

THE IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH

**Surface Run-off and Soil Erosion from Arable
Lands in the Bombay-Deccan**

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APPENDIX I—*contd.*

Class	Rainfall in inches	June	July	August	September	October	November	December	January	February	March	April	May
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(1934-35)—*contd.*

			0.49		0.20								
			0.40		0.14								
			0.31		0.14								
			0.13										
2	1-1 . . .		0.03	0.95	0.75								
			0.50										
3	1-2 . . .			1.13	1.22		1.24						
				1.52									
4	Above 2 . . .		2.17		2.67								

(1935-36)

1	0-1 . . .	0.17	0.16	0.38	0.24	0.15	...	0.43	...	0.47	0.36	...	...
		0.20	0.12	0.14	0.41	0.43				0.26			
		0.16	0.13	0.43	0.29	0.23							
		0.34	0.12	0.47	0.25	0.42							
		0.13		0.23		0.13							
		0.20											
		0.26											
2	1-1 . . .	0.75											
		0.54	0.73	0.50	0.96	0.51						0.65	0.70
		0.69	0.65	0.54	0.99								
3	1-2 . . .			1.57									
				1.03									
				1.36									
4	Above 2 . . .			3.52		4.30							

(1936-37)

1	0-1 . . .	0.18	0.16	0.25	0.14	0.37				0.21	0.49	0.22	
			0.25	0.35	0.47						0.20	0.41	
			0.10	0.16	0.42								
			0.10		0.13								
2	1-1 . . .	0.84	0.35				0.30					0.56	
		0.70					0.69						
		0.56											
3	1-2 . . .				1.73							1.03	
4	Above 2 . . .						2.03						

APPENDIX I—*contd.*

Class	Rainfall in inches	June	July	August	September	October	November	December	January	February	March	April	May
(1937-38)													
1	0— $\frac{1}{2}$. . .		0.16	0.15	0.30	0.39		0.39				0.11	0.31
			0.27	0.14	0.38			0.34					0.10
			0.47		0.32								
			0.33		0.44								
			0.42		0.28								
			0.17		0.12								
			0.14		0.26								
			0.24										
			0.21										
			0.22										
			0.14										
2	$\frac{1}{2}$ —1 . . .	0.98	0.63	0.54		0.67					0.81		
		0.80		0.52		0.62							
3	1—2 . . .				1.30	1.97		1.35			1.40		
					1.15	1.44							
4	Above 2 . . .				2.13								
					2.05								
(1938-39)													
1	0— $\frac{1}{2}$. . .	0.34	0.25	0.16	0.31	0.23						0.25	
		0.10	0.44	0.19	0.26							0.18	
		0.31	0.10	0.28									
		0.15	0.11	0.10									
		0.30	0.30	0.10									
		0.18	0.42	0.16									
		0.10	0.27	0.24									
		0.16	0.34	0.10									
			0.15	0.26									
			0.33										
			0.30										
			0.11										
			0.41										
			0.10										
2	$\frac{1}{2}$ —1 . . .	0.94	0.96	0.65	0.66	0.75							
		0.60		0.59	0.79								
					0.56								
3	1—2 . . .	1.90	1.72	1.60	1.14								
		1.50	1.78		1.76								
		1.78	1.13		1.14								
4	Above 2 . . .		2.32		4.06								

* The figures in *italics* indicate the rainfall that caused run-off of rain water and soil erosion.

APPENDIX I—contd.

(b) Loss of rain water by run-off in inches and loss of soil by erosion in pounds per acre on each day of run-off during the experimental period of five years

(1934-35)

