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## Mystic Chords Of Memory

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### Abstract

Soil exploratory surveys are costly and possess significant practical applications for revitalizing agroecosystems to achieve optimal land use. At present, there is a noticeable decline in public engagement with these valuable knowledge systems in watershed planning, which hampers the development of successful landscape-level initiatives. The rapid development of digital maps intended for validating land evaluation principles has not progressed adequately, primarily due to a lack of comprehension regarding the emergence of pedomemories among soil surveyors. The systematic process of conducting soil inventories requires the visualization of landscapes, an understanding of observed phenomena, and the transformation of these observations into conceptual images that reflect the dynamics of natural soil formations, alongside innovative thinking to articulate the realities that extend beyond immediate perceptions.

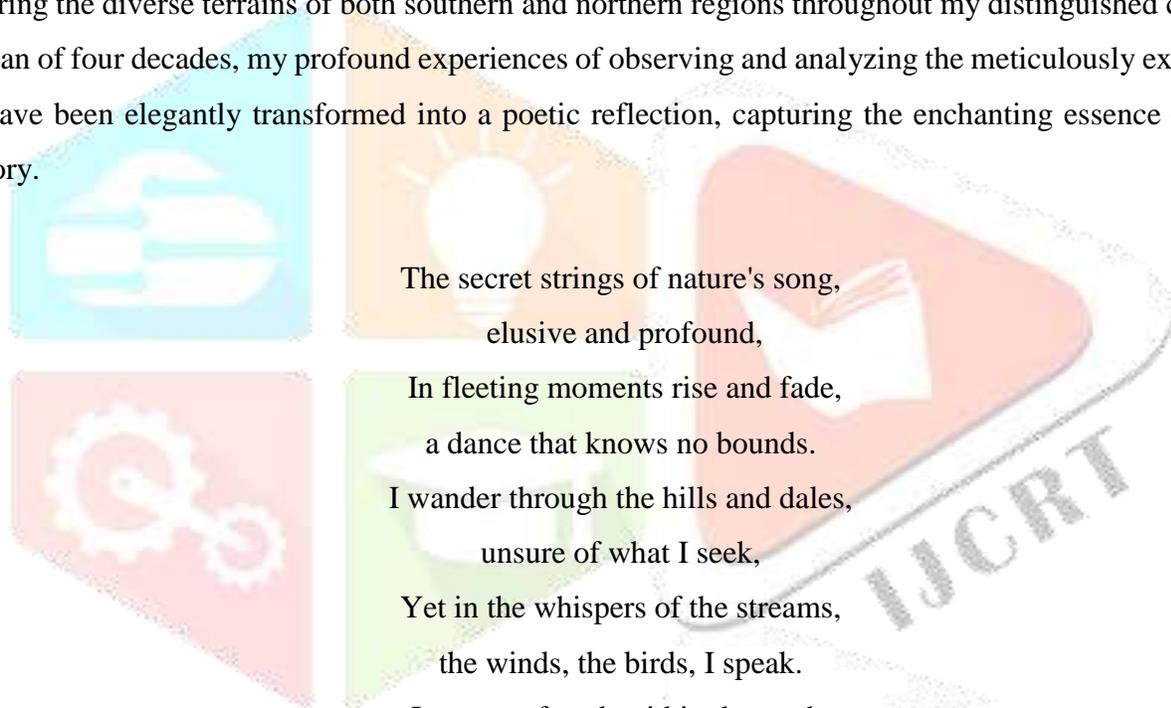
**Key words:** Soil survey, Cognitive bias, expert knowledge, agroecosystems.

### Introduction

The essence of scientific temper serves as a cornerstone in our collective consciousness, empowering us to confront societal challenges with a discerning and analytical mindset. It embodies critical elements such as the democratization of scientific knowledge and the exploration of the intricate relationships between science and society. The pragmatic dimensions of science are indispensable for cultivating new insights and fostering a critical approach to uncovering truths through empirical evidence. This rigorous examination precedes the acceptance of evidence-based reasoning, which is vital for navigating the complexities of life and addressing the myriad issues that surround us. The ethos of a scientific perspective mirrors a dynamic interplay of ideas, fostering a culture of self-reflection and the questioning of assumptions. By identifying and addressing inherent biases, we can reach well-founded conclusions and cultivate more nuanced ways of understanding the world and the knowledge systems that shape our existence.

