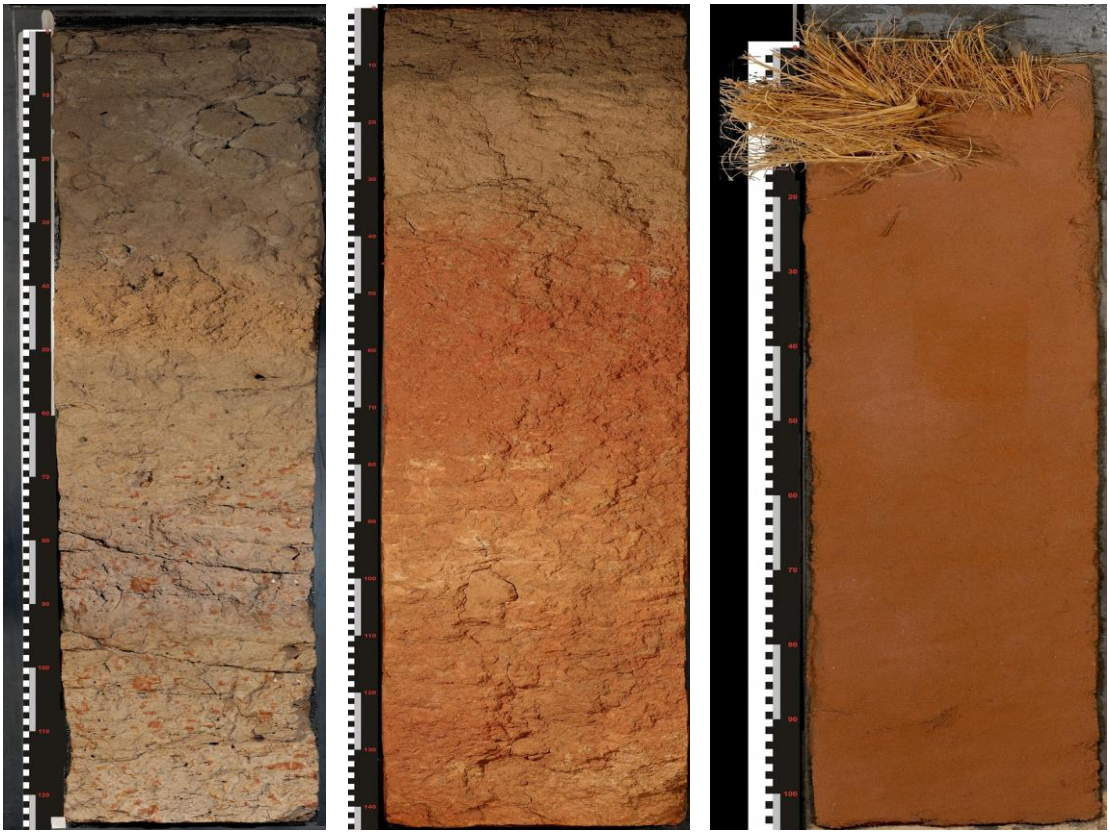
FPI PRACTICAL SOIL PROFILE GUIDES

West Africa Practical Soil Profile Guide

Volume 3 • Field assessment and training



Elfas Mcloud Shangwa Zadzagomo — Hunter

Farmer's Pride International
Hunter's Global Network

Cover: Nigeria Plinthosol; Brazil Lixisol; Namibia Arenosol. Documented reference photographs; comparative examples where outside the region. Credits on page 37.

How to use this guide

This volume supports farmers, trainers, extension officers, students and land assessors working in West Africa. Its focus is humid coastal zones, forest and savanna transitions, Sahelian drylands and river lowlands. Use it to describe soil evidence, plan investigations and make better-informed agricultural decisions.

Geographical coverage: Benin, Burkina Faso, Cabo Verde, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone and Togo. Transitional environments also require cross-border comparison.

Read the field-method chapters before comparing photographs. At the farm, link observations to the landscape, management history and assessment season. Record observed depth honestly and use laboratory or specialist investigation for questions that cannot be answered visually.

The photographic plates are documented field images or preserved reference monoliths, identified in each caption. Where a specimen comes from outside the named region, its actual country is stated. It is a comparative teaching example, not evidence from a local farm. Historical source labels are retained rather than independently reclassified.

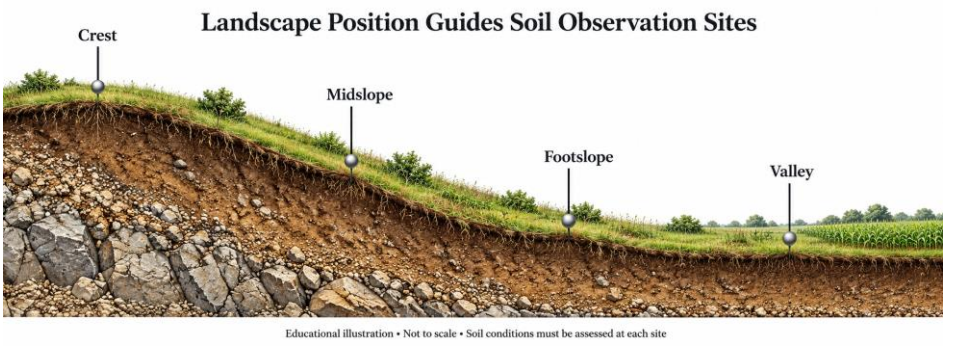
The three explanatory illustrations are AI-generated teaching images. They show concepts and are not field evidence, measured maps or verified soil profiles. Sampling markers illustrate separation of zones, not a prescribed number of samples.

