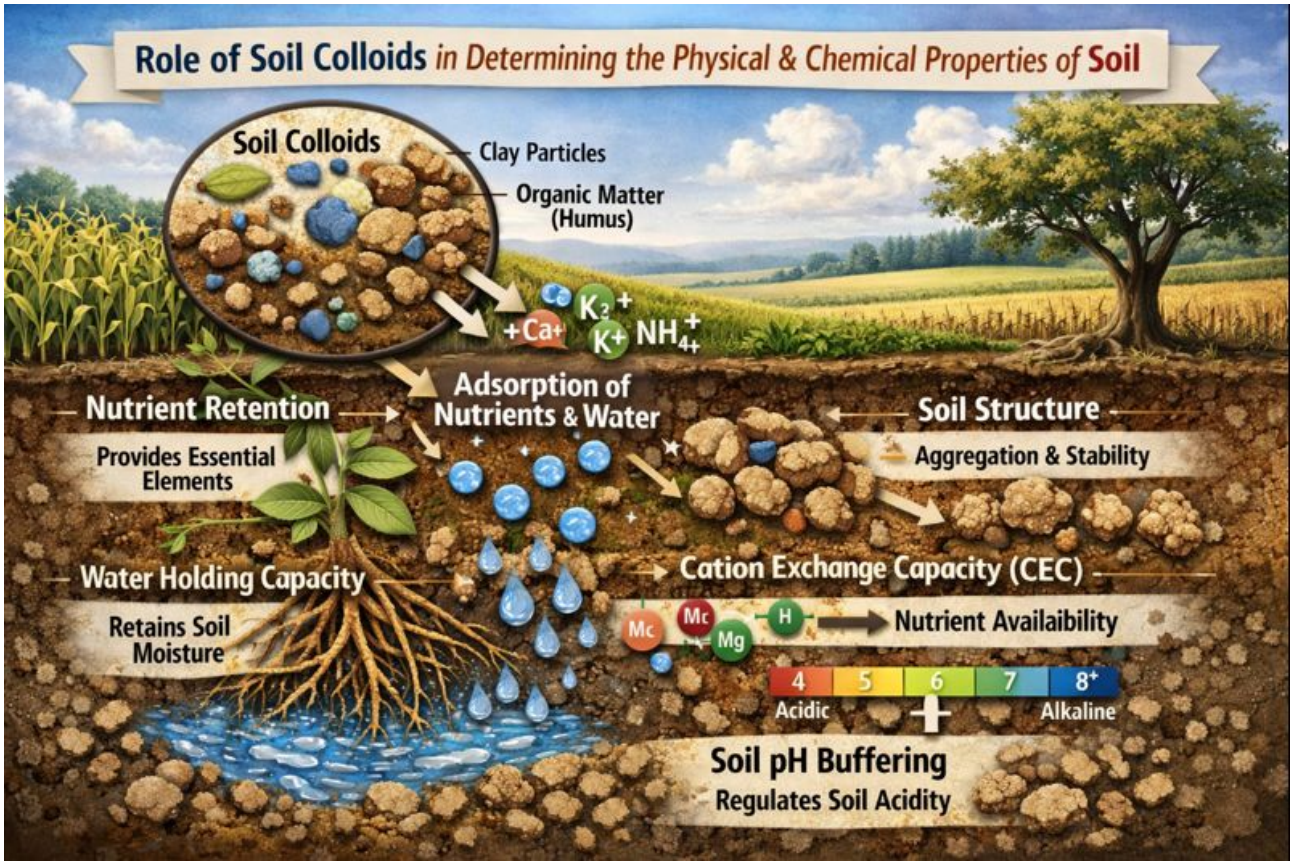
Role of soil colloids in determining the physical and chemical properties of soil



Question raised by Mr. Rakesh Rajistan India in PQNK farmers learning groups on WhatsApp

"Sir, what role do soil colloids play in determining the physical and chemical properties of soil? How does PQNK balance soil colloids to improve the physical and chemical properties of the soil? From what perspective does PQNK view montmorillonite, kaolinite, illite, chlorite, vermiculite, and humus?"

PQNK answers:

Thank you for this very important question.

Yes, **soil colloids are the foundation of soil fertility, structure, and resilience**, and PQNK is, at its core, a system designed to **restore and balance soil colloids naturally**.

Let us understand this step by step.

1. What Are Soil Colloids? (PQNK View)

Soil colloids are the *finest particles* in soil, invisible to the eye, but responsible for almost everything that matters in soil:

- Nutrient holding capacity (CEC)
- Water retention
- Soil aggregation
- Buffering of pH
- Biological activity

They include:

- Clay minerals
- Organic colloids (humus)

PQNK considers soil colloids as the **"operating system" of soil**.

