIR—A sampling scheme for study of two characters—*Biometrical Jour.*
9. SINGH, RANDHIR—On the use of incomplete frames in sample surveys—*Biometrical Jour.*

## 9. COMPUTER SCIENCE & NUMERICAL ANALYSIS

### 9.1 Data Processing :

During the quarter under report the Division of computer Science & Numerical Analysis continued to provide data processing facilities to the Scientists, Research Workers and students from various institutes under I.C.A.R., Central Agricultural Universities, Agricultural Faculties, Agricultural Colleges, Directorate of economics and Statistics, Govt. of India. The Division gave Guidance/Advise and assistance in data preparation, computer programming and statistical analysis of their research data on the electronic computer. A few organisations utilised the system on payment basis.

### 9.2 Computer Utilisation :

During the quarter under report the computer was run in two shifts from 8 A.M. to 8 P.M. On many occasions it was run on sundays and IInd Saturdays to complete the backlog. About 4930 production jobs and 1370 testing jobs were processed.

### 9.3. Programming Facilities :

Programming help was given to 43 Ph.D., 13 M.Sc. students and 15 other research workers from various organisations.

### 9.4 Software Development :

Five new computer programmes were developed and also same of the programmes were modified to meet the specific needs of the users.



### 9.5 Training Programme :

A two year full time Diploma Course in Advanced Computer programming was started from October, 1981. In this course five students have been admitted. All the regular classes of this course are being taken by the scientists of the Division.

### 9.6 M.T. Unit :

During the period under report about 3 lakhs cards were punched and verified. This punching work was related to various schemes of I.A.S.R.I. and other institutions of I.C.A.R., Agricultural Universities and a few other outside agencies. About 545 listing, 124 sorting, 70 reproduction jobs were undertaken on various unit record machines.

## 10. PAPERS PRESENTED AT INTER-ORGANISATIONAL SEMINARS, WORKSHOPS, ETC.

10.1 The title and authorship of Papers presented and the particulars of the workshops, seminars at which these were presented, are given below :

10.1.1 World Meteorological Organisation Symposium on "Meteorological aspects of tropical droughts", held at New Delhi from 7th to 11th Dec., 1981.

NARAIN, P., BHARGAVA, P.N. AND SAXENA, ASHA—A Statistical study on incidence of drought in relation to agricultural production.

10.1.2 National Seminar on "Strategies of Pest Management", held at I.A.R.I., New Delhi from 21st to 23rd Dec., 1981

NARAIN, P. AND KHOSLA, R.K. —Statistics in Pest Management.

10.1.3 Forty-first Annual Conference of the "Indian Society of Agricultural Economics" held at Karnataka University, Dharwar from 25th to 27th Dec., 1981.

JAIN, T.B. AND BHATIA, D.K.—Labour utilization in poultry keeping in a rural area.

10.1.4 Thirty-fifth Annual Conference of the "Indian Society of Agricultural Statistics" held at IASRI, New Delhi from 28th Dec., to 30th Dec., 1981.

(i) SINGH, RANDHIR—Efficiency of double sampling in two stage design.

(ii) RAI, S.C. AND RAO, P.P.—Grouping of ordered observations in split-plot designs.



- (iii) AGARWAL, RANJANA, JAIN, R.C. AND JHA, M.P.—Joint effects of weather variables on rice yield.
- (iv) BATHLA, H.V.L., KATHURIA, O.P. AND SINGH, JAGMOHAN—Methodology for assessment of losses due to floods.
- (v) GOEL, B.B.P.S. AND SINGH, K.B.—Energy from animal resources in agriculture and rural households—Measurement of efficiency.
- (vi) KATHURIA, O.P.—Sample survey for assessment of drought and flood.
- (vii) SINGH, RAJINDRA AND KATHURIA, O.P.—Sampling without replacement in qualitative response models.
- (viii) SINGH, RAJINDRA AND KATHURIA, O.P.—Use of supplementary information in quantitative randomised response model.
- (ix) KUMAR, RAM, BANERJEE, A.K. AND DEY, A.—A method of construction and analysis of confounded asymmetrical factorial design.
- (x) RAHEJA, S. K., MEHROTRA, P.C. AND TYAGI, K.K.—Some aspects of storage and disposal of foodgrains in Delhi State.
- (xi) RAHEJA, S.K., MEHROTRA, P.C. AND SATYA PAL—Role of credit in adoption of improved agricultural technology.
- (xii) RAHEJA, S.K., MAHROTRA, P.C. AND TYAGI, K.K.—A scheme for construction of index of adoption rate of improved agricultural technology.
- (xiii) SINGH, K.K. AND SRIVASTAVA, A.K.—Adjustment for non-response using auxillary character.
- (xiv) RAHEJA, S.K. AND SHASTRI, S.S.—A study on successive sampling technique adopted in HYVP surveys.
- (xv) CHAUDHRY, F.S. AND KHATRI, R.S.—Sequential estimation of population size.
- (xvi) CHAUDHRY, H.B.—Study of marketable surplus of wheat in operational research area chittorgarh.
- (xvii) SINGH, SHIVTAR AND RAUT, K.C.—Life time economics of cross-bred and non-descript cows in a rural area.



- (xviii) GUPTA, H.C. AND NADKARNI, U.G.—On ratio estimate used in cost of production studies.
- (xix) NADKARNI, U.G., AGARWAL, S.C. AND RAVINDRAN, C.D.—Floor area and transactions in birds in poultry.
- (xx) SOMAYAZULU, L.B.S. AND AGARWAL, S.C.—Study of growth of LWY and Lr breed of pigs.
- (xxi) SOMAYAZULU, L.B.S. AND AGARWAL, S.C.—Prediction of slaughter weights of pigs on the basis of a few initial weighings.

#### 11. CONFERENCES/SEMINARS/SYMPOSIA/WORKSHOPS. ETC. ATTENDED BY THE SCIENTISTS

Date	Name of the seminars. etc.	Name of scientists with designations
Nov., 12th to 16th	Fifth Annual Conference of "Central and State Statistical Organisations" organised by C.S.O., New Delhi.	Dr. Prem Narain, Director Sh. S.K. Raheja, Scientist (S-3)
Nov., 26th to 28th	Seminar on "The challenges of extension education in the eighties" organised at the annual conference of Indian Society of Extension Education, I.A.R.I., New Delhi.	Sh. S.K. Raheja, Scientist (S-3)
Dec., 3rd to 5th	National Seminar on "Strategies for achieving fertilizer consumption targets and improving fertilizer use efficiency" held at F.A.I., New Delhi.	Sh. P.N. Bhargava, Scientist (S-3) Sh. S.K. Raheja, Scientist (S-3)



1	2	3
Dec., 7 to 11	World Meteorological Organisation Symposium on "Meteorological aspects of tropical droughts" held at New Delhi.	Dr. Prem Narain, Director Sh. P.N. Bhargava, Scientist (S-3) Sh. H.C. Jain, Scientist (S-1) Mrs. Asha Saxena, Scientist (S-1)
Dec., 18 & 19	"Ninth North/Western India Dairy Husbandry Officers Workshop" held at N.D.R.I., Karnal.	Sh. J.C. Malhotra, Scientist (S-1)
Dec., 25 to 23	Seventh Workshop of "All India Co-ordinated Research Project on Poultry Breeding" held at University of Agricultural Sciences, Bangalore.	Sh. P.K. Malhotra, Scientist (S-1)
Dec., 21 to 23	National Seminar on "Strategies of pest management" held at I.A.R.I., New Delhi.	Dr. Prem Narain, Director. Sh. R.K. Khosla, Sc. Secy. to Director
Dec , 25 to 27	41st Annual Conference of "Indian Society of Agricultural Economics" held at Karnataka University, Dharwar.	Sh. T.B. Jain, Scientist (S-1)
Dec., 26 to 29	Annual Workshop of the "All India Co-ordinated Agronomic Research Project" held at B.H.U., Varanasi.	Sh. P.N. Bhargava, Scientist (S-3) Sh. P.N. Soni, Scientist (S-2) Dr. Basant Lal, Scientist (S-1)
Dec., 28 to 30	35th Annual Conference of "Indian Society of Agricultural Statistics" held at I.A.S R.I., New Delhi.	Almost all the, officers of the Institute



## 12. LIBRARY

12.1 During the period under Report 188 books on various subjects, fields of the Institute were added.

12.2 The Library has procured the following reprints published in Scientific journals for distribution among scientists on exchange basis :-

<i>Sl. No.</i>	<i>Author</i>	<i>Title</i>	<i>Name of the Jr.</i>
1.	Anand Prakash & Bokil, S.D.	Stratification and estimation procedure in cultivated surveys.	Jr. Ind. Socy. Agri. Stat. 33 (2), 1981.
2.	D. Singh & Khosla, R.K.	Crop pests, diseases and losses-a discussion.	Jr. Ind. Socy. Agri. Stat. 33 (3), 1981.
3.	Jha, M.P. <i>et al</i>	Some investigation on response to fertilizer and determination of optimum dose using soil test values.	Jr. Ind. Socy. Agri. Stat. 33 (2), 1981.
4.	Marutiram, B. <i>et al</i>	Sampling from fleeces for assessment of wool quality.	Jr. Ind.Socy. Agri. Stat. 33 (3), 1981.
5.	Prem Narain	Use of partially diallel crosses in plant improvement	Souvenir Vol. Golden Jubilee of ICAR (1929-79)
6.	Prem Narain & Arya, A.S.	Truncated triangular association scheme and related partially diallel crosses.	Sankhya Sr. 'B' 43 (1), 1981.
7.	Rai, S.C.	Analysis of ordered observations in block designs.	Jr. Ind. Socy. Agri. Stat. 33 (3), 1981

12.3 The reprographic unit of the Library has attended 50 jobs covering 900 pages sent by scientific, Technical and Administrative officers of the Institute.

