CarbonVerse

FIRST EDITION FOR REVIEW

Unlocking the Wealth in Our Fields

Zero Budget Natural Farming for Productive Farms, Ecological Renewal and the Path to Carbon Credits

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Moong fields with neem boundaries. An illustrative Indian kharif setting.

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A note to the reader

A field supports a family before it supports an argument. This book begins with that relationship. It examines zero budget natural farming through the work it asks of farmers, the resources it uses, the production it supports and the outcomes that can be demonstrated.

The central proposal is straightforward: evaluate the connected farming system fairly, and give its qualifying, independently supported climate outcomes a credible route to recognition and trading. That requires better evidence where evidence is missing and a precise account of where existing methods already work.

The first part can be read on its own. It explains the system, compares it fairly with organic farming and discusses practical transition questions. The following parts examine the practices, economics, ecology, carbon pathways and proposed pilot. The field instruments at the end turn those questions into records a project can use and review.

This is the first edition, published for review. The pilot is proposed; the book reports no results from a running CarbonVerse trial. Worked numerical examples are labelled hypothetical. Research findings are distinguished from recommendations and from crediting status. The source register records what was inspected and where further publication checking is needed.

Three ways to use the book

If you are new to the subject, begin with Part I and follow the farming decisions before the carbon calculations. If you cultivate or support farms, use the practice and economic chapters with the field instruments. If you assess research or carbon projects, begin with the framework and proposed pilot, then trace the treatment and household accounts on which they depend.

The English and Hindi editions share the same arguments and chapter structure. Hindi is written for natural reading rather than word-for-word sentence order. The digital edition has its own topic navigation; the printed book has its own composition. Both retain the distinctions needed to understand the evidence.

About the authors

Dr. Ajay Singh Tomar is a co-founder of CarbonVerse. His intended contribution to this book brings an agricultural-economics perspective to farming decisions, household returns and credible climate recognition.

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The manuscript is prepared for the authors' review. A final biographical statement will use qualification and career details confirmed for publication.

01

I · UNDERSTANDING THE SYSTEM

The wealth in a field

A farmer can bring home a good harvest and still have very little left after paying the bills. Seed, irrigation, hired labour and borrowing have to be paid for. The family has put in its own work too, often without counting the hours. By the time the crop is sold, the size of the harvest tells only part of the story.

For an agricultural economist, the next question is what remains with the farmer. There is the money left after expenses, certainly. There is also the condition of the field that must produce the next crop. A season's income and the ability to earn from the same land in the years ahead belong in the same conversation.

That is where I want to begin this book.

Our fields hold a great deal of work and knowledge. Decisions about sowing, water and the use of residues draw on what a farmer knows about the land, as well as what the household can afford. A proposed change in farming has to make sense within that life. It must help the person who will carry it out.

Zero budget natural farming deserves to be examined from this starting point. Its promise is appealing: make better use of local resources and the life of the soil, reduce dependence on purchased inputs, and help the farmer keep more of what the field earns. The question is how well that promise holds in different crops and places. This book also asks whether the climate benefits that can be demonstrated should bring farmers an additional return through carbon credits.

Three connected accounts of a field



Household economics

Cash, work and full costs



Ecological condition

Soil, water and selected organisms



Climate outcomes

Relevant net gases and stocks

An outcome in one account does not automatically establish an outcome in another.

What does the farmer keep?

Two farmers can sell similar harvests and end the season in very different positions. One may have spent more on materials. The other may have relied on more family labour or on resources already available at home. Sale receipts alone will not tell us who is better off.

Follow the work as closely as the money:

- Count the ingredients used in a farm-made preparation.
- Count the time spent collecting, preparing and applying it.
- Ask who does that work and what else they would be doing at that time.

The saving may still be worthwhile. Counting the work helps us understand how worthwhile it is, and for whom.

The same care is needed with the produce that never reaches a market. Grain kept for the household, fodder fed to cattle and a second crop grown between the rows can all contribute to the family's living. Their value belongs in the farm account. So does the value of a residue returned to the soil, provided we do not also count it as though it had been sold.

A change in practice can make these calculations harder during the first season. The farmer is learning. Materials may have to be arranged differently. There may be more work before any saving is visible. A household still has expenses to meet during that time. Anyone recommending a transition should be willing to explain how the family is expected to manage it.

What zero budget means in practice

Zero budget natural farming puts a practical question before us: how much of what a crop needs can be supplied through the farm's own resources, local materials and biological processes?

The phrase does not make labour or water free. A family that keeps cattle pays for their care in one form or another. Collecting biomass takes time. Equipment wears out. A preparation made on the farm still uses materials. Recognising these costs gives us a useful way to judge whether the approach is reducing the farmer's dependence on cash purchases and improving the return from the field.

Indian natural-farming guidance describes seed treatment, farm-prepared formulations, soil cover and the management of moisture and air around roots. Beejamrit, Jeevamrit, mulching and Waaphasa are familiar foundations of this approach. We will look closely at each of them in the chapters ahead. [SO1]

The farming system matters as much as any one preparation. A farmer needs to know how the practices fit the crop, the soil and the water available. The advice also has to account for a missing resource: what happens, for example, when there is too little suitable material for mulch, or when the work falls at the busiest time of the season? These are questions to resolve in the field and in the design of a support programme.

What the field can show us

There are good reasons to study this approach seriously. In 2023, Duddigan and colleagues reported encouraging yield and soil-moisture results from controlled natural-farming experiments. The results varied with crop and location. Over the period studied, they found no significant treatment effect on soil organic carbon. [SO4]

A 2025 study by Berger and colleagues examined Andhra Pradesh's programme and reported economic and biodiversity benefits without an overall yield penalty in the systems studied. It offers evidence of what can work at programme level, while leaving open how results will differ elsewhere. [S05]

The distinction between these findings is useful. A field can hold moisture better without a detectable increase in its carbon stock over the same period. A farmer can earn more because cultivation costs fall, even if yield stays much the same. Each is a result worth understanding.

We should be equally interested in the circumstances that produce less favourable results. A practice that works with one crop may need adjustment for another. An apparent saving may depend on labour that a different household cannot spare. The aim of research is to give farmers better grounds for a decision, including a clearer idea of where an approach is likely to suit them.

Where carbon credits enter the picture

The idea of earning from a field's climate contribution is an important part of this book. To pursue it, we need to be clear about what a carbon credit represents.

The question is how much a change in practice has reduced greenhouse-gas emissions or removed carbon dioxide, compared with what would otherwise have happened. That comparison needs a defensible starting point, records and measurements. It also needs an independent check under the rules of the programme issuing the credit.

Verra's improved agricultural land management methodology already provides a framework for relevant changes in farm management. Its requirements cover the baseline, additionality, quantification and uncertainty. The current version has published corrections and clarifications that also apply. These rules have to be met by the project seeking recognition. [S07, S08]

For natural farming, this gives us a research task as well as an opportunity. We need to establish which practices produce a climate benefit, how that benefit can be measured and where existing methods can accommodate it. Where a gap remains, we need to identify exactly what evidence or change in method would address it.

I want the case made here to be strong enough for that scrutiny. Farmers stand to gain little from a promise that cannot survive the checks required to turn it into a payment.

Keeping track of what comes from where

A field may have trees on its boundaries, a change in how paddy is irrigated and a change in its soil-carbon stock. Several benefits may occur together. Before claiming them, we have to establish what each comes from and whether any part has already been counted.

Adding biochar or rock weathering creates further questions. Either may contribute a useful result, but that result cannot simply be attributed to the original natural-farming practices. A livestock-methane project needs its own account as well. The proposed pilot must let us distinguish these effects and examine what happens when they are combined.

Some of the field's value will sit outside the carbon account. Water saved or a better habitat for useful organisms can matter greatly to a farmer. Those benefits deserve to be described in terms that make sense for them. We do not need to turn every improvement into a carbon unit to take it seriously.

This means keeping the farm's earnings, its ecological condition and its measured climate contribution visible throughout the study. Bringing them together will tell us more about the field. Keeping their measurements distinct will make the findings more trustworthy.

The farmer's place in the arrangement

A carbon price is only the beginning of a payment calculation. Sampling, laboratory work, record keeping and independent verification cost money. The farmer needs to know what those costs are, how they are paid and what amount will reach the household.

Before agreeing to participate, the farmer should have clear answers:

- What work will I need to do?
- Who may use my farm's data?
- Which costs will be deducted from my payment?
- When will the money reach me?

The project developer, farmer organisation and buyer should be able to explain these terms plainly.

Within the family, we also need to ask who does the extra work. If making preparations or collecting materials adds to the work of women or other family members, that belongs in the assessment. Where a tenant cultivates the field, the responsibilities and benefit arrangements must reflect that person's circumstances.

Even a familiar resource can have several users. Residue laid down as mulch might otherwise feed an animal or supply fuel. Sending it to a kiln changes what is available at home and on the field. Such choices should be recorded before we describe a combined project as beneficial.

What we propose to find out

The proposed pilot will begin with records of the farms as they are, then follow clearly described changes over time. It will compare management systems and keep additional interventions identifiable. Alongside production and income, it will examine ecological conditions and the climate outcomes the evidence can support.

Some results may be encouraging. Others may show little change, or reveal a problem that needs attention. If soil carbon does not measurably increase, we must say so. That would leave any demonstrated saving or water benefit intact, but change the soil-carbon claim. A measured carbon gain would still have to be considered alongside the farmer's work and earnings.

The proposal is to assess natural farming as a connected farming system and give its verified climate contribution a fair route to recognition. The work has to be good enough to serve both the farmer making a decision and the institution asked to recognise a credit.

The next chapter turns to the practices themselves: what they ask of the farmer, why they are used and what we need to understand about them.

02

I · UNDERSTANDING THE SYSTEM

What zero budget natural farming means

Before a crop is sown, a household makes a series of commitments. Some require money immediately. Others require work next week, fodder through the summer or water at the right stage of growth. A farming system changes these commitments. Understanding that change is more useful than beginning with a promise that cultivation can cost nothing.

Zero budget natural farming asks the farmer to draw more carefully on resources within the farm and its surroundings. It gives particular attention to seed treatment, farm-prepared formulations, soil cover and the balance of moisture and air around roots. These familiar foundations are called Beejamrit, Jeevamrit, mulching and Waaphasa. They belong within the management of the whole cropping year. [SO1]

The word budget directs our attention to dependence: how much money must leave the household before the crop can earn? The answer matters to a farmer who borrows for cultivation. It also matters to someone whose principal constraint is the availability of labour. Reducing one kind of dependence while increasing another should be a conscious choice.

Four foundations within the cropping year

1 **Beejamrit**

Seed and establishment

2 **Jeevamrit**

Preparations and biological processes

3 **Mulching**

The surface and its materials

4 **Waaphasa**

Moisture and air around roots

An orientation map, not a mixing or application recipe.

A name with a particular history

The modern Indian movement associated with this name is linked with Subhash Palekar. It sits within a wider history of farmers experimenting with local materials, ecological processes and cultivation suited to their surroundings. Contemporary natural-farming programmes are not all identical to the original formulation; training, institutions and practice combinations have continued to develop. The NITI Aayog training guide places these developments within the broader natural-farming landscape. [S01]

This book uses the full name when discussing the particular system and uses natural farming more broadly where the discussion warrants it. A field should not be classified from its name alone. A useful description includes what was grown, what was applied, how soil and water were managed, and how long those choices had been followed.

That description makes disagreement more productive. Two people may appear to dispute the same farming system while describing quite different practices. Recording the management gives them something concrete to compare.

The economic meaning of zero

Consider a preparation made with materials collected locally. It may save a cash purchase. Someone must still collect the ingredients, prepare the mixture, clean the equipment and apply it. If those tasks replace another operation, the comparison includes the work avoided. If they add to an already crowded day, that extra demand also matters.

The farm account therefore needs two views. The cash view records actual payments and receipts. The full-cost view also values family work, owned resources and the use of assets. Neither view cancels the other. The first explains whether the household can meet its bills; the second helps judge whether cultivation is rewarding the resources it uses.

Zero budget is best approached as a direction for reducing dependence on purchased cultivation inputs, rather than as an instruction to erase costs from the notebook. A claim of savings becomes stronger when the work has been counted honestly.

Four foundations that must work together

Beejamrit concerns the beginning of the crop: the seed or planting material and its treatment. Jeevamrit concerns farm-prepared formulations and the biological processes they are intended to support. Mulching concerns cover on the soil and the resources needed to maintain it. Waaphasa directs attention to moisture and aeration around roots. [SO1]

These are starting points for learning, not four independent guarantees. A good seed treatment cannot repair poor seed storage. A biological preparation does not make an unsuitable irrigation schedule appropriate. Soil cover is difficult to maintain if its materials have already been promised for fodder. Each choice depends on another part of the farm.

The next practice chapters follow that relationship. They explain what to observe, what to record and how to ask a useful question of a demonstration. Where quantities, handling or crop-specific decisions need a local recommendation, the training record should name that recommendation and its source.

Begin with what the field has

An honest starting inventory is surprisingly revealing. List the plots, the crops over a full rotation, water sources, equipment, livestock resources, available biomass and the people who normally perform each task. Add the periods when money and labour are most constrained.

The inventory is not an examination a farmer must pass. It identifies the support needed for a workable transition. A household without cattle should not be expected to pretend it owns livestock resources. A tenant needs an arrangement that fits the period for which cultivation is secure. A rainfed plot needs a different water conversation from a field with a reliable irrigation outlet.

- Mark resources that are genuinely available, rather than merely present somewhere in the village.
- Note their competing uses and the time required to obtain them.
- Check access during the season when the practice will actually be carried out.
- Identify who can help when the plan does not match the field.

This turns a general recommendation into a manageable set of decisions.

Learning through a season

A useful demonstration leaves the farmer able to explain the purpose of an operation. It also leaves a record of the crop, materials, date and observation. A photograph can help, but a photograph without the management record tells little about why a crop succeeded or struggled.

Learning plots should be chosen with the household. Their size needs to fit the family's ability to observe and carry the risk; this book does not prescribe one universal proportion of land. Keep a meaningful comparison where feasible and record any difference in irrigation, variety or sowing date. Otherwise the lesson may be attributed to the wrong change.

Meet after the difficult moments as well as at harvest. A delayed preparation, unavailable worker or blocked irrigation turn may explain the season better than an attractive final photograph. Training that welcomes those observations is more useful than training organised only to display success.

What the name cannot establish

A label does not establish the amount of food produced, the profit retained or the carbon stored. Those are outcomes. Research must ask about them separately and over an appropriate period.

Natural farming may reduce a purchased-input bill without producing a measurable soil-carbon gain in the same interval. Conversely, an ecological improvement may take time to affect sale receipts. Keeping these accounts distinct prevents an argument about one outcome from obscuring another.

A carbon claim adds further requirements. The relevant change, baseline, measurement and programme rules need to be established. Adoption of a named practice is evidence of an action, not by itself evidence of a tradable climate unit. The carbon chapters return to this distinction in practical detail.

The useful test

At the end of a season, ask the farmer to describe the system in ordinary words. What was bought? What was prepared? What was difficult to arrange? What did the field produce? What would the household do differently next time?

The answers reveal whether the approach has become usable knowledge. That is the foundation on which productive farming, ecological improvement and credible climate recognition must be built.

A name, a tradition and a defined treatment

Natural farming is a broad family of approaches. Zero budget natural farming identifies a particular approach associated with Subhash Palekar and the four foundations described here. NITI Aayog's training material places Palekar in its account of the development of natural farming in India. That history should be acknowledged without treating every natural-farming programme as an identical prescription. [SO1]

For a reader, the distinction becomes useful when meeting a farmer or visiting a demonstration. Ask what the person means by the name. Does the farm prepare the same formulations described in the training? Is there living cover, retained residue or both? How are water and crop protection managed? Has the system changed over time? These questions describe the work respectfully. They do not ask a household to prove loyalty to a label.

A research protocol needs a clearer description. It should state which operations define the treatment, which decisions remain with the farmer and which departures must be recorded. An operation can be locally adapted and still be identifiable. The difficulty begins when every variation is called identical before the outcomes are compared.

Three meanings of self-reliance

Self-reliance can mean that a household buys fewer materials. It can mean that the village provides a service previously obtained from outside. It can also mean that the farmer understands a decision well enough to make it without waiting for a salesperson or project worker. These are different achievements, and all deserve attention.

Suppose a farmer replaces an outside purchase with a preparation supplied by a local group. The household has changed its supplier; it has not necessarily begun making the preparation itself. The arrangement may be useful if the service is reliable and fairly priced. Its account should include the payment rather than describe the material as a free farm-made input.

Knowledge requires its own investment. A farmer who learns to identify a problem and ask for timely help has gained something not captured by the ingredient bill. Yet dependence can reappear if only one project worker knows the records or only one operator can maintain the equipment. Training should leave usable instructions, accessible records and more than one person able to perform essential tasks.

The practical test is continuity. What happens when the demonstration ends, the trainer is absent or the household faces its busiest week? A system becomes more dependable when its ordinary arrangements answer those questions.