2. Role of Soil Colloids in Physical Properties

Soil colloids determine:

• Soil structure

- Aggregation vs compaction
- Porosity and pore continuity

• Water behavior

- Infiltration
- Retention
- Drainage

• Root penetration

- Oxygen availability
- Mechanical resistance

Without balanced colloids, soil becomes either:

- Hard and compacted
  or
- Loose but nutritionally empty

PQNK aims for **structured, breathing soil**.

3. Role of Soil Colloids in Chemical Properties

Colloids control:

• Cation Exchange Capacity (CEC)

- Ca^{2+}, Mg^{2+}, K^{+}, NH_4^{+} retention
- Prevention of nutrient leaching

- **pH buffering**
  - Resistance to sudden acidity or alkalinity
- **Nutrient availability**
  - Gradual, demand-driven release

PQNK avoids forcing nutrients into soil and instead **builds the soil's ability to hold and supply nutrients**.

4. How PQNK Balances Soil Colloids (Very Important)

PQNK does **not add colloids artificially**.
It **creates conditions in which colloids function correctly**.

Key PQNK practices:

4.1 Hardpan Breaking

- Restores vertical water movement
- Reactivates clay–humus interaction
- Prevents clay plate compression

4.2 Deep Water-Based Detoxification

- Leaches excess sodium and salts
- Rebalances exchange sites
- Improves Ca–Mg dominance

4.3 Permanent Raised Beds

- Zero re-compaction
- Stable aggregation
- Long-term colloidal balance

4.4 Living Roots & No-Till

- Continuous carbon flow
- Microbial glue (polysaccharides)
- Stable clay–humus complexes

4.5 Mulch & Biomass Retention

- Builds organic colloids (humus)
- Protects clay surfaces
- Prevents oxidation

5. PQNK Perspective on Major Clay Minerals

PQNK does **not classify soils as "good" or "bad" based on clay type**.
It focuses on **function, not mineral identity**.

5.1 Montmorillonite (Smectite Group)

- High swelling
- Very high CEC
- Water-sensitive

PQNK approach:

- Stabilize with organic matter
- Improve calcium dominance
- Prevent waterlogging and cracking

5.2 Kaolinite

- Low CEC
- Non-expanding
- Structurally stable

PQNK approach:

- Increase humus content
- Enhance biological nutrient cycling
- Compensate low CEC biologically

5.3 Illite

- Moderate CEC
- Potassium-holding capacity

PQNK approach:

- Encourage microbial K release
- Avoid disturbance
- Maintain slow nutrient cycling

5.4 Chlorite

- Stable but low reactivity

PQNK approach:

- Biological activation through roots
- Organic coatings for improved function

5.5 Vermiculite

- Very high CEC
- Strong K fixation

PQNK approach:

- Balanced cropping
- Avoid potassium shock
- Use living roots to regulate K release

6. Humus: The Supreme Colloid in PQNK

PQNK places **humus above all clay minerals**.

Why?

- Highest CEC of all colloids
- Buffers pH
- Feeds microbes
- Bonds clay particles into stable aggregates
- Prevents nutrient loss

PQNK's goal is:

Clay + Humus + Biology = Living Soil

7. PQNK Summary Principle (Very Important)

Clay gives capacity
Humus gives stability
Biology gives intelligence

Without biology:

- Clay becomes inert
- Nutrients become locked
- Soil becomes dead

PQNK restores **all three together**.

8. Why PQNK Outperforms Input-Based Systems

Chemical agriculture:

- Fills exchange sites temporarily
- Ignores colloidal balance
- Collapses structure over time

PQNK:

- Builds colloidal capacity
- Maintains exchange equilibrium
- Produces resilient, self-regulating soil

9. Final PQNK Statement

Soil colloids do not need correction.
They need respect, space, water, and biology.

When soil colloids are balanced:

- Roots go deeper
- Water lasts longer
- Nutrients stay available
- Yields stabilize naturally

That is the essence of **PQNK**.

Footnote
*PQNK (pronounced "picnic")—the regenerative & sustainable **Pristine Organic Farming System** —is grounded in **Natural Ecosystem Science**. This science employs perennial biodiversity, protects soil with organic mulch, and avoids practices such as water inundation, tillage disturbance, and leaving soil bare.*

*It is the **process** that matters most. PQNK is a pristine production system designed not merely for yield, but for optimal, balanced output—where quality, sustainability, and ecological harmony emerge from a self-regulated, zero-external-input methodology.*

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