Communicative science is a craft of clarity, where the intricate tapestry of research is unraveled into threads that are both accessible and engaging for those outside the scientific realm. It invites listeners into a narrative, fostering a sense of wonder and eagerness to uncover the scientific pathways that shape our environment. In soil science, the primary endeavor is not merely aligned with societal aims but is rooted in understanding the formation and properties of soil—its physical, chemical, and biological dimensions and the processes at play. As time has passed, the focus on soil fertility has surged, intertwining with agricultural practices, soil surveys, and land evaluations, all articulated through the wisdom of experts. However, this evolution often sidelines essential foundational studies like micromorphology and clay mineralogy, as we embrace a contemporary perspective that advocates for the judicious use of natural resources to enhance human well-being.

In my esteemed role as a soil scientist, I dedicated myself to comprehensive soil survey programs across India, exploring the diverse terrains of both southern and northern regions throughout my distinguished career. Over the span of four decades, my profound experiences of observing and analyzing the meticulously excavated soil pits have been elegantly transformed into a poetic reflection, capturing the enchanting essence of the soil's memory.



The secret strings of nature's song,  
 elusive and profound,  
 In fleeting moments rise and fade,  
 a dance that knows no bounds.  
 I wander through the hills and dales,  
 unsure of what I seek,  
 Yet in the whispers of the streams,  
 the winds, the birds, I speak.  
 In quest of truth within the earth,  
 where silence holds its sway, My heart, it listens,  
 yet remains, untouched by what they say.  
 For fractured thoughts and muted words,  
 they seldom pierce the stone,  
 Of hearts that know the art of loss,  
 and how to stand alone.

A proud child of the earth, I know well the tale,  
Where the Ganges flows, washing sins without fail.  
A giver of blessings, a bane to mankind,  
In its currents, the whispers of life intertwined.  
The cool mountain breezes sweep down to the plains,  
Carrying messages of love, where hope remains.  
Yet mankind's gaze falters, blind to the unseen,  
Ignoring the silent cries, where sorrow has been.  
Wounds of the world fester, air and water defiled,  
As the land bears the scars of a heartless child.  
The trees stand as sentinels, seasons shift and sway,  
While I wander the soil, where the stories lay.  
Listening to growers, their tales of despair,  
Greed's heavy burden, a weight hard to bear.  
My heart, it melts softly, yet tightens with pain,  
Too feeble to act, but my voice shall remain.  
In stories, I weave the memories of yore,  
To share with the future, a legacy to explore.

### Science in surveys

The soil survey conducted within the Nellore schist belt, focusing on the characterization and classification of laterite-associated soils pertinent to the Telugu Ganga project under the Somasila initiative, provided an invaluable experience for my MSc thesis. This endeavour deepened my understanding of pedology, particularly in the meticulous study and documentation of soil morphologies prior to the collection of samples for laboratory analysis. The primary outcomes of this research concentrated on the detailed characterization and classification of laterite-associated soils. Subsequently, the geochemical data facilitated the calculation of weathering indices, allowing for an assessment of the degree of lateralization, alongside the computation of elemental losses and gains in comparison to the bedrock. This scholarly pursuit offered profound insights into the iron nutrition of groundnut crops within the Alfisols of Anantapur district, laying a solid foundation for my PhD program. The nutritional dimensions were thoroughly examined, leading to the establishment of active iron content in both chloritic and healthy leaves, as well as the chlorophyll content.

Upon my esteemed appointment as a Pedologist at ICAR-NBSS&LUP in Nagpur, I became intricately involved in the soil resource mapping survey of India, specifically in the picturesque region of Rajnandgaon, Madhya Pradesh. This experience afforded me the opportunity to master the art of interpreting soil morphology through a standardized framework, employing a meticulous three-tier methodology: i. image interpretation, ii. ground truth verification, and iii. cartography. This sophisticated approach encompassed the establishment of sample strips that traversed significant physiographic units, complemented by rigorous fieldwork and grids spaced at 10 km intervals, where soil profiles were excavated to a depth of 2 metre or lithic contact for detailed morphological analysis and horizon-wise sample collection for laboratory examination. The exposure gained from this project was invaluable, enhancing my understanding of the essential fieldwork processes. This endeavour was pivotal in the horizonation and morphological assessment of soil profiles, serving as a crucial foundation for subsequent mapping initiatives. Following my fieldwork in Rajnandgaon, I was directed to join a dedicated field party stationed in Anantapur, where we continued our meticulous soil resource mapping efforts. The work involved the systematic recording of soil morphology and the collection of horizon-wise samples, adhering to the stringent standards set forth by the SRM project. This rigorous undertaking persisted through three to five field surveys across the Cuddapah basin, West Godavari, and Khammam districts.