Draw two boundaries around the farm

The first boundary surrounds the plot. It helps us ask what entered the soil, what grew and what left at harvest. The second surrounds the household and its supporting relationships. It includes materials from another holding, a shared machine, an irrigation arrangement and labour exchanged with neighbours.

Neither boundary is sufficient on its own. A plot can appear to use very few purchased inputs because another household supplied biomass without payment. A household can save money while its plot draws down a nutrient reserve. Writing down the two views makes these possibilities visible without deciding the outcome in advance.

Use arrows rather than a decorative picture of a perfectly closed circle. An incoming arrow needs a source; an outgoing arrow needs a destination. If cattle dung comes from a neighbour, identify that connection. If the farmer returns fodder or pays a charge, record it. If nothing is returned, do not invent a circular exchange to make the diagram look complete.

For research, the boundary should also specify the period. One crop is part of a rotation; one rotation is part of a longer relationship with the land. The farm account follows these periods separately so that a short-term saving does not quietly become a claim about permanent self-sufficiency.

What a useful training day leaves behind

A good demonstration should produce more than a group photograph. At the end, participants should be able to identify the materials, explain the intended purpose, describe the selected instructions and recognise when to seek advice. They should also know what has not yet been established about the operation.

The demonstration can follow the same sequence as ordinary work: arrange materials, prepare, apply, clean, record and observe. Allocate time to each. Ask the person doing the work to point out the awkward steps. Equipment that looks convenient on a demonstration table may be difficult to carry across a wet field or clean at home.

Before participants leave, agree the next observation and the person responsible. A telephone number is useful only if someone can respond. A printed instruction is useful only if the farmer can read it or have it explained in the language normally used for field decisions. The proposed programme should test these arrangements during its learning phase.

Questions that make a claim clearer

When someone says…	Ask for this next
“The inputs cost nothing.”	Which cash payments stopped, and which materials or work came from home?
“The crop looks healthier.”	Which observation changed, when was it recorded, and what is the comparison?
“The soil is improving.”	Which soil property, measured by which method, over what interval?
“The whole system works.”	For which crop sequence, household circumstances and set of outcomes?
“Carbon income will follow.”	Which eligible outcome and method, and which stages remain before a possible sale?

These questions are useful at an enthusiastic field meeting as well as in a scientific review. They allow a promising idea to become a statement another person can examine. They also make room for an ordinary answer such as “we have not measured that yet.”

A farm description to carry forward

Describe the farm in a short paragraph before comparing approaches. Name the crop sequence, water arrangement, starting management, source of major materials and people doing the work. Add the changes being considered and the outcome the household most needs to improve. The description should fit the actual farm, without borrowing the conditions of a successful demonstration elsewhere.

A farmer might prioritise a smaller cash requirement, another more dependable production and another the ability to complete work on time. These priorities affect the advice that is useful. Recording them also prevents a project from changing its definition of success after the harvest.

The comparison with organic farming now has a firmer starting point. Ask what each defined system requires and delivers in this setting. The following chapters carry that question into the field, the household account and the evidence needed for climate recognition.

What do we mean by better productivity?

Productivity relates an output to a stated resource. Yield per hectare describes land productivity for a crop and period. Output or return per day of work asks a labour question. Production per unit of irrigation asks a water question. They can move differently.

For a simple hypothetical area conversion, 2,000 kilograms harvested from half a hectare is 4,000 kilograms per hectare. It is not 4,000 kilograms actually harvested from that half hectare. Keep the original quantity and area alongside the calculated rate. A small measured section also should not be described as a weighed whole-farm harvest.

For several crops, report each physical output first. A rotation can provide an additional product even when one crop's yield changes little. Conversely, an impressive result for one crop can coexist with a difficult later crop. State the interval and area covered before calling the system more productive.

Quality and usable output matter as well. Total harvested weight, marketable weight, retained food and rejected material have different roles in the account. A marketable-output gain should be identified as such rather than silently substituted for total biological production.

The proposal in this book therefore uses several clear measures instead of one all-purpose score. The farmer can see crop output, cash and full-cost returns, work, water and ecological observations together. A carbon quantity has its own calculation. No one ratio should be asked to stand for all of them.

A short description is stronger than a slogan

A useful field description can fit on one page: the plot and period; crop sequence; seed and establishment; preparation and application; cover; water; protection; outputs; work; and unresolved observations. It should describe actual management in words the household recognises.

The description need not contain every laboratory measurement. Its purpose is to make the system identifiable and useful. Detailed evidence can be linked through plot, season and batch records.

At the next visit, compare the description with what occurred. Update it with a dated change where necessary. A farmer may have adapted an operation for a good reason. Keeping that reason gives both the household and the study a more useful account than insisting that the first slogan explained the entire season.

03

I · UNDERSTANDING THE SYSTEM

Organic farming and zero budget natural farming

For a farmer, the difference between two farming systems eventually comes down to work in the field. What changes before sowing? What has to be prepared or bought? Will the family have enough labour when it is needed? The answers matter more than the name printed on a bag of produce.

Organic farming and zero budget natural farming are often discussed as though choosing one means dismissing the other. That makes the choice harder to understand. We can make a more useful comparison by looking at what they share, where their priorities differ and what a farmer would actually do under each approach.

Where the approaches meet

Organic agriculture has a broad purpose. IFOAM's definition brings together the health of soils and people, ecological processes suited to local conditions, and fair relationships. Its four principles are health, ecology, fairness and care. [S02]

A farmer working within that approach may make compost, rotate crops, grow green manure or use biological crop protection. Organic standards can also allow approved materials from outside the farm. That permission tells us what is available to the farmer; it does not tell us what every organic farmer buys. [S03, S11]

Zero budget natural farming places a particular emphasis on reducing the need to buy cultivation inputs. Seed treatment and farm-made preparations are combined with soil cover and attention to moisture and air around roots. Local resources have an important place in the approach. [SO1]

There is shared ground here. An organic farmer may also mulch, grow several crops and work to improve biological activity in the soil. Those practices do not belong exclusively to one system. To understand a difference, we have to go beyond the name and describe the management of the particular farms.

The Indian standard also makes the overlap concrete. The 2024 eighth edition of the National Programme for Organic Production describes diverse planting and nutrient recycling, rather than a system defined simply by buying organic fertiliser. Its crop and nutrient-management provisions include cover crops, rotations and farm-produced biodegradable materials. Permission to bring in an input is therefore a poor shorthand for the whole approach. [S11]

What changes for the farmer

Take the source of materials. An organic farmer may use what is available on the farm and, within the relevant standard, bring in permitted materials from elsewhere. The rules determine which inputs and practices are allowed. [S11]

Zero budget natural farming asks how much of the outside dependence can be reduced. That is an economic question as well as an agronomic one. A farmer needs to know whether local materials are available in sufficient quantity, what they cost to collect and whether someone in the household has time to prepare them.

Changing a few purchases is one possible step. Reorganising how the field is farmed is a larger one. Crop combinations, water and the handling of residues may all change. Either organic or natural farming can involve this kind of redesign. The comparison should give both a fair chance to show what they can do under good management.

That fairness has a practical meaning for research. We need records of the crops grown, irrigation, cultivation and the amount and source of materials applied. If livestock resources are used, those should be recorded too. Otherwise we could mistake the effect of one management choice for a difference between two whole farming systems.

The questions below help keep the comparison useful.

Question	Organic farming	Zero budget natural farming
What guides the work?	Ecological management under the relevant production standard.	Natural-farming practices adapted locally, with special attention to reducing purchased inputs.
Where do materials come from?	The farm itself and permitted outside sources.	Farm-made preparations and local materials; any outside purchases still need to be counted.
How do we judge fertility?	Record nutrient sources, crop removals and changes in the soil.	Use the same account. Biological activity needs to be considered alongside nutrient supply.
What goes into the cost?	Materials, water, transport, equipment and both paid and family labour.	The same costs, including the work of making preparations on the farm.
What is needed for a carbon claim?	A measured outcome that meets the relevant crediting requirements.	The same evidence and crediting requirements.

These questions describe what to look for on a farm. Its results will depend on how it is managed and on the conditions in which it operates.

Following the materials and the work

When a crop leaves the field, some of the nutrients used to grow it leave as well. A fertility plan needs to explain what returns to the soil and what has to be replenished. The discussion should include the amount of biomass available, the crops supplying it and the share already used for fodder or other purposes.

Measurements of soil and plant nutrients help us see whether that plan is working over several seasons. A good response in the first crop is useful information, but a farmer also needs to know whether the field can continue producing.

The costs need similar attention. Manure brought in from elsewhere has a source and a transport cost. A farm-made preparation requires ingredients and work. If we count every expense on one farm and treat the resources on another as free, the comparison will have little value to either farmer.

Timing can be just as important as quantity. Materials may be available in the village yet difficult to obtain at the right moment. Work that looks manageable on paper may coincide with an already busy part of the season. A training programme should help the household plan for that, including who will do the work.

Reading the studies fairly

One detail in a study can change how we should read its findings. In Duddigan and colleagues' 2023 experiments, the organic treatment used purchased organic amendments without mulch. The natural-farming treatment included mulch and farm-made formulations. All treatments used no tillage. The results apply to those choices; they do not tell us how every organic farm would perform. [S04]

Look inside the comparison before repeating its headline. The 2023 experiments used small, replicated plots growing a single crop; they were managed by designated natural-farming fellows. They were not a comparison of every feature of diversified whole farms. Mulch and several preparations changed together between treatments. A treatment difference consequently cannot identify the independent contribution of each preparation. Nor does calling a treatment organic establish that its produce held a particular certification. The methods describe management; certification needs its own evidence. [S04]

For a village discussion, ask someone to finish this sentence: “The study compared these practices, on these crops, in these conditions.” If those details disappear when a result is passed along, the message has become broader than the test. Keep the finding and its setting together. That makes a useful result easier to apply thoughtfully.

The later study of individual natural-farming inputs helps ask a more precise question: how much of an observed effect comes from a particular component? That is useful when deciding what a farmer should adopt and what needs further investigation. [S06]

In the proposed pilot, the organic comparison should be a credible local farming system. The conventional comparison should also be one that farmers actually use. We need to describe their management clearly and measure all of them with the same care. A convincing case for natural farming has no need of a deliberately weak comparison.

Certification income and carbon credits

A change of practice may come with several offers. Keep certification, crop prices and carbon payments separate.

- Certification establishes compliance with a production standard.
- A better crop price needs a willing buyer and agreed sale terms.
- A carbon credit needs a qualifying climate outcome, quantified and verified under the applicable rules. [S07, S11]

Certification alone does not establish a selling price or a carbon credit.

For NPOP, read the operator, products, validity and transaction records together. Its 2024 edition distinguishes the operator’s scope certificate from transaction certificates. A research treatment name or an input seller’s claim is not the farmer’s product certificate. Confirm the current requirements with the certification body. [S11]

An update also has a scope. APEDA’s 27 March 2026 notice sought comments on a draft; its 18 May notification brought an amended Annex 3(17) into effect that day. This annex concerns additives in processed organic food. It is not a list of field sprays. Read the operative document and the activity it covers before acting. [S54]

What is being offered?	Ask to see or explain	Keep a separate record of
A farming approach	The actual seasonal practices, inputs and support available locally.	What the household will change and who will do the work.
Certified organic produce	The named scheme and documents covering the relevant operator and products.	Validity, covered produce and any outstanding requirements.
A better crop price	The buyer, quality conditions and proposed purchase terms.	Ordinary crop income and any additional price still unconfirmed.
A carbon opportunity	The proposed outcome, accounting route and measurement responsibilities.	Costs and conditions before any payment can become payable.

Use these discussion questions when someone offers training, certification or a buyer connection. Bring the answers back to the same field and season. A certificate for one product does not cover every crop; a buyer conversation is not money received. Turn a training promise into a named service the farmer can use.

Keep ordinary crop income visible without assuming an unconfirmed premium or carbon payment. Show any proposed additional income separately, with its conditions and costs. The table is a discussion aid, not a completed application.

A lower cash bill still needs checking against production and family work. A better soil-health reading needs its own explanation; a climate result needs its own measurement. Clear distinctions help a family judge the offer.

Making a choice that fits the field

Before recommending a change, we should understand the farm as it is. The cropping year, available resources, expensive operations and household workload all matter. They help identify which changes can be tried and followed carefully while the family continues to meet its obligations.

Training should leave the farmer able to explain why a practice is used, what to observe and when an adjustment might be needed. The records should help with those decisions. They should be useful to the person cultivating the field as well as to the researchers studying it.

The case for zero budget natural farming will be strongest where farmers can see the difference in their own work, their earnings and the condition of their fields. This book sets out to understand those differences and the circumstances behind them. Where there is also a verified climate benefit, it argues for a credible way to recognise and reward it.

04

I · UNDERSTANDING THE SYSTEM

Benefits and the practical questions of transition

A recommendation becomes real when a household has to carry it through a season. Someone arranges seed, someone prepares materials and someone waits for the harvest payment. A farming transition should improve that life. Its value cannot be judged only from the enthusiasm of the training day.

The attraction of zero budget natural farming is easy to understand: less dependence on purchased cultivation inputs, more purposeful use of local resources and closer attention to the field. Evidence from some Indian settings gives reasons to investigate the approach seriously. It also gives reasons to ask which benefits travel to a new place and which depend on the circumstances of the farms studied. [S04, S05]

What can improve first?

The first visible change may be a purchase that is no longer necessary. The next may be a new task. Record both before calling the change a saving. A household may welcome a lower cash bill even where total work rises, particularly if borrowing is difficult. Another household may prefer an operation that costs more cash but fits its limited labour. These are different circumstances, not failures to understand the same advice.

Changes in field condition should also have their own record. Soil cover, water applied, crop establishment and the presence of selected organisms can be observed. Each needs a repeatable way of looking. General impressions are useful starting questions, but the comparison improves when observations use the same place, timing and method.

The possible carbon payment belongs later in the financial account, with its conditions visible. It should not be used to hide a cultivation plan that cannot meet the family's ordinary needs without an unconfirmed future sale.

A transition has a calendar

Write the coming season as a sequence of decisions. Place sowing, preparation, irrigation, weeding, harvesting and marketing on it. Add school expenses, livestock care and the household's other earning work where they affect the availability of money or time.

This calendar often reveals a difficulty that a list of annual totals misses. A task may take little time over the whole year but become impossible in the particular week when everyone is already occupied. Materials may be inexpensive yet unavailable just before sowing. Support should address the bottleneck that actually exists.

Decision point	What the household needs	What support should establish
Before sowing	Seed, materials, a feasible work plan	Availability, preparation guidance and a named contact
During establishment	Timely observations and water decisions	Visits or advice that arrive before a problem becomes severe
During crop growth	Work that fits the household's capacity	A response when labour, materials or management differ from the plan
At harvest	Reliable output and cost records	Fair weighing, quality records and a review of what happened
Before the next crop	A decision based on the season	What to retain, adjust, investigate or stop

Production cannot be assumed

Farmers need enough production as well as a reasonable cost. A lower bill is not a satisfactory explanation for a serious loss that the family cannot absorb. Equally, a similar harvest obtained with a lower cash requirement can be valuable.

This is why the proposed research must report crop-specific results and the whole rotation. A successful first crop does not settle nutrient supply for later crops. A difficult first season should be investigated rather than automatically attributed to a necessary transition period. Look at seed, weather, water, materials, pests and the timing of the change.

An earlier analysis by Smith and colleagues raised nutrient-supply and possible yield concerns, particularly for higher-input systems. It was an analysis of existing information, not a new field trial. Its questions should help shape local measurements rather than become a prediction that every natural-farming plot must fail. [S13]

The family doing the work

Ask who prepares the inputs and who controls the money saved. These may not be the same person. A change that appears inexpensive in the farm account may rely on work that is poorly recognised within the household.

Talk to the people doing the tasks, at a suitable time and with their agreement. Record paid work and family work separately. A group training event cannot substitute for understanding how a household will fit the practice into its day.

Tenants need particular attention. A cultivator may be willing to try a change but unable to commit land for a long monitoring period. An arrangement that rewards only the landowner can overlook the person paying for cultivation. Responsibilities, records and any proposed proceeds should be discussed before enrollment, using the actual tenure arrangement.

When a resource has another use

Residues illustrate the importance of asking beyond the field. A stalk may provide cover, fodder, fuel or a sale. Moving it into one use changes what is available for the others. A plan for mulch should therefore start with an allocation, not an assumption that all residues are free.

The same principle applies to cattle resources, water and shared equipment. Access can depend on another household, a service provider or the timing of a collective activity. Any charge and any work exchange should be recorded. A resource can be local and still be costly or contested.

This is also where a farmer organisation can help. It may coordinate training, equipment or records. Its usefulness should be judged by the service delivered and its cost, rather than by the number of people registered at the first meeting.

