

A SOIL SURVEY OF THE

KISTNA DELTA.

By

W. H. HARRISON & others—

Department of Agriculture, Madras

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Vol. IV—Bulletin

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OF THE

## KISTNA DELTA

BY

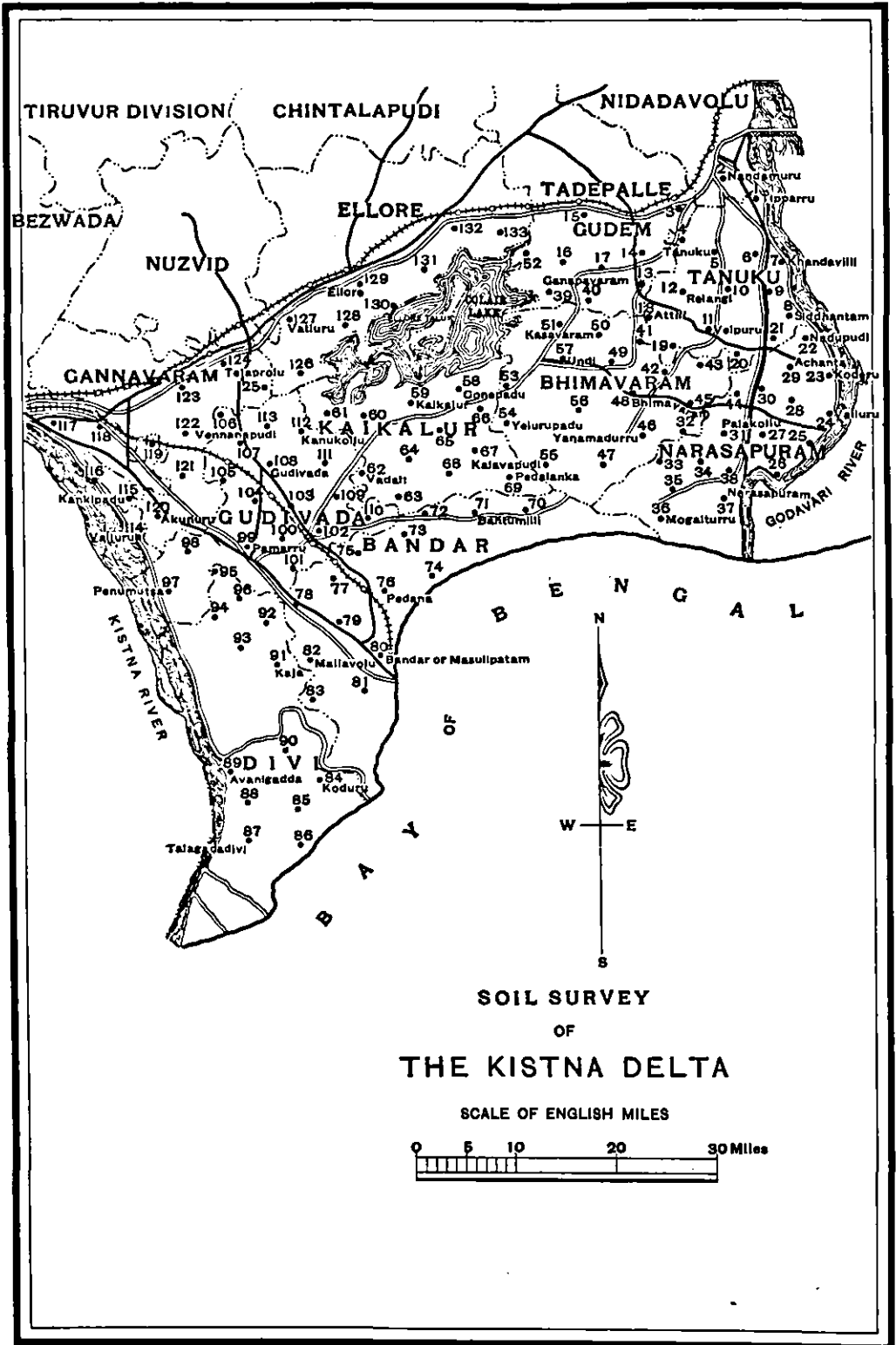
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AND  
B. VISWANATH

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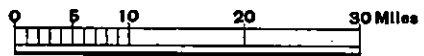
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SOIL SURVEY  
OF  
THE KISTNA DELTA

SCALE OF ENGLISH MILES



## A SOIL SURVEY OF THE KISTNA DELTA.

This soil survey has been carried out in a manner similar to the surveys of the Tanjore delta (Bulletin No. 68) and Guntūr delta (Bulletin No. 70). The tract is composed of the taluks of Tanuku, Bhimavaram, Narasapur, Kaikalūr, Bandar, Divi and Gudivāda and portions of Bezwada, Nuzvid and Ellore and is bounded by the River Gōdāvari on the north, the Bay of Bengal on the east, the River Kistna on the south and the Ellore canal on the west. For the purpose of making the survey, an extended tour was made by one of us from 3rd April to 17th July 1916 and 133 samples of soils were personally collected from typical fields under paddy cultivation. The positions of these samples are shown in Map No. I.

The analysis was confined, as in previous surveys, to the estimation of lime, magnesia, nitrogen, total and available phosphoric acid and potash, and consequently the survey must not be taken as determining the relative value of the delta soils, but rather as being an approximate guide to the manurial requirements in different areas. The table at the end of this bulletin gives the analytical results in extenso.

### DISTRIBUTION OF AVAILABLE PHOSPHORIC ACID AND POTASH.

Manurial experiments throughout the world have made it quite clear that only a portion of the phosphoric acid and potash in a soil is present in a form which can be made use of by the crop and consequently a mere measurement of the amount of these substances is of little value in fixing the immediate manurial requirements of the soil. To do this with any degree of certainty, it is necessary to determine the amount of phosphoric acid and potash in the soil which is in such a form that the crop can readily utilize it, and these utilizable manurial ingredients are spoken of as *available* phosphoric acid and potash, respectively.

In practice it is found that, if the amount of available food falls below a certain limit, the soil will respond to the application of suitable manures. For the purpose of this survey, these limits have been taken as .01 per cent for phosphoric acid and .005 per cent for potash, as being the ones most conformable with the experience gained from field experiments with paddy.

#### *Distribution of Available Phosphoric Acid.*

Map No. II shows the distribution of the available phosphoric acid throughout the delta, contoured between certain limits, and it will be at once seen that at least 75 per cent of the soils are not in

immediate need of phosphatic manures. There are four isolated blocks all round the Kolair lake which contain less than .01 per cent of available phosphoric acid; although close to the lake the percentage is above .01. The soils adjoining the two rivers are above the limit of .01 per cent, while the southern portion of the delta fed by the silt of the Kistna river is particularly well supplied with available phosphoric acid, a fact which was noted in the Guntūr soil survey.

#### *Distribution of Available Potash.*

Map No. III gives the distribution of available potash, and here it is evident that the whole delta contains over .005 per cent, the prescribed limit. Only a small portion, approximately 15 per cent of the area, is between .005 and .01 per cent and the rest contains over .01 per cent. There seems, therefore, no necessity for a potash manure in this delta.

### MANURIAL REQUIREMENTS.

#### *Phosphoric Acid and Potash.*

Map No. IV is formed by combining Maps Nos. II and III and shows the general manurial requirements of the delta with respect to available phosphoric acid and potash. As none of the soils are deficient in available potash, Map No. IV is a reproduction, in effect, of Map No. II, only showing the localities which need and those which do not need phosphatic manures.

#### *Distribution of total Phosphoric Acid and Potash.*

The total amount of phosphoric acid and potash in a soil is of less importance with regard to the immediate needs of the crop from a manurial point of view than the corresponding "available" values, but, as in course of time this unavailable plant food is gradually brought into a soluble and available form, the total values are a measure of the dormant manurial value of a soil and as such are an indication of future needs.

