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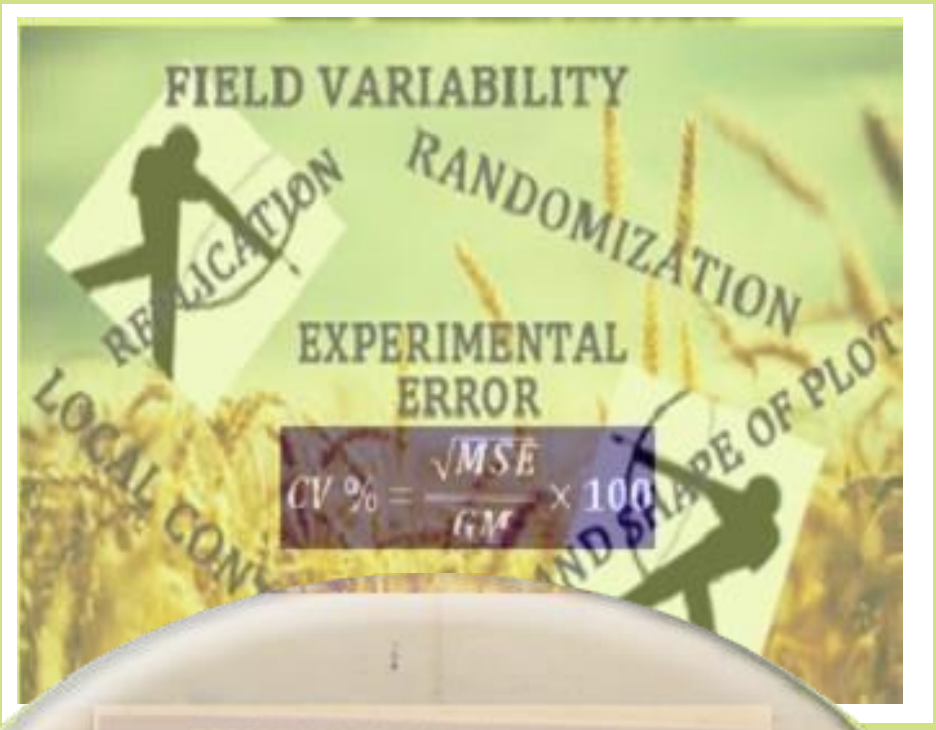

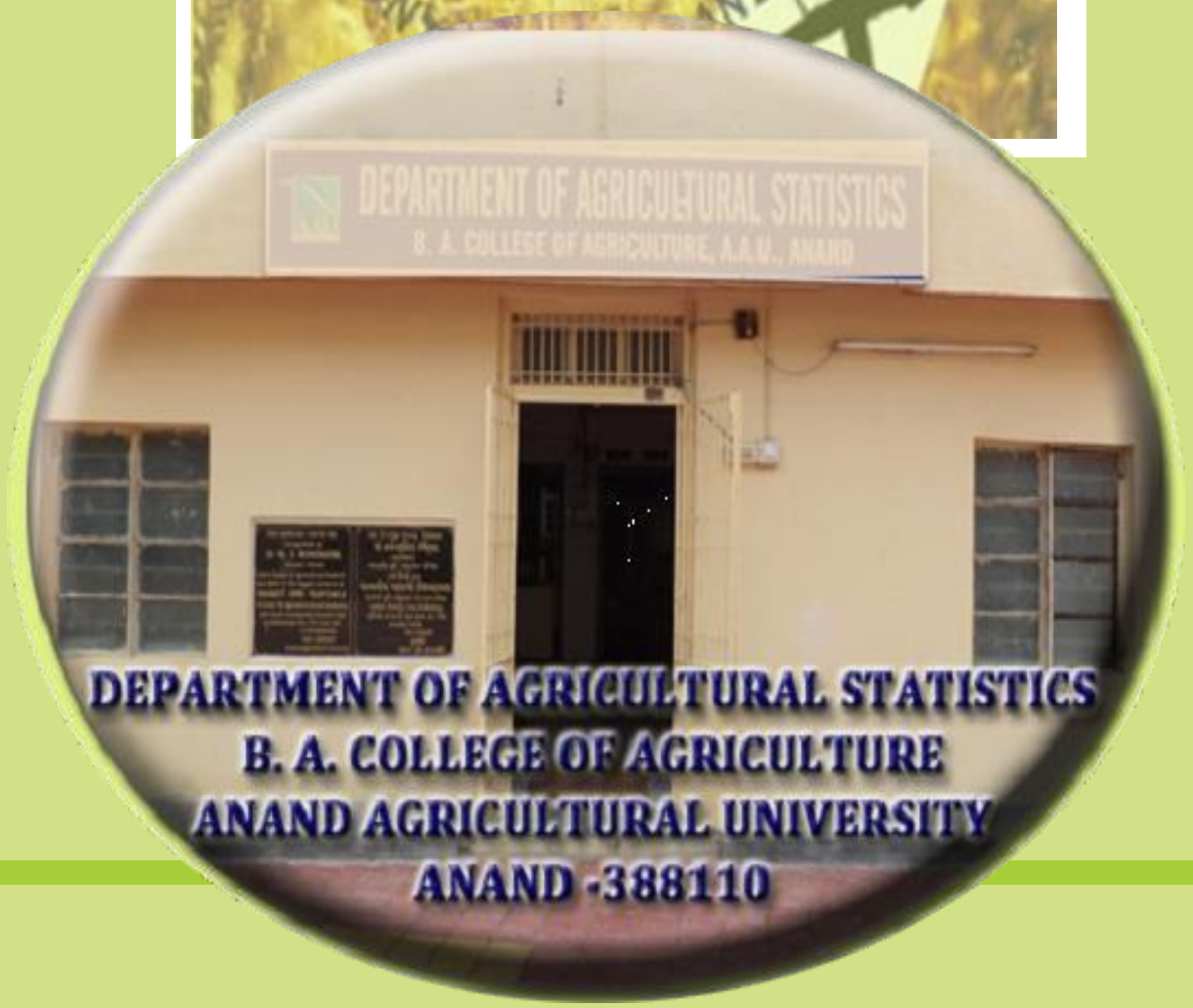

CROPS COVERED UNDER VARIABILITY STUDIES

Department of Agricultural Statistics

B. A. College of Agriculture

Anand Agricultural University

Anand

Plan Scheme: "Statistical evaluation of experimental variability and strengthening research in Agricultural Statistics" (BH-12041)