A market plan that can be checked

Growing produce under a particular system does not by itself create a higher selling price. Before putting a premium into an income projection, establish the buyer, quality expectations, volume, delivery arrangements, deductions and payment date. Compare the proposed route with the ordinary market option, including transport and rejected produce.

Certification and carbon transactions are different arrangements. Certification concerns conformity with a production standard. Carbon payments concern qualifying climate outcomes and a sale under the applicable programme. Neither should be described as money already earned because the farmer attended training. [S11, S07]

The booklet can therefore give readers a simple practical rule: make the ordinary crop account work first; show any additional, conditional income on a separate line.

A useful support promise

Support should be specific enough for a farmer to recognise when it has arrived. A named person will visit at an agreed stage. A material source will be checked before preparation. Records will be returned in language the household understands. A reported problem will receive a response.

These promises are more useful than a universal claim about profit or yield. They can also be tested. The proposed pilot should record missed support as carefully as missed farm operations; implementation is part of the explanation for the outcome.

Choosing the next step

At the end of the first learning period, the household should have a short account of production, costs, labour, field observations and unresolved problems. Decide together which changes deserve continuation and which need adjustment. A farmer who decides against expansion has still contributed valuable evidence.

For readers who came to this book to understand the difference between organic and zero budget natural farming, Part I has now provided the starting comparison. Both deserve to be assessed through actual management and results. The argument for natural farming grows stronger when a farmer can see a workable plan, useful support and evidence that fits the field. The chapters that follow examine the practices, the accounts and the proposed route from measured climate outcomes to legitimate recognition.

Put the household's question first

Before discussing adoption, ask what the household wants to change. “Spend less before harvest” is a different objective from “earn more per day of family work.” “Keep production dependable” differs from “obtain a buyer for a particular product.” A useful transition plan records these priorities in the farmer's words.

Choose a small number of outcomes that the household can review. One may concern the cash required before the first sale, another the crop produced and another a difficult operation. The research programme may collect more information, but the farmer should not need a technical report to discover whether the original problem improved.

Return to those priorities after the season. If the purchase bill falls but preparation clashes with another livelihood, discuss both. If production improves but only through unusual project support, show that dependence. The decision about continuing belongs to the household with the relevant evidence in hand.

A hypothetical decision before sowing

Consider a deliberately simplified example for one hectare and one crop. These figures describe no actual farm and are not a forecast of natural-farming performance. Suppose the present plan has expected output value of ₹80,000 and cash cultivation costs of ₹40,000. A proposed alternative has expected output value of ₹76,000 and cash costs of ₹30,000.

The difference is a ₹10,000 reduction in cash costs alongside a ₹4,000 reduction in expected output value. On these assumptions the return before valuing family work and owned resources improves by ₹6,000. Now suppose additional family work is valued at ₹4,000. The remaining improvement is ₹2,000 before any other changed costs. A headline about ₹10,000 saved would omit the rest of the decision.

What output would leave the household no better off on this simplified full-cost comparison? Existing return is ₹80,000 minus ₹40,000, or ₹40,000. Alternative costs are ₹30,000 plus ₹4,000 of additional family work. The alternative therefore needs output value of ₹74,000 to match ₹40,000. This is a break-even calculation for these invented assumptions. It is not an acceptable yield-loss margin for the pilot.

Hypothetical comparison	Present plan	Alternative plan
Output value	₹80,000	₹76,000
Cash cultivation costs	₹40,000	₹30,000
Additional family work relative to present plan	Reference	₹4,000
Return after the listed costs	₹40,000	₹42,000

Land, unchanged family work, fixed assets and financing have been omitted from both columns for this narrow incremental example. A real full account must include relevant costs consistently. Test different output and price assumptions before relying on the ₹2,000 difference; a modest change could reverse it. Chapter 10 develops the complete account.

Why annual savings may arrive too late

A plan can show a favourable annual total and still create a difficult month. Materials may need to be arranged before any crop income arrives. A buyer may pay after the household's next expenditure. A service can reduce annual labour but demand payment on the day when cash is shortest.

Write receipts and payments against actual months or operations. Include the earliest date a payment is required and the realistic date money may arrive. A hoped-for premium or carbon sale should not fill a cash gap without a real arrangement.

For the proposed pilot, record project-funded materials and free services separately. They are part of the support received during research. To understand whether a practice can continue, estimate what would happen if the household had to arrange that service itself, using an observed price or a clearly labelled unresolved cost. Free during a study does not establish free in ordinary farming.

Agree what happens when a crop struggles

Support needs an agreed response to a serious problem. Who can visit? Who may recommend a change? How quickly can the household obtain advice? What will be recorded if a rescue action is taken? These questions should be answered before sowing.

A farmer should be able to act to protect the crop without being asked to conceal that action for the sake of a comparison. Record the decision, timing, materials and cost. Researchers can then explain how actual management differed from the intended treatment. A favourable harvest after rescue may still be valuable to the household, while answering a different scientific question.

The project must be equally clear about financial assistance. No loss compensation or income guarantee is established in this proposal. If any assistance is later agreed, its conditions and funding need to be written and explained before reliance on it. Do not allow a helpful conversation to become a promise the programme cannot honour.

Ask what makes continuation possible

A farmer may complete the season successfully yet decide against repeating it. The reasons matter: a material was difficult to obtain, training arrived too late, another crop offered a better return, or the person doing the preparation had no time. These answers help improve the approach.

Do not code every decision against expansion as lack of awareness. First ask what the household encountered. Equally, continued participation does not establish that every part of the approach was beneficial. A household may continue because of training, social relationships or another service. Record the reasons without trying to force them into a success story.

A useful review separates what the farmer intends to continue independently, what depends on continuing support and what has been stopped. That distinction helps a farmer organisation decide which services are worth maintaining.

Make the first meeting useful to every participant

Ask the person preparing inputs about materials and handling. Ask the person supervising irrigation about water control. Ask the person selling produce about quality, deductions and payment. These may be different people, and a meeting with only one of them can miss the main obstacle.

Keep the record proportionate to its purpose. Explain why a question is asked and whether it is needed for cultivation advice, research or a possible commercial arrangement. Give the household a copy of the commitments relevant to it. A farmer should be able to identify whom to contact without searching through a project organisation chart.

The first meeting should leave a practical next action: inspect an available material source, review a crop recommendation, agree a baseline visit or examine a market offer. Attendance and enthusiasm are starting points. A clear, feasible action is what turns the conversation into useful support.

Five questions before expanding the area

- Can we explain the actual practices used and the departures made during the season?
- Do we know production, cash needs and family work on a comparable basis?
- Are the necessary materials and timely support available again?
- Have household members doing the work had a say in the decision?
- Can the plan stand on ordinary farming returns while additional payments remain conditional?

There is no universal score that makes these decisions for every family. A weak answer identifies work to do before expansion. A strong answer provides a reasoned basis for the household to choose the next step. This is the practical promise of the approach: a farmer understands the system well enough to judge its place in the farm.

Compare a buyer's offer after the deductions

A higher quoted price can still leave the household with less cash. Consider an invented marketing example for a 500-kilogram lot. The ordinary route buys all 500 kilograms at ₹20 per kilogram, giving ₹10,000. Transport and selling charges are ₹500, leaving ₹9,500.

A proposed route quotes ₹22 per kilogram but accepts only 450 kilograms. Its receipt is ₹9,900. Suppose its transport, sorting and selling charges total ₹1,500. Cash from this route is ₹8,400. The remaining 50 kilograms are still unsold at the comparison date, not mysteriously absent from the physical crop account.

These are hypothetical figures, not local prices or evidence that a particular premium market is unattractive. They show the questions behind an offer: quantity accepted, deductions, extra work, unsold produce and payment timing. If the 50 kilograms are later sold or used at home, record the actual event separately.

Hypothetical offer for the same starting lot	Ordinary route	Proposed route
Quantity bought	500 kg	450 kg
Quoted price	₹20/kg	₹22/kg
Receipt	₹10,000	₹9,900
Listed selling costs	₹500	₹1,500
Cash after listed costs	₹9,500	₹8,400
Quantity still unsold in this example	0 kg	50 kg

The cultivation comparison should retain the full output. The marketing comparison should retain the actual cash and the unsold inventory. A higher headline price is useful only when the full arrangement works for the household.

Follow the benefit to the person receiving it

An input saving can remain with the cultivator, pay a service provider or be offset by another expense. A market premium can be reduced by sorting and transport. A possible carbon receipt can depend on deductions and allocation. Trace each benefit rather than assuming that a favourable project total reaches every participant equally.

This matters within the household too. Someone may do more preparation while another person handles receipts. Ask how decisions are made and whether the work and benefit are understood by those involved. The project should listen without pretending it can settle every household arrangement through one form.

For workers, record changed paid work and task timing. A reduction in hired labour cost is a saving in one account and a change in paid opportunity in another. Report the distinction without treating the worker's experience as irrelevant to the wider benefit claim.

For neighbours and shared-resource users, ask whether the arrangement changes access to biomass, water or a service. A farm-level gain should not make an unrecorded transfer of cost disappear.

Food quality requires its own question

A cultivation label should not be used as a complete statement about the quality of every harvested product. If the programme wants to investigate a particular quality characteristic, define it, select an appropriate testing method and retain the lot identity.

Keep household food use visible. Record the quantity retained and the stated valuation separately from cash sales. Retained produce can be important to the household even though no money changes hands. Do not count it as a sale and again as a separate additional harvest.

Avoid health promises unsupported by suitable evidence. The useful farmer conversation concerns what was grown, how it was handled, what was tested where relevant and how the household uses it. This keeps the discussion concrete and allows genuine quality evidence to have its proper value.

A review meeting with a beginning and an end

Begin with the household's original priority. Then review the crop, cash, work, material and field records in that order or another order the family finds useful. Mark what is known, estimated and missing.

Choose a small set of next actions. A sowing delay may call for arranging material earlier. A weak market offer may call for checking another buyer. An uncertain observation may call for a better comparison. Not every problem needs a new technology or an expansion in area.

End with a readable decision record: what will continue, what will change, who will arrange the necessary support and when the next check will occur. Give the family its copy. This is how the booklet can serve after the first reading—as a guide to a conversation that produces a workable next season.

Take the conversation into the village

A discussion can begin with an ordinary question: how much money came from cultivation and how much remained? Then examine the practices, local materials and observations of soil and water. Discuss the carbon opportunity once the ordinary farming account is clear.

Do not choose a winner merely by looking at two fields. Ask about variety, sowing, water, previous management and the timing of the visit. A larger-looking plant does not establish the whole season's yield, return or carbon stock.

There is no need to choose a weak organic farmer to make the case for natural farming. A fair comparison with credible management is more useful. Where a difference has not been measured, say so.

After the conversation, a participant should understand a possible next step: begin a full account, ask better questions at training, inspect a material source or choose a learning area with appropriate local advice. Hearing the idea should not create pressure to convert an entire holding immediately.

This approach respects the farmer's experience. It allows the idea to travel while keeping the decision connected to the field, household and available evidence.

05

II · PRACTICES AND RELATIONSHIPS

Seed treatment and establishment



Moong seeds and a trifoliate sprig. An original illustration of an Indian crop, not a documented farmer encounter.

A crop begins before the first leaf appears. Seed has a history: where it came from, how it was stored, whether it was already treated and what happened between collection and sowing. When establishment is poor, that history deserves as much attention as the preparation used on sowing day.

Beejamrit is associated with seed treatment in zero budget natural farming. Its place in the system is an invitation to pay close attention to establishment. The useful question is whether a clearly documented treatment improves the relevant outcome for a particular seed lot, crop and set of field conditions. A general name cannot answer that question for every seed. [S01]

Begin with the seed lot

Keep seed lots identifiable. A bag collected from one source should not become indistinguishable from a bag obtained elsewhere. Record the crop, variety where known, supplier or household source, collection date and storage conditions. Record an existing commercial treatment rather than assuming the seed is untreated.

The point is practical. If one batch establishes poorly, the record helps identify whether the difficulty followed the seed lot, a treatment batch or a particular field. Without that information, an entire farming approach can receive credit or blame for a problem that began in storage.

For saved seed, cleaning and storage are part of the system's work. Count the time and any rejected material. For purchased seed, preserve the label or purchase record where possible. The comparison between systems should include the same care over starting material.

A seed-lot identifier should survive the next operation. If part of a lot is used for a comparison, give the portions linked identifiers rather than new names that hide their common origin. If two lots are combined, record the combination. This makes the eventual count interpretable and helps avoid treating a difference between starting materials as a treatment response.

Discuss the purpose of a seed check before interpreting it. A household checking its available seed needs a practical decision about that lot. A researcher testing a preparation needs a comparison that can distinguish the proposed treatment effect from the lot's starting condition. Those purposes can inform each other, but they are not the same study.

A preparation needs an identity

Farm-made does not mean undocumented. The person preparing a treatment should know which locally reviewed instruction is being followed. The batch record should identify the materials, source, quantities, water, preparation dates and person responsible. Record departures from the instruction rather than quietly treating them as the same preparation.

This book does not set one universal mixing recipe for every crop and seed. Preparation variants, seed handling and compatibility need to be resolved through the selected crop guidance and local agronomic review. A recipe printed without those decisions would give a false appearance of precision.

At a training session, the practical demonstration should cover the entire operation: arranging materials, preparing the batch, handling the seed, equipment cleaning and the intended timing of sowing. The work record begins when materials are collected, not only when seed is dipped or coated.

Distinguish the preparation from its application. The batch record describes what was made. The seed-operation record describes which seed received it, the reviewed handling method, the timing and the person doing the work. A correct batch record cannot establish an application that was never documented.

If there is already a treatment on the seed, the proposed operation needs an explicit compatibility decision from appropriate crop guidance. The book does not infer compatibility from either product's name. Record the decision and its source rather than ask the person sowing to resolve an unreviewed combination under time pressure.

Make the observation basis visible

Seed check	Seeds tested	→	Germination percentage
Field	Defined row or area	→	Emergence count
Harvest	Area and moisture basis	→	Yield on the stated basis

An observation map, not actual results or seed-test certification.

Separate the outcomes

Three questions are often compressed into one claim that a treatment works. Did more seed germinate? Did seedlings establish better under field conditions? Did the eventual crop yield improve? These are related questions, but they are not interchangeable.

A simple germination observation can help identify a poor seed lot. A field emergence count adds the effects of sowing depth, moisture, weather and soil conditions. Harvest measurements include the rest of the season. Following the sequence makes a useful result easier to explain.

Stage	Observation to define before starting	Important accompanying record
Seed before treatment	Identity and condition of the lot	Source, storage and existing treatment
Germination check	Number tested and number germinated	Counting date and common test conditions
Field establishment	Emerged plants in a defined area or row length	Sowing date, rate, depth and moisture conditions
Later growth	The chosen growth or disease observation	Water, weather and other management
Harvest	Marketable output and relevant co-products	Area harvested, moisture basis and weighing method

Do not describe an informal visual impression as a laboratory disease diagnosis. If disease is the research question, agree a suitable diagnostic approach before interpreting the result.

A fair small comparison

To learn about a treatment, start with seed from the same lot where feasible. Keep the variety, sowing date and other operations comparable. Allocate treatment fairly under a reviewed trial design rather than selecting the best-looking section afterwards.

A demonstration strip can teach the operation, but it may not have enough independent replication for a general efficacy claim. The chapter on research design explains why many plants in one strip are not the same as many independently assigned plots.

Record rescue actions and re-sowing. If a section needs additional work, its cost and later management belong with its result. Excluding it because it became inconvenient would make the demonstration misleading.

The comparison can also ask a narrower handling question. If one group receives a preparation and another receives no handling, a difference may include both the formulation and the handling operation. A reviewed component design can specify the comparison needed to distinguish those possibilities. This is a question for trial design, not an instruction to improvise an alternative seed treatment.

Choose the observation date and definition before seeing the result. Specify how uncertain or abnormal observations will be recorded and who can review them. Keep the original counts as well as any later correction. A consistent rule is more informative than a favourable-looking photograph selected after several different checks.

What the farmer should receive

Return a short record: the seed lot, treatment batch, sowing conditions, emergence observation and any further work. Where several farmers participate, show the spread of results rather than only the strongest photograph.

The cost sheet should include ingredients, collection, preparation, seed handling and any effect on the sowing schedule. A treatment that saves a purchase but causes a costly delay needs that delay counted. Conversely, a well-timed local arrangement may reduce both cash needs and dependence on a distant supplier.

Its place in the carbon account

Good establishment may influence the crop's later growth and management. That possibility does not give seed treatment a stand-alone carbon quantity. A carbon account would have to trace a qualifying change in emissions or removals under the chosen method and avoid attributing the same outcome to several operations.

The stronger immediate contribution is an orderly beginning: known seed, a documented operation and observations that help the next decision. The biological and economic value of that beginning should be examined directly. Carbon recognition, if an eligible outcome follows, belongs to the account of that outcome.