While conducting soil survey activities in the Cotton zone of Adilabad, I had the opportunity to gather mandal-wise crop data from a District Planning Officer. This information provided valuable insights for calculating the crop concentration index and diversification index, allowing for a correlation between crop geography and geoenvironmental conditions. The data facilitated the identification of crop zones in Adilabad, which were then associated with soil productivity indices, specifically the Storie index. This marked my initial endeavour to explore agro-geographic characteristics in conjunction with soil geographic datasets. The findings from this research were presented as a poster at the national seminar on Soil Resource Inventory for Land Use Planning, held at the Nagpur Headquarters in 1996, and subsequently published in the *Agropedology* journal.

After completing fieldwork for the SRM project in 1996, I was assigned to conduct a detailed soil survey along the left bank of the Paithan canal, specifically Branch Canal-47, as part of the Jayakwadi irrigation project. This was done in collaboration with the water management scheme of Marathwada Agricultural University in Parbhani. The survey aimed to establish soil-landscape relationships and assess lateral variations in shrink-swell properties. Subsequently, the relevance of soil-topographic groupings was utilized to develop irrigation planning based on FAO guidelines, considering the crop yield variations in the study area to redesign irrigation trials according to the soil pedological data sets.

Over a span of two years, from 1996 to 1998, I held the esteemed position of project associate, focusing on resource soil mapping within the rubber cultivation regions of Kerala and Tamil Nadu. My primary responsibility involved the creation of a comprehensive soil geographic database, meticulously developed at a scale of 1:50,000 and utilizing 1 km grid intervals. Employing a semi-detailed methodology, I conducted

selective soil transect studies to assess the lateral and horizontal variability of soils across short distances. My commitment to the project was underscored by a two-year residency at the study site, where I was based at Netracherra, Nedumandu, successfully achieving all objectives within the designated time frame. My contributions to this initiative included an in-depth understanding of the morphologies of lateritic soils and active participation in soil correlation activities during survey programs. Upon the completion of the soil survey, I returned to the Nagpur Headquarters to resume my regular office duties. During quieter periods, I focused on the characterization and classification of salt-affected soils in the Purna Valley, the classification of salt-affected sugarcane soils in the Ahmedabad district, and the Atterberg limits of Davasahetti soils in the Wardha district.

In 1999, I was appointed to the esteemed regional Centre in Jorhat, where I had the privilege of collaborating with my distinguished colleagues, Dr. Utpal Baruah and Dr. S. Vadivelu. Together, we engaged in enriching discussions that spanned the scientific methodologies employed in various survey programs. Our dialogues primarily revolved around the interpretation of soil surveys for agricultural applications and the formulation of sustainable land use strategies. We meticulously compiled and reclassified soil survey data for the state of Assam, undertaking a comprehensive remapping for land evaluation at the district level. This endeavour culminated in the publication of the land use plan for Jorhat district, alongside assessments of potassium availability in the soils and a broader land use plan for Assam. Subsequently, our research expanded to encompass the characterization of soils in chars and beels, the pedogenesis of subaqueous soils, and the analysis of soils within the dynamic fluvial landscapes of Majuli Island. We also delved into the pedogenesis of high-altitude regions and the soils of Jhum-cultivated hills on the Shillong Plateau, as well as the characterization of sand-accumulated areas in Assam. Throughout our seven-year tenure, we sought innovative avenues to disseminate our soil knowledge through various publications, significantly enhancing the visibility of the Northeast Centre. Our contributions included soil testing training programs, participation in conferences and workshops, and the organization of soil survey training schools at the Jorhat regional centre.