Plot	Treatment	Dates	30-7-34	2-8-34	28-8-34	4-9-34	7-9-34	8-9-34
		Rainfall	2.17	1.52	0.36	1.22	2.67	0.17
1	Retention of vegetation	Run-off water	0.006	...	0.006	0.004	0.190	0.003
		Silt lost	1.15	...	7.69	0.70	48.50	0.83
2	Removal of vegetation	Run-off water	0.037	...	0.024	0.148	1.105	0.061
		Silt lost	13.69	...	107.72	239.55	1,648.03	45.29
3	Shallow cultivation	Run-off water	0.019	...	0.023	0.097	1.040	0.063
		Silt lost	3.54	...	47.37	59.62	975.86	56.48
4	Cultivation of <i>rabi jowar</i>	Run-off water	0.018	...	0.025	0.009	0.896	0.053
		Silt lost	6.39	...	12.60	160.81	1,979.25	67.90
5	'Scooping'	Run-off water . . . . .	...	...	0.003	0.003	0.015	...
		Silt lost . . . . .	...	...	8.38	1.73	6.17	...
6	Cultivation of a <i>kharif</i> crop of <i>bajri</i> and <i>tur</i>	Run-off water	0.037	0.032	0.011	0.053	0.505	0.043
		Silt lost	24.29	13.82	125.03	185.03	1,883.97	61.17
7	Thorough cultivation	Run-off water	0.123	0.021	0.023	0.145	1.067	0.042
		Silt lost	126.09	4.66	212.81	559.14	2,004.31	55.14
8	Thorough cultivation with double length	Run-off water	0.046	...	0.006	0.108	1.000	0.053
		Silt lost	6.05	...	44.45	78.74	1,130.66	31.78

[VI]

SURFACE RUN-OFF AND SOIL EROSION

APPENDIX I—*contd.*

(1935-36)

Plot	Treatment	Dates . . .	26-6-35	5-7-35	24-8-35	25-8-35	27-8-35	28-8-35	29-8-35	30-8-35*	24-10-35*
		Rain-fall . . .	0.69	0.78	3.52	0.48	1.57	1.03	0.54	1.86	4.30
1	Retention of vegetation	Run-off water . .	...	...	1.13	...	0.35	0.32	0.16	1.02	1.03
		Silt lost . . .	...	...	419.0	...	145.4	201.4	92.0	7.5	453.9
2	Removal of vegetation	Run-off water . .	0.019	0.011	1.54	0.003	0.67	0.56	0.24	1.29	1.46
		Silt lost . . .	9.3	5.80	3,697.0	1.4	898.0	1,585.0	1,461.0	31,940.0	16,365.0
3	Shallow cultivation .	Run-off water . .	0.051	0.011	1.52	0.007	0.73	0.59	0.22	1.17	1.39
		Silt lost . . .	40.4	3.0	5,217.0	2.6	971.6	1,635.5	878.0	85,570.0	40,000.0
4	Cultivation of <i>rabi jowar</i>	Run-off water . .	0.011	...	1.51	0.024	0.76	0.55	0.22	1.18	1.29
		Silt lost . . .	2.7	...	11,140.0	18.7	4,325.0	6,800.0	2,544.0	137,800.0	97,160.0
5	'Scooping' . . .	Run-off water . .	...	...	1.51	...	0.19	0.33	0.03	1.02	0.73
		Silt lost . . .	...	...	5,966.0	...	464.7	1,165.0	336.5	43,120.0	36,870.0
6	Cultivation of <i>kharij</i> crop of <i>bajri</i> and <i>tur</i>	Run-off water . .	...	...	1.46	...	0.51	0.50	0.16	1.14	0.83
		Silt lost . . .	...	...	38,635.0	...	1,726.6	14,390.0	846.1	36,100.0	6,461.0
7	Thorough cultivation	Run-off water . .	...	...	1.37	0.006	0.63	0.38	0.22	1.25	1.15
		Silt lost . . .	...	...	21,460.0	3.8	4,680.0	6,586.0	1,735.0	53,510.0	124,400.0
8	Thorough cultivation with double length	Run-off water . .	...	...	1.51	...	0.51	0.29	0.20	1.24	1.54
		Silt lost . . .	...	...	11,570.0	...	626.4	2,264.0	729.3	48,770.0	39,680.0

* Shows rainfall of great intensity mentioned in Table XVII

APPENDIX I—contd.
(1936-37)