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Compiled by:

Dr. A. D. Kalola

Dr. A. N. Khokhar

Dr. D. J. Parmar

Ms. Divya Agarwal

A RESEARCH COMPENDIUM ON STATISTICAL EVALUATION OF EXPERIMENTAL VARIABILITY FOR IMPROVING THE EFFICIENCY OF FIELD EXPERIMENTATION

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Professor & Head
Department of Agricultural Statistics
B. A. College of Agriculture
Anand Agricultural University, Anand

Message

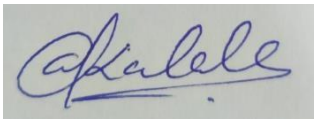
I am pleased to present the updated section of our Research Compendium, "**Statistical Evaluation of Experimental Variability for Improving Efficiency of Field Experiments**." This new section builds upon our research conducted after 2016, incorporating the latest findings from the past few years.

Our research team has meticulously analyzed chronological data on crop production, crop protection, and crop improvement research experiments for various crops, including sugarcane, maize, wheat, rice, tobacco, vegetable crops, and fodder crops. By examining yield data from numerous experiments conducted over 15 to 20 years, we have established reliable limits for accepting or rejecting results and developed a standard for measuring experimental variability (CV%).

The recent studies featured in this compendium encompass a diverse range of crops, with a focus on experimental variability. Our ultimate goal remains to enhance the reliability and efficiency of field experiments. The data presented in this compendium contribute significantly to academic knowledge and offer practical solutions for researchers.

I extend my sincere gratitude to our dedicated team of scientists and researchers whose tireless efforts have made this compendium possible. I also express my appreciation to our collaborators, university authorities, and everyone who has supported this project over the years.

As we continue to build upon our research legacy, I am confident that this updated compendium will serve as an indispensable resource for the agricultural research community, facilitating the planning of future research, accurate interpretation of experimental data, and the advancement of agricultural research practices.



Dr. A. D. Kalola

CONTENT

1. Experimental Data

1.1 SUGARCANE

The secondary yield character data of 389 experiments conducted on Sugarcane crop at Navsari center during 1997-98 to 2014-2015 and reported in AGRESCO sub-committee meeting were obtained and further analyzed to develop yardstick of CV %. The upper fiducial limits and yardstick of CV % for accepting or rejecting the results of Sugarcane crop field experiments were worked out the upper fiducial limits at 95 % and 90 % confidence level based on non central t distribution were worked out for yield character. The yardstick of CV% of field experiments was established on the basis of overall average upper fiducial limit of CV% of each experiment and significance of treatment differences by F test.

Table 1 : Upper fiducial limit of CV % for different disciplines of Sugarcane crop

Discipline	No. of expt.	CV %	U L		Range		CV % >10.16	
			(0.05)	(0.10)	(0.05)	(0.10)	No. of expt.	Proportion
Agronomy	103	8.01	11.15	10.27	3.14	2.26	25	0.24
Pl. Breeding	286	7.89	9.81	9.33	1.91	1.44	27	0.09
Mean	**389**	**7.92**	**10.16**	**9.58**	-	-	-	-

Table 2: Upper fiducial limit of CV % for different design Sugarcane crop

Design	No. of expt.	CV %	U L		Range		CV % >10.16	
			(0.05)	(0.10)	(0.05)	(0.10)	No. of expt.	Proportion
FRBD	7	8.86	10.65	10.22	1.79	1.37	1	0.14
RBD	363	7.98	10.25	9.66	2.26	1.68	70	19.28
Split Plot	19	6.40	8.32	7.82	1.92	1.42	1	5.26
Mean	**389**	**7.92**	**10.16**	**9.58**	-	-	-	-

Table 3: Upper fiducial limit of CV % for different treatments of Sugarcane crop

Treatments	No. of expt.	CV %	U L		Range		CV % >10.16	
			(0.05)	(0.10)	(0.05)	(0.10)	No. of expt.	Proportion
Up to 6	49	6.53	10.31	9.19	3.78	2.66	2	4.08
6-10	114	7.85	10.28	9.66	2.43	1.80	22	19.29
11-15	143	8.42	10.44	9.94	2.02	1.53	31	21.67
16-20	42	7.44	8.92	8.56	1.48	1.12	6	14.28
21-25	18	8.26	9.94	9.53	1.68	1.27	5	27.77
26-30	8	8.61	9.93	9.62	1.32	1.01	3	37.5
>30	15	8.88	10.01	9.75	1.14	0.88	3	20.00
Mean	**389**	**7.92**	**10.16**	**9.58**	-	-	-	-

Table 4: Upper fiducial limit of CV % for different plot size of Sugarcane crop

Plot size (m^2)	No. of experiment	CV %	U L		Range		CV % >10.16	
			(0.05)	(0.10)	(0.05)	(0.10)	No. of expt.	Proportion
<3	-	-	-	-	-	-	-	-
3-6	23	7.65	9.27	8.88	1.62	1.23	3	13.04
6-9	-	-	-	-	-	-	-	-
9-12	25	8.58	10.84	10.23	2.26	1.65	6	24.00
12-15	6	8.39	10.42	9.92	2.04	1.53	1	16.66
15-18	41	7.55	10.45	9.65	2.89	2.09	6	14.63
18-21	126	7.98	9.87	9.41	1.89	1.43	20	15.87
21-24	10	10.55	13.96	13.04	3.41	2.50	3	30.00
>24	158	7.73	10.09	9.48	2.36	1.75	33	20.88
Mean	**389**	**7.92**	**10.16**	**9.58**	**-**	**-**	**-**	**-**