12.4 The issue and return work at Library Counter involved transaction of Approximate 6800 publications.

12.5 During the quarter under report Approximate 5000 persons visited the Library.



### 13. 'LAB TO LAND' PROGRAMME

Under the ICAR Lab-to-Land programme the Institute carried out the following activities in village Garhi Randhala of Delhi during the quarter under report :-

#### 13.1 Organisation of field day :

One field day was organised in the month of October, 1981. During the field day the farmers were educated about the package of cultivation practices of wheat and vegetable crops.

#### 13.2 Crop demonstrations :

Demonstrations on the use of balanced fertilizers were conducted for higher production of vegetables and wheat as mentioned below :-

<i>Name of crop</i>	<i>No. of demonstrations</i>
Wheat	60
Cauliflower	2
Potato	8
Tomato	3

The crop in all the demonstration fields was in good condition. The harvesting in one of the cauliflower fields had been completed and the farmer had obtained a yield of 218 quintals and an income of Rs. 12,775/- per hectare.

#### 13.3 Demonstrations on use of weedicide :

Arrangement was made for undertaking spraying of 2, 4-D in 22 acres of wheat crop belonging to 17 farmers. The crop treated with the weedicides was under observation.

#### 13.4 Arrangement for control of rodent attack in wheat crop :

Zinc phosphide was supplied to all the farmers adopted under the programme for controlling rodent attack in the standing crop of wheat. The results of application of the pesticide will be known later.

#### 13.5 Popularisation of vegetable cultivation :

Encouraged by the high returns from the vegetable cultivation 21 farmers have included vegetables in their cropping pattern. Area under different crops like potato, tomato, cauliflower, brinjals, carrot and peas accounted for 23 acres during the current rabi season.



### 13.6 Popularisation of cultivation of H. Y. V. of wheat :

As result of extension activities undertaken in the village, the farmers showed great interest in adpoting H. Y. V. of wheat. They were informed about the newly developed varieties of wheat and source for their procurement. It was found that the farmers adpoted under the programme had sown H. Y. V, like H. D. —2204, H.D.—1553, W. L.—711, W. H.—147. and Sargam.

## 14. DISSERTATIONS (WITH ABSTRACTS) APPROVED DURING THE YEAR 1981 FOR AWARD OF M. Sc., DEGREE AND DIPLOMA IN AGRICULTURAL STATISTICS:

### 14.1 M. Sc. Degree

#### 14.1.1 MAITRA, B.—Milk production potentiality of crossbred and non-descript cows through feeding under village conditions.

The knowledge of the production level of rural cows and their feeding status both in terms of physical quantity and nutritive value is useful to study their production capabilities. An attempt was made to work out feed-milk relationship in respect of cross-bred and non-descript cows utilising data collected in a survey in a rural area of West Bengal. The studies was based on 140 cows and of which 94 were non-descript and 46 crossbred. The average lactation yield of cross-bred and non-descript cow respectively. Adequate DCP was available to a cross-bred cow but less DCP to a non-descript cow. There was surplus TDN available to each category of cow. From the feed-milk relationship it was worked out that by feeding additional one Kg. of concentrate, the milk yield would be enchanced by 511 gms. for a cross-bred cow and 661 gms. in the case of a non-descript cow. In both the cases, however, the additional milk yield due to more concentrate feeding would not be economical.

(GUIDE : DR. K.C. RAUT)

#### 14.1.2 SRIDHARAN, H.—Pre-harvest forecasting of Jowar Yield based on biometrical characters.

A pilot study with the aim of forecasting the pre-harvest estimates of Jowar yield (kharif season) on the base of observations on biometrical characters taken at various stages of crop growth was undertaken in Sangli district of Maharashtra. A stratified multi-stage random sampling design was adopted for the selection of villages, fields plots. The data collected were sub-



jected to correlation and regression analysis for developing suitable forecast models and determining time suitable for the forecast. The results indicate that forecast of hybrid jowar yield is possible one month before harvest for a crop of about three and half months duration using the principal components of biometrical characters. The principal components explained more than 75% variation in yield.

(GUIDE : SHRI R. C. JAIN)

#### 14.1.3 KUMAR R.—Some investigation in two dimensional sampling.

The present thesis deals with some studies for sampling two dimensional population spread in space and time. Some examples of such populations are yield estimation surveys for fruits, vegetables, milk yield, fish production etc.. In the present study, investigations are made with a particular reference to vegetable crops which involve multiple pickings.

The approach in the usual yield estimation surveys on vegetable crops is to observe all the pickings of related plots in the selected fields. In order to see the feasibility of estimating the yield on the basis of only few pickings, the approaches of double sampling and component sampling have been investigated. For this purpose the vegetable crop considered is tomato. It is found that through the application of both these techniques improvement in efficiency is observed. However, the application of component sampling as well as double sampling have got their own limitations from practical consideration. A sampling plan is suggested which is more practicable.

(GUIDE : DR. A.K. SRIVASTAVA)

#### 14.1.4 SINGH, M.—Use of auxiliary information in estimation of area under Grazing land.

A substantial part of the requirements of feeds for livestock are met from grazing lands. However no reliable information on the area and output of these lands is available at present. Such information is of vital importance for livestock development programme. To develop a sampling survey technique for collection of these data the I.A.S.R.I., New Delhi conducted in 1978-79 survey on grazing land in Puri District of Orissa State with the cooperation of the state government.

Estimation of the grazing area was the first objective of the survey.

For this purpose a stratified random samplings scheme was adopted and a sample of 45 villages was selected by S.R.S.W.O.R. in two seasons, Rainy and Winter and 85 villages in summer. In these villages information on area under grazing land was collected by field investigators by field to field enumer-



ator S.R.S.W.O.R. estimate based on these observations had large sampling errors. For all the villages in the frame information on area under grazing as reported by patwari was available. Though the figures were old and not very reliable they showed good correlation with the areas actually observed in the sample villages. It was therefore felt that use of these data as auxiliary information may enable us to obtain estimates of area under grazing land in each season with greater precision.

Various estimators have been tried, among these unbiased ratio type estimator may be preferred as other estimators are likely to be significantly biased and providing much lower precision.

(GUIDE : SHRI S.D. BOKIL)

#### 14.1.5 BOASE, RANJAN KUMAR—A study of estimation of areas under idle land and their courses.

In this dissertation data collected under the scheme 'Study to find out the causes of land lying idle in the operational holdings during agricultural year 1977-78' conducted by I.A.S.R.I. in Anantapur district of Andhra Pradesh have been utilized with a view to study the causes of land lying idle in the district.

The results of the study revealed that 29 per cent of the cultivators in the district are laying idle land. The area under idle land is estimated as 309782 acres. Of this area 48 per cent of the area belongs to government 27 per cent to others 21 per cent to cultivators and 4 per cent to village panchyat. The various causes of land lying idle in order to extent of area under idle land were, (i) potential waste land, (ii) soil sickness, (iii) Unfavourable climatic conditions, (iv) Fallow land, (v) Miscellaneous tree crops, (vi) Uneconomical infrastructure and (vii) Land under dispute.

The remedial measures suggested by the cultivators in order of magnitude of area that can be reclaimed were (i) Removal of potential waste land, (ii) Removal of soil sickness, (iii) Provision of adequate resources, (iv) Favourable climatic conditions, (iv) Removal of aged trees and permanent pastures and (vi) Disputes are to be cleared off.

Of the estimated idle land of 309782 acres, 92161 acres of area can not be reclaimed. The rest of the area can be sown with Kharif crops, rabi crops, trees and pastures.

(GUIDE : DR. A.K. BANERJEE)

#### 14.1.6 BHARGAVA, MANOJ.—Use of principal component technique for estimation of crop loss due to pests and diseases.



The thesis deals with a comparative study of the loss in rice-bran yield due to pests and diseases using two techniques. One involving multiple regression of rice-bran yield using partial data on the incidence of pests and diseases corresponding to the maximum level of the five recorded crop growth stages as regressors and the other which involves the use of entire data on incidences for all the crop growth stages through the principal components of the incidences as regressors.

The technique using principal components as regressors provided a better fit of the regression equation, proper estimate of loss and better precision of the estimate.

(GUIDE : DR. K.G. ANEJA)

#### 14.1.7 PATWARDHAN, RAVI.—Comparative study of different estimates of milk production.

Various surveys have been conducted by Indian Agricultural Statistics Research Institute to estimate the total milk production in typical tracts selected one each from different animal husbandry region of the country. In all these surveys household was taken as the ultimate stage sampling unit. In this thesis, methodologies have been developed for estimating the total milk production by taking both household as well as milch animal as the ultimate stage sampling unit. This study is based upon the bench-mark survey conducted in 1975-76 by the Indian Agricultural Statistics Research Institute in the milk shed areas of Madhavaram Milk Supply Scheme in Chingleput district of Tamil Nadu.