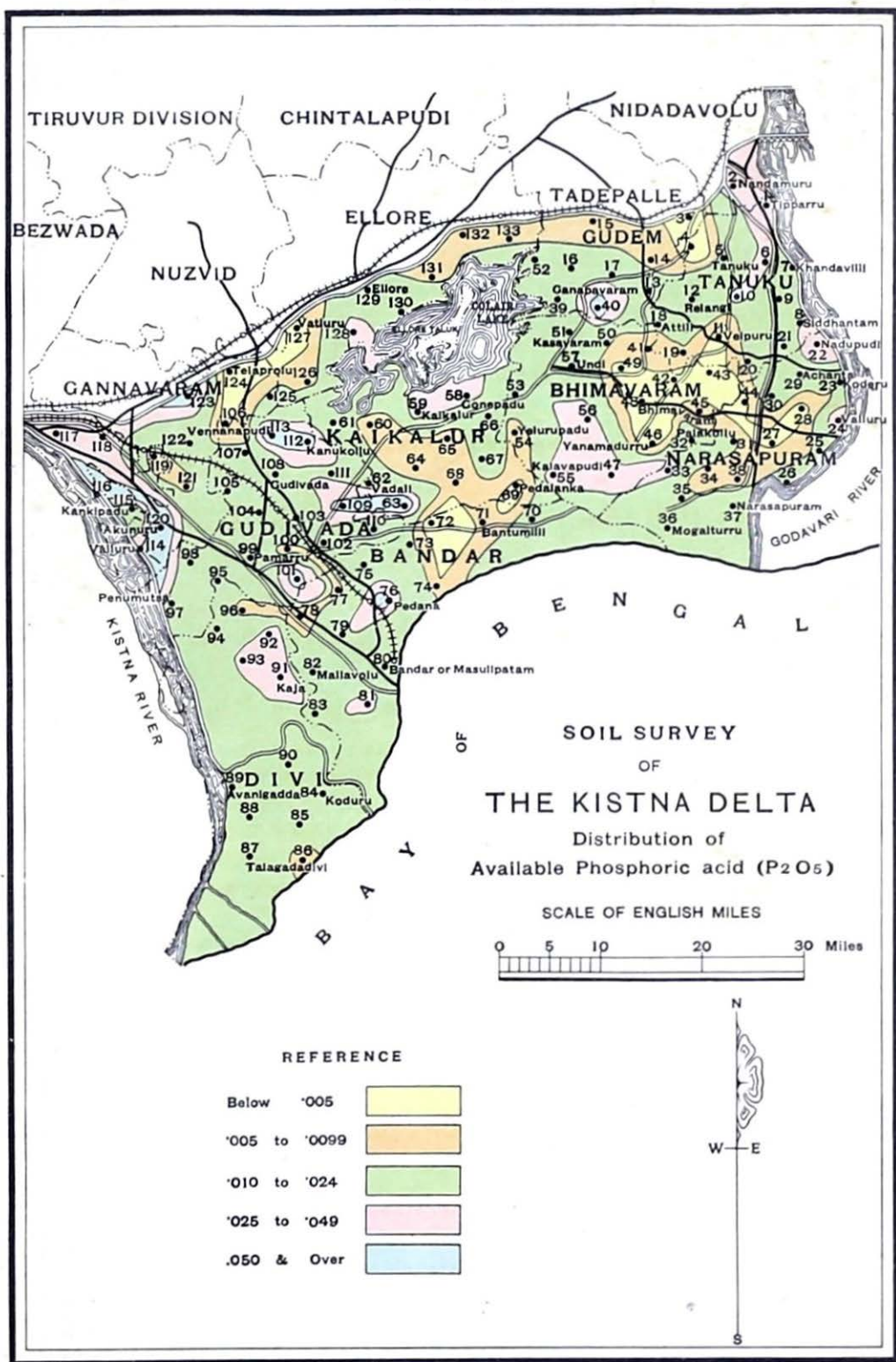
The distribution of the total phosphoric acid and potash is shown in Maps Nos. V and VI, respectively, and the soils of the Kistna delta contain approximately eight times as much potash as phosphoric acid, a result similar to that arrived at in the Tanjore and Guntūr soil surveys and indicating that greater importance is to be attached to manuring with phosphates than with potash.

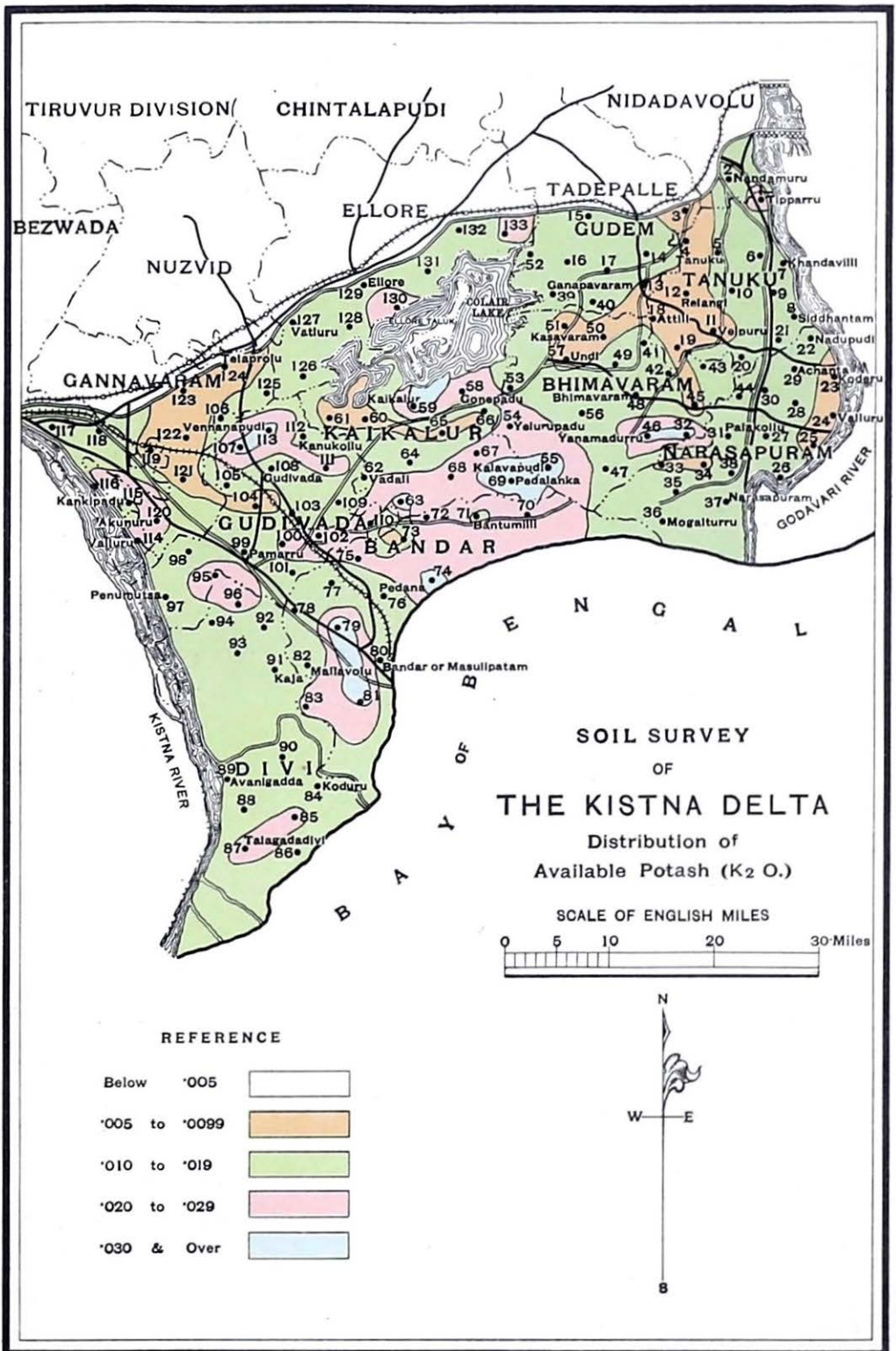
The silt-laden soils along the Kistna and Gōdāvari rivers contain a higher percentage of phosphoric acid, while the lands round the Kolair lake generally contain higher proportion of potash.