When two instructions use the same name

Before publishing or teaching a preparation, compare the actual instructions. There is a concrete reason to do so. NITI Aayog's 2026 toolkit, Table 6.1, lists 100 grams of bund soil in its Beejamrit formulation; the NITI natural-farming components webpage lists one kilogram. Both are official descriptions, yet they are different. This book records the discrepancy for agronomic resolution rather than silently selecting a quantity. [S01, S24]

The primary Beejamrit paper describes about one kilogram of soil in its preparation method too. That documents the method reported there; it does not resolve the difference between the two official descriptions or establish the better quantity for a particular seed lot. More publications repeating a quantity are not a substitute for a relevant comparison. [S29]

Treat the discrepancy as a question about the actual preparation, not a conversion of units. One kilogram and 100 grams are different amounts. But that difference cannot be translated directly into the same proportional change in microbial activity, seed exposure or crop response. Those outcomes have not been measured by comparing these two instructions here. Preserve the source wording and the eventual local decision separately. A locally selected variant should be labelled as such, rather than attributed to a source that prints something else.

A versioned instruction should be identified by source, date, crop applicability and the review that selected it. Trainers should check that the printed sheet, spoken demonstration and batch record agree. A participant should not have to reconcile conflicting quantities while preparing material on sowing day.

This is a small example of a larger standard. The name of a preparation is a starting identifier. Reproducibility requires its actual materials and process. Even after the discrepancy is resolved, the selected instruction still needs appropriate seed handling and evidence for the outcome claimed.

A germination count the farmer can follow

The following is an illustrative counting exercise, not a seed-testing certification procedure or an efficacy result. Suppose two treatment conditions each begin with 100 seeds from an identified lot, under a reviewed comparison. By the specified observation date, 88 in one condition and 82 in the other meet the agreed germination definition.

The proportions are 88 percent and 82 percent, a difference of six percentage points. This is not the same as saying that yield increased by six percent. Nor do those two counts establish a reliable treatment effect. An adequate experimental design needs independent replication and uncertainty assessment; seed lot, test conditions and handling could affect the result.

Keep the denominators visible. If the record says “88 germinated” without the number tested, the result cannot be interpreted. Record seeds excluded before the test and why. Do not remove an ungerminated seed from the denominator merely because the observer later thinks it looked weak.

The exercise teaches an important habit: write what was counted before writing what the count means. The same habit is needed for emergence, disease incidence and harvest.

There are two different ways to express the illustrative gap. The absolute difference is 88 minus 82, or six percentage points. Relative to 82, the difference is approximately 7.3 percent. Both describe the same constructed counts on different bases. Neither is a measured farm benefit, a reliable causal effect or a prediction of harvest. State the denominator whenever a percentage is used.

From the test tray to the field row

Field emergence adds conditions that the germination check does not reproduce. To interpret it, record where the count was taken, the area or row length represented, the sowing date and the time of observation. A count taken earlier in one plot can create an apparent difference simply because the crops are at different stages.

Use the same defined observation rule across comparisons. If observers select only the fullest rows, the record describes selected rows. If the protocol uses fixed locations, retain them and record why any location becomes inaccessible. The field team should not improvise a new selection rule because a patch looks awkward.

Re-sowing is part of establishment. Retain the original entry, record the additional seed and work, and identify the area re-sown. Later production can then be linked to the actual effort used to establish the crop. A season that required two attempts should not be costed as a single attempt.

Separate treatment from the rest of the starting conditions

Suppose a treated strip is sown first, while the comparison waits until the next irrigation turn. Any difference now combines treatment and timing. Suppose one section receives a different seed rate. Plant number and competition may differ even if the preparation itself has no effect. A clear record prevents a misleading explanation.

For a component comparison, the protocol should specify how seed is divided, treatments assigned and sowing conditions kept comparable. For a whole-system study, different operations may be intentional parts of the systems. The interpretation must follow that question. Holding everything constant is not automatically the right design for every systems comparison; failing to describe differences is never helpful.

Researchers should report the intended comparison and the management that occurred. If weather interrupts sowing, record it. If equipment changes, retain its identity. These entries may explain more than a retrospective statement that all plots received the same attention.

A batch can connect several farms

A shared preparation batch needs one identity and several application entries. Record how much was prepared, supplied to each user, left over or discarded. Each receiving farmer should be able to connect the material to the plot and date of use.

If several farms receive the same batch, their experiences may help investigate a batch-level problem. They are not automatically independent tests of every preparation condition. The design and analysis should recognise shared sources where these could affect outcomes.

The service provider also needs a way to receive and record a complaint. A farmer reporting poor establishment should not have to prove the cause before the report is accepted. Record the observation, arrange appropriate investigation and distinguish the reported problem from a confirmed explanation.

Handle the operation as real work

Preparation, seed handling, cleaning and waste management belong in training and the cost account. Select suitable equipment and handling measures through the reviewed local guidance, particularly where animal-derived materials are involved. Do not use the word natural as a substitute for instructions.

At the end of the operation, return a readable batch-and-plot record to the farmer. Its value lies in the next decision: whether to repeat the operation, investigate the seed source, improve handling or revise the trial. That is useful knowledge even before any general claim about efficacy is justified.

How far a laboratory result travels

Panchal and colleagues' 2026 study examines eight Beejamrit samples using bacterial DNA profiling and two forms of chemical profiling. The methods describe preparation samples, not a randomized comparison of seedling establishment or crop yield. That distinction gives the study a useful, specific place in the evidence chain. [S29]

Read its sampling map before interpreting the differences:

- Six samples came from the university centre at Sardarkrushinagar, Gujarat, across kharif and rabi in 2023–2024.
- Two came from natural-farming practitioners at Bhumbhali, Gujarat, in kharif 2023.
- The samples were processed in triplicate for analysis. Repeated processing is not three independently managed farms or three separately assigned crop treatments. [S29]

The last distinction matters when a colourful laboratory chart is used to explain a farming system. Repeated processing can inform laboratory variation. It does not create additional independent preparation events, seasons or farms. To interpret an error bar, first identify what was repeated. The proposed pilot should preserve the preparation identity, the collected sample and the laboratory repeat as linked but distinct records.

The sampling map also limits the explanation of a difference. Farmer and university samples did not form a balanced experiment independently assigning ingredient source, season and preparation method. The authors discuss those influences as possible explanations for variation. The book should not turn that discussion into a measured effect of changing one ingredient or a ranking of farmer skill. A future component experiment would need the relevant contrast and independent preparation units defined before analysis. [S29]

The bacterial work uses a DNA marker to assign detected sequences to groups. A group's name can point towards a useful biological question. It does not demonstrate that every organism assigned to that group performs a particular function in the treated seed. Similarly, the chemical work compares profiles annotated through analytical libraries. A detected or annotated compound is not, by itself, a measured effective dose reaching the seed, proof that a particular microbe produced it, or evidence that it caused a crop response. These are limits of the inference being made, rather than reasons to discard the measurements. [S29]

Keep three questions in view: what was detected in the preparation; what activity occurred after application; and what changed for the plant. The proposed pilot can connect them through a selected, feasible hypothesis. For example, if the question is establishment, retain the preparation and seed-lot identities, define the handling comparison and count the chosen outcome. Additional laboratory work should answer a stated part of that question, rather than become a long list of impressive tests unrelated to the decision.

The authors themselves call for pot and field validation, assessment of activity under use conditions, and microbiological risk assessment. Their conclusion therefore does not close the crop-response or handling questions. Nor does finding a group described as beneficial establish that every constituent is useful or that every batch is suitable for every application. Local handling and quality decisions still need their own reviewed basis; this book supplies no microbial acceptance threshold. [S29]

This makes the result more useful to a farmer. The preparation has a biological composition worth investigating, and the investigation can be tied to an identifiable operation. A laboratory profile can help choose the next question. The seed and field comparison must answer whether the relevant benefit follows. Neither stage supplies a stand-alone carbon quantity.

Why the surrounding management matters

A useful component result is now available from Duddigan and colleagues' 2024 study. Its comparison retained the other three inputs when Beejamrit was omitted from a four-input package. The authors reported a smaller main-crop yield than under their complete package, but a smaller penalty than when the other inputs were omitted. This is evidence about that omission within that management background. It is not a test of every seed-treatment formulation used alone. [S06]

The authors also explain why the result does not establish a general disease-control claim: damage in their experiments was predominantly from above-ground insect pests rather than the soil-borne diseases the seed preparation is intended to address. A later yield difference cannot identify the disease that was prevented, or supply a missing diagnosis. Nor should the smaller omission penalty be turned into universal advice to skip seed treatment. [S06]

For the proposed pilot, keep two questions distinct. What changes when a specified seed operation is omitted from an otherwise defined package? What happens when a particular preparation or handling method is compared under a design intended to test that operation? A useful design states the comparison rather than relying on the treatment's name.

This lets the farmer ask a practical question without losing the evidence: what is the purpose of this operation for this seed lot, crop and field history? Relevant observations may begin before sowing and continue through emergence and harvest. If the concern is disease, the diagnostic record should accompany the crop observations; if it is establishment, keep the counts and their denominator. The next chapter explains the omission design and its wider interpretation.

Build a usable establishment decision

For the proposed pilot, the result returned to a household should link the lot and operation with the counts, their dates and any follow-up. Separate what was observed from the likely explanation and from the practical next decision. If the cause remains uncertain, say which question is still open.

The records should also make the service assessable. Did the agreed materials and guidance arrive before the operation? Was the instruction understood? Were departures documented? Was a concern investigated in time to help the next decision? Those are useful operating outcomes even while a causal biological question remains under study.

A locally useful instruction needs more than a reconciled ingredient list. It needs crop applicability, handling, timing, compatibility, a responsible adviser and evidence appropriate to the claim. The unresolved official soil-quantity discrepancy remains a specific review item. It is not resolved by choosing the more convenient number.

The aim is a beginning the farmer can understand and the researcher can trace: identifiable seed, a defined preparation, a recorded operation and an honest account of establishment. That foundation allows the rest of the cropping year to be evaluated with fewer unanswered questions about how it started.

06

II · PRACTICES AND RELATIONSHIPS

Jeevamrit and biological processes



Moong / green gram · Vigna radiata. Editorial plant illustration; no measured response or carbon gain is represented.

The container in which a preparation is mixed is only one part of the story. Materials have entered it from somewhere, someone has spent time making it, and the crop still has a seasonal demand for nutrients. To understand Jeevamrit, follow all three: the preparation, the field processes and the farm's resources.

Jeevamrit is presented within natural farming as a farm-prepared biological formulation. The scientific question is what a documented formulation does in a specified soil and crop, and how that contribution interacts with cover, water and other management. It should not be treated as a universal replacement factor in which a litre of preparation automatically substitutes for a fixed amount of every nutrient. [S01, S06]

Biology is a process, not an unlimited supply

Living organisms influence the movement and availability of nutrients. An increase in a biological indicator can therefore be interesting. It does not establish that the crop has received everything it needs, or that more carbon has remained in the soil over time.

Follow the materials. Nutrients may arrive in preparations, manure, irrigation water or other amendments. Some may become available from existing soil reserves. Biological nitrogen fixation has its own role, but it does not manufacture phosphorus or potassium from nothing. An account that ignores removals in harvested grain or fodder will miss whether the farm is drawing down a resource.

The nutrient-supply questions raised in the 2020 analysis by Smith and colleagues are particularly relevant to this distinction. They call for testing supply against production demands, especially where a farm is moving from higher input levels. The analysis is a reason to measure the balance, not a substitute for observing a specific field. [S13]

Give every batch a history

Two mixtures with the same name can differ in their ingredients, water, preparation conditions and age at use. Record these differences before investigating why their results differ. Use the locally reviewed formulation selected for the trial, and keep that version in the protocol.

The batch sheet should include collection and mixing dates, ingredients and quantities, container identity, person responsible, preparation conditions required by the selected guidance, and the time and route of application. If a batch is shared, record which plots received it. If it is not used, record its disposal or alternative use rather than deleting the entry.

Suitable handling and equipment cleaning should be demonstrated as part of preparation. Natural origin does not remove the need to handle animal-derived materials carefully or to use an appropriate application method. The aim is a reproducible operation a household can carry out with confidence.

Separate the volume made from the volume applied. Dilution adds water; it does not create more of an ingredient already in the batch. A field record should identify the original material received, any carrier water, the area treated and the remaining quantity. Otherwise one person may report litres of preparation while another reports litres of diluted application.

A batch's age also needs a defined starting event. Does the record count from collection, mixing or completion of the selected preparation process? Choose the definition in the protocol and retain the underlying dates. A common label such as fresh or ready cannot replace those observations when different batches are compared.

Test the component and the system

A complete natural-farming treatment changes several operations together. A component comparison can ask what happens when one specified operation is changed while the others remain defined. The 2024 study by Duddigan and colleagues used an omission design: its reference treatment contained seed treatment, solid Jeevamrit, liquid Jeevamrit and dead mulch. Each alternative omitted one of those inputs. [S06]

The study ran through kharif and rabi in 2019–2020 across five Andhra Pradesh districts in four agro-climatic zones. Treatments had three replicate plots in randomized blocks at each experiment. The Anantapur experiment moved between seasons because of logistical constraints, so it was not one unchanged site throughout. The following is a reading map of the treatments, not a recommended pilot size or cultivation schedule. [S06]

Study comparison	Inputs retained	Input omitted
Reference package	All four defined inputs	None
Seed-treatment omission	Solid and liquid preparations; dead mulch	Beejamrit
Solid-preparation omission	Seed treatment; liquid preparation; dead mulch	Solid Jeevamrit
Liquid-preparation omission	Seed treatment; solid preparation; dead mulch	Liquid Jeevamrit
Dead-mulch omission	Seed treatment; solid and liquid preparations	Dead mulch

The authors reported lower main-crop yield in each omission treatment than in their reference package. Yield measurements excluded the intercrop and were standardized for comparison across crops. The study did not include a new conventional-versus-natural or organic-versus-natural comparison. Its result should not be presented as another independent ranking of those complete systems. [S06]

The liquid-omission plots received equivalent water, helping separate omission of the formulation from omission of its carrier water. Application traffic was not necessarily identical. This is a useful design lesson: control what can reasonably be controlled and preserve operational differences that could affect interpretation. It is not a reason to assume the exact mechanism has been isolated.

For the proposed pilot area, the main whole-system comparison and any component work should retain their separate questions, identities and analysis plans. The reference treatment must be described operationally. A record saying only full adoption cannot show whether the seed operation, materials, water and timing actually matched the intended comparison.

What would persuasive evidence look like?

Start with the outcome. For establishment or yield, define the crop measurement. For nutrient supply, measure relevant inputs, crop removals and soil or plant indicators using suitable methods. For a biological mechanism, specify the assay and its limits before presenting it as an explanation.

Question	Evidence to collect	What the evidence does not establish alone
Was preparation consistent?	Versioned batch and application records	A crop response
Did crop performance change?	Comparable establishment and harvest measurements	The mechanism responsible
Was nutrient supply adequate?	Material account and relevant soil/plant observations	Long-term sufficiency in every soil
Did biological activity change?	Defined, repeatable biological measurements	A carbon-removal quantity
Did the household benefit?	Cash, labour and full-cost accounts	Eligibility for a carbon credit

This sequence keeps a promising observation from being stretched into a claim it cannot answer.

The cost of making it locally

Local preparation can reduce the need for some purchases. It can also create collection, transport, preparation and application work. Value the quantities actually used. Do not charge the entire cost of keeping livestock to one batch, but do not assign livestock resources a zero cost merely because they were available at home. Choose and disclose a defensible allocation.

Shared preparation can change these economics. A community facility may make supply more reliable while adding service and transport costs. Compare the delivered preparation and the service, including timing and batch records. A lower price means little if the material arrives after the intended operation.

Read the field before increasing a claim

If a crop struggles, investigate rather than repeating a fixed explanation. Check establishment, water, root conditions, nutrient observations, competing weeds and other operations. Record adjustments and their reasons. The farmer should not be asked to protect an attractive theory by accepting an unexplained loss.

The carbon chapters use the same discipline. A formulation can be part of a management change that affects greenhouse gases. The qualifying result must still be established at its proper boundary. More microbial activity in a sample is not a measurement of net carbon removal. A well-documented practice gives researchers a sounder basis for finding out what actually changed.

A nutrient budget that does not start with a promise

Start the proposed nutrient account with quantities, not names. For each material, record the amount applied, its measurement basis and any defensible composition information. Record harvest removals on the same nutrient basis. Where laboratory values are unavailable, mark the uncertainty instead of giving a familiar preparation an assumed universal nutrient content.

A deliberately hypothetical example shows why this matters. If a material supplies 500 kilograms of dry matter with one percent nitrogen, it contains five kilograms of total nitrogen. That calculation says nothing by itself about the share available to this crop or the timing of availability. If a concentration was measured on a wet basis, it cannot be multiplied by dry mass without a consistent conversion.

Nor can five kilograms of material nitrogen be described as five kilograms of nitrogen taken up by the crop. Losses, timing, transformations and other sources belong in the assessment. A nutrient budget is a way to organise those questions. It is not a shortcut for declaring sufficiency from one ingredient.