Author: Elfas Mcloud Shangwa Zadzagomo — Hunter. Farmer's Pride International / Hunter's Global Network. Illustrated manuscript edition, November 2026. Field forms and text remain editable. Consult appropriate local advice before design, treatment or major land-use decisions.

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West Africa landscapes



AI-generated teaching illustration. Not a measured site, soil survey or field photograph. Sampling markers do not prescribe a sample count.

West Africa extends from humid coastal and forest environments to savanna and Sahelian drylands. Rainfall seasonality, landform and management history create different assessment questions across these settings. Country boundaries do not mark uniform soil conditions.

In seasonally dry areas, note surface cover, wind exposure, crusting and the reliability of soil moisture through the crop cycle. In wetter uplands, describe surface protection and vertical changes rather than assuming that deep red soils are uniformly fertile.

Iron-rich layers or hardened materials require careful field description. The word laterite is used broadly in everyday language and should not replace an assessment of depth, continuity, hardness and root access.

River lowlands, coastal deposits and inland valley bottoms can support distinct systems but also face flooding, wetness or salinity concerns. Identify the intended crop and water regime before selecting the relevant tests.

The photographs include a Nigerian reference specimen and Ghanaian erosion scene. Other profiles are explicitly labelled comparisons from outside West Africa. They illustrate processes and assessment methods, not a complete regional soil survey.

Planning a safe site assessment

Choose the assessment method before disturbing the ground. Surface observations, a hand auger, existing stable exposures and professionally prepared pits offer different information. An auger is useful for checking depth and changes in material, but it does not show undisturbed structure as clearly as a suitable exposed face.

Obtain landholder permission and identify underground services, access restrictions and sensitive habitats. Consider livestock, traffic, heat, remote working and the possibility of contaminated land. Work with a colleague where appropriate, carry communication equipment and record the site location.

Do not enter an unsupported excavation. Soil walls can collapse without warning, particularly when wet, sandy, cracked or disturbed. Excavation, access and protective measures require competent local supervision. Keep people and loads away from edges and secure the area against accidental entry.

Do not infer that a pit is safe because it is shallow or has stood overnight. If conditions are uncertain, use a lower-risk observation method and refer the excavation work to competent personnel. Restore or securely close the assessment area when work ends.

Record the depth actually examined and any limitation. Write “not observed below this depth” rather than assuming that the profile continues unchanged. A limitation honestly recorded is more useful than a complete-looking description based on guesswork.

Apply this chapter to your site

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Equipment and repeatable records

A basic kit includes a notebook or field form, pencils, measuring tape, sample labels, clean sample containers, a camera and location recording equipment. Select tools for the authorised assessment method. Include appropriate personal protective equipment and a clean water supply for texture observations.

Use a recognised soil colour reference when a formal colour description is required. Phone screens and camera processing can alter colour. Record whether the soil was dry, moist or wet. Retain the original photograph rather than editing its colours to make horizon boundaries appear stronger.

Assign identifiers before collecting samples. A useful system links project, site, horizon or depth interval, date and sample number. Use the same code on the container, field sheet, photograph register and laboratory request. Keep a duplicate electronic record.

Take a site overview, a full profile image and close views of selected features. Put a scale beside the observed face and avoid obscuring the soil with the label. Record the direction and lighting where these affect interpretation. Never invent scale markings after the photograph is taken.

At the end of each day, check that labels are legible, the register is complete and photographs can be matched to sites. Resolve missing information while the team still remembers the observations. This simple quality check prevents expensive confusion later.

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How soils develop

Soil development reflects the interaction of parent material, climate, organisms, relief and time. Human management also changes the profile through cultivation, traffic, erosion, irrigation and the movement of materials. Similar surface colours can therefore occur in soils with different histories and behaviour.

Parent material supplies the starting mineral material. Weathering changes it, while water can move dissolved substances and fine particles. Vegetation and other organisms contribute residues and modify the arrangement of soil. Landscape position influences whether material is lost, accumulated or periodically saturated.

In some profiles, layers represent different sediment deposits rather than development within one uniform material. A sudden increase in stones or a sharp texture change can therefore have several explanations. Describe the change first; do not automatically call every darker layer an old topsoil.

Management history is essential context. Ask about land clearing, cultivation depth, previous crops, fertilisers, manure, irrigation, earthworks and flooding. Treat farmer observations as valuable evidence, while distinguishing remembered events from measured records.

Training exercise: compare two locations on the same property. Identify which soil-forming and management factors appear similar and which differ. Write a short explanation of how these differences could influence the profile, then list the evidence needed to test that explanation.