#### *Distribution of Nitrogen.*

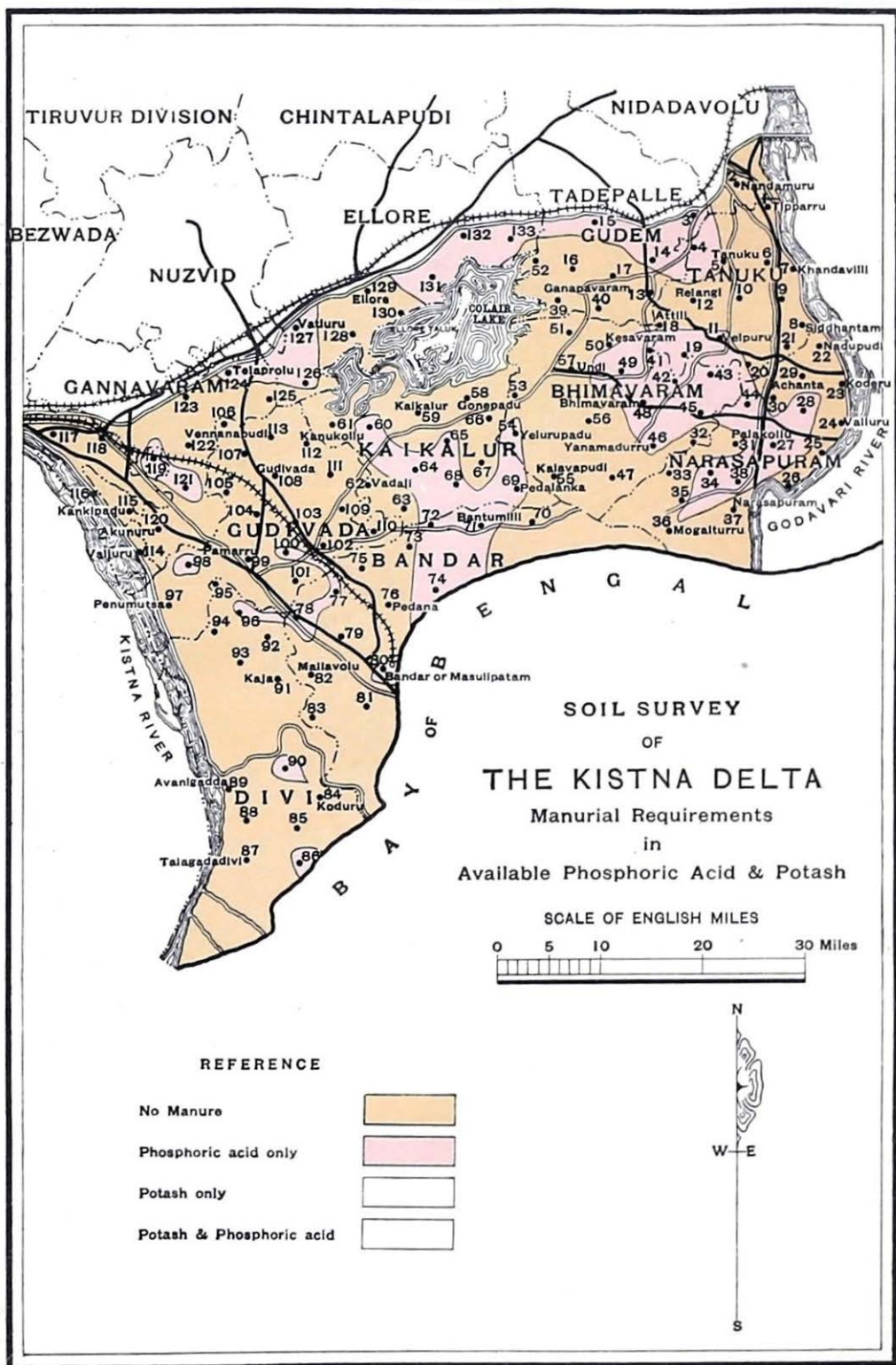
The distribution of soil nitrogen is shown in Map No. VII and the amount present, though still low, is much higher than was found to be the case in the Guntūr and Tanjore deltas. The soils adjoining the Gōdāvari river and those situated round the Kolair lake are much richer than the soils on the south. Nearly two-thirds of the delta