Available, taken up and removed are different quantities

A crop can obtain nutrients from several places during the season. The amount present in an applied material, the amount becoming available, the amount entering the plant and the amount leaving in harvested produce are different quantities. Keep their names and units explicit.

The distinction also helps interpret a good harvest. Production may be supported partly by existing reserves. That is not automatically a problem, but a single harvest cannot establish whether the same level can continue over several rotations. Repeated accounts and relevant soil and plant measurements are needed to investigate the trajectory.

When a crop residue returns to the same plot, it is a transfer within the chosen farm boundary. When fodder leaves and manure returns later, record both movements with their quantities and sources. The returning manure is not necessarily identical in nutrient content to the material originally removed. A circle on a diagram does not close the nutrient balance.

Define whether the account follows a plot or the whole farm. Manure transferred from an animal unit to a crop plot may be an input to the plot while remaining an internal transfer within the farm. If its originating feed was purchased, that purchase belongs at the relevant farm boundary. The same physical nutrient should not become two external additions simply because it passed through two records.

A balance also needs an honest unknown category. Biological fixation, irrigation contributions, deposition and losses may require different evidence. Mark what has been observed, estimated or left unresolved. A balance that appears complete only because unknown terms were set silently to zero is less informative than a partial account that names them.

What does a microbial measurement answer?

Before commissioning a biological test, write the question it is meant to answer. Is the laboratory identifying organisms, measuring a selected activity or evaluating an association with a crop response? Which material is sampled: the preparation, the root zone or bulk soil? At what point after preparation or application?

A result from the container should retain that identity. It should not become a statement about the whole field without the relevant evidence. Likewise, a change in one soil indicator should not be expanded into a claim about every biological process.

Ask the laboratory for the method, units, detection limits where relevant and conditions that affect comparability. Preserve batch and sampling identities. Without them, an impressive number cannot be connected reliably to the operation that produced it.

A useful research chain connects a documented preparation to an exposure in the field, then a defined process or plant response, then a relevant farm outcome. Finding one link is valuable. It does not establish all later links automatically.

Match the measurement to the statement. A culture count describes organisms that grew under the selected laboratory conditions. A molecular profile describes the material and measurement used for that profile. A process assay asks another question. None should be renamed as total field fertility without the relevant plant, soil and material evidence.

In the proposed pilot, a useful specialist result should identify its sampling point, units, date and interpretation limit. If the result suggests a process worth testing, specify the next observation needed. The household should receive an explanation of what the test changes in the farm decision, not merely a technical number with a favourable adjective.

Shared production needs a service account

A community preparation facility can be assessed as a service. List its materials, water, containers, space, equipment, labour, cleaning, transport and record keeping. Separate start-up equipment from recurring operations. Record the volume prepared, the volume delivered and any loss; a cost per litre depends on which denominator is used.

For an illustrative service calculation, suppose one batch costs ₹1,200 to prepare and deliver and 200 litres are actually delivered. Its listed cost is ₹6 per delivered litre. If only 150 litres are delivered for the same listed cost, the figure becomes ₹8. These invented numbers illustrate allocation, not a price recommendation or a production standard.

The farmer's account should include the quantity received, amount paid and application work. The service account should include any subsidy separately. That allows the programme to ask whether a fee covers recurring costs and whether farmers still find the arrangement worthwhile. A subsidised price can be a deliberate policy choice; it should be visible.

Use the same delivery boundary when comparing services. A collection-point price and a delivered-to-farm price may cover different work. A household may still supply containers, transport or application labour. Put those contributions into the comparison before deciding which arrangement costs less.

Keep rejected, undelivered and returned quantities visible. A service can learn from them: did demand change, did transport fail or did a batch depart from the selected instruction? Record the actual reason if known. Dividing only by the volume made can make an unreliable service look inexpensive while the household pays for the gap.

What to do when two batches differ

First verify identity and records. Were the same instructions used? Were ingredient quantities measured on the same basis? Did the preparation or delivery schedule change? Did the farms use the material at the intended time? These questions should be answered before attributing a crop difference to an unseen biological cause.

Retain departures as data. A batch that did not meet the selected instruction should not quietly disappear from the operational record. Mark how it was handled and whether any crop received it. The analysis can then distinguish the intended protocol from the actual delivery programme.

A failed delivery may teach something about feasibility even if it teaches little about biological efficacy. Reporting both helps institutions decide whether a promising component can be supported under ordinary farm conditions.

How this changes the claim we can make

The most useful immediate claim may be modest and specific: this preparation was made consistently, reached the intended plots on time and was tested within a defined management comparison. A crop or economic result can then be added when the corresponding evidence exists.

A stronger causal explanation needs evidence for the proposed mechanism, not just an attractive name for it. A long-term nutrient-sufficiency claim needs a longer account than a season's yield. A climate-removal claim needs the stock and emissions framework in Part IV.

These distinctions guide the reading of studies and the material accounts that follow. They connect a farmer's practical question with evidence a researcher can examine independently.

Read studies as different questions

The following evidence map keeps the question and inspection limit beside the finding. It is not a pooled estimate or a ranking of every natural-farming system.

Source and scope	Contribution to this question	Limit to retain
Duddigan and colleagues, 2024	Omission trial: retaining the defined four-input package gave higher main-crop yield than each single omission	Within-package comparison; mechanism, full system ranking and long-term interactions are separate questions [S06]
Aulakh and colleagues, 2013	Cereal application comparison reported no significant grain-yield response	Defined nutrient backgrounds; not the four-input omission question [S31]
Darjee and colleagues, 2024	Previously organic Uttar Pradesh rice–wheat trial compared packages; some biological indicators and grain-yield rankings favoured different treatments	Mulch, tillage and inputs varied together; the package comparison does not isolate Jeevamrit [S30]

Aulakh and colleagues' Punjab experiment used split plots with three replications over two years. Background nutrition and Jeevamrit application were separate treatment factors. The application comparison found no statistically significant grain-yield response. It did not test omission from Duddigan and colleagues' four-input reference package. [S31, S06]

Those results should not be made to cancel each other out. Adding an operation to one background and removing it from another are different interventions. A preparation may also differ between experiments. Before explaining a disagreement biologically, identify the material, the remaining management, the actual comparison and the outcome. A common name is insufficient to make two estimates interchangeable.

For a family considering a change, translate the decision into a question:

- Keep the current management and add the preparation? The useful comparison holds the relevant background in view and identifies the additional operation and work.
- Replace an existing nutrient source? The question concerns the replacement arrangement, including what is removed. Evidence for adding an operation does not automatically establish that replacement.
- Adopt or alter the complete farming system? Describe the whole arrangement and its feasible comparator. A component result informs this question but does not measure every change in the system.

These are proposed decision questions, not crop recommendations or descriptions of work already conducted in the CarbonVerse pilot. Their value is that a household and a researcher can identify the same proposed change before choosing a trial or reading a result.

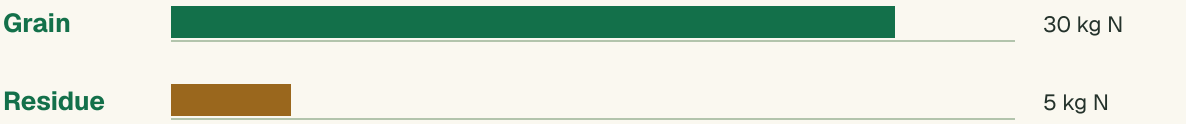
Read a table at the level it reports. An average for an application across several nutrient backgrounds is not automatically the result for one particular combination. Keep the background, the application and their combination distinct. Where a decision depends on an interaction, ask whether that interaction was estimated and with what uncertainty. Do not reconstruct an unreported combination by adding separate row averages.

A statistically non-significant comparison also needs careful language. It is not a guarantee that the effect is exactly zero, that two arrangements are equivalent, or that an important effect could not have been missed. Conversely, it is not permission to assert an unmeasured benefit. The pilot's analysis plan should identify the effect of practical interest and the precision needed to assess it; selecting that target after seeing a convenient result would change the question.

Keep the explanation equally disciplined. A crop result can challenge a nutrient-sufficiency claim without identifying every biological mechanism. If a proposed explanation concerns nutrient mobilisation or microbial function, select evidence that can examine that function. A culture count and a harvest measurement should keep their different roles rather than be forced into a complete causal story.

The useful response to contrasting evidence is therefore a better specified next decision. Retain an unfavourable result, describe the conditions it addresses and explain what remains uncertain. For the proposed pilot area, choose between a whole-system comparison, a component question and an operational delivery question according to the decision at hand. None should be presented as another experiment's answer simply because both use the word Jeevamrit.

Hypothetical nitrogen leaving the plot



Total if both leave: 35 kg N

Invented values, not a crop requirement, application recommendation or measured soil depletion.

Follow a hypothetical harvest removal

Consider a teaching example with invented composition values. Suppose an account records 2,000 kilograms of dry grain containing 1.5 percent nitrogen and 1,000 kilograms of dry residue containing 0.5 percent nitrogen. The grain contains 30 kilograms of nitrogen; the residue contains five. If both leave the plot, the recorded removal in these materials is 35 kilograms.

If the residue remains within the plot boundary, the recorded outward movement in this example is the grain's 30 kilograms. The residue should retain its destination record rather than be counted both as removed and retained. If it moves to another farm unit, distinguish that plot transfer from export out of the whole farm.

Compare those figures with the earlier hypothetical material containing five kilograms of total nitrogen. They are different entries, not proof that the preparation supplied the whole crop demand. Other inputs, soil contributions, transformations and losses remain to be assessed. Subtracting five from 35 gives a 30-kilogram difference between these particular recorded terms; it is not a measured depletion of soil nitrogen.

This example is neither a crop requirement nor an application recommendation. Its purpose is to show how mass, composition and destination produce an interpretable record. Actual nutrient balances need suitable measurements, consistent bases and a clear account of missing terms.

Measure what reached the plot

A concentration needs a measurement basis as well as a unit. Grams per litre describe something different from a percentage whose mass or volume basis has not been explained. Dry material and the original wet preparation also need different accounting. Ask what the laboratory sampled, what its result means and how that result connects to the material actually applied. Add density only where the required conversion calls for it; do not invent it to complete a calculation.

The rice–wheat study illustrates why this matters. Its input table reports nutrient percentages, while liquid application quantities appear elsewhere. Those entries need an explicit common basis before they can support a nutrient-delivery calculation. The unusual seed-treatment unit printed in its treatment table also remains a review question. A published entry is evidence of what was reported; it does not, by itself, establish a usable local instruction. [S30]

The starting soil record needs the same care. This paper's site description and initial-properties table give different starting values. The methods also describe different soil depths for the site properties and sample collection. Preserve those distinctions. Before calculating change, establish which area, depth, sampling time and sample record each value represents. Without that link, choosing a convenient starting number can create an apparent change that the comparison has not established. These differences require clarification; they do not establish which entry is wrong. [S30]

The site's history matters too: it had been organically managed for more than six years before the experiment. Its response cannot simply stand in for a household's first conversion season. The local pilot needs its own documented starting conditions. [S30]

In the application log, keep preparation quantity and carrier water separate. Record spills, leftovers and material diverted to another plot. Follow what reached the defined area, rather than only what was mixed at the centre. Then distinguish a delivery failure from a crop response after confirmed delivery. Each calls for a different investigation; neither is explained by the preparation's name alone.

Use the result to improve a decision

The pilot should return a concise account of the formulation used, delivery, field management, observations and remaining uncertainty. Explain whether a result concerns the preparation, a soil process, a crop response or the household service. Keep those identities when the information moves into a summary.

A locally reviewed operation can be improved through evidence without pretending to be a universal formula. If a measurement identifies a constraint, decide what additional observation or support is justified. If the result does not answer the question, improve the design or limit the claim. A larger application is not an automatic answer to an unexplained problem.

The next step is to read the crop response and the process measurements together. They can tell a useful story while leaving different questions open. The following comparisons show how to keep both kinds of evidence usable.

A crop response and its explanation are different findings

The omission study provides a concrete example of a result worth taking seriously without accepting every suggested explanation. Removing solid or liquid Jeevamrit reduced yield relative to the reference package, while the authors did not find significant corresponding changes in the measured microbial community, diversity or enzyme activity. They leave the mechanisms unresolved and call for further work. [S06]

A practical reading preserves the crop result and asks what would distinguish the explanations. Material may carry nutrients; an operation may change water exposure or traffic; a biological process may occur at a place or time not captured by the selected measurements. These are hypotheses to examine, not findings assigned by this book. An assay that did not detect a difference should not be made to prove either that every biological process was unchanged or that an unmeasured benefit must have occurred.

The same care applies to the word synergy. In an omission trial, each comparison asks what changes when one part is removed from the remaining package. It does not show what that input achieves alone, nor test every possible combination. The study itself identifies the need for a different design to separate additive effects from interactions. [S06]

For the farmer, this supports a better conversation about partial adoption. First identify the actual constraint: unavailable material, a delivery failure, labour at a crowded time, or uncertainty about the operation. Then ask what evidence applies to the proposed change and what support could make the arrangement feasible. A study's relative omission ranking does not resolve every crop, disease or resource question locally.

Do not require a family to adopt an infeasible package to preserve a label. Equally, do not silently remove components while presenting earlier full-package evidence as a forecast for the altered arrangement. Record the actual management and its reason. If the programme proposes to investigate that arrangement, make its comparison and review point explicit.

This leads to a service decision as well as a research question. The batch centre can check whether it delivered the intended material at the right time. The agronomist can assess crop and field concerns. The researcher can decide whether an additional component comparison is needed. Keeping those responsibilities clear gives a promising result a practical route into better cultivation.

A standardized yield is not a harvest weight

The 2024 trial used z scores to compare yield observations across crops. A z score expresses a plot's distance from the relevant experiment's mean in units of that experiment's standard deviation. It is not a tonne, kilogram or percentage gain. The original crop weights remain necessary for a farm account. [S06]

Consider two invented examples, solely to explain the transformation. In example A, a plot gives 4.5 tonnes, the experiment's mean is 4.0 tonnes and its standard deviation is 0.5 tonne. The z score is (4.5 − 4.0) ÷ 0.5 = 1. In example B, the corresponding quantities are 120 kilograms, 100 kilograms and 20 kilograms: (120 − 100) ÷ 20 = 1. These are not observations from the study or expected yields for any crop.

Invented example	Weight above its own mean	Standardized distance
A	0.5 tonne	1 standard deviation
B	20 kilograms	1 standard deviation

The same standardized distance has different physical meanings. Adding the two z scores does not produce a harvest, a household food quantity or a carbon benefit. Similarly, a plotted gap in z scores cannot simply be read as a percentage yield response.

The proposed pilot should therefore retain original quantity, unit, harvested area and crop identity beside every derived variable. If standardization is useful for a defined analysis, preserve its reference group, mean, standard deviation and version. Return physical output and costs to the household in familiar units, then explain the separate analytical comparison. A useful scientific summary should make the farm account easier to understand, rather than replace it.

07

II · PRACTICES AND RELATIONSHIPS

Soil cover and residues

A crop residue does not become unused merely because the grain has been harvested. It may already have a place in the household's fodder store, cooking arrangements, sale plan or next field operation. Before recommending that it remain as mulch, find out where it would otherwise go.

Soil cover is a central part of natural farming. The work can involve retained crop material or a managed living cover. Those choices have different demands on water, labour and the cropping calendar. Describe what covers the soil, when it is present and how it is managed. The word mulch alone is not a complete treatment description. [SO1]

Allocate the residue actually available

One physical quantity

Soil cover	Animal feed	Fuel or sale	Suitable processing

Reconcile allocations with the available material. Give returning material its own record.

Follow the material before following the benefit

Prepare a residue account at harvest. Start with the material actually available on a stated moisture basis. Estimate or measure the portion retained, fed, sold, burned, processed or otherwise used. Keep the method of estimating quantity visible; a remembered cartload is different from a weighed load.

The entries should add up without using the same material twice. If straw is sent to a biochar unit, it is no longer all present as raw mulch. If manure or digestate returns, it is a new movement with its own quantity and composition. Calling it a return does not mean the original material has remained unchanged.

Material movement	Record	Question for the household
Residue retained on the plot	Quantity, timing and placement	Does this change fodder or fuel availability?
Residue removed for animals	Quantity and destination	What returns to this field, and when?
Material sold or processed	Buyer, quantity, price and transport	Who receives the money and pays the work?
Living cover introduced	Species, area and management	How does it fit water and crop operations?
Unused or lost material	Estimated quantity and reason	Could the next season's plan reduce the loss?

Observe the soil surface

A practical cover record should use defined observation points and dates. Record whether the surface is bare or covered, what the cover consists of, and whether management has changed. Observe after important operations and weather events as well as when the field looks its best.

If moisture or temperature is being compared, use the same depth, timing and instrument approach across treatments. An observation immediately after irrigation should not be compared with a dry field measured at a different point in its irrigation cycle. Record rainfall and water application alongside the reading.