In the year 2006, I found myself once more transitioning from the Jorhat Regional Centre to the Soil Survey Unit in Nagpur, a time when my son was in the seventh grade and my daughter was just beginning her educational journey in the first grade. Upon my arrival at this esteemed unit, the Director entrusted me with the critical task of preparing soil survey reports for the Seoni district in Madhya Pradesh and the Wardha district in Maharashtra, emphasizing the urgency of the assignment. I diligently completed this responsibility, submitting the reports within the designated timeframe, all while collaborating closely with the field crew engaged in the necessary fieldwork. Notably, two significant publications emerged from the Seoni district, focusing on GIS-based land use planning and soil informatics for agricultural development. During this period, I also authored a publication on the application of Remote Sensing and GIS in the management of wetland

resources in Majuli Island, alongside studies on the pedogenesis and geochemistry of paddy soils in the same region. Additional works include an exploration of the pedogenesis of spatially associated red and black soils in the Purna Valley of Central India, as well as an assessment of the capability and quality of rice-growing hydric soils on Majuli Island.

In September 2008, I assumed the role of project leader for the reconnaissance survey of the Yavatmal district in Maharashtra, overseeing five field teams tasked with surveying an extensive area of 1.35 million hectares within the cotton-producing region. The project utilized data from the Indian Remote Sensing Satellite (IRS)-P6 equipped with the Linear Imaging Self-Scanning Sensor (LISS)-1V, in conjunction with 1:50,000 scale toposheets from the Survey of India. The comprehensive soil survey and subsequent report took seven years to finalize. This survey program focused on soil analysis and land evaluation to determine cotton suitability, with findings presented at both national and international conferences. A significant aspect of this work was the landscape planning for agricultural development at a regional level, which also included published evaluations for irrigation planning. A geopedological approach was employed, proving effective in the land evaluation processes. During this timeframe, I contributed to the writing of book chapters, particularly on pedogeomorphic analysis in soil landscape studies and a methodological approach to land resource inventory for rural land use planning, which included a case study of Lagadwal Village in Dhule District. As an associate in the National Agricultural Innovation Project, I conducted a detailed soil survey in Lagadwal village and developed a soil map utilizing Geographic Information Systems (GIS). My involvement in field experiments on rice-based cropping systems, conducted by Dharm Singh at the Jorhat Centre, culminated in the publication of findings under the title "Economic Evaluation of Rice-Based Cropping Systems in the Brahmaputra Valley, Assam," along with soil analogies for varietal and fertiliser recommendations for these cropping systems.

Soil science focuses on broad knowledge, but at landscape level, the farming issues are complex and varied. Therefore, we must tailor the knowledge to fit the specific conditions that farmers face. We must work together to find ways to keep the soil healthy and fertility using eco-friendly farming practices, which also involves using the indigenous knowledge of farmers for sustainable agriculture. A significant example of the current environmental crisis is the persistent degradation of drylands in the semiarid and arid regions of India, recognized as a critical area for national natural resource conservation. The primary drivers of soil and water degradation, along with rural migration, are the expansion of urban areas into rural landscapes and declining productivity and income from unsustainable agricultural practices. To counteract these issues, immediate reforms in agroecological systems are essential. This includes promoting the sustainable use of natural resources and implementing, planning and governance strategies that ensure farmers benefit from the services offered by agro-ecosystems. Farmers' understanding and management of soil quality play a crucial role in agro-ecosystems, influencing their production decisions regarding natural resource use. When combined with the idea of environmental services, agro-ecosystems can be viewed as the outcome of the interplay between social structures, farming practices, and the local ecosystem.

The top-down methodologies have revealed significant shortcomings over the years, leading to the imposition of agricultural practices that are often socially and environmentally inappropriate for farmers. Farmers, being custodians of their unique landscapes, possess an intimate understanding of the intricate problems that characterizes their environments. Overlooking this invaluable expertise has proven to be a critical misstep in development strategies for many years. Agriculture is intricately linked to natural processes, and local ecosystems cannot simply serve as blank canvases for the application of generalized technologies without the essential insights and feedback from the farmers who engage with them. Conversely, the alternative approach of unreservedly venerating traditional local knowledge can be socially simplistic, as not all rural wisdom is inherently valid or beneficial. The body of literature surrounding traditional farming reveals instances where, due to social dynamics, soil fertility diminishes, and erosion becomes a pressing issue over time. The reduction in farm size leads to shorter fallow periods, which, if not addressed with organic or synthetic fertilizers, results in a gradual decline in soil fertility and structure, ultimately creating a downward spiral of declining productivity. To bridge the divide between contemporary agricultural science and traditional indigenous wisdom, it has been suggested to implement participatory strategies that foster meaningful dialogue between farmers and agricultural scientists. Nevertheless, this endeavour remains somewhat elusive, hindered by the contrasting perspectives of farmers and scientists, which still await thorough exploration.