MAP No. II

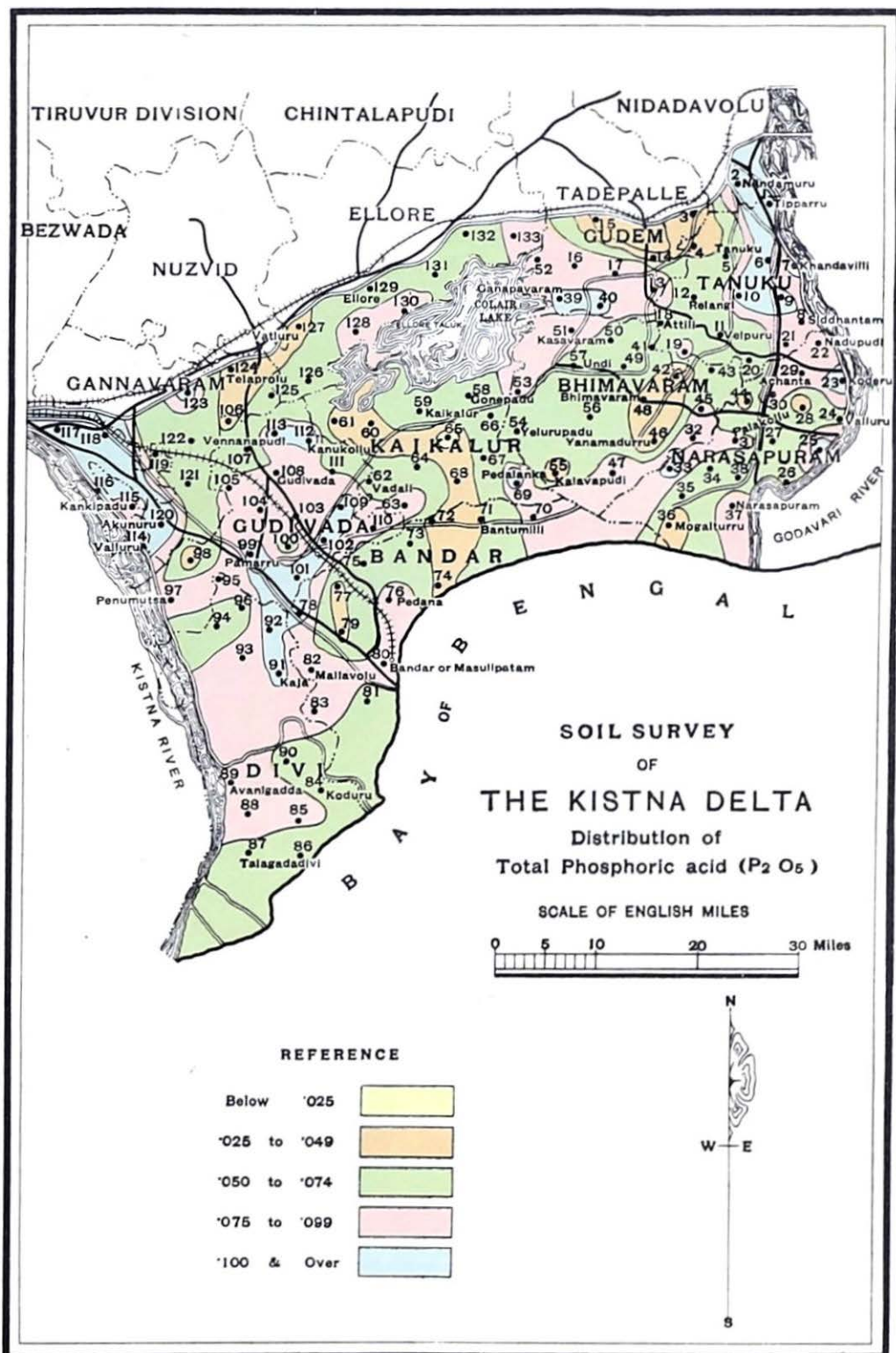


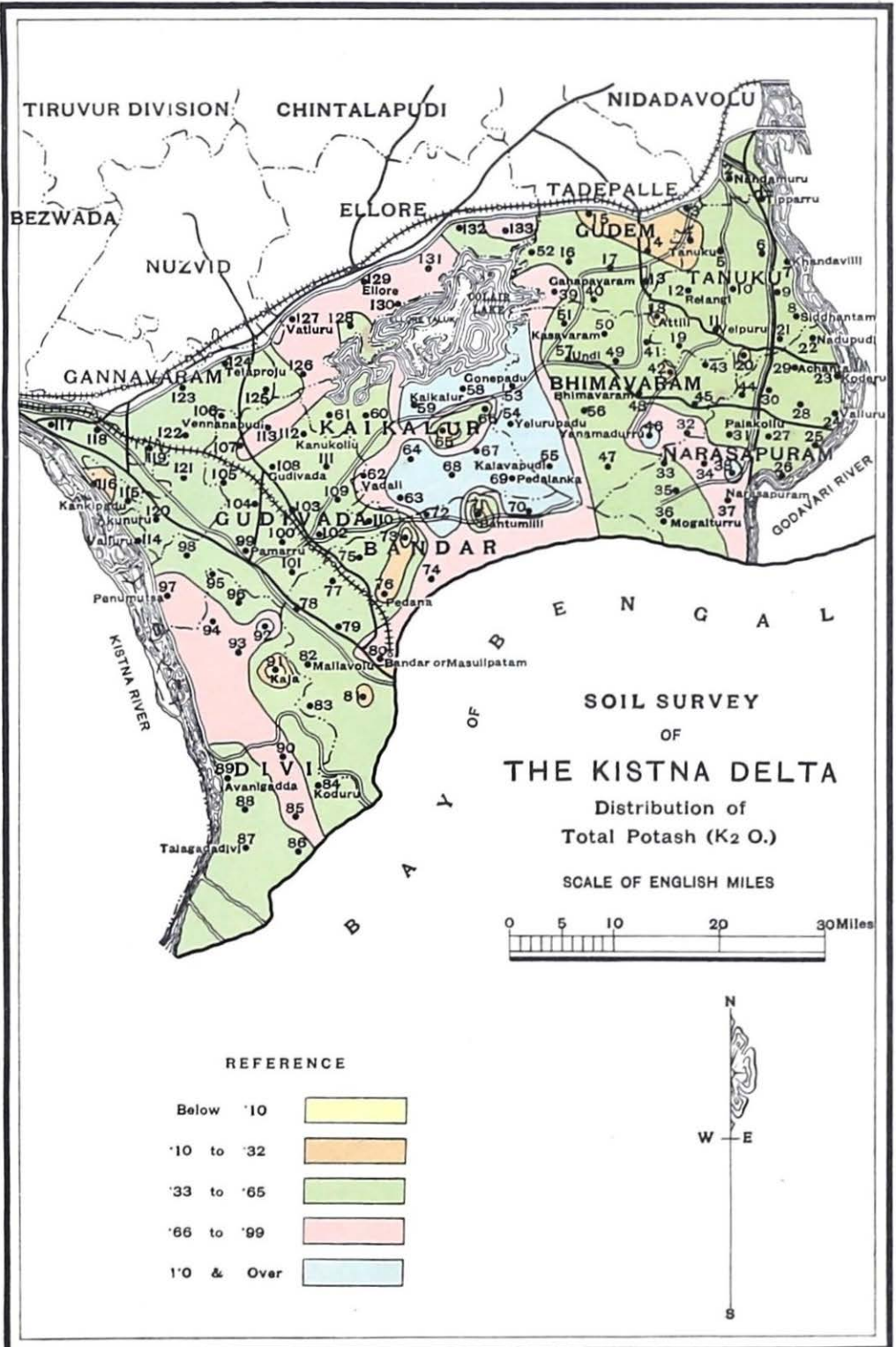








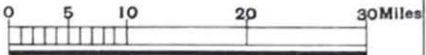




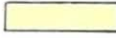




SOIL SURVEY  
OF  
THE KISTNA DELTA

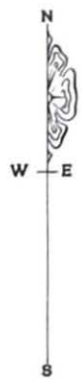
Distribution of  
Total Potash (K<sub>2</sub>O.)