Apply this chapter to your site

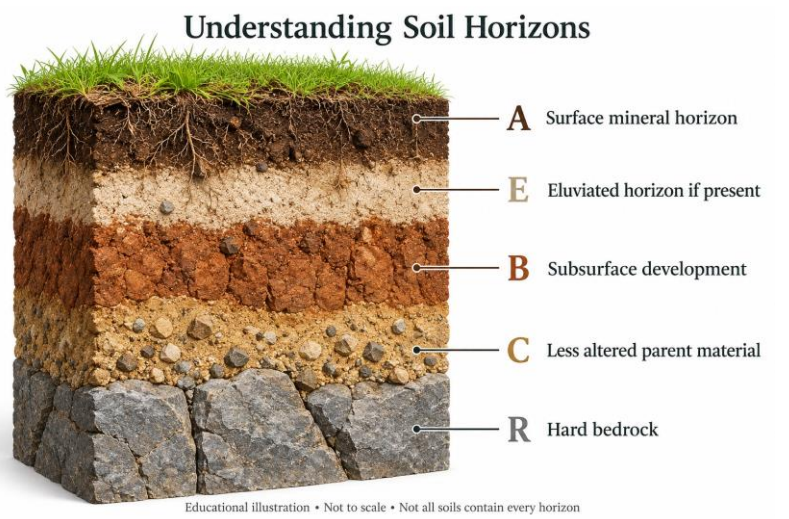
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Reading soil horizons



AI-generated teaching illustration. Not a measured site, soil survey or field photograph. Sampling markers do not prescribe a sample count.

Horizon letters are a concise language for describing parts of a profile. In a simplified mineral-soil sequence, A identifies a surface mineral horizon influenced by organic matter; E identifies a horizon of removal or eluviation; B identifies a subsurface horizon changed by soil development; C identifies relatively little-altered material; and R denotes hard bedrock. Organic layers require their own descriptions.

These letters are not a compulsory sequence. Many soils lack an E horizon, some lack a recognisable B, and cultivated or deposited materials can complicate the pattern. A dark layer is not automatically an A horizon, and a red layer is not automatically a B horizon.

Measure boundaries downward from a clearly defined reference surface. Note whether a boundary is sharp or gradual, approximately level, wavy or irregular. Where a layer varies in thickness, record that variation instead of forcing it into a single exact number.

Use tentative descriptive layer numbers when uncertain. A defensible description of “layer 2, approximately 20–45 cm, finer textured than above” is preferable to an unsupported diagnostic classification. Formal soil naming requires the relevant diagnostic criteria and, often, analytical measurements.

The accompanying diagram is a teaching schematic. Its layers are not measured from a farm and its colours do not establish a soil type. Use it to learn the recording sequence, then describe actual sites independently.

Colour and visible concentrations

Describe the dominant soil colour separately for each layer. Observe a fresh surface under suitable natural light and record moisture condition. When using a standard colour chart, note the reference used so another assessor can understand the record.

Colour can suggest processes worth investigating, but it cannot establish fertility, organic carbon concentration, drainage class or crop suitability on its own. Red, yellow, grey and dark materials occur in different combinations across the region. Compare colour with texture, structure, position and rooting.

Record spots or mottles separately from the main colour: their colour, approximate abundance, size and position. Some patterns are associated with changes in oxidation and reduction; others may reflect parent material or older conditions. Confirm present water conditions with seasonal evidence rather than relying on one visual feature.

Describe visible nodules, coatings and pale accumulations without assuming their composition. Carbonates, salts, gypsum and other materials need appropriate identification methods. A white deposit is a reason to investigate, not sufficient evidence for a named soil problem.

Field task: photograph one sample dry and moist under similar lighting. Compare the appearance and explain why an image without moisture information can mislead. Keep any colour correction out of the evidential image and preserve the original file.

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Texture and the fine earth fraction

Texture concerns the relative proportions of sand, silt and clay in the fine earth fraction. It differs from structure, which describes how particles are arranged. Stones and gravel should be recorded separately because they reduce the volume occupied by fine soil and may influence cultivation and water storage.

A moist hand assessment can provide a useful field estimate. Examine how gritty, smooth, sticky or plastic the sample feels and how it behaves when worked gently. Use a consistent recognised procedure and practise against samples with laboratory results. A quick field estimate is not a substitute for particle-size analysis.

Describe texture for each layer. A sandy surface can overlie much finer material, and the change can matter more for root and water movement than the surface description alone. Record the depth and character of that transition.

The jar settling demonstration can support teaching, but incomplete dispersion, organic material and timing affect the result. Do not use an informal jar test to assign precise percentages or a formal soil classification.

Management question: if two layers have contrasting texture, where could water accumulate and where might roots become restricted? Treat these as hypotheses. Check structure, continuity, slope position and actual moisture observations before selecting irrigation or drainage measures.

Apply this chapter to your site

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Structure and soil consistency

Structure describes the natural arrangement of soil into aggregates and the spaces between them. Granular, blocky, prismatic, platy and weakly structured materials can behave differently. Describe what a fresh sample reveals before it is crushed or heavily handled.

Examine the ease with which a natural aggregate separates. Note its shape and approximate size, visible pores and whether roots follow cracks or enter the aggregates. Do not mistake fragments created by digging for natural structural units.

Consistency changes with moisture. Material that is hard when dry may be workable when moist and sticky when wet. Record the condition during assessment so observations from different seasons are not treated as directly equivalent.

The management implication is functional: can air, water and roots move through the profile under normal field conditions? A neat-looking surface does not answer this question. Look beneath cultivated soil and compare trafficked and less disturbed locations.

Exercise: collect intact samples from two authorised shallow observation points and compare their natural aggregates. Record the differences without assigning a quality score until the site context is known. Photograph the samples with a scale and retain the assessment notes.

