

COMPREHENSIVE SOIL ANALYSIS REPORT

Registration & Test Details

Report Number: HSR/HR/2024/117428

Issue Date: 22 November 2024

Sample Registration Date: 15 November 2024

Test Completion Date: 21 November 2024

Farmer Information

Field	Details
Farmer Name	Sh. Rajesh Kumar Sharma
Registration ID	HAR-SONIPAT-2847
Father's Name	Sh. Harendra Singh Sharma
Contact Number	+91-9876543210
Email	rajesh.sharma847@email.com
Village	Nangal Chhoti
Block	Kundli
District	Sonipat, Haryana
State	Haryana
Pincode	131028

Land & Sampling Details

Particulars	Information
Land Area Surveyed	2.5 hectares (6.18 acres)
Geographical Coordinates	Latitude: 28.9821° N, Longitude: 77.0524° E
Elevation Above MSL	218 meters
Soil Type Classification	Medium Loam (Medium Clay Alluvial)
USDA Classification	Typic Ustochrepts
FAO Classification	Fluvisols
Physiography	Indo-Gangetic Plains
Drainage Class	Well-drained
Erosion Status	Minimal wind erosion
Sample Collection Method	Auger sampling (0-15 cm depth)
Composite Sample Prepared	Yes, 8 sub-samples combined
Sample Collection Date	12 November 2024

PHYSICAL ANALYSIS

Soil Texture & Structure

Parameter	Result
Sand (%)	28.5
Silt (%)	42.3
Clay (%)	29.2
Soil Texture Class	Medium Loam
Textural Grade	Fine-loamy, mixed

Table 1: Soil Texture Analysis Results

Interpretation: The soil exhibits a well-balanced medium loam texture with adequate proportions of sand for drainage and clay for nutrient retention. This composition is ideal for intensive agriculture and supports a wide range of crops including wheat, rice, maize, and pulses commonly grown in Sonipat district[1].

Physical Characteristics

Property	Value	Standard Reference
Bulk Density (g/cm³)	1.42	1.30-1.60
Particle Density (g/cm³)	2.65	2.60-2.70
Porosity (%)	46.4	>40 (Optimal)
Water Holding Capacity (%)	32.8	25-35
Saturated Hydraulic Conductivity (cm/h)	2.15	1.0-3.0

Table 2: Physical Properties of Soil

Remarks: The water holding capacity indicates adequate moisture retention during dry seasons, reducing irrigation requirements. The porosity and hydraulic conductivity values suggest good aeration and drainage, minimizing waterlogging risks[1].

CHEMICAL ANALYSIS

Reaction & Salinity Status

Parameter	Result	Rating	Status
pH (1:2.5 soil to water)	8.32	Moderately Alkaline	Normal Range
Electrical Conductivity (dS/m)	0.58	Non-saline	Safe

Table 3: Soil Reaction and Salinity

Analysis: The soil pH falls within the moderately alkaline category typical for Haryana's alluvial soils[1]. The low EC value indicates the absence of salt accumulation, making the soil suitable for most vegetable crops without leaching requirements.

Organic Matter & Nutrients

Parameter	Result	Status	Interpretation
Organic Carbon (%)	0.54	Low	Requires organic input
Organic Matter (%)	0.93	Low-Moderate	Below optimal
Total Nitrogen (%)	0.068	Low	Dependent on OC
Available Nitrogen (kg/ha)	195	Low-Medium	Below standard range

Table 4: Organic Matter and Macronutrients - Nitrogen Status

Status Code:

- **LOW** = Immediate corrective measures required
- **MEDIUM** = Maintenance application needed
- **HIGH** = Adequate for next crop cycle

Macronutrients (NPK Status)

Nutrient	Available (kg/ha)	Status	Recommended Action
Nitrogen (N)	195	Low	Apply 150 kg/ha N fertilizer
Phosphorus (P)	18.4	Low	Apply 60 kg/ha P ₂ O ₅
Potassium (K)	245	Medium	Apply 40 kg/ha K ₂ O

Table 5: Available Macronutrients (NPK Analysis)

Standard Reference Values for Haryana:

- Nitrogen: 280-560 kg/ha (deficiency noted)
- Phosphorus: 15.0-25.0 kg/ha (borderline low)
- Potassium: 180-300 kg/ha (adequate)[2]

Micronutrients & Secondary Nutrients

Micronutrient	Available (mg/kg)	Status	Assessment
Iron (Fe)	12.4	Adequate	Sufficient
Zinc (Zn)	0.82	Deficient	Corrective dose advised
Manganese (Mn)	8.6	Adequate	Sufficient
Copper (Cu)	1.24	Adequate	Sufficient
Boron (B)	0.64	Low	Monitor closely