A stratified two stage sampling design was adopted for the survey. Using the methodologies developed, the estimates of total milk production were obtained. From the results obtained, it was observed that the variances of the estimates built by taking milch animal as the ultimate unit are much higher than the variances of estimates built by taking household as the ultimate unit.

(GUIDE : DR. H.P. SINGH)

## 14.2 Diploma

### 14.2.1 JAT, P.R.—Stratification in multi character surveys.

The first chapter of this thesis deals with review of literature on the problems of allocation and stratification in univariate as well as multivariate cases. In second chapter equations for determining OPS have been obtained by minimising the loss function under proportional, equal and Yate's plans of allocation for a scheme of stratification in which strata are considered as disjoint sets of increasing rectangles. In third chapter equations for obtaining optimum



parts of stratification, for the sub-division of a standardised bivariate normal distribution in k-strata have been obtained. OPS have been tabulated for the sub-division of above distribution into two strata by minimising the loss function and their efficiencies are compared with that of univariate stratification. The results obtained in the chapter have been utilised to determine optimum points of stratification for sub-division of a bivariate real population into two, three and four strata under different allocations considered. The efficiencies of these methods have been discussed by comparing their losses and individual variances of sample means of the study characters. In addition, the proposed approach is compared with that of minimisation of generalised variance of sample means under proportional allocation.

(GUIDE : DR. D.V. SUBBARAO)

#### 14.2.2 SINGH, HAKIM.—Statistical study on buffer-stock policy.

This study deals with the crucial question of size of buffer-stock. Starting with a given size of buffer-stock and for a given magnitude of random variation around the trend live of production the probability of being able to meet the deficit in bad years can be calculated, for 1,2,...n years. The problem becomes more difficult when the random variation is itself assumed to increase over years according to a certain law which is a realistic assumption. The problem has been dealt with in the present study. The method developed by Simaika (of F.A.O.) has been applied with suitable modifications to suit Indian conditions. The emerging results are expected to be of considerable practical utility in providing guide lines for government policy in relation to foodgrain stocking and distribution.

(GUIDE : SHRI S.D. BOKIL)

#### 14.2.3 CHANDAK, R.R.—Use of RHC method for PPS sampling on successive occasions.

In sampling on successive occasions, varying probability techniques have often been employed for selection of sampling units on the first and/or second occasion. In this thesis two sampling strategies corresponding to the sampling schemes given by Ghangurde & Rao and Jayanti Chotai using ratio method of estimation in place of the difference method applied by these authors, have been considered. Efficiency of sampling strategies developed by the author have been compared with those already available in the literature by considering an appropriate finite population model. A number natural populations have been examined and compared the efficiencies of these estimators.

(GUIDE : DR. O.P. KATHURIA)



## 15. MISCELLANEOUS

## 15.1 Personnel Information

15.1.1 Dr. Prem Narain, Joint Director took over the charge as the Director of the Institute w.e.f, 1st October, 1981 on the premature retirement of Dr. Daroga Singh, former Director of the Institute on 30th September, 1981 to join as Sr. Statistical Adviser (FAO Assignment) Amman, Jordan. He also became the Honorary Secretary of the I.S.A.S. and ex-officio Member of the various Committees, Panels, etc. in the capacity of the Director, IASRI from 1st October, 1981.

## 15.1.2 Appointment/Promotion/Transfer, Etc (From class II and above)

Appointment :—

Consequent upon the appointment of the following persons to the post of Technical Assistant (Stat.). They have joined their duty at the Regional Stations w.e.f the date mentioned against each :—

1. Sh. G. Sajeevan	24.9.1981 (FN)	Bhubneshwar.
2. Sh. S.V. Bhagwat	7.10.1981	Pune
3. Sh. Rama Gopal Kondapalli	16.10.1981	Hyderabad
4. Sh. Arun Kumar Nath	21.10.1981	Jorhat
5. Sh. G.C. Bhaskaran	29.10.1981	Coimbatore

Resignation

Smt. Rita Arora, Technical Assistant (Stat.) has resigned from the services of this Institute w.e.f. 30.11.1981 (A.N.) vide O.O. No. 39 (272)/80-Admn.II dated 30.11.81.

Promotion:—

1. Shri P.R. Yeri, Sr. Tech. Assistant has given Merit Promotion to Grade T-5 (Category-II) in the pay scale of Rs. 650-1200 w.e.f. 1.7.1980.
2. The following Technical Personnel has been given the Merit Promotion to Grade T-4 (Category-II) in the pay scale of Rs. 550-900 w.e.f. the dates mentioned against each :—

Sl. No.	Name of official	Date from which promoted
1.	Shri Jaswant Singh	1.7.1976
2.	Shri H.S. Sikarwar	1.7.1981
3.	Shri Raj Kumar	1.7.1981
4.	Shri R.N. Garg	1.7.1981
5.	Shri V.P.N. Singh	1.7.1981



1	2	3
6.	Shri Vinod Kumar	1.7.1981
7.	Shri Pramod Kumar	1.7.1981
8.	Shri S.P. Jain	1.7.1981
9.	Smt. Shub Lata Paul	1.7.1981
10.	Shri A.R. Keshva	1.7.1981
11.	Shri O.P. Khanduri	1.7.1981
12.	Shri Vinay Kumar Jain	1.7.1981
13.	Shri Kishan Lal	1.7.1981
14.	Shri Rakesh Chandra	1.7.1981
15.	Shri Santosh Saxena	1.7.1981
16.	Shri Shiv Prasad	1.7.1981
17.	Shri Rajinder Kumar-I	1.7.1981
18.	Shri Ravi Kant	1.7.1981
19.	Shri T.A. Khan	1.7.1981
20.	Shri Ram Gopal	1.7.1981
21.	Shri Ashok Kumar-II	1.7.1981
22.	Shri Vishnu Hari Gupta	1.7.1981
23.	Shri Rajinder Kumar-II	1.7.1981
24.	Shai D.K. Gulati	1.7.1978
25.	Shri P.K. Azad	1.7.1980
26.	Shri S.S. Kataula	1.7.1979
27.	Shri M.M. Manchanda	1.7.1980
28.	Shri N.K. Jain	1.7.1977
29.	Shri C.B. Tiwari	1.7.1977

15.1.3 The scientists of IASRI deputed to attend training/study tour/ meetings and to deliver lectures etc. during Oct.-Dec., 1981.

1. Dr. Prem Narain, Director.
  - (i) Attended the Central & States Statistical Organisation Conference at Vigyan Bhawan on 12, 13 and 14.11.1981 as ICAR Representative.
  - (ii) Attended the Executive Council meeting of Indian Society of Agricultural Statistics on 20.11.1981 and 28 12-1981.
  - (iii) Attended the Academic Council meeting of IARI on 27.11.1981.
  - (iv) Attended a meeting with D.G., ICAR regarding ISAS Conference, on 30.11.1981.



- (v) Attended a meeting with the Hon'ble Union Minister for Agriculture & Rural Reconstruction, Shri Rao Birendra Singh regarding Inaugural Function of I.S.A.S. Conference on 1.12.81.
- (vi) Attended the Seminar at IARI given by Prof. John Mellor, Director, IFPRI, Washington on 1.12.81-Topic: 'Global Food Scene'.
- (vii) Attended the International Conference on Flood Disasters, Indian National Science Academy, New Delhi (3-5 Dec., 1981).
- (viii) Attended the Quinquennial Review Team meeting on 5.12.81 at IASRI with Dr. B.P. Adhikari, Dr. P. Bhattacharya and Dr. Mukhtiar Singh.
- (ix) Attended the world Meteorological Organisation Symposium at Vigyan Bhavan and presented a paper on 11.12.81 entitled "A statistical study on the incidence of drought in relation to agricultural production".
- (x) Attended the meeting of Technical Committee on Agricultural Census on 15.12.81 at Krishi Bhavan.
- (xi) Discussed with Dr. S.N. Singh, Deputy Director NDDB, Delhi Office and Dr. H.P. Singh on the Project "Pilot Studies for developing statistical methodology for assessing the losses due to diseases and pests in bovines" on 17.12.81 at IASRI.
- (xii) Attended the meeting of Working Group on Agriculture, Livestock and investment Survey at Sardar Patel Bhavan on 22.12.81



- (xiii) Organised the 35th Annual Conference of the Indian Society of Agricultural Statistics at IASRI from 28th to 30th December, 1981.
2. Dr. S.S. Pillai,  
Jt. Director.
- (i) Attended the meeting of project Advisory Committee on Natural resources data management systems held at Department of Science & Technology on October 30, 1981 in Technology Bhawan, New Delhi.
- (ii) Attended the meeting of the Ad-hoc working committee on information conducted by Department of Science and Technology in the Central Statistical Organisation on 18.11.1981 under the chairmanship of Dr. K.C. Seal, Director General, C.S.O.
- (iii) Attended the 6th meeting of the Indo-U.S. Sub-commission on science and Technology held at Technology Bhawan on 7-9 Dec., 81.
- (iv) Gave a lecture on 'Computers in Agriculture' to the participants of UNESCO course on application of computers for Development held at Indian Institute of Technology, Kanpur on 14th December, 1981.
3. Sh. M.P. Jha,  
Head, C.F.M. Division
- (i) Delivered a lecture to I.S.S. and other Sr. Officers from states on 31.10.81 at C.S.O., New Delhi on "Techniques of Forecasting of Crop Yield".
- (ii) Discussed with Dr. Baldev Sahai, Head Aerial Survey, Ground Truth and Photo Interpretation Division, Space Applications Centre, Ahmedabad on "Crop Forecasting Methodology" on 30th Nov., 1981.



