

Soil Testing in Karnataka and Tamil Nadu Regions



marcatus

in
collaboration with



Kodakana International School

**Center for
Environment
and Humanity**

Introduction:

The amount of land suitable for farming in India is shrinking, and soil fertility on existing farmland is declining. This poses significant challenges to produce enough food for the country's growing population, as degraded soil results in lower crop yields. The most effective solution to improve soil health is to start with soil testing, as it helps identify nutrient deficiencies, allowing farmers and landowners to be more precise about their inputs. Overuse of fertilizers, or adding unnecessary chemical inputs can degrade soil health further. Marcatus in collaboration with Kodaikanal International School's Center for Environment and Humanity is raising awareness in the Palani Hills on best practices for soil nutrient management and organic fertilizer application for targeted crops. Through a combination of soil testing and sustainable land management practices, farmers will experience higher yields, prevent soil erosion, and increase soil fertility.

Soil conditions suitable for Gherkin Cultivation:

For successful cultivation of gherkins, the soil conditions play a crucial role, alongside the climatic factors and other resources such as agricultural land, water, labour, and electricity. Given the optimum temperature range of 15°C to 36°C, the ideal soil conditions for gherkin cultivation are as follows:

- **Soil Texture:** Gherkins thrive in well-drained, loamy soil with a balanced mixture of sand, silt, and clay. This texture ensures good root development and prevents waterlogging, which could lead to root rot or poor growth.
- **Soil pH:** The optimal soil pH for gherkin cultivation is slightly acidic to neutral, ranging from 6.0 to 7.5. Soils outside this range can affect nutrient availability and plant health.
- **Soil Fertility:** Gherkins require nutrient-rich soil, with adequate 3-5% levels of organic matter. The soil should be supplemented with compost or well-decomposed manure to improve its fertility, especially to support the plant's growth during the flowering and fruiting stages.
- **Drainage:** Well-drained soils are essential as gherkins do not tolerate waterlogging. Adequate drainage prevents the roots from being submerged in water, which could lead to oxygen deprivation and other diseases.
- **Soil Temperature:** Since gherkins require a temperature range of 15°C to 36°C, the soil should be warm enough to promote germination and early growth. Soils that are too cold may delay seedling emergence, while excessively hot soils could stunt plant growth.
- **Soil Depth:** Gherkins have shallow root systems, but deep soils (at least 30–40 cm) are preferable to accommodate their root development and allow for good moisture retention, especially in areas with less frequent rainfall.
- **Soil Moisture:** While gherkins require consistent moisture, the soil should not be too wet (visual observance like no flooding, leaching). Maintaining adequate moisture without waterlogging is key to preventing fungal diseases and ensuring healthy growth.

Soil Report of Karnataka Regions

Serial No	Taluk/ Region	District	Soil Type	pH
1	Sira	Tumkur	Weathered gneiss (Alkaline), Clayey loam	8
2	Madhugiri	Tumkur	Alkaline, clayey loam, clayey skeletal soil	8.4
3	Pavagada	Tumkur	Alkaline, gravelly	8
4	Kotturu	Vijayanagara	Slightly Alkaline	7.78
5	Kudligi	Vijayanagara	Laterite, red loamy, black	7.56
6	Harapanahalli	Vijayanagara	Red loamy, black	8.4
7	Kushtagi	Koppal	Entisols, slightly alkaline, black, red sandy	8.0
8	Yelaburga	Koppal	Black, red sandy	7.7
9	Kukanuru	Koppal	Slightly alkaline, black, red sandy	8.53
10	Hanamasaga	Koppal	Black, red sandy	7.22
11	Sandooru	Bellary	Slightly alkaline, black, red sandy	7.72
12	Gajendragada	Gadag	Clayey and red loamy soil	7.3
13	Arsikere	Hassan	Red/black loamy	7.2
14	Arasikere	Near Anantpura	Red loamy	7.94
15	Hosadurga	Chitradurga	Clayey soil	7.4
16	Challakere	Chitradurga	Clayey soil	6.92
17	Ranebennuru	Haveri	Black clay soil	7.16