Table 6: Micronutrient Status

Secondary Nutrients:

- Calcium (Ca): 2850 mg/kg (Adequate)
 - Magnesium (Mg): 385 mg/kg (Adequate)
 - Sulphur (S): 22.5 mg/kg (Adequate)
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BIOLOGICAL ANALYSIS

Parameter	Value	Assessment
Microbial Biomass Carbon ($\mu\text{g C/g soil}$)	185	Good biological activity
Dehydrogenase Activity ($\mu\text{g TPF/g soil/24h}$)	42.3	Active soil microorganisms
Total Bacterial Count ($\text{CFU/g} \times 10^7$)	8.2	Healthy microbial population
Fungal Count ($\text{CFU/g} \times 10^5$)	4.6	Adequate fungal diversity

Biological Health Index: 72/100 (GOOD) - Indicates active soil ecosystem with good decomposition potential[3].

SOIL HEALTH INDEX (SHI)

- **Calculated SHI Score:** 0.68/1.0
- **Rating:** MODERATE-GOOD
- **Components Evaluated:**
 - Chemical indicators (pH, EC, nutrient status)
 - Physical indicators (water holding capacity, bulk density)
 - Biological indicators (microbial biomass, enzyme activity)
- **Trend:** Improving with proper management

CROP-SPECIFIC RECOMMENDATIONS

For Wheat Cultivation (Rabi Season)

Nutrient Management:

- **Nitrogen:** Apply 150 kg/ha (due to low available N)
- **Phosphorus:** Apply 60 kg/ha P_2O_5 as DAP or single superphosphate
- **Potassium:** Apply 40 kg/ha K_2O
- **Micronutrient Management:** Zinc sulphate @ 25 kg/ha pre-sowing; Boron foliar spray at tillering stage

Recommended Fertilizer Schedule:

- **Basal Application (at sowing):** DAP 250 kg/ha + Urea 50 kg/ha + Zinc Sulphate 25 kg/ha
- **Top Dressing at Crown Root Stage:** Urea 50 kg/ha
- **Top Dressing at Tillering:** Urea 50 kg/ha + Boron foliar spray (0.2%)

Organic Inputs: Apply 8-10 tons/ha well-decomposed farmyard manure (FYM) mixed with vermicompost

Expected Yield: 55-60 quintals/hectare under recommended package

For Basmati Rice (Kharif Season)

Pre-planting Preparations:

- Deep ploughing followed by 2-3 puddling operations
- 3-day drainage period after puddling to conserve moisture
- Drain water to soil field capacity condition

Nutrient Recommendations:

- **Nitrogen:** 90 kg/ha for long-duration varieties; 60 kg/ha for medium-duration
- **Phosphorus:** 40 kg/ha P_2O_5
- **Potassium:** 30 kg/ha K_2O

Application Method:

- Apply half N and full P & K as basal dose before transplanting
- Remaining N as split doses (40% at tillering, 10% at boot stage)

Micronutrient: Zinc for rice-wheat system is critical; broadcast Zinc Sulphate @ 25 kg/ha annually

Expected Yield: 45-50 quintals/hectare (good quality Basmati grain)

For Maize (Kharif & Rabi)

Nutrient Package:

- N: 160 kg/ha, P: 75 kg/ha P_2O_5 , K: 50 kg/ha K_2O
- Maize is highly responsive to nitrogen; maintain split application
- Zinc deficiency must be corrected through soil application or foliar spray

Expected Yield: 65-75 quintals/hectare of grain

For Pulses (Chickpea/Gram - Rabi)

- **Nitrogen:** 20 kg/ha (lower requirement due to symbiotic fixation)
- **Phosphorus:** 60 kg/ha P_2O_5
- **Potassium:** 40 kg/ha K_2O
- **No zinc application** required for pulses

Expected Yield: 20-22 quintals/hectare

FERTILITY CLASSIFICATION

Based on comprehensive analysis, the land is classified under **MEDIUM FERTILITY ZONE** as per Haryana soil classification system[1].

Fertility Status Summary:

- ✓ Nitrogen: LOW (improvement needed)
 - ✓ Phosphorus: LOW-MEDIUM (supplementation required)
 - ✓ Potassium: MEDIUM (adequate)
 - ✓ Micronutrients: ZINC DEFICIENCY noted; Boron on monitoring list
 - ✓ Organic Matter: LOW (build-up essential)
 - ✓ Physical Properties: GOOD
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CORRECTIVE MEASURES & MANAGEMENT STRATEGIES

Short-term (Immediate - Next 1-2 Seasons)

1. Address Nitrogen Deficiency:

- Increase organic matter incorporation by 2-3 tons/ha annually
- Apply legume-based green manuring crops
- Use nitrogenous fertilizers as per crop requirement

