

Establishment of Laboratory for Soil, Microbial and Biochemical Analysis

The average productivity in Tamil Nadu is only 60 per cent of the potential and the technology adoption by the farmers is low. The main reason for low productivity is decline in soil organic matter and soil fertility status, lack of awareness on the latest technologies and lack of suitable advisory services. The adoption of suitable crop production techniques and soil test based nutrient recommendation will pave way for enhanced crop productivity. The research must be focused on testing of nutrients in organic fertilizers (bio-inputs). Identification of microbes and their population in various soil conditions need to be studied for their utilisation to increase the productivity of Indian soils.

Background

The average productivity of the major crops grown in Tamil Nadu is only 60 per cent of the potential yield. The yield gap is mainly attributed to decline in soil health, water deficit, unfavourable climatic conditions; poor adoption of agro technology etc., Deterioration of soil health is primarily due to decline in soil fertility, organic matter and microbial activity.

The organic matter status of Tamil Nadu soils delivered a steep decline from 1.2 % in 1970s to 0.68 % in 2002. Tamil Nadu soils in general, are low in available nitrogen, medium in available phosphorus and medium to high available potassium. Sulphur deficiency is prevalent in 23 per cent of the soils. Micronutrient removal due to high yielding varieties and intensive agriculture is also higher which necessitates regular application of micronutrients in order to match their depletion from the native soil reserve. The extent of the micronutrient deficiency in

the recent years has increased considerably to 64, 25, 13 and 41 per cent for Zn, Fe, Mn and Cu respectively. The delineation of the soils for boron in Tamil Nadu indicated 34.5 per cent deficiency.

The sustainability of soil productivity is affected mainly due to the decline in soil microbial population and microbial activity. The declined microbial population is because of the ecosystem damage caused by the excessive and unscientific application of chemicals fertilizers and pesticides.

If the consequences of these activities are not adequately managed, the stability of soil's ecosystem for the next generations will be jeopardized. It is the need of the hour that due attention be paid on soil health for sustainability of agricultural production in Tamil Nadu.

Project goals :

- i) Soil, water, plant and bio-input sample testing to know the nutrients and their content in these samples.
- ii) Identification of microbes in soils managed under various conditions.
- iii) Testing of herbals & organic pesticides.

Project components

The main components of the project are:

- i) Soil Testing Laboratory,
- ii) ii) Water Testing Laboratory and
- iii) iii) Plant & Bio-input Testing Laboratory.

Detailed Budget Estimate of Soil, Microbial and Biochemical Laboratory

I. Requirement of Equipments

S.No.	Item	Total cost (Rs.)
1	EC Meter & pH Meter	20,000
2	Spectro-calorimeter (visible)	30,000
3	Flame Photometer	30,000
4	Macro-kjeldahl Distillation set	10,000
5	Distillation Water set	10,000
6	Mechanical Shaker	5,000
7	Electronic Balance	10,000
8	Hot air oven	10,000
9	Hand refractometer	5,000
10	Research microscope	10,000
11	Autoclave	15,000
12	Refrigerator	15,000
13	Laminar air flow chamber	45,000
14	Centrifuge	8,000
15	Incubator	20,000
16	Hot plate	1,000
17	Microbiology kit	3,000
	Worktables with cupboards	30,000
	Voltage stabilizers for Equipments	10,000
	Miscellaneous (Electrical fittings, Gas supply)	10,000
	Total (Rs.)	2,97,000

II. Requirement of Glassware & Apparatus

Item	Nos.	Item	Nos.
Dist. Flask (1 lit.)	4	Pipette (Graduate - 5 ml)	4
Glass beaker (250 ml)	10	Pipette (Graduate - 10 ml)	4
Glass beaker (100 ml)	10	Pipette (Volumetric - 25 ml)	2
Shaking bottle (PP) (100 ml)	10	Pipette (Volumetric - 10 ml)	2
Beaker (100 ml) (PP)	10	Funnel (PP) (3 inches)	10
Measuring cylinder (100 ml)	4	Funnel (Glass) (7.5 cm)	5
Measuring cylinder (10 ml)	4	Reagent Bottle (2 lit.)	4
Measuring cylinder (250 ml)	4	Reagent Bottle (5 lit.)	2
Measuring cylinder (500 ml)	4	Vials with screw cap (15 ml)	25
Measuring cylinder (1000 ml)	2	Glass rod (20 cm/6 mm dia)	10
Measuring cylinder (25 ml)	4	Glass tube	10
Volumetric flask (2 lit.)	2	Watch Glass (75 mm)	10
Volumetric flask (1 lit.)	4	Squeeze bottle (500 ml)	4
Volumetric flask (500ml.)	4	Burette (50 ml)	4
Volumetric flask (250 ml.)	4	Burette (25 ml)	2