Apply this chapter to your site

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Roots and effective soil depth

Effective rooting depth is the depth of soil a particular crop can use under the site's physical and chemical conditions. It may be less than the depth of visible soil. Rock, dense layers, seasonal saturation, salinity or other conditions can restrict access.

Describe roots by depth and distribution. Note whether fine roots are present throughout a layer, concentrated along cracks, flattened at a boundary or absent below it. Also record crop species, stage of growth and season, because these affect the root pattern.

A root turning sideways is evidence of a local change, not proof of compaction alone. Compare the material above and below, examine continuity and seek supporting measurements. An isolated stone and a continuous restrictive horizon have very different management implications.

Keep observed profile depth and effective rooting interpretation separate. If an auger stops, record whether the obstruction appears to be rock, gravel, a hard layer or an unidentified barrier. Do not assume that refusal at one point represents the whole field.

For long-term plantings and infrastructure, investigate sufficient locations to describe variability. Where a major restriction is suspected, obtain competent advice before committing to deep cultivation, drainage or permanent irrigation layouts.

Apply this chapter to your site

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Drainage and seasonal wetness

Drainage assessment considers how water enters, moves through and leaves the soil and landscape. A dry inspection during the dry season cannot establish that a site remains aerated during the rainy season. Combine profile observations with local history and repeat visits.

Look for water in the observation hole, contrasting moisture above a boundary, surface ponding, restricted roots and relevant colour patterns. Record recent rainfall and irrigation, since a recent event can explain temporary conditions.

Distinguish water held above a restrictive layer from a broader groundwater problem. The appropriate investigation and management may differ. A proposed drain also needs an acceptable outlet and consideration of downstream effects and applicable land-use requirements.

Avoid treating wet areas as failed farmland by default. Some are environmentally sensitive or have uses incompatible with drainage. Check local requirements and obtain the necessary technical assessment before earthworks.

Field task: mark suspected wet patches on the property sketch and ask when they appear, how long they persist and whether the pattern follows irrigation. Plan a return visit under relevant seasonal conditions. Record unresolved questions instead of promising a drainage solution from one inspection.

Apply this chapter to your site

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Iron-rich layers and Plinthosols



Nigeria • Plinthosol. Preserved reference monolith. CC BY-SA 3.0. Photographer and source on page 37.

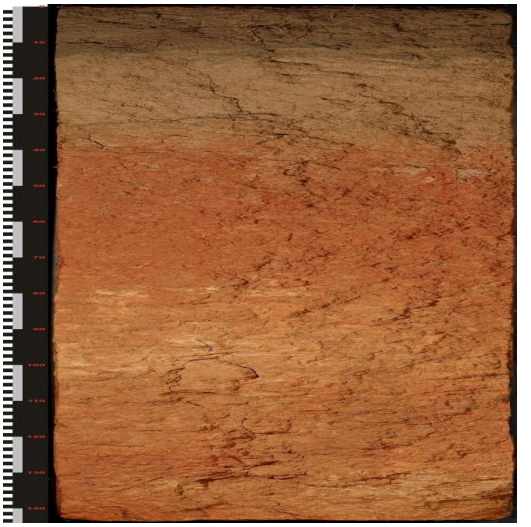
The Nigerian specimen provides a regional example of a source-labelled Plinthosol. Iron-rich concentrations require description of depth, continuity and hardness rather than the loose label laterite for every red material.

Investigate the actual rooting and water conditions above and below any restrictive material. Hardness and seasonal behaviour affect whether land preparation or irrigation proposals are feasible.

Preserved reference specimens omit part of the field context. Observe your own site with a scale, record its location and do not transfer numerical measurements from this specimen.

Field task: describe two features you can actually see, identify two important unknowns and specify the next observation or test. Keep that record separate from any assumption based on the soil name.

Clay redistribution and Lixisols



Brazil • Lixisol. Preserved reference monolith. CC BY-SA 3.0. Photographer and source on page 37.

This Brazilian specimen is a comparative reference, not a West African sample. Lixisol discussions are relevant to parts of the seasonally dry tropics, but the name requires diagnostic evidence.

At the farm, compare surface and subsoil texture, structure and roots. Ask whether boundaries reflect development within one material or a change in deposits, then design sampling around that question.

Preserved reference specimens omit part of the field context. Observe your own site with a scale, record its location and do not transfer numerical measurements from this specimen.

Field task: describe two features you can actually see, identify two important unknowns and specify the next observation or test. Keep that record separate from any assumption based on the soil name.

Humid profiles and Acrisols



Thailand • Acrisol. Preserved reference monolith. CC BY-SA 3.0. Photographer and source on page 37.

The Thai specimen illustrates a source-labelled Acrisol for comparison with humid settings. It does not demonstrate the pH, base status or fertility of a West African farm.

Assess acidity and nutrient constraints using locally interpreted results. Retain surface cover and investigate erosion on sloping land rather than expecting a fertiliser purchase to resolve all limitations.

Preserved reference specimens omit part of the field context. Observe your own site with a scale, record its location and do not transfer numerical measurements from this specimen.

Field task: describe two features you can actually see, identify two important unknowns and specify the next observation or test. Keep that record separate from any assumption based on the soil name.

Sandy dryland profiles



Namibia • Arenosol. Preserved reference monolith. CC BY-SA 3.0. Photographer and source on page 37.