## 15.2. Training-cum-Discussion Seminar

A Training-cum-Discussion Seminar on "Monitoring & Evaluation of Training & Visit System" was organised by the Ministry of Agri., Directorate of Extension, Shastri Bhavan, New Delhi in the Auditorium of Computer Centre Building at the Institute from 2nd to 7th November, 1981. Dr. Prem Narain, Director of the Institute inaugurated the seminar. Shri S.D. Bokil, H.D., S.S.M. was the Convenor. Dr. A.K. Banerjee, Dr. J.S. Maini, Dr. K.K. Tyagi and Shri P.C. Mehrotra delivered lectures to the participants on various topics.

## 15.3. Distinguished Visitors

15.3.1 Seven members of Nepalese delegation of agricultural experts from the Institute of Agriculture and Animal Sciences (Tribhuvan University, Nepal) viz, (i) Dr. Garland P. Wood, Head of the Delegation-(Economics); (ii) Mr. Nanda P. Joshi-(Livestock); (iii) Mr. Tara P. Nepal-(Agronomy); (iv) Mr. Rishi P. Adhikari-(Horticulture); (v) Mr. Ram Bahadur Chhetri-(Physics); (vi) Mr Sunder M. Shrestha-(Pathology) and (vii) Mr. Badri Bahadur Langol-(Extension) visited this Institute in the afternoon of 13th October, 1981 for getting themselves acquainted with the functions and activities of this Institute. Dr. Prem Narain, Director, I.A.S.R.I., New Delhi welcomed the Nepalese delegation and apprised them with the functions and activities of the Institute carried out in the various projects of different Divisions. They also visited the Computer Centre. Dr. Garland Wood, Head of the Delegation wished that such exchange of ideas and visits would be very useful in future.

15.3.2. Dr. J.C. Gower of Rothamsted Experimental Station, Harpenden, Herts (U.K.) visited this Institute in the fore-noon of 9th Dec., 1981. Dr. Prem Narain, Director, IASRI, New Delhi welcomed Dr. Gower and introduced all the HD's and Senior Scientists to him. Thereafter, Director apprised him with the functions and activities carried out in the different Divisions of the Institute. Dr. Gower explained in brief about the functions and activities specially of the Deptt. of Statistics, Rothamsted Experimental Station. Thereafter, he delivered a Seminar talk on 'Multi-Variate Analysis'. He also delivered a seminar talk on 10.11.1981 on the same subject.

## 15.4. Monitoring Cell

There was a meeting of H.D. (A.S.) and the Convenor, Monitoring Cell with the Plan Scheme Co-ordinator on 23rd Nov., 1981. In the light of the discussion, the two forms prepared earlier viz, "Base Proforma" and "Progress proforma" have been suitably combined for monitoring the progress of Research Projects.



**15.5. Exhibition Room**

The exhibition room was given a facelift for the occasion of 35th Annual Conference of Indian Society of Agricultural Statistics held at IASRI, in December, 1981. Twenty new charts were prepared and a number of charts were updated. A number of recent reports and publications of Scientists of the Institute were recented for display in the exhibition room.

**15.6. Staff Research Council**

Meeting of S.R.C. was held on 22nd, 24th and 26th October, 1981 and 71 projects were discussed.

**15.7. IASRI Representatives at Scientific Panel/Meetings of the ICAR**

Name of the Officer	Name of Scientific Panel and date.
(i) Sh. U.G. Nadkarni	"Animal Nutrition and Physiology", held on 13th & 14th Oct., 1981.
(ii) Sh. H.C. Jain	"Agronomy and Soil Science" held on 5th & 6th Nov., 1981.
(iii) Sh. P.N. Bhargava	"Soil Science" held on 5th & 6th Nov., 1981.
(iv) Sh. L.K. Garg	"Plant Breeding" held on 23rd & 24th Nov., 1981.
(v) Sh. J.C. Malhotra	"Animal Breeding" held on 8th & 9th Dec., 1981.

**15.8 Meetings :**

During the quarter under report the following meetings were held.

(i) Sr. Officers	on	Oct.-19th
(ii) HDS and Sr. Scientists	„	Oct.-20th
(iii) Management Committee	„	Oct.-30th
(iv) Hindi Parishad	„	Oct.-31th
(v) HDS and Sr. Scientists	„	Nov.-10th
(vi) HDS and Sr. Scientists	„	Nov.-23rd
(vii) HDS and Sr. Scientists	„	Nov.-26th
(viii) HDS and Sr. Scientists	„	Dec.-10th
(ix) HDS and Sr. Scientists	„	Dec.-17th
(x) Grievance Committee	„	Dec.-17th
(xi) HDS and Sr. Scientists	„	Dec.-24th
(xii) Advisory Board	„	Dec.-30th



### 15.9 Other Information

15.9.1 Dr. Prem Narain has been nominated by Director, IARI a member of Academic Council of IARI in place of Dr. Daroga Singh, *vide* letter no. PGS/13-5/77 dt. 19.11.81.

He was nominated by ICAR letter No. *vide* 7 (56)/81-EE-II dated 11.12.81 as a member of the Advisory Committee on the Marketing Consultancy Assignment awarded to Agricultural Finance Corporation.

Dr. Narain was also nominated to represent Indian Council of Agricultural Research/Deptt. of Agricultural Research & Education on the Fifth Conference of Central and State Statistical Organisation on 12-16th Nov., 1981 at New Delhi in place of Dr. Daroga Singh the former Director *vide* their letter No. 23/3D/81 Estt.

15.9.2. Sh. S.C. Rai nominated as alternative member of Food Sampling Sub-Committee AFDC-57 of Indian Standard Institution.

15.9.3 The following officers were nominated for representing the Committees/Sub-Committees of Indian Standard Institution, engaged in the preparation of standard on Statistical Quality Control, *vide* their letter No. STAT/EC3/A-1 dated 9-11-81.

<i>Name of Committee/ Sub-committee</i>	<i>Principal representative</i>	<i>Alternate</i>
Quality Control and Industrial Statistics Sectional Committee, EC-3	The Director	Dr. S.S. Pillai
Process and Product Control Sub-committee, EC 3:6	The Director	Dr. K.G. Aneja
Industrial Statistics Sub-committee, EC 3:7	The Director	Dr. B.B.P.S. Goel
Sampling Methods Sectional Committee, TDC 33	Dr. Prem Narain	



## 16. कृषकों के खेतों में चना एवं अन्य दालों के लिये उर्वरकों की अनुक्रियाएं

कृषि में आधुनिक प्रौद्योगिकी को अधिक अपनाने से देश में अनाज के उत्पादन में तीव्र गति आई है, जिसने अन्तर्राष्ट्रीय मान्यता प्राप्त कर ली है। यद्यपि, गत दशक में दालों के कुल उत्पादन में थोड़ा बहुत प्रगतिरोध रहा। औसतन वार्षिक उत्पादन लगभग ११ लाख टन तक घटता-बढ़ता रहा। फिर भी राजस्थान, मध्य प्रदेश, महाराष्ट्र और उड़ीसा जैसे कुछ राज्यों में दालों के उत्पादन में देखने योग्य उन्नति हुई किन्तु उत्तर प्रदेश, बिहार, हरियाणा और पंजाब राज्यों में इसके उत्पादन में अधिक गिरावट आई। ऐसे क्षेत्र जिनमें दाल के उत्पादन में अधिक गिरावट आई और उन क्षेत्रों में जहां इसके उत्पादन में हरित क्रान्ति के फलस्वरूप उच्च स्तर का लाभ हुआ, को हम नीचे दी गयी सारिणी में देख सकते हैं :—

### सारिणी-1 : औसत वार्षिक क्षेत्र और दालों की फसलों के उत्पादन में परिवर्तन

राज्य	दालों की फसल के अधीन औसत वार्षिक क्षेत्र (०००, हैक्ट० में)		दालों का औसत वार्षिक उत्पादन (०००, टनों में)	
	1967-68 से 1969-70 तक	197-78 से 1979-80 तक	1967-68 से 1969-70 तक	1977-78 से 1979-80 तक
राजस्थान	3205	3525	1158	1581
मध्य प्रदेश	3977	4642	189	1876
महाराष्ट्र	2410	2770	845	1028
उड़ीसा	78	1532	379	682
उत्तर प्रदेश	4052	2964	3305	2093
हरियाणा	1110	984	1042	812
बिहार	1646	1381	1133	665
पंजाब	506	378	395	287
समस्त भारत जिसमें अन्य राज्य शामिल हैं।	21979	22968	11404	10842