Table 5: Upper fiducial limit of CV % for different replications of Sugarcane crop

Replication	No. of expt.	CV %	UL		Range		No.of expt.	Proportion
			(0.05)	(0.10)	(0.05)	(0.10)		
2	28	8.51	10.18	9.78	1.67	1.27	6	21.42
3	321	7.96	10.27	9.67	2.31	1.71	62	19.31

4	40	7.25	9.34	8.81	2.09	1.56	4	10.00
Mean	**389**	**7.92**	**10.16**	**9.58**	-	-	-	-

Table 6: The average upper fiducial limit and yardstick for CV % for the experiments of Sugarcane crop

Name of Crop	No. of experiments	Mean CV %	Upper fiducial limit of CV %		Overall yardstick of CV%
			0.95	0.90	
Sugarcane	389	7.92	10.16	9.58	11 %

Table 7: Power of F-test as influence by CV%

Classes CV%	No. of experiments	F-test		
		Significant	Non-Significant	Ratio
1-3	1	1	0	0.00
3-5	42	41	1	0.02
5-7	119	113	6	0.05
7-9	103	97	6	0.06
9-11	72	58	14	0.24
11-13	32	24	8	0.33
13-15	2	9	0	0.00
15-17	10	2	8	4.00
17-19	1	1	0	0.00
Total	389	346	43	0.12

Recommendation for scientific community

The yard stick of CV% for accepting the results of Sugarcane crop experiments is 11 per cent for yield character.

1.2 MAIZE

Yield data of 607 experiments conducted on Maize crop during the period 2002-03 to 2016-2017 were used to work out fiducial limits and yardstick of CV % for accepting or rejecting the results of Maize crop. The upper fiducial limits at 95 % and 90 % confidence level based on non-central "t" distribution was also worked out for yield character. The yardstick of CV% of field experiments was established on the basis of overall average upper fiducial limit of CV% of each experiment and significance of treatment differences by F test.

Table 1: Upper fiducial limit of CV % for different disciplines of Maize crop

Discipline	No. of expt.	CV %	U L		Range		CV % >16.45	
			(0.05)	(0.10)	(0.05)	(0.10)	No. of expt.	Proportion
Agronomy	183	13.23	22.23	18.14	9.00	4.91	33	0.18
Entomology	118	12.09	15.04	14.30	2.95	2.21	25	0.21
Pathology	24	10.47	13.48	12.71	3.01	2.24	4	0.16
Pl. breeding	282	10.74	13.53	12.83	2.80	2.10	44	0.15
Average		**11.74**	**16.45**	**14.71**				

Table 2: Upper fiducial limit of CV % for different design of Maize crop

Design	No. of expt.	CV %	U L		Range		CV % >16.45	
			(0.05)	(0.10)	(0.05)	(0.10)	No. of expt.	Proportion
FRBD	24	14.81	19.29	18.11	4.49	3.31	5	0.20
RBD	530	11.39	16.31	14.44	4.92	3.05	86	0.16
Split Plot	53	13.83	16.52	15.88	2.70	2.05	15	0.28
Average		**11.74**	**16.45**	**14.71**				

Table 3: Upper fiducial limit of CV % for different treatments of Maize crop

Treatments	No. of expt.	CV %	U L		Range		CV % >16.45	
			(0.05)	(0.10)	(0.05)	(0.10)	No. of expt.	Proportion
Up to 6	52	9.24	12.88	11.90	3.64	2.66	4	0.07
6-10	200	10.75	14.26	13.35	3.50	2.60	28	0.14

11-15	128	13.81	25.32	19.82	11.51	6.01	22	0.17
16-20	133	12.09	14.51	13.93	2.43	1.85	34	0.25
21-25	35	13.33	15.80	15.22	2.48	1.89	9	0.25
26-30	14	9.81	11.31	10.96	1.50	1.15	3	0.21
>30	45	11.48	12.86	12.55	1.38	1.07	6	0.13
Average		**11.74**	**16.45**	**14.71**				

Table 4: Upper fiducial limit of CV % for different plot size of Maize crop

Plot size (m^2)	**No. of expt.**	**CV %**	**U L**		**Range**		**CV % >16.45**	
			(0.05)	**(0.10)**	**(0.05)**	**(0.10)**	**No.of expt.**	**Proportion**
<3	24	16.91	21.26	20.13	4.35	3.23	5	0.21
3-6	116	11.20	13.77	13.14	2.57	1.94	18	0.15
6-9	69	13.88	16.87	16.14	2.99	2.26	28	0.40
9-12	72	9.81	12.63	11.92	2.83	2.11	12	0.16
12-15	122	11.04	14.24	13.42	3.20	2.39	18	0.14
15-18	47	13.66	16.62	15.89	2.96	2.24	15	0.31
18-21	116	9.85	12.71	11.98	2.87	2.14	5	0.04
21-24	19	21.78	28.93	27.47	5.38	4.69	2	0.10
>24	22	9.72	12.29	11.63	2.57	1.91	3	0.13
Average		**11.74**	**16.45**	**14.71**				