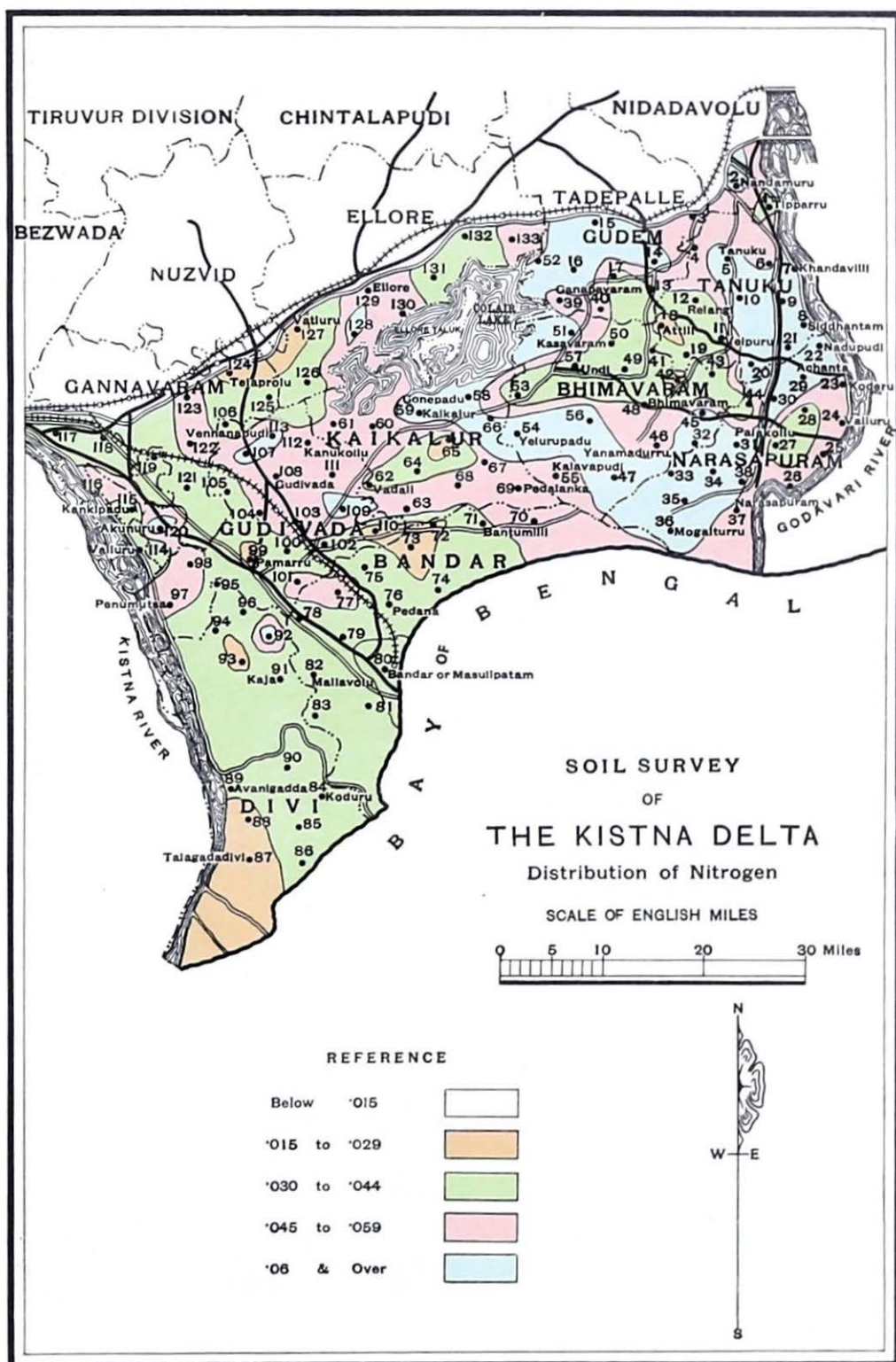
SCALE OF ENGLISH MILES



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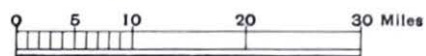
Below '10	
'10 to '32	
'33 to '65	
'66 to '99	
'100 & Over	








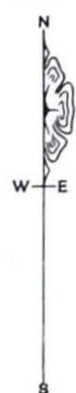
SOIL SURVEY  
OF  
THE KISTNA DELTA  
Distribution of Nitrogen

SCALE OF ENGLISH MILES

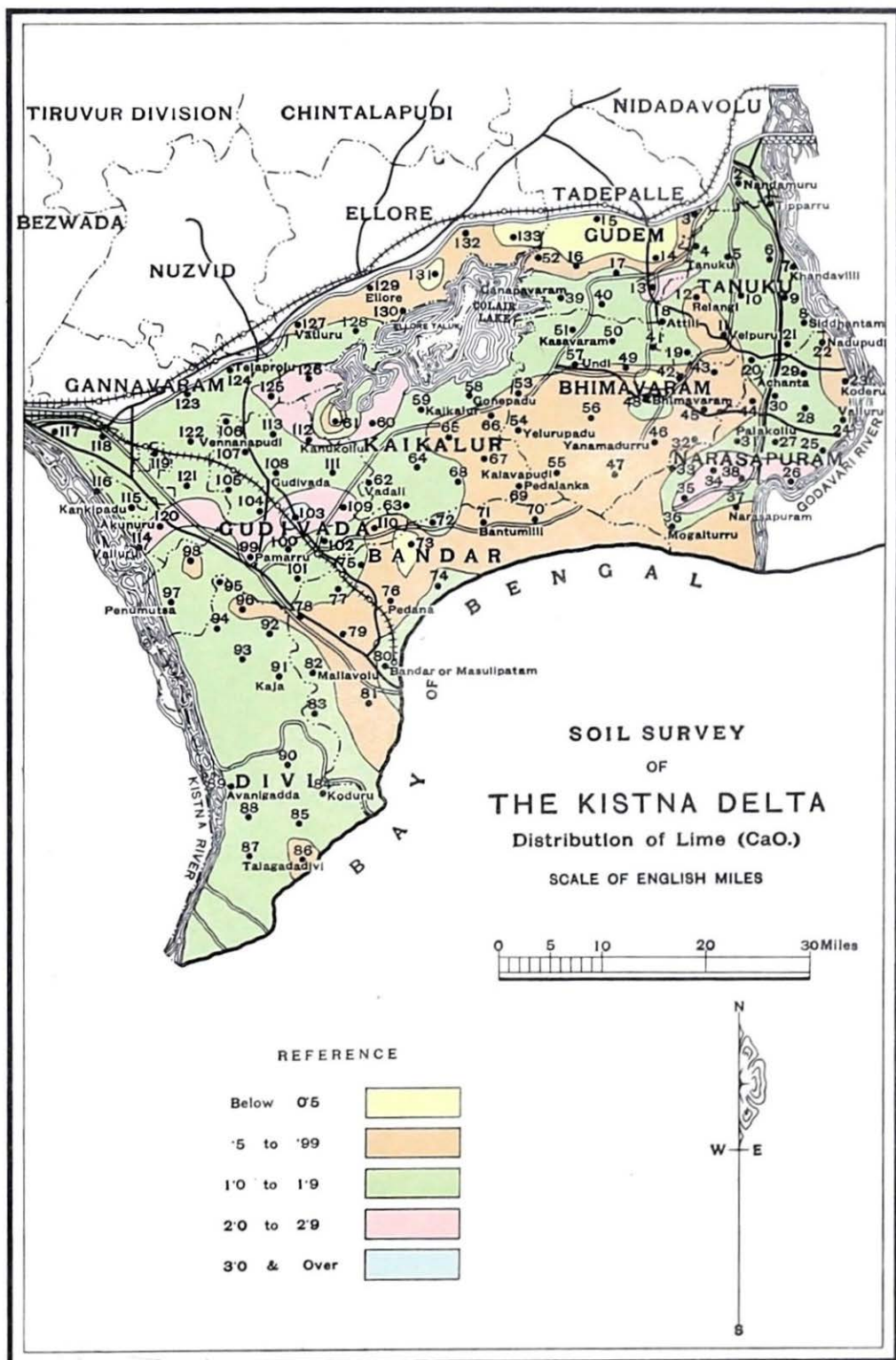


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Below .015	
.015 to .029	
.030 to .044	
.045 to .059	
.06 & Over	

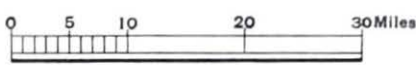






SOIL SURVEY  
OF  
THE KISTNA DELTA  
Distribution of Lime (CaO.)