This sandy specimen comes from Namibia. It is included to teach the assessment of coarse materials; it is not evidence that a particular Sahelian site has the same profile.

In a dryland production setting, investigate rooting volume, water reliability, wind exposure and nutrient losses. Do not use the colour of sand to set an irrigation interval or a fertiliser programme.

Preserved reference specimens omit part of the field context. Observe your own site with a scale, record its location and do not transfer numerical measurements from this specimen.

Field task: describe two features you can actually see, identify two important unknowns and specify the next observation or test. Keep that record separate from any assumption based on the soil name.

Cracking clay management



Namibia • Vertisol. Preserved reference monolith. CC BY-SA 3.0. Photographer and source on page 37.

The comparative specimen shows cracking clay features. In West African lowlands, a similar-looking field still needs its own description and seasonal assessment.

Relate workability to the intended production calendar. Check whether the crop, equipment and available labour can operate within suitable moisture conditions before investing in expansion.

Preserved reference specimens omit part of the field context. Observe your own site with a scale, record its location and do not transfer numerical measurements from this specimen.

Field task: describe two features you can actually see, identify two important unknowns and specify the next observation or test. Keep that record separate from any assumption based on the soil name.

Alluvial profile variability



Ethiopia • Haplic Fluvisol. Source-identified field profile. CC BY-SA 4.0. Photographer and source on page 37.

This Ethiopian field photograph demonstrates a source-labelled alluvial profile outside West Africa. It supports the principle that deposited materials must be assessed layer by layer.

For local river valleys, review flood history, sediment layers, drainage and water quality. Keep distinct terraces and wet patches separate in the sampling plan.

This is a source-documented field photograph. Its location and supplied identification belong to the photographed site; they cannot establish the classification or condition of another field.

Field task: describe two features you can actually see, identify two important unknowns and specify the next observation or test. Keep that record separate from any assumption based on the soil name.

Erosion as field evidence



Ghana • Erosion scene not a soil classification. Field scene without soil classification. CC BY-SA 4.0. Photographer and source on page 37.

This Ghanaian photograph shows gully erosion, not a classified soil profile. It is included as evidence of a visible land condition and must not be assigned a soil group from the photograph.

Describe the contributing slope, water pathways, exposed layers and assets at risk. A gully-control design needs competent site assessment and an understanding of where diverted water would go.

This photograph records a visible land-management setting. It is not a diagnostic soil profile and does not justify a soil-group label or an input rate.

Field task: describe two features you can actually see, identify two important unknowns and specify the next observation or test. Keep that record separate from any assumption based on the soil name.

Rainfall transitions and iron-rich layers

Build a seasonal calendar before interpreting a field inspection. The same surface can be bare and hard in one season and saturated or actively eroding in another. Record farmer observations and plan visits that address the intended production period.

Where iron-rich material occurs, distinguish loose nodules from a continuous hard layer. Measure the actual restriction and examine roots. The appropriate management question is whether the soil can provide the intended rooting and water conditions.

In sandy areas, evaluate whether surface protection, water supply and nutrient timing can be maintained. A production proposal should include realistic access to inputs and monitoring, not only an establishment budget.

Coastal and estuarine developments require investigation beyond ordinary fertility sampling where acid sulphate or salinity concerns are plausible. Do not recommend drainage of a wet deposit from a dry-season photograph alone.

Training task: compare a humid upland, a savanna field and a river lowland. Prepare three different observation plans and explain why one standard composite sample would not answer all three management questions.

Apply this chapter to your site

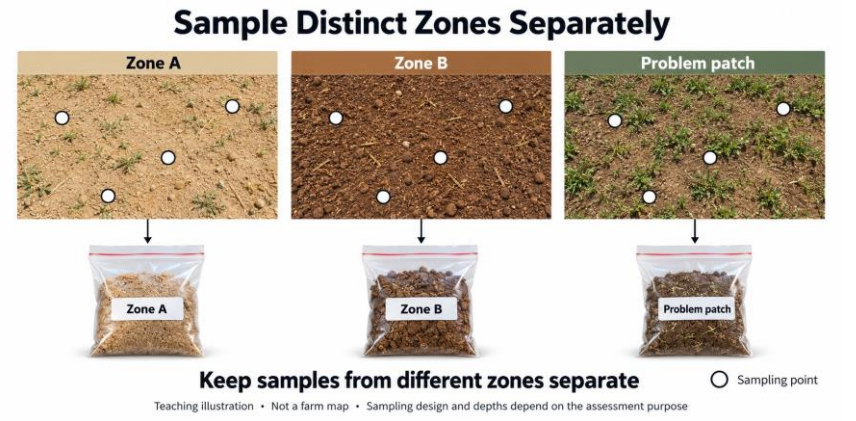
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Designing a soil sampling plan



AI-generated teaching illustration. Not a measured site, soil survey or field photograph. Sampling markers do not prescribe a sample count.

Begin with the question the samples must answer. Routine fertility assessment, investigation of poor crop growth, salinity assessment and formal profile classification may require different sampling designs. Agree the method, depths, containers and handling with the receiving laboratory before collection.

Separate areas with different soil, slope, management history or crop performance. Do not mix an abnormal patch into a larger composite if the objective is to explain that patch. Keep profile horizons separate when investigating vertical changes.

For a composite sample, use a consistent depth and a justified distribution of subsamples within the defined zone. Record the number of subsamples and area represented. The laboratory's local protocol should guide quantities and exclusions.