जनसंख्या—वृद्धि से दालों की प्रति व्यक्ति उपलब्धता 20 प्रतिशत से भी अधिक कम हुई है। आयात द्वारा इसकी आपूर्ति को बढ़ाने के लिये भी अधिक कार्यक्षेत्र नहीं है क्योंकि दालें, अन्तर्राष्ट्रीय व्यापार में अनाज, कपास, तिलहन इत्यादि की तुलना में नगण्य हैं। भारतीयों की औसत खुराक अधिकतर शाकाहारी है और दालों का उत्पादन गिर रहा है। अतः यह आवश्यक है कि देश में पोषण स्तर को कायम रखा जाये। इस शोघ्नता को ध्यान में रखते हुए कृषि अनुसंधान और विकास कार्यक्रमों में दालों पर प्रयोग करने पर बल दिया गया। वर्तमान अध्ययन में उर्वरक डालकर दालों का उत्पादन बढ़ाने के लिए कार्यक्षेत्र एवं प्रसार की परीक्षा करने के प्रयास किये गये। उपयोग में लाये गये आंकड़े, समन्वित शस्य अनुसंधान कार्यक्रम के अधीन कृषकों के खेत पर किये गये प्रयोगों से सम्बद्ध थे। अधिकांश प्रयोग चना, अन्य महत्वपूर्ण दालें जैसे उड़द, मूंग, अरहर पर किये गये और कुछ हद तक मसूर पर भी किये गये।

## चना

चने पर किये गये 1229 प्रयोगों के आंकड़े उपलब्ध थे। जिनमें से 228 प्रयोग 1972-73 से 1974-75 तक के समय से, 232 प्रयोग 1975-76 से 1976-77 तक के समय से और शेष 769 1977-78 से 1978-79 तक के समय से सम्बन्धित थे। इस समय में डाले गये उर्वरकों के चयनित स्तरों की कुछ औसत अनुक्रिया नीचे दर्शायी गयी है :—

**सारणी-2 चने पर नाइट्रोजन, फास्फोरस और पोटेशियम के चयनित स्तरों से सम्बन्धित उर्वरक अनुक्रिया**

अवधि	राज्य	जिलों की संख्या	प्रयोगों की संख्या	बिना उर्वरक (नियंत्रण) के औसत उपज (कि०ग्रा०/हेक्टा०)	उर्वरक डालने पर अनुक्रिया (कि०ग्रा०/हेक्टा०)				
					N <sub>20</sub>	P <sub>40</sub>	N <sub>20</sub> P <sub>20</sub>	N <sub>20</sub> P <sub>40</sub>	N <sub>20</sub> P <sub>40</sub> K <sub>20</sub>
72-73 से 74-75 तक	उ० प्र०, पंजाब, राज० गुजरात	5	228	674	211	109	313	265	363
75-76 से 76-77 तक	पंजाब, राजस्थान, म० प्र०	4	232	871	197	195	292	389	531
77-78 से 78-79 तक	हि० प्र०, उ० प्र० बिहार, पं०, राज०, हरियाणा, म० प्र०, महाराष्ट्र, कर्नाटक आ० प्र०	422	769	823	349	295	546	664	742



उपर्युक्त सारिणी से ज्ञात होता है कि अध्ययन के अधीन आगामी समय में चने में उर्वरकों के उपयोग से आपेक्षित वृद्धि की प्रवृत्ति देखी गयी। फिर भी 3 अवधिओं के दौरान लिये गये जिलों में उपज में भिन्नता आई, अवधि 2 और 3 में बिना उर्वरक नियंत्रण भूखण्ड में प्रवांसीय भिन्नता नहीं हुई।  $N_{20}P_{40}K_{80}$  के स्तर पर उर्वरक डालने पर प्रथम अवधि के दौरान प्रयोगों में उपज दर 6.74 विव०/हेक्ट० से 10.37 विव०/हेक्ट० तक बढ़ी। दूसरी अवधि के दौरान प्रयोगों में 8.7 से 24.00 विव०/हेक्ट० तक बढ़ी और अंतिम अवधि के प्रयोगों में यह वृद्धि 8.23 से 15.65 विव०/हेक्ट० तक की थी। प्रतिशत में यह वृद्धि क्रमशः 54.61 और 90 प्रतिशत के क्रम में थी।  $N_{20}P_{80}$  के निम्न स्तर पर भी उपज दर, प्रथम अवधि में 3.13 विव०/हेक्ट० (46%) तक, दूसरी अवधि में 2.9 विव०/हेक्ट० (33%) तक और अंतिम अवधि में 5.46 विव०/हेक्ट० (66%) तक बढ़ी।

विभिन्न स्थानों पर फसलों की उर्वरक अनुक्रिया में ध्यापक विचलन देखा गया। इसके अतिरिक्त यह महत्वपूर्ण पादक पोषक, नाइट्रोजन, फास्फोरस और पोटेशियम के सापेक्ष महत्व को तथा उनको परस्पर क्रिया के प्रभाव की प्रकृति सुनिश्चित करने में भी उपयोगी हो सकता है। इसके लिए प्राप्त अंतिम अवधि (1977-79) से सम्बद्ध आंकड़ों पर करीबी परीक्षण का कार्य हाथ में लिया गया। सुसंगत परिणाम सारिणी-3 में प्रस्तुत किये गये हैं। नाइट्रोजन की अनुक्रिया से देखा जा सकता है कि 20 कि० ग्रा०/हेक्ट० नाइट्रोजन डालने पर अनुक्रिया में सामान्यतः 1.5 से 4.5 विव०/हेक्ट० तक की विभिन्नता आयी। मगर 3 जिलों अर्थात् भरतपुर, अलवर और उज्जैन में क्रमशः 9.5, 8.0 और 5.6 विव०/हेक्ट० की बहुत उच्च अनुक्रियाएं प्राप्त हुईं। 5 जिलों अर्थात् हमीरपुर, जौनपुर, सवाई माधोपुर, अजमेर और चिकमगलूर में 3.6-4.8 विव०/हेक्ट की सीमा में 20 कि० ग्रा० N/हेक्ट० की अनुक्रिया बहुत अच्छी रही थी। हजारीबाग, फिरोजपुर-फरीदकोट, बूंदी, विलीङ्गाढ़, सागर, सांगली और मेड़क इन सात जिलों में अनुक्रिया 2.4 और 3.6 विव०/हेक्ट० के बीच की सीमा में साधारणतया अच्छी थी। 6 जिलों अर्थात् कांगड़ा, हिसार, सतना, अमरावती नानदेद और बिदर में अनुक्रिया की सीमा 12.2 और 2.4 विव०/हेक्ट के बीच में थी। गुलबर्गा ही केवल एक ऐसा जिला था जहां 20 कि० ग्रा० N/हेक्ट० की अनुक्रिया एक विचलन प्रति हेक्टेयर से भी कम थी।

### फास्फोरस (P) की अनुक्रिया :

फास्फोरस की अनुक्रिया का दो स्तरों क्रमशः 20 और 40 कि० ग्रा०  $P_2O_5$  प्रति हेक्टेयर पर अध्ययन किया गया। फास्फोरस के निम्नतम स्तर पर जौनपुर और कांगड़ा में (लगभग 4.25 विव०/हेक्ट०) की अधिकतम अनुक्रिया प्राप्त हुई। अन्य तीन जिलों में अर्थात् बूंदी, सागर और उज्जैन में 2.4 से 3.6 विव०/हेक्ट० तक की सीमा में अच्छी अनुक्रिया प्राप्त हुई। अधिक से अधिक 9 जिलों अर्थात् हमीरपुर, फीरोजपुर-फरीदकोट, हिसार, सवाई-माधोपुर, भरतपुर, अलवर, सतना, सांगली और चिकमगलूर में 20 कि० ग्रा०  $P_2O_5$ /हेक्ट० की अनुक्रिया 1.2 और 2.4 विव०/हेक्ट के बीच की सीमा में थी और इस क्रम की अनुक्रिया को चने और अन्य दालों के लिए प्राप्त



वर्तमान उच्च मूल्यों के लिए भी संतोषजनक समझा जा सकता है। शेष 8 जिलों अर्थात् हजारीबाग, चित्तौड़गढ़, अजमेर, अमरावती, नानदेद, गुलबर्गा, बिदर और भैदक में फास्फोरस की अनुक्रिया बहुत खराब थी जो 1.2 क्वि०/हेक्ट० से भी कम थी। फास्फोरस के निम्नस्तर के लिये औसत अनुक्रिया 22 जिलों में 1.85 क्वि०/हेक्ट० के क्रम में थी।