Plot	Treatment	Date	23-7-36	26-9-36	28-9-36	18-11-36*	14-11-36*
		Rainfall	0·85	1·73	0·42	2·03	0·90
1	Retention of vegetation	Run-off water . . . . .	...	0·05	...	0·02	...
		Silt lost . . . . .	...	92·6	...	69·49	...
2	Removal of vegetation	Run-off water	0·09	0·48	0·04	0·27	0·18
		Silt lost	101·6	775·3	65·0	592·6	911·0
3	Shallow cultivation	Run-off water	0·04	0·70	0·06	1·02	0·40
		Silt lost	57·9	909·5	84·5	2,381·0	3,775·0
4	Cultivation of <i>rabi jowar</i>	Run-off water . . . . .	...	0·69	0·01	0·82	0·37
		Silt lost . . . . .	...	1,051·0	22·3	3,514·0	5,174·0
5	'Scooping'	Run-off water . . . . .	...	0·09	...	0·10	0·005
		Silt lost . . . . .	...	433·0	...	291·6	64·59
6	Cultivation of <i>khari</i> crop of <i>bajri</i> and <i>tur</i>	Run-off water . . . . .	...	0·48	...	0·76	0·34
		Silt lost . . . . .	...	596·9	...	11,690·0	6,144·0
7	Thorough cultivation	Run-off water . . . . .	...	0·68	0·03	0·83	0·39
		Silt lost . . . . .	...	969·8	47·2	37,190·0	1,301·0
8	Thorough cultivation with double length	Run-off water . . . . .	...	0·78	0·02	0·00	0·49
		Silt lost . . . . .	...	688·0	25·7	1,151·0	673·3

* Shows rainfall of great intensity mentioned in Table XVII

Plot	Treatment	Date	17-6-37	19-6-37	6-7-37	{ 10-7-37 11-7-37 }	5-8-37	2-9-37	3-9-37
		Rainfall	0.98	0.80	0.47	0.96	0.54	1.30	0.38
1	Retention of vegetation	Run-off water	...	...	...	...	...	...	...
		Silt lost	...	...	...	...	...	...	...
2	Removal of vegetation	Run-off water	...	0.22	0.07	0.13	0.03	0.28	...
		Silt lost	...	323.4	278.8	198.1	64.8	203.0	...
3	Shallow cultivation	Run-off water	0.28	0.43	0.08	0.15	0.08	0.61	Trace
		Silt lost	371.5	902.4	362.1	267.7	121.5	388.8	14.56
4	Cultivation of <i>rabi jowar</i>	Run-off water	0.21	0.42	Trace	0.08	...	0.38	...
		Silt lost	373.0	1,614.0	87.32	124.6	...	280.0	...
5	(Scooping)	Run-off water	0.19	0.37	...	...	...	0.24	...
		Silt lost	358.8	1,788.0	...	...	...	232.7	...
6	Cultivation of <i>khari</i> , crop of <i>bajri</i> and <i>tur</i>	Run-off water	0.18	0.40	Trace	0.07	...	0.45	...
		Silt lost	287.1	1,806.0	85.6	146.5	...	220.2	...
7	Thorough cultivation	Run-off water	0.03	0.39	Trace	0.08	...	0.41	...
		Silt lost	121.1	1,381.0	79.40	150.3	...	407.2	...
8	Thorough cultivation with double length	Run-off water	0.05	0.36	...	0.06	...	0.50	...
		Silt lost	103.7	438.8	...	91.4	...	336.9	...

(1938-

Plot	Treatment	Date	{ 7-6-38 8-6-38 }	10-6-38	{ 20-6-38 21-6-38 }	22-6-38
		Rain-fall	2.0	1.50	2.72	0.60
1	Retention of vegetation	Run-off water	...	...	0.15	...
		Silt lost	...	...	66.9	...
2	Removal of vegetation	Run-off water	0.38	0.56	1.59	0.15
		Silt lost	229.5	1,154.0	1,986.0	88.0
3	Shallow cultivation	Run-off water	0.28	0.57	1.55	0.16
		Silt lost	173.2	865.4	2,187.0	83.8
4	Cultivation of <i>rabi jowar</i>	Run-off water	...	0.35	1.27	0.12
		Silt lost	...	441.0	2,010.0	78.4
5	'Scooping'	Run-off water	...	...	Trace	...
		Silt lost	...	...	106.2	...
6	Cultivation of <i>khari</i> crop of <i>bajri</i> and <i>tur</i>	Run-off water	...	0.34	1.09	0.08
		Silt lost	...	533.8	3,960.0	55.38
7	Thorough cultivation	Run-off water	...	0.41	1.28	0.011
		Silt lost	...	448.8	3,359.0	67.0
8	Thorough cultivation with double length	Run-off water	...	0.04	1.19	0.08
		Silt lost	...	90.6	660.1	46.6

DIX I—contd.