Use clean equipment and suitable containers. Avoid contamination from fertiliser residues, galvanised tools where relevant, dirty bags or unlabelled handling. Some tests require fresh, cooled or specially preserved samples; confirm requirements in advance.

Retain a chain of identification from site to laboratory. Record collection date, depth, purpose, handling and requested analyses. A precise laboratory result has little practical value if its sampling location or depth is uncertain.

Reading laboratory results

Check sample identifiers, depths and units before interpreting numbers. Confirm the analytical methods. Results produced using different extraction procedures may not be directly comparable, even where the property name appears the same.

Useful tests may include particle-size distribution, pH, organic carbon, electrical conductivity and nutrients appropriate to the local interpretation system. Investigations of sodium or other specific constraints need additional tests. Choose analyses according to the question, not the longest available package.

Distinguish a measured concentration from a recommendation. Crop requirements, expected production, water supply, previous inputs, soil properties and local calibration influence an application plan. A reference range from another country may not be suitable.

Ask the laboratory or qualified adviser to explain unusual results and any uncertainty. Where the result conflicts with the field record, check sampling, identification and method before accepting a convenient explanation.

Keep the original report and a separate interpretation note. Record who made the recommendation and when it should be reviewed. Do not convert this guide into a universal table of fertiliser, lime or gypsum rates; these decisions require local evidence.

Apply this chapter to your site

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Soil information for irrigation planning

Irrigation assessment requires both the soil profile and the water source. Examine water quality, available supply, crop demand, rooting conditions, intake behaviour and drainage. A soil photograph cannot establish an irrigation design.

Differentiate surface intake from water movement deeper in the profile. Water may enter quickly but encounter a restrictive layer below. Conversely, a surface seal can limit intake even where deeper material is permeable. Record both conditions.

Measure and compare representative zones. Field infiltration demonstrations are useful for learning but are affected by initial moisture, installation, surface disturbance and test duration. Record the procedure so results are not compared as though methods were identical.

After installation, verify distribution and actual wetting in the root zone. Adjust scheduling using crop and soil observations and appropriate measurements. Do not wait for visible stress as the only indicator that irrigation is needed.

Before investing, document the unresolved risks: variable depth, poor water quality, wetness, unreliable supply or uncertain drainage. Resolve these with the relevant specialist and include monitoring costs in the operating plan.

Apply this chapter to your site

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Organic matter and nutrient planning

Organic inputs can contribute nutrients and influence soil condition, but their properties vary. Compost, manure, crop residues and other materials differ in nutrient content, maturity, salt content and possible contaminants. Assess the actual material rather than relying on its name.

Match inputs to measured needs and the production standard being followed. Record source, batch, quantity, application date and field. Where food safety or certification requirements apply, confirm permitted materials and handling conditions before use.

Surface cover and appropriate rotations can be part of a soil management plan. Consider competing uses for residues, termite activity, fire exposure, grazing and water availability. Practices must be feasible under the farm's conditions.

Avoid promising that one product will correct acidity, salinity, compaction and nutrient deficiency together. Diagnose each constraint and choose an intervention with a plausible mechanism and measurable result.

Trial method: identify one objective, select a representative area, keep an untreated comparison where practical and record initial conditions. Use consistent management and measurements. Review the result before extending the treatment across the entire farm.

Apply this chapter to your site

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Erosion and landscape protection

Observe whether soil is being detached, transported or deposited. Look for exposed roots, pedestals, rills, gullies, sediment fans, windblown material and changes at field boundaries. Record the setting and recent weather; a single feature may not reveal the long-term rate.

Plan cover, access routes and water movement together. Bare soil, concentrated runoff and poorly located tracks can interact. An isolated structure may shift the problem downstream if the wider catchment is ignored.

Select locally suitable measures with competent design where earthworks are involved. Slope, rainfall, soil depth, runoff volume and maintenance capacity affect what is appropriate. Do not copy dimensions from a photograph or construct a drain without understanding its outlet.

Track change using fixed photograph points and repeated observations after relevant events. Keep dates and the direction of view consistent. Where a major gully or unstable bank threatens land or infrastructure, obtain specialist assessment.

Exercise: draw the paths that water takes across the field. Mark bare areas, traffic routes and places where flow concentrates. Identify one low-cost observation or management change and one issue that requires technical design.

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Compaction and field traffic

Compaction assessment combines soil condition, moisture, rooting and management history. Compare wheel tracks, turning areas and less trafficked ground. A hard dry soil is not automatically compacted, and a soft wet surface does not prove that deeper layers are unrestricted.

Record where roots change direction, aggregate shapes become platy or pores appear reduced. Measurements such as penetration resistance depend strongly on moisture and method. Compare results only when conditions and procedures are suitable.

Prevention often requires changes to timing, load and traffic patterns. Identify which operations are essential and whether routes can be kept consistent. Avoid working soils under conditions known to damage their structure.

Deep ripping is a specific intervention, not a routine cure. Establish whether a breakable restrictive layer exists, whether the operation is feasible and whether subsequent traffic will recreate the problem. Consider risks to buried services, stones, erosion and irrigation systems.

Monitoring exercise: select paired locations with contrasting traffic history. Describe structure and roots and record moisture condition. Repeat after an agreed management change. Use the results to decide whether the intervention helped rather than relying on appearance immediately after cultivation.