FAO's conservation-agriculture guidance describes surface cover as protection from raindrop impact and a way to reduce soil evaporation. It also identifies the need to manage a living cover before competition with the next crop. These are mechanisms and management questions, not a measured response for every zero budget natural farming field. [S32]

Turn the proposed benefit into an observation. If the question is surface protection, document the surface and relevant weather. If it is irrigation demand, retain the irrigation sequence and crop result. If it is reduced weeding work, record the changed tasks. The same photograph cannot answer all three questions.

Duddigan and colleagues' 2023 experiment helps explain why treatment detail matters. Natural farming included mulch; the organic comparator did not, and all treatments used no tillage. The study reported context-dependent yield and moisture advantages, while soil organic carbon did not show a significant treatment effect during the study. These findings concern those treatments and that period. [S04]

Living cover asks for management

A living plant can provide useful cover while also using resources. Its role must fit the main crop and the season. Choose species and termination or harvesting decisions with local crop guidance. Record whether the cover itself yields food or fodder and whether its labour is included in the account.

Local agronomic selection remains essential. A plant belonging to India is not automatically suitable for every Indian field, soil or irrigation condition. The intended role, crop relationship, available water and seasonal work need assessment.

Weed observations also need a defined basis. Record the chosen count, cover estimate or weeding work consistently. Less weeding time can be an economic benefit even where no carbon outcome is established. If a problem increases, record the response and its cost rather than removing it from the system description.

A conversion project changes the comparison

Biochar and biogas may offer additional routes for suitable material. Their value depends partly on what would have happened to the feedstock otherwise. A project cannot assume that every residue was waste with no prior use.

If removing material reduces cover or requires replacement fodder, those effects belong in the assessment. So do transport, processing and any returning material. The carbon method will determine the formal accounting boundary; the farm account should still show consequences that matter to the household outside that boundary.

This is where integrated planning earns its place. It compares allocations before committing biomass to several incompatible uses. It can find combinations that work together, but it cannot make the physical material available twice.

The result to carry forward

At the end of the season, bring together cover observations, crop performance, water records, labour and material movements. Ask whether the household could repeat the practice without an unrecorded subsidy in materials or work.

Carbon in residue is not automatically durable removal, and cover is not itself a credit unit. The important next question is how management changed the relevant stocks or emissions against a defensible baseline. The residue account makes that question answerable while keeping the field's immediate needs in view.

Make the residue account balance

Take a hypothetical harvest yielding six tonnes of dry residue. Suppose the household allocates four tonnes to fodder, one tonne to field cover, half a tonne to sale and half a tonne to storage. The six tonnes have now been allocated. A proposal to send two tonnes to a conversion unit cannot be added as another free use; some existing allocation must change.

This example is an accounting exercise, not an observed residue yield or recommended allocation. The quantities that matter on a real farm must be measured or estimated transparently. Keep grain, straw and other co-products distinct and record the relevant moisture basis.

Identify the accounting date as well as the harvest. Opening stock, new material received and material produced must reconcile with outward movements, closing stock and separately recorded losses or unexplained differences. Material already stored at the beginning of the period is not a second harvest. Material moved between two units on the same farm is a transfer, not new production.

Hypothetical dry-residue allocation	Tonnes
Fodder	4.0
Retained for cover	1.0
Sold	0.5
Stored at the accounting date	0.5
Total allocated	6.0

If stored material is later used, update the inventory. Do not count the storage entry as an additional final use. If material arrives from another farm, add an incoming movement with its source. A balancing difference should be investigated or reported as unmeasured; it should not be filled with an invented quantity called “other recycling.”

Which material has really become available?

Ask about commitments before calling residue surplus. A household may need the material later, after the present field visit. A neighbour may have an established exchange arrangement. Storage may bridge a period when fodder is scarce. Sale may provide money for the next crop.

The question is therefore more precise than whether the material is lying in a pile today. What use has been arranged? Who controls the decision? What would replace that use if material moved elsewhere? An attractive collection price should be compared with the value and cost of the displaced arrangement.

This approach also protects a carbon assessment. The feedstock's baseline fate must be established under the relevant method. A project's preferred story about unused material cannot substitute for the household's history and records. Even when a material qualifies under a method, the ordinary farm account should retain the effects important to the household.

Observe cover without choosing the best photograph

A picture can document a particular point and date. To compare cover through time, use a defined observation rule. Choose the observation locations according to the protocol, record the date and field operation, and retain photographs from repeat visits where appropriate.

The proposed pilot could use fixed photographic positions alongside a reviewed cover-estimation method. The final protocol must specify selection, viewing area, observer training and how patchiness is represented. No universal number of observation points is set here.

Distinguish material mass from the proportion of soil surface covered. A weighed load tells us how much material was present on its stated basis; a surface observation tells us how it was distributed at that visit. Do not convert kilograms into percentage cover through an assumed universal formula. Keep the two records linked where both are measured.

Look after sowing, management operations and important weather events, rather than only at peak cover. A seasonal account can show when the soil was exposed and whether the practice fitted the crop calendar. A single attractive photograph cannot describe that history.

For interpretation, retain management records with the images. Material spread yesterday and material retained through the season represent different observations. So do a weed-dominated cover and the planned crop or residue cover. Describe them rather than treating all green or brown pixels as the same treatment.

Measure work that shifts between operations

Retaining cover may change several operations. Record collection, spreading, repositioning, sowing through the material, weeding and any later handling where they occur. A statement that one task took less time is useful, but the whole work account needs all changed tasks.

Household work can also move between people. Ask who performs the new operations and when. A saved paid operation does not necessarily mean that the household has gained the same number of free hours.

Compare the timing as well as the total. Spreading material in a relatively quiet period may be manageable; arranging it during a narrow sowing window may be difficult. These distinctions help explain why the same proposed practice can be attractive to one household and impractical for another.

Live cover and harvested co-products

A living cover should have an identifiable purpose and management plan. If it yields food or fodder, record that output and its harvesting work. If it remains unharvested, record its place in the field and how it is managed before the next crop.

The account should distinguish an intentional cover from an unplanned change in weed management. Both may affect observations, but they answer different questions. A protocol should also say how local guidance will handle competition with the main crop and what response follows a concern. This book does not supply a universal species mix or termination date.

Where a demonstration includes several crops, show their quantities separately. If a value aggregate is used, disclose prices and compare on the same area and period. A productive additional crop is valuable without being presented as an unexplained increase in the main crop's yield.

Plan a biochar question before removing material

Before a proposed conversion module receives feedstock, draw the material route. Identify the supplying plot, collection, transport, processing, losses and final product destination. Link the returned product to its batch and application record. Keep raw residue quantities separate from product quantities.

The farming-system comparison must also show what changed on the supplying plot. Did cover decrease? Was fodder replaced? Did household work or cash change? Do not assume that a conversion benefit answers those farm questions.

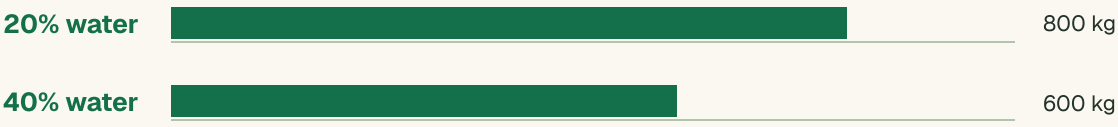
The climate account then follows the selected method, including its relevant baseline, process emissions, durability and safeguards. A field carbon measurement containing added biochar cannot automatically be treated as a second removal of the same carbon already credited through the biochar route.

The decision belongs to the whole season

At the next planning meeting, place the allocation table beside the crop and household accounts. Which uses were fulfilled? Which required an unplanned purchase? How much remained and where? Which observations justify keeping or changing the arrangement?

This discussion may support more cover, a different material source or a narrower conversion proposal. It may also show that no uncommitted residue is available. The following accounting and operational examples help make that decision explicit.

Dry material in a one-tonne wet load



Hypothetical example; water is a percentage of total wet mass. Not a typical crop moisture or recommended quantity.

A wet load is not the same as dry material

Suppose a teaching example records a one-tonne load with water equal to 20 percent of its total wet mass. The dry material is 800 kilograms. Another one-tonne load at 40 percent water contains 600 kilograms of dry material. The scale shows the same load mass, yet the dry quantities differ by 200 kilograms. These are invented values, not measurements or typical moisture contents for any Indian crop.

The calculation uses a wet-mass basis: dry mass equals wet mass multiplied by one minus the water fraction. A laboratory value expressed on a dry-mass basis needs a different conversion. Ask which basis was used before combining records. The word moisture without its basis is incomplete information.

Suppose, still hypothetically, that the first load later weighs 900 kilograms and its water fraction is measured as 10 percent. Those entries imply 810 kilograms of dry material, ten more than the original estimate. That difference is a reason to check sampling, weighing, dates and possible material movements. It is not proof that storage created ten kilograms of new crop residue. Preserve the entries and investigate their consistency.

Weighing and sampling need to refer to the same material at a meaningful time. A moisture sample from one small corner may not represent a mixed load. A later sample should not silently replace an earlier measurement. The proposed protocol must specify how a representative sample is obtained and how uncertain quantities are reported.

For the farmer, the useful output is straightforward: what was collected, how the quantity was established, which uses were met and what remains. The detailed record supports that simple account. Precision should follow the measurement rather than the number of decimal places a spreadsheet can display.

Can the next crop actually be established?

Residue retention has to meet the next field operation. In the rice–wheat setting, the question includes harvesting, residue distribution, equipment access, field condition and the available sowing window. A plan that counts only the final mulch layer can miss the work needed to establish wheat through that material.

Sidhu and colleagues' 2015 Turbo Happy Seeder paper, as summarised in CIMMYT's research catalogue, describes sowing wheat into rice residues in north-west India. It also records operating constraints, including wet straw and residue distribution. Only the catalogue abstract was inspected here. This is evidence about a particular technology, not a complete natural-farming comparison. [S33]

A different study asks what happens after wheat is established. Balwinder-Singh and colleagues' 2016 paper used the APSIM model to simulate irrigated wheat at Ludhiana on sandy loam and clay loam soils. The model assumed non-limiting nutrients and used separate crop-development calibration for mulched and non-mulched wheat. It did not test whether natural-farming preparations could replace nutrient inputs. [S34]

In those simulations, the response to mulch depended on sowing time, soil and seasonal conditions. Earlier sowings could benefit while delayed sowings faced a greater chance of yield loss. The authors called for further field and simulation evaluation of that interaction. This is a reason to investigate timing alongside cover, not a local sowing calendar or a promise that mulch always raises yield. [S34]

The paper also distinguishes two water-productivity measures: grain yield divided by irrigation applied, and grain yield divided by evapotranspiration, the water leaving soil and plants as vapour. Each uses a different water quantity. Keeping the same harvest while reducing irrigation raises the first ratio; that alone does not show an equal reduction in total water consumed. For the proposed field account, retain irrigation, rainfall and the relevant soil-water observations rather than label every change in a ratio “water saved”. [S34]

The modelling paper does not remove the operating problem described in the machinery abstract. A household may understand the value of retaining residue yet still be unable to establish the next crop on time. For a local demonstration, investigate three links:

- From harvest to cover: describe residue placement and field condition, including any departure from the planned operation. A final photograph cannot reconstruct the whole sequence.
- From booking to completed work: identify the service, agreed contact, travel, waiting, interruptions and area actually served. A machine somewhere in the district is not confirmed access within this household's crop window.
- From changed operation to changed comparison: retain the actual sowing date, manual or machine work and any revised water or input management. If the operation changes, investigate that change before attributing the season's outcome to cover alone.

The proposed observations need agronomic review and an agreed measurement procedure. They do not prescribe a present-day machine specification, rental price, irrigation threshold or preferred product. The simulation's assumptions and the household's actual conditions must remain visible as different records.

The broader lesson is to assess the sequence. A practical cover option must connect the previous harvest to the next crop's establishment. Its usefulness depends on that connection being feasible, not simply on a promise that residue will remain somewhere on the farm.

A cover record should survive a difficult week

The most useful visit may be the one after an operation or weather event has changed the surface. Return to the defined observation units, describe what is present and link the visit to the event record. If a location cannot be observed, retain the missing visit and its reason. Do not replace it with the nearest attractive patch without recording a protocol departure.

Where photographs support a cover estimate, identify their viewing area, orientation and classification rules. Can an observer distinguish live crop, residue, unplanned vegetation and bare soil consistently? Can another observer interpret the same frame? These questions should be settled in the pilot's training and quality checks before an automated image score is used as an outcome.

A changing cover record can be useful without a single season-wide percentage. Dates matter. A surface protected at one visit and exposed at another should retain both observations. If the study later summarises time under cover, explain how the gaps between visits were handled; the record does not directly observe every day between photographs.

Compare feasible allocations with the household

Bring alternatives to the same area, period and material basis. The proposed review can use the following questions without pretending that every farm must choose the same allocation.

Option to assess	Consequence to investigate	Record needed before a decision
Retain a larger share on the plot	Another existing use may need a replacement	Material allocation, displaced use and actual replacement arrangement
Obtain material from elsewhere	Collection and transport become part of the option	Source, quantity basis, permissions and work/cash record
Introduce a living cover	Water, crop timing and management must fit	Locally reviewed species/management plan and crop observations
Supply a conversion module	The supplying plot and household also change	Revised allocation, product route and separate climate-method assessment

Ask who can authorise the change and who must carry it out. A person agreeing to a sale may not be the person responsible for finding replacement fodder. Record those roles before describing a collective benefit. A technically workable allocation can still be unacceptable to the household if it displaces an essential use or concentrates difficult work on one member.

The chosen arrangement should return to the next season's plan with its reasons. Keep successful operations, unresolved difficulties and the case for changing an allocation together. Soil cover earns a lasting place when the farm can support it through the whole year and the evidence shows what it achieved.

08

II · PRACTICES AND RELATIONSHIPS

Waaphasa and water management

Water arrives at a field through weather, an irrigation arrangement or both. The farmer's decision is not simply whether water is good. It is how much can be supplied, when it is needed, how it reaches roots and what happens when supply is unreliable.

Waaphasa draws attention to moisture and aeration around roots within natural-farming practice. It should lead to careful crop-specific decisions. It should not become one watering instruction applied unchanged to upland crops, flooded rice and every soil. The intended condition must be translated into observations a farmer and adviser can use. [SO1]

Start with the water arrangement

Record the source, access conditions, method of application and the person deciding irrigation. A farmer sharing a canal turn has different control from a farmer operating a private pump. A tenant paying by the hour may face a different incentive from an owner paying electricity or fuel costs directly.

Distinguish the water requested, the water delivered and the water used within the crop system. If only pump hours are known, say so. Hours alone do not establish volume where flow varies. A volume estimate should disclose how flow was measured or calibrated and how duration was recorded.

Give the measurement a physical location. Water measured at a pump outlet is an entry at that point. Water measured entering a particular plot is an entry at the plot. If several fields share a channel, explain the route and any allocation rule before assigning the pump's entire volume to each field. One supply cannot become several complete supplies in the account.

Measure a change on a common basis

A claim of water saving needs a comparison: less than which management, over what period and for what area? Record rainfall, crop, soil conditions and major management differences. A wet season can reduce irrigation without proving that the changed practice caused the reduction.

State whether the indicator is irrigation applied, total water supplied or another defined measure. Do not describe an irrigation reduction as a complete estimate of catchment-level water conservation. Return flows and changes elsewhere may matter to that wider question.

Record	Practical purpose
Irrigation date and plot	Connect water to the actual crop operation
Duration and measured/calibrated flow	Estimate applied volume with a known basis
Rainfall and major weather events	Interpret seasonal differences
Crop stage and field observation	Explain why the decision was made
Energy, charges and labour	Assess the household's cost
Missed or interrupted supply	Identify a constraint outside the intended practice

The crop must remain visible

A schedule should respond to the selected crop and local conditions. During the pilot, document the agronomic guidance, monitoring method and response when observations indicate a problem. Water-saving ambition must not hide a production loss or transfer an impractical burden to the farmer.

Where soil cover or crop diversity changes at the same time, record them. A whole-system comparison may estimate their combined effect. It will not automatically identify which part caused a difference in irrigation or yield. A component experiment needs its own allocation and measurement plan.

The decision record should show the information available at the time: crop stage, observation, advice, action and any constraint. Later weather or harvest results can help evaluate a decision; they should not be rewritten as information the farmer possessed beforehand. Keep a correction distinguishable from the original entry.

Rice is a distinct climate question

Flooded rice can have a greenhouse-gas account different from that of an upland crop. Changes in water and crop management may affect methane, while other emissions and soil effects also need attention. Water records and climate quantification must therefore be linked without being treated as the same measurement.

Verra's VM0051 v1.1, active from 14 July 2026, addresses improved management in flooded rice production. The official status page identifies both the current version and transition arrangements for v1.0. It also describes attention to soil-carbon safeguards and expert agronomic assessment. A particular farm still needs assessment under the full applicable documents. [S15]

Do not prescribe an irrigation regime from this methodology summary. Crop suitability, water control, implementation safeguards and the full monitoring requirements must be resolved for the actual rice system. A plot without reliable control over water cannot be assumed to implement the intended treatment merely because its farmer enrolled.