EC	Organic Matter(%)	Soil Characteristics	Nutrients		
			Nitrogen	Phosphorous	Potassium
0.38	0.49	Sand, clay sand	114	7.95	120
0.19	0.48	Clay, silt & sand	93.52	8.25	114
0.17	0.71	Sand, clay	112.5	11.3	61.5
0.34	0.51	Clay, silt & sand	74.8	3.83	113.3
0.35	0.55	Silt, clay	93.11	17.7	157
0.23	0.50	Clay, silt & sand	125	11.4	88.3
0.54	0.67	Sand & Silt	93.5	12.63	126.7
0.43	0.75	Red Sandy, black	93.5	13.1	144.9
0.35	0.75	Red sandy, loamy	98.1	8.90	184
0.21	0.47	Red sandy loamy	110	11.9	85.4
0.43	0.51	Gravelly silt loamy	94.9	18	164.7
0.19	0.46	Clay, silt & sand	105	10.6	85.42
0.46	0.81	Sand, clay & silt	95.14	17	180
0.18	0.69	Loamy soil silt	104	12.1	55
0.20	0.45	Clay, silt	104.4	10.8	85
0.21	0.35	Clay, silt	103.2	8	126.3
0.32	0.59	Clay, silt	46.5	4	34.4

Soil Report of Tamil Nadu Regions

Serial No	Taluk/ Region	District	Soil Type	pH
1	Jamunamathur	Tiruvannamalai	Red loamy, deep & thin red, clayey and gravelly soil	6.7
2	Chengam	Tiruvannamalai	Red loamy, red ferruginous and gravel	6.9
3	Palcode	Dharmapuri	Red loamy red ferruginous and gravel	7.5
4	Polur	Tiruvannamalai	Red loamy Fertile, black cotton soil, crystalline and sedimentary limestone	7.3
5	Tenkasi	Tenkasii	Red loamy fertile, black cotton soil, crystalline and sedimentary limestone	6.5
6	Usilampatti	Madurai	Clay loam, thin & deep red sandy	8.2
7	Periyakulam	Theni	Red sandy loam, brown soils-calcerous(genesis)	6.8
8	Natham	Dindigul	Red sandy loam, brown soils-calcerous(genesis)	6.8
9	Bargur	Krishnagiri	Red non-calcerous loam crystalline metamorphic complex	7.2
10	Berigai	Krishnagiri	Red non-calcerous loam crystalline metamorphic complex	6.7
11	Byrepalli	Krishnagiri	Red and black sandy loam	6.7
12	Karumandurai	Krishnagiri	Red calcerous loam	8.0

EC	Organic Matter(%)	Soil Characteristics	Nutrients		
			Nitrogen	Phosphorous	Potassium
0.65	0.27	Sand, silt and clay	119.8	6	95.14
0.18	0.15	Sand, silt and clay	80.97	7.6	94
0.32	0.17	Sand, silt and clay	82.9	10.1	76.92
0.61	0.30	Sand, silt and clay	81	6	91
0.9	0.32	Sand and clay	75	3.80	79
0.61	0.51	Sand, silt and clay	59.9	9	114
0.66	0.11	Sand and clay	64.77	5	127
0.08	0.45	Sand and clay	119.3	4.5	91
0.27	0.39	Sand and clay	72	10.1	69.6
0.36	0.39	Sand and clay	60.7	8	130
0.41	0.33	Sand and clay	55	8	64.7
0.3	0.5	Sand, silt and clay	91	7.28	176.92

Soil Report of Kodaikanal

S.no	Revenue Villages	Elevation (m)	Soil Type	pH	EC	Organic Matter(%)	Soil Characteristics	Nutrients		
								Nitrogen	Phosphorous	Potassium
1	Kodaikanal	2225	Laterite	5.5	0.1	0.81	Silt, clay	45	17	188
2	Vilpatti	1770	Laterite	5.7	0.08	0.62	Silt, clay	66	21	216
3	Poombarai	1920	Laterite	5.8	0.09	0.89	Silt, clay	83	14	172
4	Kookal	1890	Laterite	5.4	0.07	0.90	Silt, clay	58	18	197
5	Mannavanur	1880	Laterite	5.3	0.07	0.99	Silt, clay	76	8	290
6	Poondi	1945	Laterite	5.9	0.09	0.87	Silt, clay	67	16	179
7	Vellakavi	1300	Laterite	6.1	0.08	1.01	Silt, clay	58	17	216
8	Adukkam	415	Laterite	6.2	0.08	0.64	Silt, clay	43	19	197
9	Vadakavunji	1920	Laterite	6.6	0.1	0.51	Silt, clay	112	17	216
10	Pannaikadu	1288	Laterite	6.2	0.11	0.43	Silt, clay	126	18	230
11	Poolathur	1096	Laterite	6.3	0.12	0.85	Silt, clay	142	16	224
12	Thandikudi	1247	Laterite	5.9	0.1	0.62	Silt, clay	146	22	295
13	Kaamanur	1250	Laterite	6.2	0.09	0.41	Silt, clay	158	18	217
14	K. C. Patti	1208	Laterite	6.3	0.1	0.63	Silt, clay	144	12	196
15	Periyur	1400	Laterite	6.2	0.11	0.59	Silt, clay	161	15	175
16	Pachalur	1400	Laterite	6.1	0.09	0.67	Silt, clay	142	14	182