40 कि०ग्रा० ( $P_2O_5$ )/हेक्ट० के उच्च स्तर पर जोनपुर में (7.84 क्वि०/हेक्ट०) उसके बाद बूंदी और उज्जैन में क्रमशः (6.85 क्वि०/हेक्ट०) तथा (5.03 क्वि०/हेक्ट०) की उच्चतम अनुक्रिया प्राप्त हुई। भरतपुर, कांगड़ा और सतना जिलों में 3.6 से 4.8 क्वि०/हेक्ट० की सीमा में अच्छी अनुक्रिया प्राप्त हुई। उच्च स्तर पर 2.4 से 3.6 क्वि०/हेक्ट० तक की सीमा में संतोषजनक अनुक्रियाएं 6 जिलों अर्थात् हमीरपुर, फीरोजपुर-फरीदकोट, हिसार, बूंदी, अलवर और चिकमंगलूर में प्राप्त हुई। शेष 10 जिलों में 40 कि० ग्रा० ( $P_2O_5$ )/हेक्ट० की अनुक्रिया सम्बन्धित रूप से निम्न थी जो 2.4 क्वि०/हेक्ट० से भी कम थी।

### नाइट्रोजन और फास्फोरस (N P) की अन्योन्यक्रिया :

बांछनीयतया अन्यथा नाइट्रोजन तथा फास्फोरस का संयुक्त अनुप्रयोग के परीक्षण करने के निमित्त विभिन्न जिलों में (20 कि० ग्रा० N/हेक्ट०) नाइट्रोजन की अनुपस्थिति और उपस्थिति में 20 और 40 कि० ग्रा०  $P_2O_5$ /हेक्ट० की फास्फोरस की अन्तःत्मक अनुक्रियाओं का पता लगाया गया। इन्हें सारिणी 3 में भी दिया गया है। हमीरपुर, हिसार, सतना, बूंदी, चित्तौड़गढ़ और बिदर इन 6 जिलों में फास्फोरस के दोनों स्तरों पर घनात्मक पारस्परिक क्रिया सार्थक थी जबकि 4 जिलों अर्थात् जोनपुर, फीरोजपुर-फरीदकोट, चिकमंगलूर और सांगली में नाइट्रोजन और फास्फोरस की पारस्परिक क्रिया ऋणात्मक थी। गुलबर्गा और सागर में केवल उच्च स्तर पर ही घनात्मक पारस्परिक क्रिया देखी गयी। शेष 10 जिलों में किसी भी स्तर पर नाइट्रोजन और फास्फोरस की पारस्परिक क्रिया सार्थक नहीं थी। सभी 22 जिलों को एक साथ लेते पर, नाइट्रोजन और फास्फोरस की पारस्परिक क्रिया फास्फोरस के दोनों ही स्तरों पर सार्थक नहीं थी। निम्न एवं उच्च स्तरों (औसतन N के 2 स्तरों पर) पर फास्फोरस की अनुक्रियाओं के आकलन 1.9-3.2 क्वि० प्रति हेक्ट० की सीमा में थे। इस प्रकार फास्फोरस डालने के लिए हास प्राप्त का नियम स्पष्ट रूप से निर्दिष्ट है।

### पोटाशियम (K) की अनुक्रिया :

सागर में 20 कि० ग्रा०  $K_2O$ /हेक्ट० पर पोटाशियम की अनुक्रिया ( 1.7 क्वि०/हेक्ट० ) उच्चतम थी। उज्जैन, अलवर, कांगड़ा और बूंदी जिलों में 1.28 से 1.43 क्वि०/हेक्ट० तक की सीमा में अच्छी अनुक्रिया प्राप्त हुई। जोनपुर, सर्वाई-माधोपुर, चित्तौड़गढ़, सतना, सांगली, नानदेद और चिकमंगलूर इन 7 जिलों में 0.6 से 1.2 क्वि०/हेक्ट० तक की सीमा में साधारण अनुक्रियाएं प्राप्त हुई। शेष 10 जिलों में फास्फोरस की अनुक्रिया या तो सार्थक नहीं थी या निम्न ) 0.6 क्वि०/हेक्ट० से कम ) थी।



## नाइट्रोजन, फास्फोरस, पोटेशियम (N P K) की पारस्परिक अनुक्रिया :

विभिन्न जिलों में  $N_{20}^0 P_{40} K_{20}$  स्तर पर सभी तीनों पोषकों की संयुक्त अनुक्रिया का भी पता लगाया गया, जिसे सारणी 3 में भी प्रस्तुत किया गया है। जिलों को निम्नानुसार दर्शाया जा सकता है। जौनपुर, बुंदी, भरतपुर, अलवर, उज्जैन में 10 किंव०/हैक्ट० से अधिक की (उत्कृष्ट) अनुक्रिया थी। हमीरपुर, मवाई-माधोपुर, सागर, सतना में 8 से 10 किंव०/हैक्ट० तक की बीच की (बहुत अच्छी) अनुक्रिया थी। कांगड़ा, हिसार, चित्तौड़गढ़, अजमेर में 6 से 8 किंव०/हैक्ट० तक की बीच की (अच्छी) अनुक्रिया थी। हजारीबाग, फिरोजपुर-फरीदकोट, सांगली, नागदेद, चिकमंगलूर, मेडक में 4 से 6 किंव०/हैक्ट० के बीच की (साधारण) अनुक्रिया थी।

अमरावती, गुलबर्गा, बिदर में अनुक्रिया 4 किंव०/हैक्ट० (निम्न) से कम थी। 22 जिलों में प्राप्त औसत अनुक्रिया 7.4 किंव०/हैक्ट० थी।

## बंगाल ग्राम (चना) के अतिरिक्त अन्य दालें :—

बंगाल चना के बाद दूसरी देश में उगायी गयी अन्य महत्वपूर्ण दालें हैं—उड़द, मूंग, अरहर और मसूर। देश में इन चार फसलों का कुल मिलाकर उत्पादन सभी दालों के उत्पादन का लगभग आधा है।

1977-78 से पहले कृषकों के खेतों में इन फसलों पर बहुत ही सीमित संख्या में प्रयोग किये गये। वर्ष 1977-78 और 1978-79 के दौरान आयोजित 774 प्रयोगों से सम्बद्ध आंकड़ों का परीक्षण किया गया और जिसके परिणाम सारिणी 4 में दिये गये हैं। इनमें से 350 प्रयोग उड़द पर 236 मूंग पर 128 अरहर पर और 60 मसूर पर किये गये थे। ऐसे भूखण्डों जिनमें उर्वरक का उपयोग नहीं किया गया (नियन्त्रित भूखण्ड) तथा उन भूखण्डों जिनमें उर्वरक डाले गये, में इन फसलों की औसत उपज दर सामान्यतः चना (Bengal Gram) की तुलना में निम्न थी। ऐसे भूखण्डों जिनमें उर्वरक का उपयोग नहीं किया गया है, (नियन्त्रित भूखण्डों) में औसत उपज दर उड़द और मूंग के लिए 3.5 किंव०/हैक्ट० अरहर के लिए 4 किंव०/हैक्ट० और मसूर के लिए 5 किंव०/हैक्ट० के क्रम में थी।

## नाइट्रोजन (N) की अनुक्रिया :

20 कि० ग्रा० N/हैक्ट० डालने पर कुष्णा में उड़द पर, कुष्णा और मुन्दरगढ़ में मूंग पर और मेडक में अरहर पर 3.6 किंव०/हैक्ट० की अनुक्रिया बढ़ी और किसी भी जिले में मसूर की नहीं किया गया। हमीरपुर और पूर्वी गोदावरी में उड़द पर, भड़ोच में मूंग, मुन्दरगढ़ और फूलबनी में अरहर और कामरूप तथा ललितपुर में मसूर पर 2.4 से 3.6 किंव०/हैक्ट० तक की अच्छी अनुक्रिया प्राप्त हुई। उड़द और मूंग उगाने वाले कुल जिलों में से लगभग आधे जिलों में, 20 कि० ग्रा० N/हैक्ट० की अनुक्रिया 1.2 और 2.4 किंव०/हैक्ट० के बीच की सीमा में थी। इनमें उड़द के लिए कांगड़ा, ललितपुर, आगरा, फरुखाबाद, सतना और मूंग के लिए कच्छ, बोलांगीर, मेडक, खम्माम और फूलबनी जिले शामिल हैं। इस अनुक्रिया समूह में अरहर के लिए



केवल सतना और मसूर के लिए कांगड़ा आते हैं। जीनपुर, फीरोजपुर-फरीदकोट, बिदर और चित्तौड़गढ़ में उड़द पर, बिदर में मूंग पर और गुलबर्गा में अरहर पर अपेक्षाकृत निम्न अनुक्रिया प्राप्त हुई जो 1.2 क्वि०/हेक्ट० से कम थी। एक साथ लेने पर सभी जिलों में 20 कि० ग्रा० N/हेक्ट० की औसत अनुक्रिया अरहर पर 2.8 क्वि०/हेक्ट०, मूंग पर 2.5 क्वि०/हेक्ट०, मसूर पर 2.4 क्वि०/हेक्ट० और उड़द पर 1.9 क्वि०/हेक्ट० के क्रम में थी।