Water and energy can move differently

Less irrigation may reduce pumping energy, but the relationship depends on the pump, source and operation. Record fuel or electricity with its measurement basis. A shorter operating time with a changed pump is not the same comparison as shorter operation of the same equipment under similar conditions.

Where a household pays a fixed charge, physical water use may fall without an immediate reduction in its bill. That does not erase the physical result; it changes the economic interpretation. Report the outcome the farmer actually experiences alongside the resource measurement.

Bring the lesson back to the field

At review, show the farmer the irrigation sequence, the crop outcome and the cost. Note interrupted turns, repairs and unusual rainfall. Ask which decisions were feasible and which depended on support that may not be available again.

Waaphasa becomes useful when it improves attention to the root environment and the timing of field decisions. A demonstrated irrigation benefit deserves its own account. Any methane or energy claim then follows the relevant evidence and method, with no automatic conversion of water saved into carbon credits.

Convert hours into a transparent volume estimate

Consider a hypothetical irrigation record. A measured average flow of 20 cubic metres per hour continues for three hours, giving 60 cubic metres applied. Over a measured area of half a hectare, or 5,000 square metres, that is 0.012 metre of depth, equivalent to 12 millimetres.

The conversion follows physical units: one millimetre over one hectare is ten cubic metres. It is not an irrigation recommendation. Actual flow may change during operation, and the protocol must state how variation is captured. A single convenient flow reading should not be presented as continuous measurement.

If duration is remembered rather than recorded and flow is assumed rather than measured, label the result an estimate with those limitations. The purpose of the calculation is to make the basis inspectable. More decimal places do not repair uncertain inputs.

What exactly was saved?

Suppose two hypothetical plots receive 1,000 and 800 cubic metres of irrigation per hectare over the same stated period. Applied irrigation is 200 cubic metres lower, a 20 percent reduction relative to 1,000. This statement alone says nothing about total water use, rainfall, return flows or yield.

Now suppose their harvested outputs are 4,000 and 3,200 kilograms per hectare. Both yield four kilograms per cubic metre of applied irrigation. The second plot used less irrigation and produced less output in the same proportion. An irrigation-efficiency claim needs to state the indicator rather than relying on the lower water total.

These numbers are deliberately constructed for explanation. They are not results for Waaphasa or a proposed acceptable production trade-off. A real comparison should show applied water, relevant weather, crop outputs, costs and the uncertainty in measurements.

Print the denominator with a water-productivity number. Kilograms per cubic metre of irrigation applied answers a different question from kilograms per cubic metre of total evapotranspiration. A value comparison also needs a declared price basis. Choose the indicator for the decision being examined and retain its components so readers can see why it changed.

Record control as well as supply

A water plan can fail because the farmer lacks control over delivery, even when the recommended decision is understood. The proposed baseline should record who can start or stop supply, how turns are allocated and whether a neighbouring field's drainage affects the plot.

Record a missed turn as a missed turn, not as intended water-saving management. Record an emergency purchase or pumping operation with its cost. These departures are part of the actual system through which the farmer works.

The research comparison should distinguish a decision the household could make from a condition it could only endure. This is important when assessing whether a proposed treatment can be repeated outside a closely supervised study.

Interpret a sensor through its location

An instrument needs an identity, a location and a measurement basis. A reading from one depth or part of the field should retain that context. The proposed monitoring plan should document installation, calibration or checks required by the device, maintenance and the treatment of implausible or missing readings.

A display can appear precise even when placement or calibration is poor. Cross-check unusual values through the reviewed field procedure. Retain the original observation and any corrected interpretation rather than overwriting inconvenient readings.

Sensors can help describe water conditions and support decisions. They do not by themselves measure a soil-carbon stock or establish a methane reduction. Linking the data to another account requires the relevant validated approach.

Rice-water management needs its own operational plan

Before including a rice module, establish how fields are supplied, drained and affected by neighbouring water. Identify the agronomic adviser, intended practice, observation method and response when conditions depart from the plan. Resolve the applicable methodology requirements in the technical protocol.

A plot should not be counted as implementing a specified rice-water practice because a training session occurred. The implementation record needs dates and observations capable of showing what happened. If a water condition could not be achieved, retain that result.

Research may still learn from an unsuccessful implementation: perhaps the control arrangement was unsuitable or support insufficient. That finding should inform site selection and feasibility. It cannot be relabelled a successfully delivered methane intervention.

Connect water, energy and the bill carefully

Measure the physical quantities that matter before calculating a household saving. Fuel use, metered electricity, pumping time, service charges and labour represent different entries. A fixed fee can remain unchanged when operating time falls. A repair can alter energy performance.

Where a comparison uses an emissions factor for energy, identify the source, period and boundary in the carbon calculation. Do not convert every saved pumping hour into an assumed fixed carbon amount without the corresponding energy and quantification basis.

The farmer's review can remain simple: what water arrived, what decisions were possible, what the crop produced and what the household paid. The following examples show how a measurement and an advice record can support that account.

Read a crop model as a model

Balwinder-Singh and colleagues' 2016 APSIM wheat simulations for central Punjab examined mulch, sowing date, soil and irrigation together. Results depended on those conditions. The authors identify model improvements still needed and call for further evaluation. These are simulated scenarios, not forty years of observed natural-farming treatments or a watering schedule for this pilot. [S34]

A model can explore combinations that a short field trial cannot all examine. Ask what was held constant, which starting conditions were assumed, how crop response was represented and where the model had been tested. The number of weather years is not the number of independent farms enrolled in an experiment.

Keep model exploration and field evidence identifiable. A simulated outcome can motivate a question or help plan sensitivity analysis. A field outcome can test the relevant prediction within its actual conditions. Neither inherits the other's status simply because both appear in the same evidence packet.

A scenario supporting an interaction between cover and timing is a reason to review those decisions together. It is not permission to copy an historical date, variety or threshold into another field. The actual crop, location, water arrangement and responsible agronomic advice must remain visible.

Flow changes across two hours

First hour	18 m^3/h	→	18 m^3
Second hour	12 m^3/h	→	12 m^3

Total 30 m^3 · half a hectare · depth 6 mm

Hypothetical arithmetic, assuming representative interval flows. Not irrigation advice.

When the flow changes during an irrigation

Consider a constructed example for a half-hectare plot. During a first recorded one-hour interval, representative measured flow averages 18 cubic metres per hour. During a second one-hour interval, it averages 12. The corresponding volumes are 18 and 12 cubic metres, giving 30 cubic metres in total. Over 5,000 square metres, that equals six millimetres of applied depth.

Using only the first flow reading for both hours would give 36 cubic metres, or 7.2 millimetres. In this invented case, that overstates the interval-based estimate by six cubic metres, or 20 percent relative to 30. The lesson is to match the flow record to the time it represents. Neither calculation is an irrigation recommendation.

Hypothetical interval	Representative flow	Duration	Estimated volume
First interval	18 cubic metres/hour	1 hour	18 cubic metres
Second interval	12 cubic metres/hour	1 hour	12 cubic metres
Total	Flow varies	2 hours	30 cubic metres

An interval estimate still depends on whether its average flow is representative. The protocol should specify how changing flow, interruptions and instrument limits are handled. A flow totaliser, timed measurements and a remembered duration are different evidence sources. Describe the one actually used rather than upgrading an estimate's status in the report.

If supply stops, distinguish operating time from elapsed clock time. A two-hour visit with an interruption is not necessarily two hours of flowing water. Record the interruption, any restart and the measurement available for each period. If a reliable estimate cannot be made, retain that limit instead of assigning an invented volume.

Keep advice, authority and action together

Imagine that a field observation suggests a change, but the household cannot alter its next canal turn. That is a control constraint. Imagine instead that a pump can be operated, but a fault prevents delivery. That is a different operational failure. Neither event should be entered as successful planned management merely because the delivered volume was lower.

An advice record can be brief while preserving the distinction:

- What observation prompted the decision, and when was it made?
- Which locally reviewed advice applied to this crop and situation?
- Who could authorise or carry out the action?
- What was actually done, and what prevented or changed it?
- Which follow-up observation or responsible contact was agreed?

The record should help the household, not demand that it diagnose a technical failure before receiving support. A concern can be accepted as a report and investigated. If advice is revised, retain the version and reason. The pilot needs a route for timely agronomic decisions; a research form cannot substitute for that service.

Build a season from identifiable events

Each irrigation event needs an identity linking the source measurement, plot, crop and energy or charge entry. If one event serves several plots, record how the shared quantity was allocated and whether it was measured at each outlet. Reconcile those entries before adding them to a seasonal total. Report uncertainty where allocation cannot be resolved.

Keep rain observations and irrigation records separate even when a combined supply indicator is calculated later. State where rainfall was measured and which plots that observation represents. A distant station is a particular evidence source, not a direct measurement at every plot. A missing record should remain distinguishable from a measured zero.

At season end, show coverage as well as totals. Which events have measured volume, an estimate or no usable amount? A complete-looking number assembled from undocumented gaps can conceal more than a qualified account. Decisions about missing data belong in the analysis plan, with sensitivity where appropriate.

The farmer and the climate account need different answers

A household may ask whether its crop was supported on time and its bill was manageable. A water manager may ask about withdrawals and wider flows. A carbon assessment may ask about a qualifying emissions change. Each question needs its own boundary and evidence, even when event records are shared.

Return crop output, applied irrigation, practical control and costs together. Show an unfavourable outcome as clearly as a favourable one. If irrigation fell because an essential supply failed, describe that event. If a changed decision achieved a useful result, preserve the observations and the conditions under which it was feasible.

Waaphasa's place here is an invitation to understand the root environment and make better decisions within a real farming arrangement. Connect that intention to crop-specific observations and household experience. Where an eligible climate outcome follows, its formal account can be examined without losing the field decision that came first.

09

II · PRACTICES AND RELATIONSHIPS

Diversity and the complete farm

A field can contain more than the crop that brings its largest cash receipt. There may be a second crop between rows, fodder for animals, trees at a boundary and material returning from the household. The farming system is the relationship among these activities, including their competition for time, light, water and money.

This chapter brings the practice discussion together. Diversity should serve the farm's needs and local conditions. It is not a contest to put the largest possible number of species into one plot.

Think in rotations and relationships

Draw the cropping year before selecting a combination. Record when each crop occupies the field, when labour peaks, what is harvested and what remains. Include fallow periods and delayed sowing. A combination that looks attractive at one visit may interfere with a later crop or the household's busiest operation.

Compare outputs on a declared basis. Kilograms of different crops cannot simply be added and presented as a meaningful single yield. Report crop outputs separately. If the analysis also uses a value-based or other aggregate measure, explain its prices, units and purpose. Keep that aggregate alongside the original crop quantities.

FAO's species-diversification guidance describes rotation objectives including food, fodder, residue supply, nutrient use and crop protection. It identifies biological nitrogen fixation through particular plant–soil associations among the relevant processes. This guidance helps frame questions; it does not establish a fixed nutrient contribution or a universal crop sequence for zero budget natural farming. [S36]

Begin with the household's purpose. Is an additional crop intended to supply food, bridge a fodder gap, use a particular field window or create a saleable product? Several purposes may be legitimate, but they need different records. A crop grown mainly for home use should not be judged only by cash sales. A crop grown for a market needs its selling arrangements examined as well as its harvest.

Livestock resources have a place and a cost

Livestock can connect fodder, manure, household work and farm-made preparations. Follow those flows without assuming every household owns an animal or can obtain its materials on the same terms.

Where materials are purchased or exchanged, record quantity, source, price and transport. Where a household supplies its own, use a disclosed allocation rather than treating the materials as free. Include the labour that makes them available. A farming recommendation becomes more inclusive when it identifies workable access arrangements instead of assuming a missing resource exists.

Separate an internal movement from a new input to the whole farm. Fodder taken from a plot to the household's animal unit changes location; a purchased feed arrives from outside the boundary. Manure returning to a plot has its own quantity and composition. Those movements belong in a connected account, without assuming that all nutrients in the fodder return in the manure.

Ask who controls access to each resource. An exchange may depend on another household's crop, transport or willingness to continue. Record the agreement's actual status and what happens when material is unavailable. The proposed system should be assessed for households with different assets, rather than making animal ownership an unstated condition of participation.

Observe crop protection rather than promising immunity

A diverse field still needs observation. Choose an inspection route and timing suitable for the crop. Record the organism or symptom and its extent; distinguish an initial field identification from a confirmed diagnosis.

Keep this observation separate from the decision about what to do. A useful record can say that the cause is unresolved. It should not acquire a confident diagnosis merely because a later account needs an explanation. Locally reviewed crop guidance, including any botanical option, belongs in the subsequent decision record.

Keep the core and the add-ons identifiable

The full opportunity discussed in this book reaches beyond the four foundations. Suitable farms may also have questions about trees, rice-water management, biochar, enhanced rock weathering or manure methane. Researching those possibilities together is sensible. Applying all of them indiscriminately is not a definition of core zero budget natural farming.

Layer	What belongs in its record	What the distinction protects
Core management	Seed treatment, formulations, cover, water and crop decisions actually used	An interpretable farming-system comparison
Additional intervention	A named tree, biochar, rice, weathering or methane treatment	Attribution of its own costs and outcomes
Shared resources	Biomass, land, water, equipment and labour	Detection of competition and double allocation
Outcomes	Production, full-cost returns, ecology and greenhouse gases	Separate evidence for each benefit

A treatment identifier should make the combination visible. If trees are added only to some plots, record that allocation. If biochar enters the soil, keep the application quantity and its carbon identity linked to the soil account. The system can be studied as a whole while its parts remain traceable.

An interaction can help or hurt

Start with a resource question: do the proposed components need the same material, field window or service? Retaining a residue for cover and sending it elsewhere are competing destinations until an actual allocation is made. An apparent circular flow may also depend on collection, storage or transport outside the plot.

A resource map can reveal these conflicts before planting. It cannot establish a biological interaction or divide a package's effect among its components. Later in this chapter, the component comparison and worked interaction example address that separate research question.

Make a seasonal system map

Put the field at the centre of a simple drawing. Add incoming materials and work, outgoing produce and residues, and returning resources. Label each arrow with its season and source. Use measured quantities where available and mark estimates as estimates.

Then check the map with the household. An arrow that looks circular on paper may depend on transport, storage or work that has not been arranged. A supposedly closed loop may actually bring nutrients or biomass from elsewhere. Those links are not inherently wrong; they need to be visible.

The map is a starting description. It now needs a calendar to show when the links operate, an area record to show where they occur and a ledger to show which quantities actually moved. The following sections build those checks before drawing any conclusion about the complete system.

Diversity in space and diversity through time

Several crops can share a field at the same time, or follow one another through the year. These are different arrangements. A map shows the first; a calendar is needed for the second. The proposed field description should retain both, including any period when no crop occupies the plot.

For each crop, record the date it enters the field, the area or arrangement it occupies and the dates of its outputs. If a second crop is introduced before the first is harvested, make the overlap visible. If a planned crop is not sown, record the reason instead of preserving an ideal calendar that did not occur.

A system can also be diverse across separate plots. That arrangement may be easier for some operations than mixing crops within one plot. Compare the actual alternative available to the household. Diversity deserves examination in its practical form rather than through a single attractive field pattern.

A way to compare unlike outputs

FAO defines the land equivalent ratio as the land area under sole crops needed to match the component yields from a unit area of intercropping or mixed cropping. It is a land-productivity measure, not a profit or carbon measure. [S25]

For a hypothetical two-crop example, suppose one hectare of the mixture produces 2.4 tonnes of crop A and 0.6 tonne of crop B. Under comparable sole-crop conditions, suppose yields are 3.0 tonnes per hectare for A and 1.0 tonne for B. Matching the mixture would require 2.4 ÷ 3.0 = 0.8 hectare of A and 0.6 ÷ 1.0 = 0.6 hectare of B: 1.4 hectares altogether.

This invented example illustrates the calculation, not an observed advantage or recommended crop combination. Its interpretation depends on credible sole-crop comparisons and comparable conditions. It does not mean that farm profit is 40 percent higher, that every product has a buyer, or that the mixture uses less labour. Keep the component quantities, work, costs and prices alongside the ratio.

If crops occupy different durations, state the period being compared and consider an appropriate area-and-time analysis. A seasonal ratio should not quietly become an annual productivity claim.

Put tasks on the same calendar

Write the operations for each crop on one calendar. Check sowing, weeding, water, protection, harvest, drying, storage and sale. A combination that separates harvests may fit a household well; another may crowd several demanding operations into the same week.

Also check machine access and the ability to identify and weigh the component outputs. An arrangement can be biologically interesting while making an ordinary operation difficult. Record that difficulty as part of performance.