Not Within Normal Range

Within Normal Range

Interpreting Results:

When you send a soil sample for testing, you will get a report card telling you which nutrients are sufficient or deficient. This will help you determine what targeted organic inputs your land needs. Listed below are indicators that appear in a soil test report card.

- Alkaline or acidity level
- Electrical conductivity
- Organic content
- Nitrogen
- Phosphorus
- Potassium
- Iron
- Manganese
- Zinc
- Copper
- Boron

The tables below will help you interpret your results. Healthy soil test results are in the Beige.

Range	pH	Factors	Normal	Medium Salt	High Salt Content
3.0-5.6	High Acidity	Electirc Conductivity Parameters	<1.0	1.0-2.0	>2.0
5.6-6.2	Medium Acidity		Low	Medium	High
6.2-6.7	Low Acidity	Organic Carbon(%)	<0.50	0.50-0.75	>0.75
6.7-7.3	Neutral	Available Nitrogen	<280	280-560	>560
7.3-7.9	Low Alkaline	Available Phosphorous	<22.9	22.9-56	>56
7.9-8.5	Medium Alkaline	Available Potassium	<144	144-336	>336
>8.5	High Alkaline	Exch. Calcium	<1.5	1.5-3	>3
		Exch. Magnesium	<1	1-2	>3
		Available Sulphur	<10	10-20	>20

Electircal Conductivity

Range	EC(dS/m)
<2.0	Very Less
2-4	Less
4-8	Medium
8-16	High
>16	Very High

Organic Carbon & Macronutrients

S. No	Nutrients	Low	Medium	High
1	Organic Carbon (%)	>0.5	0.5-0.75	0.75-1.0
2	Nitrogen (kg/ac)	<80	80-180	>180
3	Phosphorous-Olsen Method (kg/ac)	<4.4	4.4-8.8	>8.8
4	Phosphorous-Bray Method (kg/ac)	<9.68	9.68-19.88	>19.88
5	Potassium (kg/ac)	<47.2	47.2-112	>112

Micronutrients

S.no	Micronutrients	Sufficient	Deficient
		Milligram/kg	
1	Zinc	>1.2	<1.2
2	Iron- Non Clacerous Soil	>3.7	<3.7
3	Iron- Calcerous Soil	>6.3	<6.3
4	Manganese	>2.0	<2.0
5	Copper	>1.2	<1.2
6	Boron	>0.6	<0.6

How to Test Soil:

Farmers can take soil samples to government Technical Advisory Centers for testing. The Advisory Center will recommend suitable fertilizer doses. However, soil testing is only useful if the sample is collected following the correct method. Tips on where, when, and how to collect a soil sample:

- Collect the soil sample during the fallow period if you grow seasonal crops and vegetables.
- Collect samples between rows if you grow perennial crops in an orchard or plantation.
- Sampling at several locations in a zig-zag pattern ensures homogeneity.
- Fields which are similar in appearance, production and past-management practices, can be grouped into a single sampling unit.
- Collect separate samples from fields that differ in colour, slope, drainage, past management practices like liming, fertilization, cropping systems, etc.
- Avoid sampling in dead furrows, wet spots, areas near water sources, trees, manure heaps and irrigation channels.
- For shallow rooted crops, collect samples up to 15 cm depth. For deep rooted crops, collect samples up to 30 cm depth. For tree crops, collect samples at 30, 60 and 90cm depth.

Procedure to collect a soil sample:

- Divide the field into different zones based on visual observations and farmer's experience.
- Remove the surface litter at the sampling spot.
- Make a 'V' shaped cut to a depth of 15 cm in the sampling spot using a spade.
- Remove thick slices of soil from top to bottom of the exposed face of 'V' shaped cut and place in a clean container.