### फास्फोरस (P) की अनुक्रिया :

फास्फोरस की अनुक्रिया दोनों स्तरों पर प्रयोग की गयी अर्थात् उड़द, मूंग और अरहर के अन्तर्गत अधिकांश आधे जिलों में 20 कि० ग्रा० और 40 कि० ग्रा०  $P_2O_5$ /हेक्ट० की अनुक्रिया 20 कि० ग्रा० N/हेक्ट० स्तर पर नाइट्रोजन की अनुक्रिया से निम्न थी। यही स्थिति मसूर उगाने वाले सभी तीनों जिलों में थी। इन फसलों पर लिये गये जिलों में औसत अनुक्रिया में भी उसी प्रकार की पद्धति देखने में आई। फास्फोरस डालने पर जिन जिलों में अच्छी अनुक्रिया देखने में आई वे थे—उड़द पर सतना और कृष्णा, मूंग पर कृष्णा, अरहर पर मेड़क और फूलबनी और मसूर पर ललितपुर। इन सभी जिलों में 40 कि० ग्रा०  $P_2O_5$ /हेक्ट० से अनुक्रिया 2.4 क्वि०/हेक्ट० बढ़ी। फीरोजपुर-फरीदकोट, कांगड़ा, फरुखाबाद, बिदर और पूर्वी गोदावरी में उड़द पर मडोंच, कच्छ और बिदर में मूंग, गुलबर्गा और सुन्दरगढ़ में अरहर तथा कांगड़ा और कामरूप जिलों में मसूर पर फास्फेट की अनुक्रिया प्रत्येक स्तर पर निम्न थी। इन सभी जिलों में 40 कि० ग्रा०  $P_2O_5$ /हेक्ट० पर बिना नाइट्रोजन के अनुक्रिया 1.2 क्वि०/हेक्ट० या कम थी। उड़द, मूंग और मसूर के अधीन जिलों का संयोजन करने पर फास्फोरस की औसत अनुक्रिया निम्न स्तर (20 कि० ग्रा०  $P_2O_5$ /हेक्ट०) के लिये 0.8 से 0.9 क्वि०/हेक्ट० और उच्च स्तर के लिये लगभग 1.5 से 1.7 क्वि०/हेक्ट० के क्रम में थी। दोनों स्तरों पर फास्फोरस डालने पर अरहर की अनुक्रिया बहुत अच्छी थी जो कि लगभग 1.5 और 2.4 क्वि०/हेक्ट० थी।

### नाइट्रोजन, फास्फोरस (N P) की पारस्परिक क्रिया :

उड़द, मूंग और मसूर के अधीन अधिकांश जिलों में NP की पारस्परिक क्रिया नहीं देखी गयी। लिये गये जिलों के वर्गीकृत परिणामों में भी इसी प्रकार की प्रवृत्ति देखने में आई। मगर अरहर के अधीन सभी जिलों में NP की पारस्परिक घनात्मक सार्थक क्रिया देखी गयी। नाइट्रोजन के  $N_{20}$  स्तर पर जब फास्फोरस डाली गई तो उसकी उच्च अनुक्रिया काफी अच्छी थी। विशेषकर उस समय जब फास्फोरस उच्च स्तर पर डाला गया। जब लिये गये जिलों में 20 कि० ग्रा० N/हेक्ट० पर 40 कि० ग्रा०  $P_2O_5$ /हेक्ट० की अनुक्रिया की औसत निकाली गई तो वह 3.2 क्वि०/हेक्ट० के क्रम में थी जबकि बिना नाइट्रोजन के फास्फोरस की उतनी ही मात्रा डालने पर यह लगभग 2.4 क्वि०/हेक्ट० थी। 20 कि० ग्रा०  $P_2O_5$ /हेक्ट० के निम्न स्तर पर जब फास्फोरस नाइट्रोजन की उपस्थिति और अनुपस्थिति में डाली गई तो अनुक्रिया में भिन्नता 0.4 क्वि०/हेक्ट० के क्रम में थी। ( लिये गये जिलों पर औसत )।



सारणी—3. 1977-79 में कृषकों के खेतों में चने पर उर्वरक अनुक्रिया के जिलानुसार आकलन

राज्य	जिले	प्रयोगों की संख्या	बिना उर्वरक वाले भूखंडों में औसत उपज	N <sub>20</sub> की अनुक्रिया	फास्फोरस की अनुक्रिया				K <sub>2</sub> O की अनुक्रिया	N <sub>20</sub> P <sub>40</sub> K <sub>20</sub> की संयुक्त अनुक्रिया	अनुक्रिया की मानक त्रुटि
					P <sub>20</sub> पर		P <sub>40</sub> पर				
					N <sub>0</sub> पर	N <sub>20</sub> पर	N <sub>0</sub> पर	N <sub>20</sub> पर			
हिमाचल प्रदेश	कांगड़ा	22	518	142	425	453	403	402	134	678	54
उत्तर प्रदेश	हमीरपुर	25	1042	383	140	202	283	448	67	899	24
"	जीनपुर	29	1320	448	427	334	784	675	71	1194	32
बिहार	हजारीबाग	77	459	292	92	92	176	180	53	525	12
पंजाब	फीरोज़पुर- फरीदकोट	55	926	316	230	138	267	205	43	564	25
हरियाणा	हिसार	29	1144	155	152	186	274	369	54	678	21
राजस्थान	सवाई माधोपुर	12	1273	416	142	196	247	309	98	823	52
"	बूंदी	18	1023	357	344	404	685	762	128	1247	31
"	चित्तौड़गढ़	15	813	278	80	174	188	274	77	629	33
"	भरतपुर	18	1230	941	219	218	473	390	48	1379	54
"	अजमेर	11	928	448	96	98	200	228	17	693	71
"	अलवर	30	856	801	189	172	324	295	137	1233	32
मध्य प्रदेश	सागर	30	1512	356	245	266	196	326	171	853	64
"	उज्जैन	59	1191	558	303	301	503	469	143	1170	18
"	सतना	56	606	177	180	368	388	573	102	852	18
महाराष्ट्र	अमरावती	57	462	158	70	35	94	79	30	267	16
"	सांगली	59	608	292	198	116	196	197	95	584	16
"	नांदेद	9	276	230	105	119	139	138	94	462	62
कर्नाटक	गुलबर्गा	46	530	91	99	117	88	187	5	283	18
"	चिकमगलूर	39	598	393	171	66	276	80	82	255	33
"	बिदर	38	577	125	62	176	89	202	16	343	16
"	मेदक	35	217	324	106	100	160	149	38	511	20
अन्य आच्छादित जिले		769	823	349	185	197	295	315	78	742	8



सारणी—4

1977-79 में कृषकों के खेतों में चने के अतिरिक्त अन्य दालों पर उर्वरक अनुक्रिया के जिला अनुसार आकलन

राज्य	जिले	प्रयोगों की संख्या	बिना उर्वरक वाले भूखंडों में औसत उपज	N की अनुक्रिया	फास्फोरस की अनुक्रिया				K <sub>2</sub> O की अनुक्रिया	N <sub>20</sub> P <sub>40</sub> K <sub>20</sub> की संयुक्त अनुक्रिया	अनुक्रिया की मानक त्रुटि
					P <sub>20</sub> पर		P <sub>40</sub> पर				
					No पर	N <sub>20</sub> पर	No पर	N <sub>20</sub> पर			
1	2	3	4	5	6	7	8	9	10	11	12
<b>उड़द</b>											
हिमाचल प्रदेश	कांगड़ा	10	292	152	57	64	89	108	102	362	21
उत्तर प्रदेश	हमीरपुर	19	360	269	72	74	167	162	24	455	17
"	जौनपुर	13	533	102	98	158	196	273	38	413	54
"	ललितपुर	30	457	232	94	100	204	160	96	488	18
"	आगरा	23	395	148	83	92	148	157	32	337	16
	फर्रुखाबाद	20	328	130	51	89	115	206	5	341	16
पंजाब	फीरोजपुर-										
	फरीदकोट	54	320	98	58	77	95	107	8	213	8
राजस्थान	चित्तौड़गढ़	9	250	101	73	125	104	174	55	330	18
मध्यप्रदेश	सतना	31	303	171	164	173	295	300	128	599	14
कर्नाटक	बिदर	38	284	110	71	119	89	157	13	180	15
आन्ध्र प्रदेश	कृष्णा (रबी)	80	474	548	147	218	270	338	103	934	11
	ईस्ट गोदावरी (रबी)	23	195	272	64	14	73	72	73	447	23
	लिए गए राज्य	350	349	194	86	108	154	184	52	430	7
<b>मूंग</b>											
गुजरात	भड़ोच	26	408	239	23	40	84	61	44	344	94
"	कच्छ	20	529	217	36	24	75	24	4	301	21
उड़ीसा	बोलांगीर	33	150	158	132	184	188	272	48	478	26
आन्ध्र प्रदेश	खम्माम	52	290	200	80	55	121	101	51	352	16



सारणी-4 क्रमागत —

1977-79 में कृषकों के खेतों में चने के अतिरिक्त अन्य दालों पर उर्वरक अनुक्रिया के जिले अनुसार आकलन