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21-9-37	22-9-37	*24-9-37	*25-9-37	2-10-37	{ 3-10-37* 4-10-37 }	5-10-37	13-12-37	14-12-37	24-12-37	26-3-38
1.15	0.44	2.13	2.05	0.67	2.59	1.44	0.39	0.34	1.35	1.40
...	...	0.24	0.31	...	0.10	...	...	...	Trace	...
...	...	145.1	185.6	...	73.63	...	...	...	100.9	...
0.29	0.06	1.20	1.42	0.30	1.26	0.61	...	...	Trace	0.49
394.1	95.8	58,650.0	75,010.0	78.2	55,650.0	4,109.0	...	...	942.3	712.2
0.48	0.08	1.39	1.37	0.22	1.08	0.48	0.01	0.01	1.05	0.58
589.4	107.4	70,930.0	89,300.0	1,294.0	72,810.0	3,075.0	31.02	47.2	4,435.0	739.2
0.46	Trace	1.38	1.39	0.16	1.07	0.48	...	...	1.07	0.37
349.4	11.82	16,500.0	115,000.0	805.0	44,230.0	3,256.0	...	...	15,410.0	838.1
...	...	0.55	0.96	0.15	0.87	0.40	...	...	0.57	0.02
...	...	35,130.0	40,100.0	799.1	22,720.0	8,782.0	...	...	2,885.0	168.7
0.18	...	1.42	1.28	0.19	1.08	0.62	...	...	0.78	0.34
215.3	...	117,300.0	93,670.0	1,172.0	34,040.0	6,816.0	...	...	5,331.0	854.3
0.40	0.04	1.27	1.29	0.27	1.23	0.46	...	...	0.92	0.35
549.3	73.60	113,200.0	94,450.0	3,390.0	35,850.0	9,397.0	...	...	3,533.0	582.9
0.42	0.03	1.40	1.22	0.26	1.35	0.50	1.13	0.46
417.8	40.30	76,470.0	134,000.0	3,125.0	55,440.0	10,810.0	4,255.0	501.4

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*3-7-38	6-7-38	8-7-38	13-7-38	16-7-38	3-9-38	10-9-38	21-9-38	{ *24-9-38 25-9-38 }
2.32	1.72	1.78	0.34	0.96	1.14	1.76	1.14	4.32
Trace	...	...	...	...	...	...	...	0.49
47.4	...	...	...	...	...	...	...	254.6
1.59	0.48	0.36	0.02	0.24	0.48	0.96	0.49	2.74
12,310.0	799.7	628.2	42.0	360.2	792.3	1,810.0	2,019.0	23,560.0
1.40	0.47	0.31	0.01	0.20	0.43	0.89	0.49	2.75
12,640.0	11,49.0	226.8	27.8	269.3	313.4	1,521.0	3,796.0	16,990.0
1.15	0.03	Trace	...	0.06	0.31	0.60	0.42	2.61
13,650.0	44.8	10.7	...	39.4	195.2	729.5	2,446.0	54,920.0
0.02	...	...	...	...	...	0.17	0.04	1.78
130.4	...	...	...	...	...	176.7	230.4	29,730.0
0.62	0.10	0.07	...	0.08	0.11	0.13	0.04	1.75
1,916.0	120.4	91.0	...	73.3	98.9	116.1	229.2	24,340.0
0.63	0.20	0.03	...	0.07	0.31	0.64	0.38	2.35
21,330.0	189.2	29.0	...	74.8	175.1	416.5	1,090.0	40,480.0
1.16	0.13	Trace	...	0.05	0.38	0.67	0.41	2.19
2,034.0	86.7	23.3	...	9.5	216.7	523.4	753.6	58,060.0