- Collect at least 10 to 15 samples from each acre and place in a bucket or tray.
- Mix the samples thoroughly and remove foreign materials like roots, stones, pebbles and gravel.
- Reduce the sample to about 0.5 - 1 kilogram by quartering.
- Quartering is done by dividing the thoroughly mixed sample into four equal parts. The two opposite quarters are discarded and the remaining two

quarters are remixed and the process repeated until the sample size is between 0.5 and 1 kg (images behind).

- Store the sample in a clean cloth or plastic bag.
- Label the bag with: farmer name, farm location, survey number, previous crop grown, current crop (if crops are perennial), next crop to be grown, and date of collection.

Sampling Depth

Crop	Sampling Depth (in cm)
Perennial Crops, plantations and orchard crops	Three soil samples at 30,60 and 90cm
Hilly Vegetables	22cm
Shallow rooted millets	15cm
Fallow land to be converted to farmland	5cm

Reclamation of Alkaline soils:

For soil that has a pH more than 8.5, farmers can adopt the following methods:

- Plough the soil when moisture is at about 20%.
- Non-synthetic Gypsum (Calcium Sulphate Dihydrate) application at 2-4 t/ ac. This is acceptable in organic farming.
- Provide sufficient drainage to facilitate the removal of excess water and dissolved salts from the root zone.
- Add green manure (green plant material, primarily from legumes crops) at 2 t/ac.

Reclamation of Acidic soil:

Acidic soils have a pH of less than 6.0

- Apply lime as per the lime requirement test. The best application method is to uniformly broadcast.
- Apply alternatives to lime such as dolomite, basic slag, chimney dust, wood ash, or pulp mill lime as per the lime requirement test.
- Lime rates to raise soil pH about 1 pH unit in soil is as follows:
- For Sandy soil - 400-800 kg/ac.
- For Loamy (mixed) soil - 800-1200 kg/ac.
- For Clay soil - 1200-1600 kg/ac.

Guidelines to Increase Soil Fertility:

S. No	Organic Inputs	Recommendations per acre	Can be used for deficiencies in
1	Compost(Bio compost, tea compost, etc.)	25t/ac/year	Nitrogen, Phosphorous & Potassium
2	Farmyard Manure	25t/ac/year	Balances mix of nutrients including Nitrogen, Phosphorous & Potassium
3	Vermicompost	3t/ac/year	Nitrogen, Phosphorous & Potassium
4	Chicken Manure	1.5-2t/ac/year	Nitrogen, Phosphorous & Potassium
5	Sheep/ Goat Manure	4.5-5t/ac/year	Nitrogen, Phosphorous & Potassium
6	Pig Manure	4-5t/ac/year	Nitrogen, Phosphorous & Potassium
7	Green leaf Manure	6.25t/ac/year	Organic carbon(%) and Nitrogen
8	Pongamia cake	50-60kg/ac	Nitrogen, Phosphorous & Potassium
9	Neem Cake	100-200kg/ac	Nitrogen, Phosphorous & Potassium and acts as a natural pesticide
10	Castor Cake	100-200kg/ac	Nitrogen, Phosphorous & Potassium
11	Bone Meal	300-500kg/ac at the time of sowing/ planting	Phosphorous
12	Wood Ash	4.5-6t/ac/year	Potassium

Other sustainable practices:

- Crop rotation with legumes such as peas, beans, cowpea, and lablab can boost nitrogen
- Mulching the soil with materials like leaf litter, hay and crop waste after harvest can improve organic content and retain moisture
- Minimum tillage/No tillage can reduce erosion and improve soil fertility
- Cover cropping with Dutch clover, sweet potato, vegetable cowpea to suppress weeds and control erosion
- Maintain poultry, goat, sheep, or cows along with crops to get organic farm manure and additional income

Next steps:

- Take a soil sample from your farm and find your nearest Technical Advisory Center
- Contact KIS CEH for more information on testing, how to interpret your results, and recommended organic inputs based on your results



Clean the top surface area



Create a 'V' shape



Take an assortment of soil samples



Mix well on a clean surface



Divide the soil into quarters and dispose two of the four quarters, until the sample is between .5 - 1kg.



Store the soil sample in a bag and connect with your nearest Technical Advisory Center.