2. Zinc Management:

- Apply Zinc Sulphate @ 25 kg/ha in rice-wheat system
- Foliar spray of 0.5% Zinc Sulphate at critical growth stages
- Maintain annual application for sustained productivity

3. Boron Monitoring:

- Soil test after 2 years
- If crop shows symptoms, apply Borax @ 10 kg/ha

Medium-term (1-3 Years)

1. Organic Matter Build-up:

- Incorporate crop residues and FYM (8-10 tons/ha annually)
- Practice crop rotation with legume crops
- Target: Increase organic carbon to 0.8-1.0%

2. Cropping System Optimization:

- Adopt **Rice-Wheat system with legume integration** or **Maize-Wheat system**
- Zero-tillage practice for wheat to conserve moisture and reduce erosion
- Use of mulching for moisture conservation in summer crops

3. Water Management:

- Drip/sprinkler irrigation for vegetables to reduce water use by 30-40%
- Maintain soil moisture at field capacity for optimal nutrient availability

Long-term (3-5 Years)

1. Sustainable Intensification:

- Build soil organic matter to >1.0% through consistent residue management
- Stabilize nutrient status through balanced fertilization
- Introduce precision farming techniques

2. Soil Health Improvement:

- Biological indicators should improve to SHI > 0.75
- Reduce external input dependency through improved organic matter
- Expected improvement: +0.5 tons/hectare additional productivity

PROBLEM SOILS & CONSTRAINTS

Current Constraints: NONE detected

Preventive Measures Recommended:

- **Salinity/Alkalinity:** Monitor EC and pH annually; currently within safe limits
- **Waterlogging Risk:** Minimal; good drainage ensures low risk
- **Wind Erosion:** Low risk in Sonipat block; maintain vegetative cover during off-season
- **Acidification:** Not a concern; pH is stable

IRRIGATION WATER QUALITY ASSESSMENT

Parameter	Result	Standard	Status
pH	7.8	6.5-8.5	Suitable
Electrical Conductivity (dS/m)	0.68	<3.0	Safe
Total Dissolved Solids (mg/L)	435	<2000	Excellent
Sodium Adsorption Ratio (SAR)	2.4	<3.0	Safe
Chloride (mg/L)	85	<355	Safe
Nitrate-N (mg/L)	12	<45	Safe

Conclusion: Irrigation water quality is SUITABLE for crop cultivation without any restrictions[2].

CERTIFICATION & VALIDITY

Testing Laboratory: Soil Science & Agricultural Chemistry Department, Haryana Agricultural University, Hisar

Laboratory Accreditation: ISO/IEC 17025:2017 Accredited

Test Methods: ICAR-STFR (Soil Test and Fertilizer Recommendation) protocol as per Government of India standards

Report Validity: Valid for 2 years (until 21 November 2026) from date of issuance

Report Issued by:

Name: Dr. Priya Dutta
Designation: Senior Soil Scientist
Qualification: Ph.D. (Soil Science)
License No.: SCSL-HAR-2847
Signature: _____
Date: 22 November 2024
Seal: [Official Laboratory Seal]

FARMER'S NOTES & CONSULTATION

Consultation Conducted: Yes, on 20 November 2024

Duration: 45 minutes

Consultant: Dr. Priya Dutta, Senior Soil Scientist

Key Discussion Points:

1. Nitrogen management through FYM and organic amendments
2. Zinc deficiency correction protocol
3. Crop rotation benefits for this medium loam soil
4. Irrigation scheduling based on crop water requirement
5. Cost-benefit analysis of recommended fertilizer package

Farmer's Feedback: Satisfied with recommendations; agreed to implement organic matter management alongside mineral fertilizers

REFERENCES

[1] Haryana Agricultural University. (2024). Soil Health Card Development for Haryana. Technical Bulletin, Department of Soil Science.

[2] ICAR-Indian Institute of Soil Science. (2024). Soil Test and Fertilizer Recommendation Standards for Indo-Gangetic Plains. Government of India Publications.

[3] Purakayastha, T.J., et al. (2023). Soil health index development for rice-wheat systems in Haryana. *Indian Journal of Soil Science*, 71(2), 156-165.

[4] Ministry of Agriculture & Farmers Welfare. (2024). Soil Health Card Scheme Annual Report. Department of Agriculture & Cooperation.

[5] Singh, P., & Kumar, A. (2023). Physical and chemical properties of alluvial soils in Sonipat district. *Journal of Agricultural Science Research*, 45(3), 234-248.

APPENDICES

Appendix A: Detailed fertilizer recommendation schedule for wheat season

Appendix B: Micronutrient deficiency symptoms and management

Appendix C: Organic input sources available in local market

Appendix D: Government schemes for soil health improvement in Haryana

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