Table 5: Upper fiducial limit of CV % for different replications of Maize crop

Replication	**No. of expt.**	**CV %**	**UL**		**Range**		**No.of expts.**	**Proportion**
			(0.05)	**(0.10)**	**(0.05)**	**(0.10)**		
3	52	11.48	14.31	13.61	2.84	2.13	9	0.17
4	415	11.97	17.45	15.27	5.49	3.30	74	0.18
5	129	10.98	13.98	13.23	3.00	2.25	19	0.15
7	11	13.44	17.43	16.41	3.99	2.98	4	0.36
Average		**11.74**	**16.45**	**14.71**				

Table 6: The average upper fiducial limit and yardstick for CV % for the experiments of Maize crop

Name of Crop	No. of experiments	Mean CV %	Upper fiducial limit of CV %		Overall yardstick of CV%
			0.95	0.90	
Maize	607	11.74	16.45	14.71	17%

Table 7: Power of F-test as influence by CV%

Classes CV%	No. of experiments	F-test		
		Significant	Non-Significant	Ratio
1-5	66	65	01	0.02
5-10	232	217	15	0.07
10-15	167	129	38	0.29
15-20	92	71	21	0.30
20-25	35	25	10	0.40
25-30	7	6	1	0.17
> 30	8	4	4	1.00
Total	607	517	90	0.17

Recommendation for scientific community

The yard stick of CV% for accepting the results of Maize crop experiment conducted at Main Maize Research Station, Godhra is 17 per cent for yield character.

1.3 RICE

Yield data of **1810** experiments conducted on Rice crop during the period 2005-06 to 2019-20 have been used to work out fiducial limits and yardstick of CV % for accepting or rejecting the results of Rice crop. The upper fiducial limits at 95 % and 90 % confidence level based on non-central "t" distribution was also worked out for yield character. The yardstick of CV% of field experiments was established on the basis of overall average upper fiducial limit of CV% of each experiment and significance of treatment differences by F test.

Table 1: Upper fiducial limit of CV % for different disciplines of rice crop

Discipline	No. of expt.	CV %	U L		Range		CV % >13.56	
			(0.05)	(0.10)	(0.05)	(0.10)	No.of expt.	Proportion
Agronomy	157	10.16	12.30	11.78	2.14	1.62	24	0.15
Entomology	36	10.16	13.23	12.44	3.07	2.28	9	0.25
Pathology	26	6.62	8.52	8.04	1.90	1.42	1	0.04
Pl. breeding	1591	11.17	13.78	13.14	2.61	1.96	411	0.26
Average		**11.00**	**13.56**	**12.93**				

Table 2: Upper fiducial limit of CV % for different design of rice crop

Design	No. of expt.	CV %	U L		Range		CV % >13.56	
			(0.05)	(0.10)	(0.05)	(0.10)	No. of expt.	Proportion
FRBD	13	9.40	11.81	11.20	2.40	1.80	2	0.15
RBD	1683	11.05	13.66	13.01	2.61	1.97	424	0.25
Split Plot	114	10.47	12.39	11.94	1.92	1.47	19	0.17
Average		**11.00**	**13.56**	**12.93**				

Table 3: Upper fiducial limit of CV % for different treatments of rice crop

Treatments	No. of expt.	CV %	U L		Range		CV % >13.56	
			(0.05)	(0.10)	(0.05)	(0.10)	No. of expt.	Proportion
Up to 6	13	10.72	14.73	13.66	4.01	2.94	4	0.31
6-10	249	9.66	12.94	12.08	3.28	2.42	33	0.13
11-15	634	10.83	13.63	12.94	2.80	2.11	136	0.21

16-20	379	11.42	13.95	13.34	2.53	1.92	105	0.28
21-25	209	11.13	13.36	12.83	2.23	1.70	62	0.30
26-30	110	10.56	12.42	11.98	1.86	1.42	23	0.21
>30	216	12.41	14.13	13.74	1.73	1.33	82	0.38
Average		**11.00**	**13.56**	**12.93**				

Table 4: Upper fiducial limit of CV % for different plot size of rice crop

Plot size (m^2)	**No. of expt.**	**CV %**	**U L**		**Range**		**CV % >13.56**	
			(0.05)	**(0.10)**	**(0.05)**	**(0.10)**	**No. of expt.**	**Proportion**
<3	41	12.96	15.17	14.64	2.22	1.69	15	0.37
3-6	365	12.15	15.01	14.30	2.86	2.15	123	0.34
6-9	580	11.77	14.53	13.85	2.76	2.08	169	0.29
9-12	693	9.82	12.07	11.52	2.25	1.70	110	0.16
12-15	50	9.68	12.32	11.66	2.64	1.97	9	0.18
15-18	69	10.70	13.52	12.81	2.81	2.11	18	0.26
18-21	9	8.27	10.19	9.71	1.92	1.44	1	0.11
21-24	1	5.84	7.29	6.94	1.45	1.10	0	0.00
>24	2	4.61	5.65	5.40	1.04	0.79	0	0.00
Average		**11.00**	**13.56**	**12.93**				

Table 5: Upper fiducial limit of CV % for different replications of rice crop

Replication	**No. of expt.**	**CV %**	**UL**		**Range**		**No. of expts.**	**Proportion**
			(0.05)	**(0.10)**	**(0.05)**	**(0.10)**		
2	704	11.33	14.09	13.40	2.76	2.07	202	0.29
3	972	11.07	13.56	12.96	2.50	1.89	225	0.23
4	121	8.70	10.67	10.19	1.97	1.49	17	0.14
6	11	9.79	12.56	11.86	2.76	2.06	1	0.09
8	2	7.16	9.10	8.61	1.94	1.44	0	0.00
Average		**11.00**	**13.56**	**12.93**				

Table 6: The average upper fiducial limit and yardstick for CV % for the experiments of rice crop

Name of Crop	No. of experiments	Mean CV %	Upper fiducial limit of CV %		Overall yardstick of CV%
			0.95	0.90	
Rice	**1810**	**11.00**	**13.56**	**12.93**	14%