* Shows rainfall of great intensity mentioned in Table XVII

APPENDIX I—*concl.*(c) *Total soluble salts in run-off water*

(Expressed in pounds per acre)

Plot No. and treatment	1934-35	1935-36	1936-37	1937-38	1938-39	Total during 5 years 1934-35 to 1938-39	Average per annum
1. Retention of vegetation .	11.18	75.09	5.67	16.45	23.32	131.61	26.32
2. Removal of vegetation .	53.31	101.70	24.39	133.87	255.70	573.97	114.79
3. Shallow cultivation .	43.43	124.51	36.90	174.48	207.70	677.02	135.40
4. Cultivation of <i>rabi jowar</i> .	48.31	104.41	26.06	148.06	234.02	560.86	112.17
5. 'Scooping' .	6.06	81.00	2.28	101.51	71.08	268.53	53.70
6. Cultivation of <i>kharif bajri</i> and <i>tur</i>	36.12	83.27	28.29	143.66	155.59	446.23	89.38
7. Thorough cultivation .	37.81	93.07	30.84	143.74	175.17	490.63	98.12
8. Thorough cultivation with double length	41.68	88.48	33.22	130.55	171.54	465.27	93.05

(d) *Total soluble lime (CaO) in run-off waters*

(Expressed in pounds per acre)

Plot No. and treatment	1934-35	1935-36	1936-37	1937-38	1938-39	Total during 5 years 1934-35 to 1938-39	Average per annum
1. Retention of vegetation .	3.13	31.83	1.31	6.58	6.95	49.85	9.97
2. Removal of vegetation .	15.06	42.74	6.27	48.83	93.86	211.76	42.35
3. Shallow cultivation .	15.75	51.09	10.57	71.43	101.87	250.71	50.14
4. Cultivation of <i>rabi jowar</i> .	18.62	44.42	9.22	62.44	91.18	225.88	45.17
5. 'Scooping' .	1.43	24.62	2.42	37.67	30.46	96.60	19.32
6. Cultivation of <i>kharif bajri</i> and <i>tur</i>	8.43	36.36	9.76	64.14	64.94	182.63	36.52
7. Thorough cultivation .	7.87	37.09	9.10	57.57	74.55	186.27	37.25
8. Thorough cultivation with double length	10.31	30.24	9.45	57.30	72.63	179.99	35.99

APPENDIX II

STANDARD ERROR OF THE TWO RUN-OFF PLOTS RECEIVING SIMILAR TREATMENTS

An attempt is made here to answer any possible objection regarding the single-plot lay-out mentioned earlier. Fortunately we have some data to throw light on the possible variation between two similar plots. Plots 4 and 7 were practically the same. Plot 4 had a *rabi* crop of *jowar* from October onwards, but most of the run-offs took place before the sowing of the crop, and therefore both the plots can be considered as comparable. The data of quantities of water lost by run-off as calculated in inches from these plots during the five years are as follows.

Inches of rainfall lost by run-off

	1934-35	1935-36	1936-37	1937-38	1938-39	Total for five years
Plot 4 . . .	1.09	5.55	1.89	7.47	6.92	22.92
Plot 7 . . .	1.42	5.02	1.93	7.14	6.41	21.92

The results in all the years show such a great agreement between the two plots that no objection may be raised regarding the single-plot lay-out. Further, in order to find out the probable variation in the two plots receiving exactly the same treatment, the results of run-off during five years are again compared, after omitting the run-offs obtained after sowing of the *rabi jowar* in October. The following table shows the actual figures thus obtained for the two plots for five years.

Years	Plot 4	Plot 7	Total
1934-35	1.09	1.42	2.51
1935-36	4.26	3.87	8.13
1936-37	0.70	0.71	1.41
1937-38	6.14	5.87	12.01
1938-39	6.92	6.41	13.33
Total	20.54	19.85	40.39

Analysis of variance

Due to	Degrees of freedom	Sum of squares	Mean square	Z theo.
Treatments	1	0.07	0.07	Not significant for 5 per cent Significant for 1 per cent
Season	4	58.36	14.59	
Error	4	0.22	0.055	
Total	9	58.65	..	

The analysis of variance clearly indicates that the variation between plots is very small and is not statistically significant.