The discipline of soil science is pivotal in addressing pressing environmental challenges such as climate change, the decline of biodiversity, the alarming rate of dryland degradation, and the critical issue of food security. Soil mapping serves as an invaluable tool, illuminating the intricate patterns and properties of soil that influence the repercussions of emerging land-use strategies, which present significant challenges to the soil science profession. Furthermore, land resource inventory initiatives are intricately tied to heightened political awareness, fostering dynamic interactions among planners, stakeholders, and agricultural welfare organizations. These initiatives necessitate collaborative research endeavours that unite soil scientists with geologists and hydrologists. The methodical approach entails an initial examination of problems through straightforward means, pinpointing gaps that warrant further investigation. Fundamental research becomes essential when existing knowledge or basic modelling falls short of addressing the complex questions that arise from systems analysis conducted by interdisciplinary teams.

## Conclusion

The absence of cited literature underscores the introspective nature of the survey, which serves as a self-reflection and evaluation by the soil scientist. This process shapes the memories of their observations, offering a unique perspective that transcends traditional book knowledge. From the rich tapestry of the field, we construct theories and models, employing mathematical tools to derive insights and validate the realities of soil examination in its natural context. These concepts are articulated with a poetic elegance, designed to resonate deeply with the audience. In the realm of scientific communication, one must master the art of storytelling,

rather than solely relying on the impressive statistical methodologies of artificial intelligence or machine learning. Nature remains the ultimate authority, her resonant whispers in tranquil valleys echoing eternally.

The song of soil:

The earth, a timeless storyteller, whispers tales

Etched in the ancient whispers of the ground

From dusk to dawn, and dawn to dusk

Creatures wander through this domain

Leaving echoes for future ears to hear

Quiet in the meadows, vibrant yet sombre in the mountains

A fusion of weathered particles and rugged remnants

Yet with minuscule clay as the essence of existence,

scientifically responsive

A treasury of age-old knowledge, shifting with distance

A concealed reservoir of nourishment, elements mingling

and intertwining

A silent guide, yet showcasing transformations, igniting spirits

A magical realm where empires ebb and flow

Mankind can only ponder its true essence, how it nurtures life.

Delve into the earth's core, peer through the lens,

Astonishing sights of the microcosmic dance,

Threads and chambers, secrets unfold,

Unheard whispers of tiny strings, stories untold.

The wound we inflict runs deep in this frame,

Silent cries of life, a heartache untamed,

Minds may ponder, but hearts remain cold,

Understanding this mystic body, a tale yet untold.

Exploration reveals soil's diverse classes,

Monitoring its health, life's intricate masses,

Await the response, the call of life's plea,

Lessons learned, sustenance for you and me.

The path of the soil surveyor does not seek the lofty peaks,  
But rather delves into the earth's embrace, where layers speak.

The essence of soil wisdom transcends mere numbers' flight,  
It forms the heart of human insight, shining ever bright.

From one stratum to the next, theories rise and grow,  
Validated through the ages, in regions far and low.

This knowledge, shaped by practice, flows from data's core,  
Fostering innovation, where disciplines explore.

In the realm of communicative science,

we weave a tapestry bright,

Transforming complex findings into tales that ignite.

For the curious hearts, we craft stories that flow,

Inviting all to listen, to learn, and to grow.

Through the art of storytelling, we bridge the divide,

Awakening wonder for the world outside.

Soil science, a quest not for society's gain,

But to uncover the secrets of earth's rich domain.

From genesis to properties, we delve deep and wide,  
Yet as fertility blooms, we must not let knowledge hide.

With surveys and evaluations, we seek to apply,

Practical wisdom to help crops reach the sky.

In this age of awareness, let us strive to be wise,

Using nature's gifts for the good of all lives.

The child-centred view unveils the bounds,

Where human growth in harmony resounds.

It reshapes the flowing dance of water,

Solutes and energy, a vibrant slaughter.  
These currents shift with land's embrace,  
To grasp their rhythm, we must trace  
The soil's patterns on nature's face.  
With maps in hand, we seek to find,  
The layers of earth, their secrets entwined.  
Each soil series, a tale to tell,  
Reveals the capacity where life can dwell,  
Defining the limits of the pedosphere's grace,  
In this intricate web, we find our place.