Table 7: Power of F-test as influence by CV%

Classes CV%	No. of experiments	F-test		
		Significant	Non-Significant	Ratio
<5	152	150	2	0.01
5-8	371	363	5	0.01
8-11	517	494	20	0.04
11-14	375	357	18	0.05
14-17	230	213	17	0.08
17-20	83	68	13	0.19
20-23	22	20	2	0.10
23-26	26	20	6	0.30
26-29	14	12	2	0.17
29-32	3	1	2	2.00
32-35	5	5	0	0.00
35-38	4	2	2	1.00
38-41	3	2	1	0.50
41-44	1	0	1	0.00
44-47	0	0	0	0.00
47-50	1	1	0	0.00
> 50	3	1	2	2.00
Total	**1810**	**1709**	**93**	**0.05**

Recommendation for scientific community

The yard stick of CV% for accepting the results of rice crop experiment conducted at Main Rice Research Station, Nawagam is 14 per cent for yield character.

1.4 TOBACCO

Yield data of 548 experiments conducted on Tobacco crop during the period 2003-04 to 2019-20 have been used to work out fiducial limits and yardstick of CV % for accepting or rejecting the results of Tobacco crop. The upper fiducial limits at 95 % and 90 % confidence level based on non-central "t" distribution was also worked out for yield character. The yardstick of CV% of field experiments was established on the basis of overall average upper fiducial limit of CV% of each experiment and significance of treatment differences by F test.

Table 1: Upper fiducial limit of CV % for different disciplines of tobacco crop

Discipline	No. of expt.	CV %	U L		Range		CV % >14.76	
			(0.05)	(0.10)	(0.05)	(0.10)	No.of expt.	Proportion
Agronomy	104	11.64	14.38	13.71	2.74	2.07	26	25.0
Bio-chem	4	13.71	16.68	15.96	2.98	2.25	1	25.0
Pathology	21	18.71	24.94	23.28	6.23	4.57	13	61.9
Pl. breeding	393	11.40	14.51	13.72	3.11	2.32	56	14.2
Pl. Physio.	22	8.98	11.05	10.54	2.07	1.56	0	0.0
Soil Chem	4	12.53	15.17	14.53	2.56	2.01	1	25.0
Average	**548**	**11.65**	**14.76**	**13.98**				

Table 2: Upper fiducial limit of CV % for different design of tobacco crop

Design	No. of expt.	CV %	U L		Range		CV % >14.76	
			(0.05)	(0.10)	(0.05)	(0.10)	No. of expt.	Proportion
FRBD2	28	12.26	15.19	14.47	2.93	2.21	8	28.5
FRBD3	13	14.33	17.22	16.53	2.89	2.20	5	38.5
RBD	428	11.46	14.70	13.88	3.24	2.42	65	15.2
Split Plot11	76	12.01	14.49	13.89	2.47	1.88	18	23.7
Split Plot111	2	12.80	15.72	14.99	2.92	2.19	0	0.0
Split Plot12	1	15.20	17.56	17.02	2.36	1.82	1	100.0
Average	**548**	**11.65**	**14.76**	**13.98**				

Table 3: Upper fiducial limit of CV % for different treatments of tobacco crop

Treatments	No. of expt.	CV %	U L		Range		CV % >14.76	
			(0.05)	(0.10)	(0.05)	(0.10)	No. of expt.	Proportion
Up to 5	18	15.54	21.72	20.04	6.18	4.49	6	33.3
6-10	288	11.25	14.64	13.77	3.39	2.52	43	15.0
11-15	124	11.32	14.02	13.36	2.70	2.04	24	19.4
16-20	103	12.29	14.72	14.14	2.42	1.84	20	19.4
21-25	13	12.99	15.20	14.68	2.21	1.69	3	23.1
26-30	2	14.10	16.28	15.77	2.18	1.67	1	50.0
>30	0	0	0	0	0	0	0	0.0
Average	**548**	**11.65**	**14.76**	**13.98**				

Table 4: Upper fiducial limit of CV % for different plot size of tobacco crop

Plot size (m^2)	No. of expt.	CV %	U L		Range		CV % >14.76	
			(0.05)	(0.10)	(0.05)	(0.10)	No. of expt.	Proportion
<3	0	0	0	0	0	0	0	0
3-6	0	0	0	0	0	0	0	0
6-9	99	13.47	17.17	16.23	3.70	2.76	32	33.3
9-12	114	11.11	14.11	13.35	2.99	2.24	25	22.0
12-15	220	10.94	13.80	13.08	2.86	2.14	16	7.3
15-18	15	18.33	24.87	23.11	6.54	4.77	6	40.0
18-21	6	10.97	13.87	13.15	2.90	2.18	1	16.7
21-24	10	9.12	11.38	10.82	2.26	1.70	1	10.0
>24	84	11.28	14.02	13.35	2.74	2.06	16	19.1
Average	**548**	**11.65**	**14.76**	**13.98**				

Table 5: Upper fiducial limit of CV % for different replications of tobacco crop

Replication	No. of expt.	CV %	UL		Range		No. of expts.	Proportion
			(0.05)	(0.10)	(0.05)	(0.10)		
2	1	11.80	14.59	13.91	2.79	2.11	0	0.0
3	404	11.67	14.73	13.96	3.06	2.29	66	16.4
4	133	11.68	14.95	14.12	3.27	2.44	29	21.8

5	2	12.70	16.79	15.73	4.09	3.03	0	0
6	8	10.39	13.15	12.46	2.77	2.07	2	25.0
Average	**548**	**11.65**	**14.76**	**13.98**				