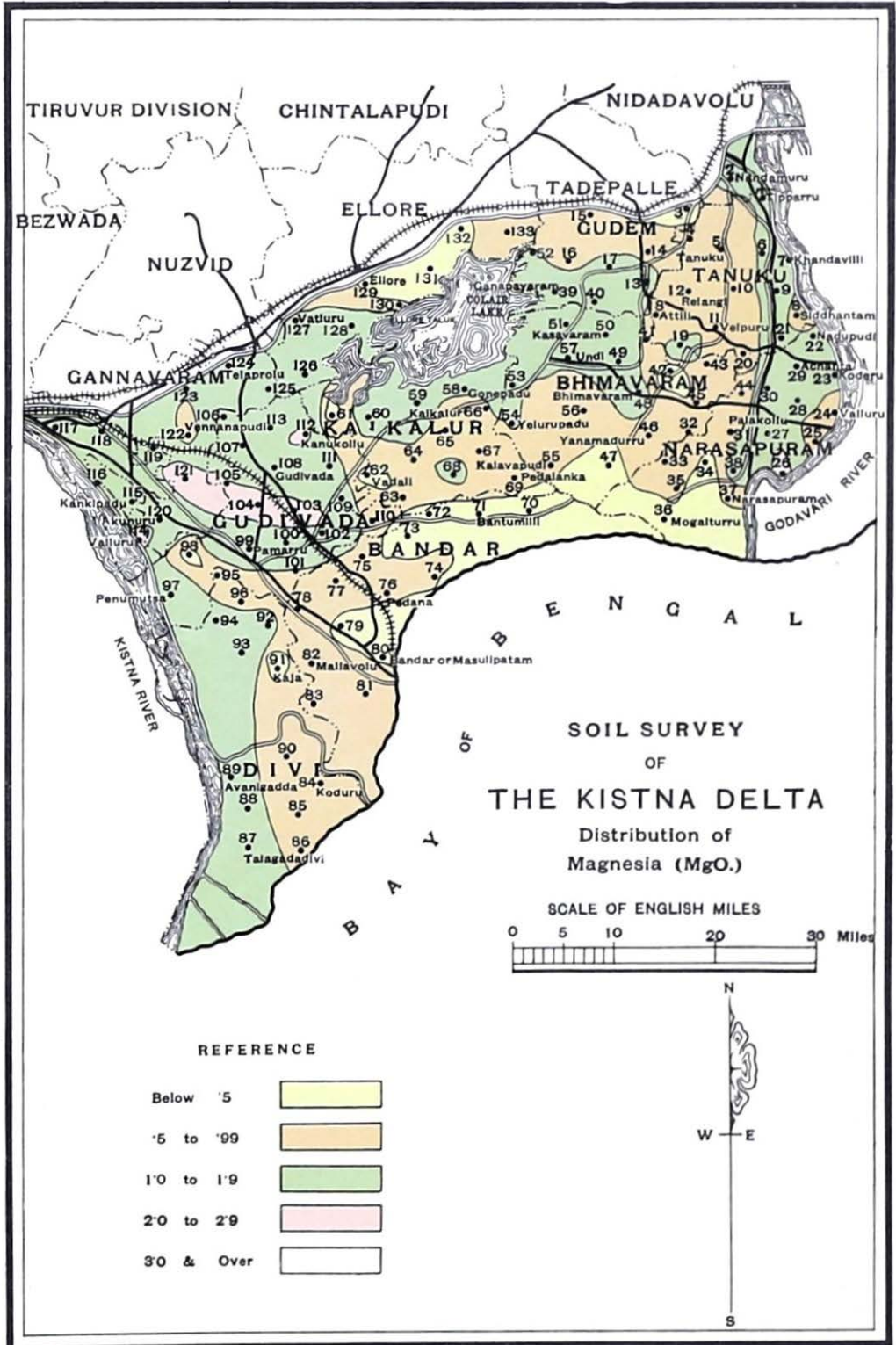
SCALE OF ENGLISH MILES

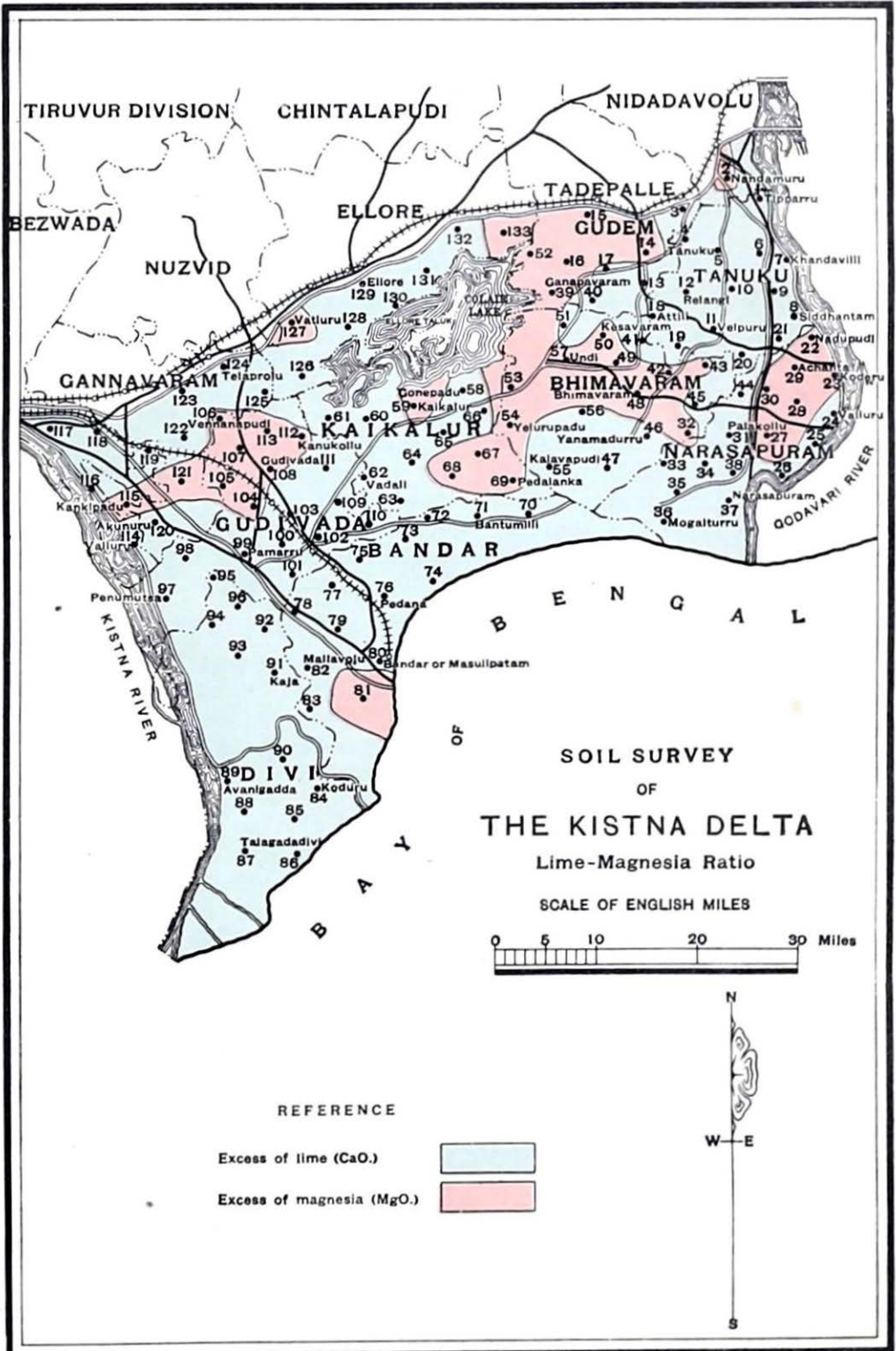


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Below 0.5	
.5 to .99	
1.0 to 1.9	
2.0 to 2.9	
3.0 & Over	









contains over '045 per cent and quite a fourth of the delta contains over '06 per cent. It is possible that the comparatively higher percentage of nitrogen of this delta is due to the practice of growing sunnhemp which is largely prevalent here. The nitrogen content seems to be gradually diminishing down the course of the Bandar canal and is very low in that portion of the Divi taluk situated near the mouth of the Kistna river.

#### *Distribution of Lime and Magnesia.*

The distribution of lime and magnesia is shown in Maps Nos. VIII and IX. The contours for both the substances approximately follow each other, lime content being generally higher than magnesia. The richer soils are on the Kistna riverside and the soils become gradually poorer towards the north and the east, those near the sea coast being very poor. The soils adjoining the Gōdāvari river and lying along the Narasapur canal are, however, well supplied. While the richness in lime and magnesia of soils close to the rivers is to be attributed to the silt brought down by these, the greater richness of soils on the Gudivāda side is due as well to the fact that these are old regada soils.

#### *Lime-Magnesia Ratio.*

The significance of the ratio existing between lime and magnesia in a soil is explained in Bulletin No. 68 (Soil Survey of the Tanjore Delta). Over 80 per cent of the soils have an excess of lime over magnesia. Parts of Bhimavaram and Tanuku bordering the Kolair lake and portions of Narasapur and Gudivāda taluks have less lime than magnesia and an application of lime may be useful in these parts.

On the whole the delta is well supplied with lime.

#### GENERAL CONCLUSIONS.

The nitrogen content of the soils, though higher than that of soils in Tanjore and Guntūr, is still low and the application of special nitrogenous manures like sulphate of ammonia, calcium cyanamide or oilcakes will be advantageous.

Only one-fourth of the delta is in immediate need of phosphatic manures. The silt of the Kistna and Gōdāvari rivers is rich in lime and magnesia and in total potash and phosphoric acid and the conservation of the river silt is very important from a manurial point of view. There is no need for potash fertilisers nor, except in some localities, for liming.