Volumetric flask (100 ml.)	4	Filter stand (10 holes)	2
Volumetric flask (25 ml.)	15	Burette stand (PP) (12.5x15x75 cm)	4
Conical flask (250 ml)	5	Wire gauze	10
Conical flask (100 ml)	5	Glass bead (6 mm)(kg)	1
Petri plate	20	Gloves (medium) of 100 Nos.	1 pack
Test tubes	20	Spatula (8 inches) stainless steel	10
Inoculation needle	5	Aluminium foil (Pack)	4
Microscopic Slides (Pack)	2	Gram staining kit	1
Spirit lamp	2	Tissue paper (200 gm role)	10
Cotton role	20	Glass slide boxes	2
Mask	10	Spects	2
Apron	4	Lab coat	2

Total cost of glassware: Rs.38,000/-

III. Requirement of Laboratory Chemicals

Item	Qty.	Item	Qty.
Ammonium sulphate(500 gm)	1	Agar-agar (250 g AR)	2
Acetone (2.5 L AR)	1	Barium chloride (500 g AR)	1
Ammonium acetate (250 g AR)	10	Potassium perchloride (250 g AR)	1
Ammonium Fluoride (500 g AR)	2	Tricalcium phosphate (500 gm)	
Ammonium molybdate (100 g AR)	2	Ammonium molybdate(500 g AR)	1
Antimony potassium tartarate (100gAR)	2	Sodium cobalt nitrite (100 g AR)	1
Ascorbic acid (25 g AR)	2	Iso-Propyl alcohol (500 ml AR)	1
Boric acid (500 g AR)	1	Eriochrome black T. Indicator (25 g AR)	1
Bromocresol green (5 g AR)	2	pH 9.2 (10 packets)	1
Concentrated H ₂ SO ₄ (2.5 L AR)	2	Hydroxylamine hydrochloride (100 g AR)	1
Concentrated sulphuric acid (2.5 L AR)	1	Potassium chromate (250 g AR)	1
Darco G 60 (500 g AR)	4	Diphenylamine (100 g AR)	1
Diphenylamine (100 g AR)	1	Silver nitrate (25 g AR)	1
Ethyl alcohol (lit.)	10	Sodium Hydroxide Pellets(500 g AR)	2
Ferrous Ammonium Sulphate (500g AR)	1	Methyl orange (100 g AR)	1
Filter paper whatman No. 1 (Box of 100 sheets)	1	Amylalcohol (500 ml AR)	1
Filter paper whatman No.40 (Box of 100 sheets)	1	Ammonium thiocynate (250 g AR)	1
Glass beads (1.0 kg)	1	Ammonium Hydroxide (500 ml AR)	2
KH ₂ PO ₄ - Potassium dihydrogen phosphate (500 g AR)	2	Silver nitrate (25 g AR)	1
Liquid paraffin (1.0 L AR)	1	Ammonium chloride (500 g AR)	1
Methyl red (10 g AR)	1	Acetic acid (500 ml)	1
Nutrient Agar (100 g AR)	2	EDTA (100 g AR)	2
Orthophosphoric acid (500 ml. AR)	1	Sodium Chloride (500 g AR)	1
Peptone broth (500 g AR)	2	YMA agar (500 g AR)	2

Item	Qty.	Item	Qty.
Potassium chloride (500 g AR)	2	Tetramethyl diamine diphenyl methane (50 g AR)	1
Potassium dichromate (500 g AR)	1	Phenolphthalin (100 g AR)	2
Potassium permanganate (500 g AR)	2	Buffer tablets pH 4.0 (10 packets)	1
Sodium bicarbonate (500 g AR)	5	Gum acacia (500 g Food Grade)	1
Sodium hydroxide(Pellets) (500 g AR)	2	pH 7.0 (10 packets)	1
Sucrose (500g AR)	2	Alcohol (500 ml AR)	2
Sulphuric acid (2.5 L AR)	1	Mureoxide (25 g AR)	1
Dextrose (500 gm)	5	Malic acid (500 gm)	4
Mannitol (500 gm)	1	Yeast extract (500 gm)	2
Beef extract (500 gm)	2	Surgical spirit (500 ml)	2
Magnesium sulphate (500 gm)	1	Manganese sulphate (500 gm)	1
Sodium molybdate (100 gm)	1	Sodium chloride (500 gm)	1
Calcium chloride (500 gm)	1	Ferric chloride (500 gm)	1
Hydrochloric acid (500 ml)	1	D-Biotin vitamin (100 gm)	1
Formaldehyde (500 ml)	2	Xylene (500 ml)	1
Glyceral (500 ml)	1	Vitamin B1 – Thiamine (10 gm)	1
Vitamin B2 – Riboflavin (5 gm)	1	Vitamin B26 – Pyridoxine HCL (10 gm)	1
Potato Dextrose Agar (100 gm)	1	Bromothymol blue indicator (125 ml)	4
Total Cost = Rs. 55,000/-			

Miscellaneous Expenses = Rs.25, 000/-

Abstract of Expenditure

S.No.	Particulars	Total cost (Rs.in lakhs)
1	Equipments	2.97
2	Glasswares and apparatus	0.40
3	Laboratory chemicals	0.55
4	Miscellaneous expenses	0.25
	Total cost	5.17

(Total cost: Rupees Five lakhs and seventeen thousand only)