Table 6: Upper fiducial limit of CV % for different locations of tobacco crop

Location	**No. of expt.**	**CV %**	**UL**		**Range**		**No. of expts.**	**Proportion**
			(0.05)	**(0.10)**	**(0.05)**	**(0.10)**		
ANAND	424	12.17	15.40	14.59	3.23	2.42	78	18.4
DHARMAJ	102	10.88	13.84	13.10	2.97	2.22	18	17.7
LADOL	20	4.51	5.78	5.45	1.27	.95	0	0.0
SANAND	2	13.80	17.31	16.45	3.51	2.65	1	50.0
Average	**548**	**11.65**	**14.76**	**13.98**				

Table 7: The average upper fiducial limit and yardstick for CV % for the experiments of tobacco crop

Name of Crop	**No. of experiments**	**Mean CV %**	**Upper fiducial limit of CV %**		**Overall yardstick of CV%**
			0.95	0.90	
Tobacco	**548**	**11.65**	**14.76**	**13.98**	**14.76**

Table 8: Power of F-test as influence by CV%

Classes CV%	**No. of experiments**	**F-test**		
		Significant	**Non-Significant**	**Ratio**
1-4	14	13	1	.080
4-7	53	51	2	.040
7-10	124	104	20	.190
10-13	128	145	37	.260
13-16	103	76	27	.360
16-19	44	22	22	1.000
19-22	12	5	7	1.400
22-25	9	8	1	.130
25-28	3	0	3	-
28-31	2	0	2	-

31-34	0	0	0	-
34-37	0	0	0	-
37-40	0	0	0	-
40-43	1	0	1	-
43-46	0	0	0	-
46-49	0	0	0	-
49-52	1	0	0	-
52-55	0	0	1	-
>55	0	0	0	-
Total	**548**	**424**	**124**	**.290**

Recommendation for scientific community

The yard stick of CV% for accepting the results of tobacco crop experiment is 14.76 *i.e.*, 15 per cent for yield character.

1.5 VEGETABLE CROPS

Yield data of 26 years of 2713 experiments conducted on vegetable crops during the period 1996-97 to 2021-22 have been used to work out fiducial limits and yardstick of CV% for accepting or rejecting the results of Vegetable crops. The upper fiducial limits at 95% and 90% confidence level based on non-central "t" distribution was also worked out for yield character. The yardstick of CV% of field experiments was established on the basis of overall average upper fiducial limit of CV% of each experiment and significance of treatment differences by F test

Table 1: Upper fiducial limit of CV% for different disciplines of Vegetable crops

Discipline	No. of expt.	CV%	U L		Range		CV% >16.72	
			(0.05)	(0.10)	(0.05)	(0.10)	No. of expt.	Proportion
Agronomy	41	13.20	13.28	13.26	0.08	0.06	11	26.83
Ento	111	14.56	14.56	14.56	0.00	0.00	34	30.63
Pl. breeding	2561	14.70	16.87	16.31	2.17	1.61	664	25.93
Average	**2713**	**14.67**	**16.72**	**16.19**				

Table 2: Upper fiducial limit of CV% for different design of Vegetable crops

Design	No. of expt.	CV%	U L		Range		CV% >16.72	
			(0.05)	(0.10)	(0.05)	(0.10)	No. of expt.	Proportion
CRD	14	13.32	13.32	13.32	0.000	0.000	2	14.29
RBD	2684	14.70	16.77	16.23	2.07	1.54	706	26.30
SPLIT PLOT	5	9.77	10.45	10.29	0.69	0.52	1	20.00
STRIP	10	11.89	12.58	12.41	0.70	0.53	0	0
Average	**2713**	**14.67**	**16.72**	**16.19**				

Table 3: Upper fiducial limit of CV% for different treatments of Vegetable crops

Treatments	No. of expt.	CV%	U L		Range		CV% >16.72	
			(0.05)	(0.10)	(0.05)	(0.10)	No. of expt.	Proportion
Up to 6	108	15.51	20.51	19.10	5.00	3.59	34	31.48
6-10	1511	14.59	16.94	16.33	2.35	1.75	380	25.15
11-15	777	14.16	15.46	15.14	1.31	0.98	186	23.94
16-20	224	15.02	16.22	15.94	1.20	0.91	64	28.57
21-25	42	17.40	19.03	18.64	1.64	1.25	17	40.48
26-30	31	19.85	21.91	21.43	2.06	1.58	17	54.84
>30	20	18.86	21.45	20.85	2.59	1.99	11	55.00
Average	**2713**	**14.67**	**16.72**	**16.19**				

Table 4: Upper fiducial limit of CV% for different plot size of Vegetable crops

Plot size (m^2)	No. of expt.	CV%	U L		Range		CV% >16.72	
			(0.05)	(0.10)	(0.05)	(0.10)	No. of expt.	Proportion
<3	99	15.22	15.33	15.19	0.11	0.03	23	23.23
3-6	682	14.82	16.38	15.96	1.56	1.13	191	28.00
6-9	567	14.84	16.62	16.11	1.78	1.27	160	28.22
9-12	177	14.99	17.12	16.43	2.13	1.44	59	33.33
12-15	378	13.40	14.79	14.43	1.40	1.04	70	18.52
15-18	382	15.36	18.57	17.68	3.21	2.32	122	31.94
18-21	289	14.38	16.16	15.70	1.77	1.31	64	22.14
21-24	43	13.32	15.48	14.64	2.16	1.32	11	25.58
>24	96	15.19	17.29	16.54	2.10	1.35	30	31.25
Average	**2713**	**14.67**	**16.72**	**16.19**				

Table 5: Upper fiducial limit of CV% for different replications of Vegetable crops

Replication	No. of expt.	CV%	UL		Range		CV% >16.72	
			(0.05)	(0.10)	(0.05)	(0.10)	No. of expt.	Proportion
2	91	16.98	19.25	18.65	2.27	1.67	36	39.56