The soils adjoining the Kolair lake made up apparently of the fine silt of the two rivers are generally rich.

The infertility of isolated parts is probably to be ascribed more to defective drainage than want of manurial constituents. The practice obtaining in this district of applying periodically several cartloads of *patimannu* is apparently one intended to alter the mechanical texture of the soils rather than to add manurial value to them.

TABLE.

Number of sample.	% N.	% CaO.	% MgO.	Ratio % CaO / % MgO ( $\frac{CaO}{MgO} = 1$ .)	% P <sub>2</sub> O <sub>5</sub> .		% K <sub>2</sub> O.		Name of village.
					Total.	Available.	Total.	Available.	
<i>Tanuku Taluk.</i>									
1	0.032	1.49	1.04	.70	0.130	0.045	0.84	0.023	Tiparru.
2	0.060	1.19	1.04	1.24	0.120	0.025	0.39	0.011	Nandamur.
3	0.050	0.97	0.44	0.45	0.043	0.0016	0.36	0.0059	Alampuram.
4	0.056	1.01	0.53	.52	.046	0.0026	0.26	0.0078	Duvva.
5	0.063	1.94	0.89	.46	0.081	0.006	0.56	0.010	Tanuku.
6	0.055	1.68	1.10	.65	0.110	0.026	0.55	0.018	Poravali.
7	0.070	1.55	1.07	.69	0.065	0.014	0.41	0.011	Khandavilli.
8	0.063	1.99	0.87	.44	0.098	0.024	0.44	0.016	Siddbantam.
9	0.088	1.33	1.16	.87	0.110	0.016	0.47	0.0097	Cherukuvada.
10	0.077	1.85	0.85	.63	0.120	0.026	0.45	0.012	Eletipad.
11	0.038	0.83	0.55	.66	0.053	0.004	0.55	0.0075	Velpur.
12	0.039	0.90	0.56	.62	0.067	0.019	0.33	0.0091	Relangi.
13	0.043	2.12	1.80	.85	0.087	0.011	0.51	0.0095	Bodapad.
14	0.083	0.43	0.61	1.42	0.028	0.0087	0.32	0.016	Pentapad.
15	0.088	0.41	0.53	1.30	0.028	0.0081	0.28	0.016	Badampudi.
16	0.067	0.49	0.83	1.69	0.096	0.012	0.59	0.016	Ratsuru.
17	0.034	1.58	1.48	.95	0.090	0.017	0.50	0.010	Pippara.
18	0.021	1.03	0.95	.92	0.072	0.011	0.25	0.006	Attilli.
19	0.032	1.33	1.23	.93	0.080	0.0098	0.52	0.008	Penumontra..
20	0.158	1.22	0.79	.65	0.057	0.010	0.24	0.010	Alamur.
21	0.101	1.75	1.64	.94	0.080	0.015	0.55	0.012	Neggipudi.
<i>Narasapur Taluk.</i>									
22	0.069	0.99	1.35	1.36	0.060	0.032	0.45	0.011	Nadupudi.
23	0.057	0.73	1.30	1.78	0.110	0.011	0.36	0.0083	Koderu.
24	0.050	1.02	0.79	.78	0.070	0.036	0.39	0.0083	Valluru.
25	0.053	1.26	0.79	.62	0.100	0.010	0.39	0.0081	Doddipatla.
26	0.046	2.15	2.00	.94	0.073	0.0102	0.55	0.0139	Chinchinada.
27	0.039	1.10	1.53	1.39	0.052	0.0032	0.60	0.0139	Medapad.
28	0.036	1.03	1.48	1.45	0.019	0.0029	0.59	0.0120	Gummuluru.
29	0.066	1.20	1.36	1.13	0.097	0.0148	0.43	0.0139	Atsanta.
30	0.073	1.05	1.38	1.31	0.083	0.017	0.36	0.010	Pemmaraju- polavaram.
31	0.063	1.10	0.94	.85	0.077	0.014	0.53	0.013	Palkol.
32	0.063	0.76	0.82	1.08	0.097	0.025	0.83	0.036	Matchapuri- palim.
33	0.071	0.87	0.83	.95	0.110	0.031	0.57	0.0093	Vempa.
34	0.138	2.28	0.22	.09	0.053	0.0083	0.78	0.0085	Mallavaram.
35	0.111	2.29	0.79	.35	0.070	0.012	0.59	0.013	Sitarampuram.
36	0.101	0.68	0.27	.40	0.035	0.010	0.28	0.0098	Mogalturru.
37	0.054	0.88	0.53	.60	0.067	0.018	0.84	0.014	Narasapur.
38	0.092	2.50	1.15	.46	0.089	0.0077	1.08	0.0194	Agarru.
<i>Bhimavaram Taluk.</i>									
39	0.055	1.40	1.80	1.28	0.110	0.017	0.85	0.017	Ganapavaram.
40	0.067	1.45	1.25	.86	0.110	0.053	0.50	0.014	Gopavaram.
41	0.043	1.25	0.92	.74	0.053	0.0076	0.49	0.0130	Garagaparru.
42	0.025	0.33	0.46	1.39	0.013	0.0014	0.24	0.0112	Ponnada.
43	0.039	0.93	0.93	1.00	0.057	0.0037	0.43	0.0120	Konitivada.
44	0.038	0.91	0.60	.68	0.018	0.0031	0.51	0.013	Lankalakoderu.