Apply this chapter to your site

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Crop selection and botanical production

Crop planning should combine soil evidence with climate, water, farm capability and market requirements. Use the guide to identify constraints and questions, not to issue a universal suitability rating for a soil colour or reference group.

For Moringa and other botanical crops, assess rooting depth, drainage, irrigation-water quality and the ability to maintain appropriate field conditions. Also consider access for harvest, hygienic handling, drying and traceability. A crop can establish successfully yet fail to meet a buyer's quality requirements.

Keep planting-density and yield assumptions separate from soil description. A proposed density requires agronomic evaluation and trial evidence under the intended management system. It cannot be validated by selecting a photograph of a favourable-looking soil.

Where land has an uncertain use history, consider whether contaminant investigations are needed. Visual inspection does not demonstrate that a site is free from chemical residues or other contamination.

For FPI assessments in West Africa, report site evidence, operating limitations and required follow-up separately. Connect soil information to suitable water, crop, handling and market plans. This guide does not prescribe planting densities, yields or universal input rates.

Apply this chapter to your site

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A hypothetical iron-rich upland

A grower proposes a plantation where a hard reddish layer appears in some observation points. The depth varies and roots are sparse below it. This is a fictional training exercise.

Record the layer's depth, continuity, hardness and landscape position. Compare locations where the layer is shallow with locations where it is absent or deeper. Do not classify it solely by colour.

Ask whether the restriction is continuous rock, a cemented soil horizon or another material. Obtain specialist identification where necessary and evaluate usable rooting volume.

The decision must explain whether the proposed crop can be established responsibly, where further work is needed and why a blanket ripping recommendation is premature.

Apply this chapter to your site

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A hypothetical coastal lowland

A producer wants to drain a seasonally wet coastal field for vegetables. No subsurface chemistry or groundwater investigation has been completed. The example is illustrative.

Map wetness and flood history, inspect safely and establish appropriate sampling depths with qualified advice. Consider salinity and potential acid sulphate issues where the setting justifies investigation.

Drainage changes can alter soil chemistry and affect downstream water. Do not interpret a neutral surface pH as proof that deeper materials are safe to expose.

A defensible action plan identifies the required investigations and permissions before earthworks, together with alternatives if drainage is unsuitable.

Apply this chapter to your site

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Practical training session

Purpose: enable participants to produce an accurate, clearly identified soil description and distinguish observation from interpretation. Use a safe authorised site or the reference photographs where field access is unsuitable.

Preparation: the trainer selects two contrasting examples, checks access and equipment, prepares field forms and explains specimen provenance. Participants are told which data are measured, supplied or unknown.

Activity one: participants independently describe visible layers, boundaries, colour and structure. They then compare records and identify disagreements. The trainer asks what additional observation would resolve each disagreement.

Activity two: teams develop a sampling plan for a defined agricultural question. They specify zones, depths, identification and the laboratory request. Teams must explain why they would keep certain samples separate.

Activity three: each team writes an action note for the landholder. It must contain findings, limitations, recommended investigations and a review point. Assessment should reward accurate records and justified reasoning, not confident guesses about soil names.

Completion check: can the participant link a photograph to a site, describe the observed depth honestly, identify an unsupported claim and explain when laboratory or specialist assistance is needed? Retain completed forms as training evidence.

Apply this chapter to your site

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Glossary for field use

Aggregate: a natural grouping of soil particles. Boundary: the transition between described layers. Cation exchange capacity: a measure associated with the soil's ability to retain exchangeable cations, reported using a specified method.

Composite sample: a combined sample made from subsamples collected under a defined plan. Consistency: how soil resists deformation or rupture under specified moisture conditions. Drainage: the removal and movement of water from soil and its landscape setting.

Electrical conductivity: a method-dependent measure used in assessing soluble salts. Horizon: a soil layer with characteristics associated with soil formation. Infiltration: entry of water through the soil surface. Monolith: a preserved section extracted from a soil profile.

Parent material: the mineral or organic material from which soil develops. Profile: a vertical section showing the arrangement of soil materials. Reference Soil Group: a grouping within the World Reference Base classification system.

Salinity: the presence or concentration of soluble salts in the relevant soil or water assessment. Sodicity: a sodium-related soil condition assessed using appropriate measurements. Structure: the arrangement of particles and aggregates. Texture: the proportions of sand, silt and clay in the fine earth fraction.

Use these explanations as learning aids. Formal diagnostic definitions and laboratory interpretation require the applicable technical reference and method. A familiar word used loosely in conversation may have a narrower meaning in classification.

Apply this chapter to your site

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Site assessment form

Complete one record per observation site. Use the same site code on photographs, samples and the farm sketch. Mark unknown information clearly.

Project and site identifier

_____

_____

Assessor and assessment date

_____

_____

Location coordinates and recording method

_____

_____

Landholder and current land use

_____

_____

Landscape position slope and surface condition

_____

_____

Recent rainfall irrigation and seasonal history

_____

_____

Observation method and actual depth examined

_____

_____

Photograph references and sample identifiers

_____

_____

Horizon description form

Copy this page for each described layer. Record observations before assigning an interpretation or a formal horizon designation.