3	2392	14.43	16.33	15.84	1.89	1.41	589	24.62
4	180	15.97	19.88	18.87	3.91	2.90	65	36.11
5	16	15.26	16.33	16.06	1.07	0.80	5	31.25
6	34	18.02	21.28	20.46	3.26	2.44	14	41.17
Average	**2713**	**14.67**	**16.72**	**16.19**				

Table 6: Upper fiducial limit of CV% for different locations of Vegetable crops

Location	**No. of expt.**	**CV%**	**UL**		**Range**		**CV% >16.72**	
			(0.05)	**(0.10)**	**(0.05)**	**(0.10)**	**No. of expt.**	**Proportion**
ANAND	1549	15.12	16.92	16.54	1.80	1.33	421	27.17
BHARUCH	9	14.37	18.35	17.36	3.98	2.99	2	22.22
DANGS	1	4.71	4.71	4.71	0.00	0.00	0	0
DEESA	36	18.47	20.63	20.08	2.16	1.61	15	41.67
DHARI	8	15.84	20.67	19.44	4.83	3.59	3	37.50
JAGUDAN	90	14.10	14.10	14.10	0.00	0.00	28	31.11
JUNAGADH	567	13.86	16.67	15.95	2.81	2.09	120	21.16
LADOL	72	13.95	15.44	15.06	1.49	1.11	21	29.17
NAVSARI	179	14.75	16.91	16.36	2.16	1.60	55	30.73
SK NAGAR	97	13.88	17.42	16.51	3.54	2.62	29	29.90
THASARA	19	11.53	11.53	11.53	0.00	0.00	1	5.26
WAGHAI	52	11.60	13.00	12.64	1.40	1.04	4	7.69
OTHERS	34	15.13	18.99	18.01	3.85	2.88	10	29.41
Average	**2713**	**14.67**	**16.72**	**16.19**				

Table 7: The average upper fiducial limit and yardstick for CV% for the experiments of Vegetable crops

Name of Crop	**No. of experiments**	**Mean CV%**	**Upper fiducial limit of CV%**		**Overall yardstick of CV%**
			0.95	0.90	
Vegetable Crops	**2713**	**14.67**	**16.72**	**16.19**	**16.72**

Table 8: Power of F-test as influence by CV%

Classes CV%	No. of experiments	F-test		
		Significant	Non-Significant	Ratio
1-6	68	66	2	0.030
6-11	689	653	36	0.055
11-16	1152	1056	96	0.091
16-21	464	372	92	0.247
21-26	197	143	54	0.380
26-31	67	46	21	0.460
31-36	39	24	15	0.630
36-41	16	9	7	0.780
41-46	7	2	5	2.500
46-51	1	1	0	0.000
51-56	6	2	4	2.000
56-61	1	0	1	-
61-66	4	0	4	-
66-71	0	0	0	-
71-76	1	1	0	0.000
76-81	0	0	0	-
81-86	0	0	0	-
86-91	1	1	0	0.000
Total	**2713**	**2376**	**337**	**0.14**

Recommendation for scientific community

The yard stick of CV% for accepting the results of the vegetable crops experiment is now recommended as 16.72, *i.e.* 17 per cent for yield character in place of our previous recommendation of 17.73 per cent.

1.6 FORAGE CROPS

Yield data of 19 years of 845 experiments conducted on Forage crops during the period 2005 to 2023 have been used to work out fiducial limits and yardstick of CV% for accepting or rejecting the results of Forage crops. The upper fiducial limits at 95% and 90% confidence level based on non-central "t" distribution were also worked out for yield character. The yardstick of CV% of field experiments was established on the basis of overall average upper fiducial limit of CV% of each experiment and significance of treatment differences by F test.

Table 1: Upper fiducial limit of CV% for different disciplines of Forage crops

Discipline	No. of expt.	CV%	U L		Range		CV% >13.50	
			(0.05)	(0.10)	(0.05)	(0.10)	No. of expt.	Proportion
Agronomy	130	9.51	12.40	11.55	2.88	2.04	24	18.46
Bio-Chem	48	8.29	10.47	9.93	2.18	1.64	6	12.50
Ento	15	10.67	14.03	13.16	3.36	2.50	8	53.33
PBG	652	10.70	13.94	13.11	3.23	2.41	137	21.01
Average	**845**	**10.38**	**13.50**	**12.69**				

Table 2: Upper fiducial limit of CV% for different design of Forage crops

Design	No. of expt.	CV%	U L		Range		CV% >13.50	
			(0.05)	(0.10)	(0.05)	(0.10)	No. of expt.	Proportion
CRD	1	16.00	19.40	18.57	3.40	2.57	1	100.0
RBD	813	10.38	13.54	12.71	3.16	2.34	169	20.78
SPLIT PLOT	31	10.32	12.38	11.89	2.06	1.57	5	16.13
Average	**845**	**10.38**	**13.50**	**12.69**				

Table 3: Upper fiducial limit of CV% for different treatments of Forage crops

Treatments	No. of expt.	CV%	U L		Range		CV% >13.50	
			(0.05)	(0.10)	(0.05)	(0.10)	No. of expt.	Proportion
Up to 6	55	12.04	18.13	16.24	6.08	4.20	16	29.09

6-10	499	9.96	13.17	12.35	3.21	2.38	94	18.84
11-15	194	9.99	12.38	11.80	2.40	1.81	37	19.07
16-20	62	12.46	15.09	14.46	2.64	2.00	19	30.65
21-25	18	13.60	16.08	15.49	2.49	1.90	4	22.22
26-30	8	10.34	12.01	11.62	1.68	1.29	2	25.00
>30	9	11.33	12.87	12.51	1.54	1.18	3	33.33
Average	**845**	**10.38**	**13.50**	**12.69**				