1	2	3	4	5	6	7	8	9	10	11	12
आन्ध्र प्रदेश	मेढक	11	179	142	82	88	141	147	0	287	22
कर्नाटक	बिदर	35	292	102	63	122	103	166	31	299	17
उड़ीसा	सुन्दरगढ़ (रबी)	35	391	377	80	138	192	223	127	727	27
	फूलबानी	14	297	175	106	116	237	188	33	396	14
आन्ध्र प्रदेश	कृष्णा (रबी)	10	459	677	133	145	290	314	133	1124	39
लिये गये राज्य		236	333	254	82	101	159	166	58	478	13
<b>अरहर</b>											
उड़ीसा	सुन्दरगढ़	25	457	277	0	113	84	205	135	617	22
"	फूलबानी	24	290	347	290	185	245	317	73	737	15
मध्य प्रदेश	सतना	15	308	208	141	191	239	301	30	539	19
आन्ध्र प्रदेश	मेढक	18	393	497	284	382	509	603	170	1270	50
कर्नाटक	गुलबर्गा	46	606	74	52	96	103	166	102	342	15
लिये गये जिले		128	411	281	153	193	236	318	102	342	15
<b>मसूर</b>											
हिमाचल प्रदेश	कांगड़ा	11	284	152	75	74	115	111	18	281	22
असम	कामरूप	24	559	283	67	22	131	65	78	426	14
उत्तर प्रदेश	ललितपुर	25	710	287	119	185	269	278	69	634	16
लिये गये जिले		60	518	241	87	94	172	151	55	447	10



### पोटाशियम (K) की अनुक्रिया :

उड़द पर सतना, मूंग के साथ-साथ अरहर पर सुन्दरगाढ़ और कुष्णा जिलों में  $N_{20}P_{40}$  के ऊपर से 20 कि०ग्रा०  $P_2O_5$ /हैक्ट० डालने पर 1.2 कि०/हैक्ट० या अधिक की अच्छी अनुक्रिया प्राप्त हुई। अन्य जिलों में पोटाशियम की अनुक्रिया सामान्यतः निम्न थी। लिये गये समस्त जिलों को एक साथ लेने पर अरहर पर अनुक्रिया एक कि० प्रति हैक्ट० और अन्य दालों पर 0.5-0.6 कि०/हैक्ट० प्राप्त हुई।

### नाइट्रोजन फास्फोरस पोटाशियम (N P K) की संयुक्त अनुक्रिया :

उड़द और मूंग पर कुष्णा तथा अरहर पर मेदक में  $N_{20}P_{40}K_{20}$  की संयुक्त क्रिया 8 कि०/हैक्ट० बढ़ी। इन फसलों के अधीन अधिकांश जिलों में साधारण से अच्छी अनुक्रिया 4 और 8 कि०/हैक्ट० के बीच की सीमा में प्राप्त हुई। फीरोजपुर-फरीदकोट, विदर, कांगड़ा, आगरा और चित्तौड़गढ़ में उड़द पर, मेदक, विहार, भड़ौच, कच्छ और खम्माम में मूंग पर; गुलबर्गा में अरहर पर और कांगड़ा में मसूर पर ( 4 कि०/हैक्ट० से कम ) निम्न अनुक्रिया प्राप्त हुई। जब लिये गये जिलों को संयोजित क्रिया गया तब  $N_{20}P_{40}K_{20}$  स्तर पर उर्वरक डालने से औसत अनुक्रिया अरहर पर 7 कि०/हैक्ट० तक उच्च थी जबकि उड़द मूंग और मसूर पर 4.3--4.8 कि०/हैक्ट० तक थी।

### कुल मिलाकर निष्कर्ष :

चालू अध्ययन से देश में दालों के उत्पादन की वृद्धि के बड़े अच्छे आसार स्पष्ट नजर आ रहे हैं।  $N_{20}P_{40}K_{20}$  पर उर्वरक डालने पर ली गयी इन फसलों की उपज दर अधिकांशतः दुगनी हो सकती है।

दूसरा महत्वपूर्ण निष्कर्ष यह है कि दालों की फसलो पर ( 20 कि० ग्रा० N/हैक्ट० की सामान्य मात्रा ) डालने की आवश्यकता है हालांकि इन फसलों की फलिया नाइट्रोजन स्थिरण वाली हैं।

अनुवादक :

श्री अखलेन्द्र पालसिंह

निरीक्षक :

सर्व श्री महाराज स्वरूप एवं कर्णान्द्र पालसिंह



## 17. गत तिमाही में संस्थान के विभिन्न अनुभागों में हिन्दी के प्रयोग से सम्बन्धित प्रगति की रिपोर्ट

यूनी संस्थानमें हिन्दी का प्रयोग दिन-प्रतिदिन बढ़ता जा रहा है फिर भी स्वाभाविक उतार-चढ़ाव गत तिमाही में काफी देखने को मिला। विभिन्न अनुभागों से जारी होने वाले सामान्य आदेशों की संख्या अन्य तिमाहियों की अपेक्षा कुछ कम ही थी किन्तु हिन्दी भाषी क्षेत्रों में भेजे जाने वाले पत्रों की संख्या में वृद्धि हुई। इसके अतिरिक्त अधिकांश कर्मचारियों ने टिप्पणी लेखन एवं मसौदा लेखन का कार्य हिन्दी में ही किया। इसी तिमाही में विभिन्न अनुभागों से प्राप्त लगभग 45 प्रपत्रों का अनुवाद करके उन्हें द्विभाषी रूप में तैयार किया गया। राजभाषा कार्यान्वयन समिति की आवश्यक बैठक आयोजित की गई एवं तिमाही रिपोर्ट भी समय पर ही भेजी गई। कुल मिलाकर विभिन्न अनुभागों से मिली रिपोर्ट के अनुसार कुल मिला कर विभिन्न अनुभागों में हिन्दी के कार्य में अन्य तिमाहियों की अपेक्षा 10 प्रतिशत की वृद्धि हुई।



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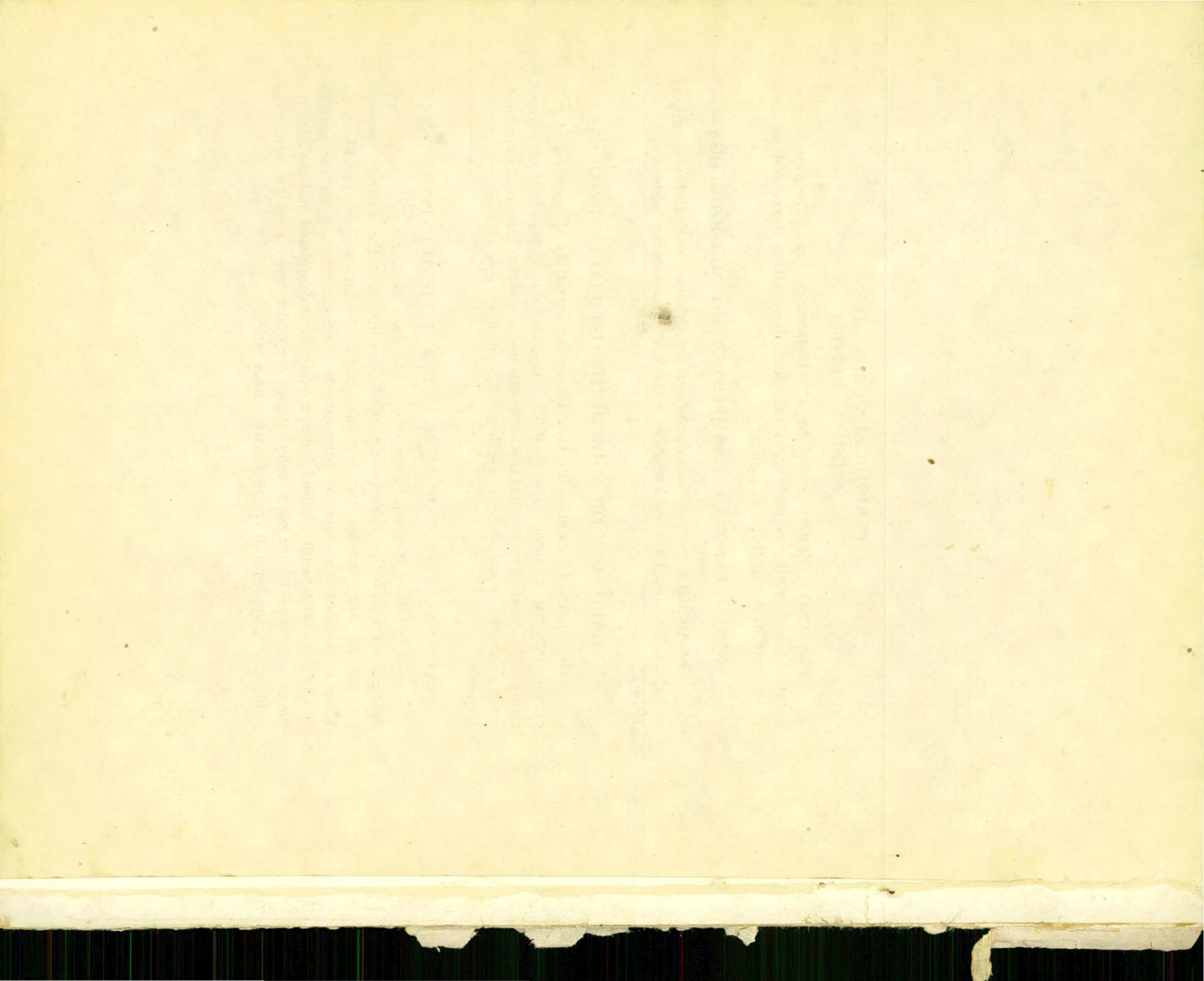
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