Number of sample.	% N.	% O <sub>2</sub> .	% M <sub>g</sub> O.	Ratio % C <sub>2</sub> O <sub>3</sub> / % CaO (= 1.)	% P <sub>2</sub> O <sub>5</sub> .		% K <sub>2</sub> O.		Name of village.
					Total.	Available.	Total.	Available.	
<i>Bhimavaram Taluk—cont.</i>									
45	0.063	0.96	0.61	.64	0.083	0.0070	0.34	0.0089	Veeravasaram.
46	0.049	0.80	0.63	.79	0.045	0.0033	1.18	0.033	Yenamadurru.
47	0.063	0.73	0.44	.60	0.085	0.0360	0.50	0.018	Jakkaram.
48	0.043	1.05	1.38	1.31	0.048	0.0027	0.64	0.0112	Bhimavaram.
49	0.037	0.75	1.24	1.65	0.051	0.0045	0.60	0.0105	Mahadevapatnam.
50	0.041	1.60	1.75	1.09	0.060	0.010	0.60	0.0085	Kesavaram.
51	0.067	1.18	1.03	.91	0.089	0.0134	0.63	0.0066	Kolamur.
52	0.062	0.85	1.02	1.20	0.076	0.0249	0.55	0.0109	Adivikolanu.
53	0.036	0.96	1.09	1.14	0.081	0.020	1.24	0.017	Akuvid.
54	0.071	0.93	1.03	1.11	0.082	0.0064	1.40	0.024	Yelurpad.
55	0.045	0.84	0.52	.81	0.045	0.034	1.13	0.033	Kalavapudi.
56	0.067	0.55	0.53	.96	0.071	0.042	0.38	0.012	Kalla.
57	0.038	1.06	1.13	1.06	0.057	0.016	0.35	0.0078	Undi.
<i>Kaikalur Taluk.</i>									
58	0.060	1.28	1.07	.84	0.069	0.0293	1.44	0.0264	Gonepad.
59	0.064	1.25	1.70	1.35	0.066	0.0274	1.28	0.0298	Kaikaluru.
60	0.050	2.60	1.83	.70	0.044	0.0058	0.62	0.0074	Ayyavāri Rudravaram.
61	0.053	0.43	0.38	.77	0.035	0.0194	0.36	0.0083	Mandavilli.
62	0.044	1.18	0.48	.43	0.062	0.013	0.91	0.018	Vadali.
63	0.053	1.14	0.51	.45	0.160	0.021	1.34	0.030	Tummidi.
64	0.032	1.19	0.85	.72	0.059	0.0087	1.53	0.017	Mulakalapalli.
65	0.026	0.70	0.59	.84	0.013	0.0073	0.16	0.0085	Bomminampad.
66	0.093	0.65	0.58	.89	0.056	0.0192	0.44	0.0101	Tadinada.
67	0.045	0.68	0.72	1.06	0.050	0.0190	1.04	0.0279	Venkatapurum.
68	0.053	1.15	1.65	1.43	0.048	0.0066	1.42	0.0271	Kalidindi.
69	0.053	0.64	0.67	1.05	0.110	0.0033	1.16	0.041	Peddalanka.
<i>Bandar Taluk.</i>									
70	0.051	0.75	0.35	.47	0.084	0.028	1.01	0.027	Kruthivennu.
71	0.044	0.88	0.42	.18	0.025	0.0053	0.07	0.0081	Bantumilli.
72	0.025	1.21	0.48	.39	0.048	0.0036	1.09	0.018	Kanchadam.
73	0.023	0.85	0.22	.63	0.067	0.011	0.09	0.008	Manjuluru.
74	0.033	1.20	0.68	.57	0.047	0.005	0.92	0.035	Nandamur.
75	0.042	1.10	0.56	.52	0.059	0.011	0.38	0.011	Guruvindagunta.
76	0.039	0.77	0.58	.74	0.083	0.074	0.11	0.015	Pedana.
77	0.049	1.06	0.68	.61	0.036	0.0077	0.44	0.012	Vadlamannadu.
78	0.038	0.78	0.56	.74	0.120	0.0076	0.39	0.014	Jakkamoheria.
79	0.031	0.74	0.49	.66	0.041	0.021	0.58	0.051	Arrepalle.
80	0.023	1.87	0.41	.30	0.076	0.0069	0.90	0.019	Bandar.
81	0.032	0.60	0.94	1.56	0.073	0.040	0.26	0.049	Gilakaladindi.
82	0.041	1.59	0.51	.32	0.088	0.014	0.46	0.017	Mallavolu.
83	0.036	1.11	0.73	.66	0.077	0.022	0.52	0.022	Chinnapuram.
<i>Divi Taluk.</i>									
84	0.031	1.21	0.68	.56	0.068	0.011	0.62	0.018	Koduru.
85	0.035	1.01	0.72	.72	0.050	0.018	0.71	0.021	Bhuvadevarapalle.
86	0.030	0.98	0.90	.92	0.059	0.0082	0.59	0.018	Mandapakala.
87	0.029	1.55	1.21	.76	0.070	0.018	0.57	0.022	Talagadadi.
88	0.023	1.68	1.09	.68	0.080	0.020	0.62	0.017	Nangegadda.
89	0.038	1.50	1.34	.90	0.080	0.024	0.63	0.018	Avanigadda.

Number of sample.	% N.	% CaO.	% MgO.	Ratio % CaO/ MgO (CaO=1)	% P <sub>2</sub> O <sub>5</sub> .		% K <sub>2</sub> O.		Name of village.
					Total.	Available.	Total.	Available.	
<i>Divi Taluk—cont.</i>									
90	0.086	1.25	0.61	.49	0.072	0.0095	0.68	0.015	Viswanathapalle.
91	0.085	1.53	0.45	.30	0.104	0.038	0.05	0.018	Kaja.
92	0.074	1.90	1.67	.88	0.116	0.0434	1.08	0.0163	Nidumolu.
93	0.028	1.95	1.59	.82	0.084	0.0260	0.89	0.0124	Krosur.
94	0.031	1.53	1.53	1.00	0.073	0.0209	0.89	0.0143	Movva.
95	0.037	1.28	0.81	.63	0.080	0.0158	0.58	0.025	Inampudi.
96	0.039	0.83	0.55	.66	0.080	0.0083	0.41	0.028	Chinamuttevi.
<i>Gudivada Taluk.</i>									
97	0.052	1.68	1.32	.80	0.085	0.0231	0.83	0.0163	Penumantsa.
98	0.045	0.82	0.40	.49	0.040	0.0099	0.51	0.018	Kapileswarapuram.
99	0.029	2.07	1.52	.73	0.125	0.011	0.37	0.014	Pamaru.
100	0.035	1.37	1.35	.99	0.071	0.008	0.45	0.025	Mamidikolla.
101	0.058	1.66	0.92	.55	0.159	0.067	0.439	0.019	Korimorla.
102	0.038	1.88	1.62	.86	0.173	0.022	0.461	0.024	Kavutavaram.
103	0.046	3.85	2.44	.63	0.083	0.013	0.49	0.011	Nuzella.
104	0.046	1.86	2.15	1.18	0.084	0.022	0.37	0.0072	Ramanapudi.
105	0.037	1.85	2.11	1.14	0.098	0.023	0.47	0.011	Ventrappagada.
106	0.032	1.33	1.62	1.21	0.039	0.0054	0.57	0.012	Puttagunta.
107	0.061	1.17	1.51	1.20	0.064	0.011	0.663	0.064	Dosapad.
108	0.050	1.25	1.26	1.01	0.088	0.021	0.476	0.016	Gudivada.
109	0.072	2.06	1.31	.64	0.155	0.0713	0.527	0.015	Gudlavalleru.
110	0.027	0.86	0.59	.68	0.077	0.018	0.42	0.010	Tadicherla.
111	0.057	1.85	1.17	.83	0.074	0.022	0.428	0.022	Mudunepalle.
112	0.050	2.06	2.20	1.06	0.1241	0.0708	0.4456	0.0157	Kanukolla.
113	0.065	1.45	1.48	1.02	0.2123	0.1241	0.6891	0.042	Vennanapudi.
<i>Bezavada Taluk.</i>									
114	0.041	2.70	2.65	.98	0.1284	0.0611	0.3341	0.0198	Valluru.
115	0.036	1.34	1.44	1.06	0.0752	0.0164	0.3279	0.0900	Kankipad.
116	0.046	1.40	1.22	.87	0.156	0.0904	0.30	0.0202	Idpugalla.
117	0.040	1.65	1.29	.78	0.126	0.0446	0.470	0.0167	Anekepad.
118	0.041	1.83	1.74	.94	0.114	0.0356	0.43	0.0151	Nidamanuru.
119	0.036	1.95	1.61	.83	0.067	0.0084	0.40	0.0079	Komatigunta.
<i>Nuzvid Taluk.</i>									
120	0.076	2.01	1.72	.86	0.144	0.0671	0.419	0.0204	Akunuru.
121	0.032	1.91	2.27	1.19	0.063	0.0079	0.548	0.0079	Manikonda.
122	0.055	1.04	0.55	.53	0.053	0.0134	0.361	0.0073	Azzampudi.
123	0.056	1.27	1.09	.86	0.178	0.078	0.386	0.0059	Atukuru.
124	0.023	1.40	1.31	.94	0.028	0.0025	0.57	0.0066	Telaprolu.
125	0.034	2.55	1.24	.49	0.057	0.0102	0.59	0.0128	Perikidu.
<i>Ellore Taluk.</i>									
126	0.085	2.95	1.90	.64	0.062	0.0093	0.66	0.0112	Vasantavada.
127	0.023	0.88	1.03	1.17	0.025	0.0018	0.77	0.0124	Vatluru.
128	0.064	1.64	1.35	.82	0.094	0.0416	0.614	0.0179	Idulakunta.
129	0.058	0.79	0.30	.38	0.064	0.0115	0.721	0.0161	Ellore.
130	0.051	0.65	0.41	.62	0.020	0.0216	0.738	0.0239	Chataparru.
131	0.037	0.38	0.28	.74	0.059	0.0043	0.677	0.0161	Thosapadu.
132	0.036	0.612	0.248	.41	0.058	0.0086	0.614	0.016	Gundugolana.
133	0.046	0.432	0.820	1.90	0.093	0.0067	0.779	0.0214	Malikmahamad- param.