Table 4: Upper fiducial limit of CV% for different plot size of Forage crops

Plot size (m^2)	**No. of expt.**	**CV%**	**U L**		**Range**		**CV% >13.50**	
			(0.05)	**(0.10)**	**(0.05)**	**(0.10)**	**No. of expt.**	**Proportion**
<3	2	15.60	16.96	16.66	1.36	1.05	2	100.0
3-6	25	15.34	18.50	17.74	3.16	2.40	11	44.00
6-9	170	10.70	13.77	12.99	3.07	2.29	34	20.00
9-12	166	9.92	12.62	11.95	2.70	2.03	27	16.27
12-15	414	10.27	13.58	12.70	3.32	2.43	87	21.01
15-18	33	9.51	12.71	11.83	3.19	2.31	8	24.24
18-21	19	10.03	13.38	12.52	3.35	2.49	4	21.05
21-24	5	8.56	10.76	10.21	2.20	1.65	0	0
>24	11	8.78	11.56	10.85	2.78	2.07	2	18.18
Average	**845**	**10.38**	**13.50**	**12.69**				

Table 5: Upper fiducial limit of CV% for different replications of Forage crops

Replication	**No. of expt.**	**CV%**	**UL**		**Range**		**No. of expt.**	**Proportion**
			(0.05)	**(0.10)**	**(0.05)**	**(0.10)**		
2	23	12.07	14.82	14.14	2.75	2.07	8	34.78
3	565	10.24	13.23	12.47	2.99	2.23	111	19.65
4	232	10.62	14.06	13.12	3.44	2.50	49	21.12
5	25	9.80	13.24	12.34	3.44	2.53	7	28.00
Average	**845**	**10.38**	**13.50**	**12.69**				

Table 6: Upper fiducial limit of CV% for different locations of Forage crops

Location	No. of expt.	CV%	UL		Range		No. of expt.	Proportion
			(0.05)	(0.10)	(0.05)	(0.10)		
ANAND	776	10.06	13.08	12.30	3.02	2.23	150	19.33
ARNEJ	10	9.94	13.06	12.26	3.12	2.33	2	20.00
DEESA	2	6.00	7.49	7.12	1.49	1.11	0	0
DEROL	2	7.38	9.81	9.21	2.42	1.82	0	0
DHANDHUKA	12	10.60	13.84	13.01	3.24	2.41	2	16.67
DHARI	7	25.93	34.35	32.14	8.42	6.21	5	71.43
KHAPAT	1	3.20	4.10	3.87	0.90	0.67	0	0
KHDEBRAMA	1	8.90	11.41	10.78	2.51	1.88	0	0
NAVSARI	2	10.50	13.77	12.91	3.27	2.41	0	0
RADHANPUR	1	27.90	36.44	34.27	8.54	6.37	1	100.0
S K NAGAR	6	15.88	21.17	19.77	5.28	3.89	3	50.00
SANSOLI	2	8.66	10.90	10.34	2.24	1.68	0	0
TARGHADIA	1	5.60	7.17	6.78	1.57	1.18	0	0
VALLBHIPUR	1	18.60	24.02	22.65	5.42	4.05	1	100.0
VIRAMGAM	21	15.84	20.32	19.19	4.48	3.35	11	52.38
Average	**845**	**10.38**	**13.50**	**12.69**				

Table 7: The average upper fiducial limit and yardstick for CV% for the experiments of Forage crops

Name of Crop	No. of experiments	Mean CV%	Upper fiducial limit of CV%		Overall yardstick of CV%
			0.95	0.90	
Forage Crops	**845**	**10.38**	**13.50**	**12.69**	**13.50**

Table 8: Power of F-test as influence by CV%

Classes CV%	No. of experiments	F-test		
		Significant	Non-Significant	Ratio
<5	81	63	18	0.29
5-8	253	218	35	0.16
8-11	224	185	39	0.21

11-14	130	104	26	0.25
14-17	93	85	8	0.09
17-20	29	24	5	0.21
20-23	9	5	4	0.80
23-26	9	8	1	0.13
26-29	3	2	1	0.50
29-32	3	2	1	0.50
32-35	1	1	0	0.00
35-38	0	0	0	0.00
38-41	2	2	0	0.00
41-44	0	0	0	0.00
44-47	1	0	1	-
47-50	1	0	1	-
>50	6	5	1	0.20
Total	**845**	**704**	**141**	**0.20**

Recommendation for scientific community

The yard stick of CV% for accepting the results of the Forage crops experiment is now recommended as 13.50, *i.e.* 14 per cent for yield character which is similar to our previous recommendations.

2. Research Recommendations

Year 2019

The yard stick of CV% for accepting the results of Sugarcane crop experiments is 11 per cent for yield character.

Year 2020

The yard stick of CV% for accepting the results of Maize crop experiments conducted at Main Maize Research Station, Godhra is 17 per cent for yield character.

Year 2021

The yard stick of CV% for accepting the results of rice crop experiment conducted at Main Rice Research Station, Nawagam is **14** per cent for yield character.

Year 2022

The yard stick of CV% for accepting the results of tobacco crop experiment is 14.76 *i.e.,* 15 per cent for yield character.

Year 2023

1. The yard stick of CV% for accepting the results of the vegetable crops experiment is now recommended as 16.72, *i.e.*, 17 per cent for yield character in place of our previous recommendation of 17.73 per cent.
2. The yard stick of CV% for accepting the results of the Forage crops experiment is now recommended as 13.50, *i.e.,* 14 per cent for yield character which is similar to our previous recommendation of 13.94 per cent.

Year 2024

1. The yard stick of CV% for accepting the results of the irrigated wheat crop experiment is recommended as 11.07 per cent and for restricted irrigated wheat as 11.41 per cent for yield character.

2. It is recommended that weather parameter namely maximum temperature, temperature difference, sunshine hours and relative humidity are most contributing predictors for insect-pest incidences of Dead Heart, Damage Leaf and White Backed Plant Hopper in rice crop.