Site code layer identifier and photograph reference

_____

_____

Upper and lower depths and boundary characteristics

_____

_____

Colour including moisture condition and reference chart

_____

_____

Texture coarse fragments and natural structure

_____

_____

Roots pores coatings nodules and other features

_____

_____

Moisture condition and evidence requiring investigation

_____

_____

Sample identifier requested tests and handling

_____

_____

Interpretation uncertainty and required verification

_____

_____

Investigation and action register

Convert the assessment into accountable follow-up. Repeat this entry for each major issue and identify the evidence on which the decision depends.

Site and management zone

_____

_____

_____

Observed issue and supporting photograph or measurement

_____

_____

_____

Possible explanations and information still needed

_____

_____

_____

Investigation or trial and success measure

_____

_____

_____

Responsible person resources and target date

_____

_____

_____

Result decision and review date

_____

_____

_____

References and further reading

1 Field description

FAO. Guidelines for Soil Description. Fourth edition, 2006. Technical reference; source tables and figures are not reproduced.

Open reference 1

2 Soil classification

IUSS Working Group WRB. World Reference Base for Soil Resources. Consult the applicable edition and updates.

Open reference 2

3 Reference profiles

ISRIC World Soil Reference Collection. Site descriptions and analytical records.

Open reference 3

4 African regional context

European Commission JRC and partners. Soil Atlas of Africa. Regional context, not a farm-scale survey.

Open reference 4

5 Soil group background

ISRIC. Reference Soil Group information. Source specimen labels may use historical classifications.

Open reference 5

6 Field assessment

USDA NRCS. Cropland In-field Soil Health Assessment Guide.

Open reference 6

7 Water and salts

FAO. Irrigation Water Management training material, Chapter 7.

Open reference 7

8 Acid soils and lowlands

FAO Soils Portal. Acid soils and acid sulphate soil management.

Open reference 8

Consult the complete technical source and competent local advice for diagnostic classification, site treatment or engineering design. Photographic specimens illustrate selected features; they do not validate a management prescription for another farm.

Photograph credits and permissions

Seven documented photographs are reproduced proportionally and re-encoded for book layout. Soil features and colours have not been invented. Source classifications are retained, not independently updated. The cover uses a subset of these images.

NG-008 Nigeria Plinthosol

Moormann, FA & E, Chijioke. CC BY-SA 3.0.

Photograph source NG-008

BR-001 Brazil Lixisol

Jacobs, T. ISRIC – World Soil Information. CC BY-SA 3.0.

Photograph source BR-001

TH-004 Thailand Acrisol

Van der Kevie, W. CC BY-SA 3.0.

Photograph source TH-004

NA-001 Namibia Arenosol

Creutzberg, D & H, Scholz. CC BY-SA 3.0.

Photograph source NA-001

NA-009 Namibia Vertisol

ISRIC World Soil Reference Collection; photographer not specified by source. CC BY-SA 3.0.

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ET-FL Ethiopia Haplic Fluvisol

Jan Nyssen. CC BY-SA 4.0.

Photograph source ET-FL

GH-ER Ghana Erosion scene not a soil classification

Suglo20. CC BY-SA 4.0.

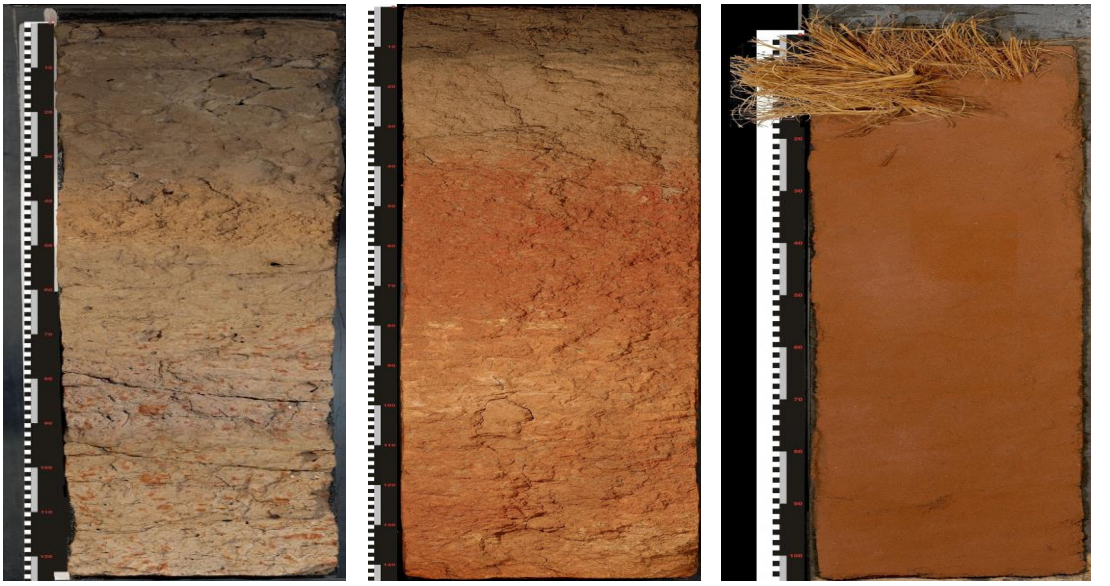
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Three AI-generated teaching illustrations: soil horizons, landscape positions and sampling zones, prepared for this FPI series in 2026. These are explanatory images, not field evidence. Original text and forms: Farmer's Pride International / Hunter's Global Network, 2026.

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