Keep planned and actual calendars side by side. When one harvest is delayed, update the next operation's available window. If a planned crop is dropped, retain the planned and realised systems as distinct descriptions. A record of what could not be delivered can explain a result more usefully than an unchanged diagram of the ideal rotation.

This is where a practical trial can improve the plan before expansion. Ask the household to walk through the intended work with the actual equipment and available people. Resolve foreseeable bottlenecks before relying on the combined income.

Crop protection needs a decision record

A crop-protection entry should connect the observed problem with the advice, decision, action and later check. Record who supplied the advice and its basis, without treating a service contact as independent confirmation unless that confirmation actually occurred.

For any material used, retain the correctly identified source, preparation or product, batch, amount, date and plot connection. Use reviewed crop-specific handling and application guidance; this chapter supplies no recipe. Include a decision to wait, obtain identification or use another response when that is what happened.

Keep the observation date, advice date and application date separate. If several plots share a preparation batch or service visit, retain those links. Otherwise a later analysis may assign the entire cost or response to the wrong crop. A short decision trail should make the action understandable without manufacturing a diagnosis or a successful outcome.

Trees change the time horizon

A proposed tree component requires decisions about land access, location, species, management and expected products over a longer period than one annual crop. Resolve local suitability through appropriate agronomic and tree expertise. A field-boundary plan should also consider the neighbouring arrangement and the person responsible for maintenance.

For economics, distinguish establishment costs, recurring work and the timing of possible outputs. Do not put mature-tree receipts into the first year's crop account. Record any changed annual-crop area and operations rather than assuming that the tree component occupies no resources.

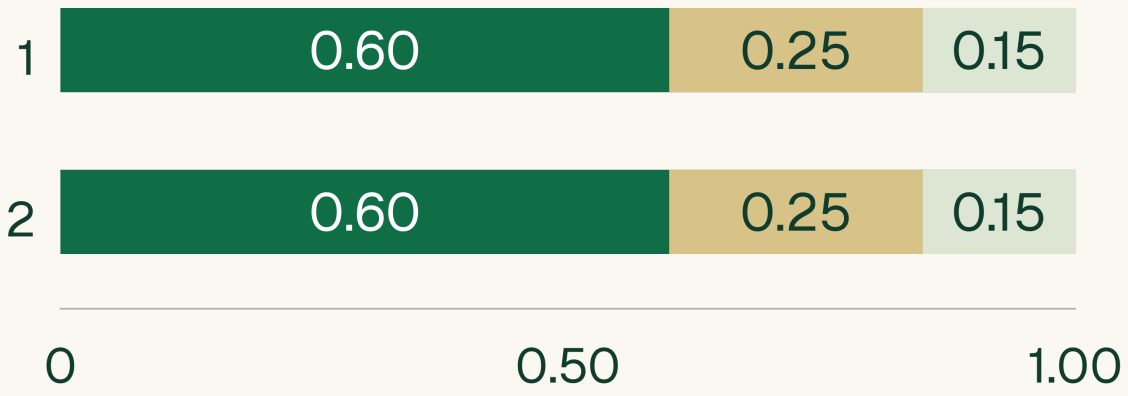
For carbon, retain the tree intervention's identity and apply its relevant method and safeguards. Its presence within a natural-farming holding does not make tree carbon a separate reward for every accompanying core practice.

Test the relationship instead of naming a synergy

The research question needs its own set of comparisons. For a conceptual formulation-and-cover question, the combinations are neither component, formulation only, cover only and both. The four means can then be used to describe the interaction contrast illustrated later; they still require independent replication and an appropriate model to assess uncertainty.

Actual plot numbers, allocation and crop management need expert design and power assessment. Listing four combinations does not fund four sound treatments. If the proposed project can support only a well-described package comparison, report that comparison and retain component interactions as unresolved questions.

Two seasons, the same ground



Rows 1 and 2 are seasons. Green: crops 0.60 ha; gold: separate trees 0.25 ha; pale: shared space 0.15 ha. Both show the same invented 1.00 ha holding. Summed activity is 1.20 crop-ha-seasons, not extra land or eligible crediting area. Not a recommended layout.

A system map that can be checked

The map and ledger must use the same area and period. Start by identifying the physical holding and any separately managed plot or enterprise. Then record the crop occupancy and the operations within it. A hectare repeated in two seasons is still the same hectare of land.

Consider an invented, non-overlapping layout: a 1.00-hectare holding contains 0.60 hectare of annual-crop land, a 0.25-hectare tree block and 0.15 hectare of shared space. The three areas sum to 1.00 hectare. These numbers teach accounting; they are not a suggested farm layout, tree allocation or pilot site.

Suppose the same 0.60-hectare crop portion carries one crop and then another in a second season. Adding the two crop occupations gives 1.20 crop-hectare-seasons. That describes repeated activity over time, not 1.20 hectares of physical land. Keep both quantities named rather than using the larger one whenever it makes a result look better.

Constructed area entry	Value	What it represents
Physical holding	1.00 ha	The land boundary in the example
Annual-crop portion in each season	0.60 ha	The same crop area revisited
Separate tree block	0.25 ha	A distinct area in this layout
Shared space	0.15 ha	The remaining physical area
Two sequential crop occupations	1.20 crop-ha-seasons	Activity summed across two seasons

The denominator must match the question. Crop yield may use that crop's harvested area. A whole-holding annual account includes the defined enterprises and their resources over its stated period. Shared access, storage or water equipment cannot be removed from the cost account simply because it is outside the harvested crop area. Explain the allocation instead.

This example deliberately gives the tree block a separate footprint. Where trees and crops share the same ground, describe the overlap rather than counting it as two independent parcels. A mapped research area is also not automatically an eligible carbon-project area. Crediting boundaries require the applicable method, land and project evidence.

Finally, follow internal movements across these units. Material cannot be both fully sold and fully retained. A crop product transferred to the animal enterprise can be recorded at that boundary without becoming a second external sale in the consolidated holding account. A preparation made jointly for several plots needs a stated allocation of work and materials. These links make the map usable in the next comparisons.

Learn from a regional system without copying it

Meena and colleagues describe an irrigated, 1.5-hectare integrated model at ICAR-IIFSR, Modipuram, studied during 2016–17 to 2018–19. Crops occupied 1.04 hectares, alongside dairy and other enterprises. This is a research-farm account, not a controlled comparison of the complete ZBNF system with farmers' existing practice. Nor is it a measured carbon-credit outcome or an agreement with our proposed pilot. [S35]

Read its production measure carefully. The paper converts different outputs into sugarcane-equivalent yield using market prices. Milk expressed in this unit remains milk: the conversion does not turn it into a physical sugarcane harvest. Keep original quantities and their price basis beside the equivalent total when comparing systems. [S35]

The financial account also needs reconciliation before its figures become a teaching example. The abstract and Table 1 report different whole-model benefit–cost ratios. In the table, subtracting the listed total production cost from gross return does not reproduce the listed net return. The inspected methods do not explain enough about cost coverage and valuation to resolve these differences. We therefore do not select a preferred income figure or use it to promise household earnings. [S35]

Recycling deserves the same care. Table 2 presents approximate nutrient quantities and a remaining nutrient deficit; it does not demonstrate complete replacement of outside nutrients. Its monetary valuation of nutrients is not, by itself, evidence of cash left in a family's bank account. The nutrient balance later in this chapter shows how to keep a physical flow separate from a financial saving. [S35]

For our proposed household visit, use the model to ask three connected questions. These are the book's proposed checks, not findings from the study:

- What can the family actually operate? Put land, animals, water, skills and the busiest work periods on the same plan. A familiar enterprise can still require an unavailable service or more daily care than the household can supply.
- Where does each product go? Separate sales, household food, feed and transfers to another enterprise. An internal transfer may help the receiving enterprise, but it is not another sale by the whole farm.
- What does the comparison include? Use the same area, period and cost boundary for both options. Identify family work, purchased inputs, shared equipment and establishment costs before interpreting a difference in net return.

The useful regional lesson is a way to examine relationships. A crop residue, an animal enterprise and household food needs can belong in one account, while still needing separate records. Local feasibility must be established with the household; historical research-farm prices cannot supply today's pilot budget.

A hypothetical two-component comparison

Cover B	Without A	With A
Without B	3.0	3.2
With B	3.4	3.8

Difference between differences: 0.2 t/ha

All values are invented yields in t/ha; A is a formulation. No efficacy or statistical significance is established.

Work through an interaction, not just a package total

The following numbers are invented solely to explain a comparison. Suppose a reviewed experiment considers a formulation, called A, and cover, called B. For one crop outcome, the four hypothetical treatment means are 3.0 tonnes per hectare with neither, 3.2 with A only, 3.4 with B only and 3.8 with both. These are not efficacy findings, pilot predictions or recommended yields.

On this additive yield scale, A's difference without B is 3.2 minus 3.0, or 0.2 tonne per hectare. A's difference with B is 3.8 minus 3.4, or 0.4. The difference between those differences is 0.2 tonne per hectare. The same arithmetic comes from 3.8 minus 3.2 minus 3.4 plus 3.0.

Another way to see it is to add the separate hypothetical differences to the starting value. That gives 3.0 plus 0.2 plus 0.4, or 3.6 tonnes per hectare. The constructed value for both is 3.8, leaving the same 0.2-tonne difference. The calculation explains an interaction contrast on the chosen scale. It does not establish statistical significance, an underlying biological mechanism or an effect on another outcome.

Real treatment means come with variation. Independent allocation, replication, the analysis model and uncertainty matter. A calculation from four numbers cannot tell us whether the difference is reliable. With different numbers the contrast could be zero or negative. With a different outcome scale the interpretation also changes.

If the proposed project cannot resource a suitable component experiment, retain the interaction as a question. It can still study a clearly described package. The important discipline is to report the question the design can answer, rather than divide a package result into several unsupported practice claims.

Test the busiest window before adding annual totals

More annual work can mean a paid opportunity, a household burden or both. Its timing decides whether the work can actually be done. An annual total does not reveal two crops needing attention in the same short period.

Take a hypothetical five-day window. Suppose the household identifies 30 hours available for field work after its other essential commitments. Existing crop operations require 16 hours, a proposed additional crop requires 12 and other continuing field work requires eight. Demand is 36 hours, six above the available time. These are constructed planning values, not a typical Indian household's working day.

Hypothetical work in the same window	Hours
Existing crop operations	16
Additional crop operations	12
Other continuing field work	8
Total demand	36
Available field-work time	30
Unresolved gap	6

The gap needs an explicit decision. Could a locally reviewed operation occur at another time? Is a suitable service actually available? Should the proposed crop area or arrangement change? Would the household prefer not to add it? Do not close the spreadsheet gap by assuming someone will work longer or that a woman, older person or paid worker will absorb it without a decision.

Record who has the authority to agree to the revised arrangement and who will do the work. If a paid service is chosen, its terms and actual delivery need evidence; this illustration supplies neither. If agronomic timing makes a delay unsuitable, the plan must respect that constraint. A calendar is useful when it can change a proposal before a crop is committed.

A legume is a nutrient question, not a complete balance

When a rotation includes a pulse or another legume, keep its intended role specific. Food production, fodder, retained material and a possible contribution to the nutrient account are different entries. The crop's presence does not supply a measured quantity for any of them.

The nutrient record should identify material entering, harvested products leaving, residues retained or moved, and the soil observations required by the research question. An estimate of biological fixation needs an appropriate method and uncertainty. Do not substitute all nitrogen found in plant material for a measured amount newly fixed from the atmosphere.

Likewise, residue returned is a material movement; it does not mean its nutrients are all available to the next crop at the moment required. That next crop still needs assessment under the selected agronomic approach. The book does not prescribe a standard fertiliser credit, an application adjustment or a carbon quantity merely because a legume appears in the rotation.

The 2020 analysis by Smith and colleagues helps explain why the starting system matters. It compared estimated nitrogen provision with a national fertiliser-application benchmark, bringing together literature and simulation. That benchmark is not a measured nutrient requirement for this household's crops. Nor is its national scenario an observed yield response in the proposed pilot area. The paper calls for better evidence on actual practices, nutrient processes and production over time. Read it as a reason to test the source of supply, especially during transition from higher inputs, rather than a reason to assign the same nutrient outcome to every farm. [S13]

This is where the earlier nutrient and residue accounts join the diversity discussion. Follow what the household harvested and retained, what crossed the boundary and what remains unmeasured. A useful rotation can be valued for its actual products and performance while its nutrient mechanism continues to be investigated.

Follow each product beyond the harvest photograph

The additional crop needs its own output record: quantity, quality basis, losses and intended destination. Produce consumed at home, saved as seed, fed to animals or sold serves different purposes. Keep those allocations mutually consistent. A kilogram cannot be both a full household consumption entry and a full market sale.

Ask what the new product requires after harvest. Does it need separate drying, grading, storage, transport or collection? Can the household distinguish its quantity in a mixed harvest? Who manages those tasks, and when will any actual payment arrive? These are operating questions to resolve, not evidence that an additional crop necessarily creates an additional profitable enterprise.

Where the family values home use, return that result in its own terms. Report the quantity and period supplied, rather than converting every product into assumed cash. A nutrition claim would need evidence about actual diets and relevant outcomes; producing several crops alone does not measure those outcomes.

Keep crop-protection learning inside the system account

A rescue action can affect several accounts at once. Record the changed operation, the material used, any extra work or service and the crop to which it applied. The production record should show what was actually harvested, including loss or failure. The economic account should retain the actual extra expense or resource use.

The research description must also retain the departure from intended management. Whether the original allocation remains the main analysis label, or another analysis is appropriate, depends on the stated design and plan; a farmer's practical response does not settle that statistical choice. Do not delete an action to protect a treatment label, or infer its effectiveness solely because a harvest followed it.

At the next seasonal review, ask whether the same problem would change the proposed crop combination, service arrangement or observation schedule. This is learning from a recorded decision, not a universal protection claim. The purpose is to improve the next plan while keeping the previous season's history intact.

Choose a connected plan that can be revised

At the proposed seasonal review, place the field map, crop calendar, work window and material accounts together. Which links operated as planned? Which relied on unavailable resources? Did the added enterprise meet its stated household purpose? Which observation justifies keeping, changing or dropping a component?

Keep the core farming comparison and each optional intervention identifiable as that plan changes. A household may have a sound reason to adopt one component and decline another. The evidence programme should be capable of learning from that choice. It should not treat the maximum number of modules as the definition of a successful farm.

One nutrient, one boundary, one year

Now place the crop, animal and storage records inside the same outline. A useful annual account needs a named boundary and opening and closing dates. Decide whether the household's animals and stores are inside it. A plot-only account and a holding-wide account may both be useful, but their entries cannot be exchanged without changing what “input” and “output” mean.

Start with a single nutrient. In the following teaching example every quantity is invented and expressed as kilograms of total nitrogen for one whole holding during one illustrative year. These are neither application rates nor crop requirements, actual farm observations or proposed pilot forecasts. The nutrient quantities are given to explain consolidation; no feed or manure composition is prescribed.

Invented annual entry	kg of nitrogen	Treatment in the whole-holding account
Purchased feed entering from outside	40	External input
Grain sold outside the holding	28	External output
Animal products sold outside	4	External output
Manure transferred outside	3	External output
Own fodder moved from crop plot to own animals	24	Internal transfer, not a new external input
Own manure returned from animal unit to crop plot	15	Internal transfer, not a new external input
Identified feed stock at the opening date	6	Opening inventory of this stock only
Same feed-stock category at the closing date	8	Closing inventory of this stock only

The listed external outputs contain 28 + 4 + 3 = 35 kilograms of nitrogen. The listed external input contains 40. Their difference is five kilograms. Call it the balance of these recorded external flows. Calling it nitrogen saved, nitrogen available to the next crop or a gain in soil fertility would add information the example does not contain.

The feed-stock inventory has increased by 8 – 6 = two kilograms of nitrogen. That is one identified destination within the account. Subtracting that change from the five-kilogram flow difference leaves three kilograms to reconcile with the other terms. It is not a measurement of nitrogen loss. Other stocks, biological fixation, deposition and losses have not been quantified here. The example cannot close the whole nitrogen balance by declaring them zero.

The 24-kilogram fodder transfer is an output from the crop enterprise and an input to the animal enterprise. It cancels when those enterprises are consolidated. The 15-kilogram manure return works in the same way, in the opposite direction. Keep both in their enterprise records, linked to their destinations, while excluding them from the list of new external additions to the whole holding. Internal recycling remains useful and visible without appearing to create a second supply from outside.

Do not subtract 15 from 24 and label the nine-kilogram difference an observed animal-system loss. The animals also received the purchased feed; products, stocks and other pathways need their own entries. Those two internal arrows alone do not describe the complete animal balance. This is why matching source, destination and period matters as much as doing the subtraction correctly.

At year-end, carry each identified closing inventory into the next year's opening record on the same basis. If stored material changes condition or the measurement method changes, document the reconciliation. Do not carry the five-kilogram flow difference forward as though it were a physical stock waiting in a shed. A calculated remainder and an identified inventory are different kinds of record.

Let the unresolved terms guide the next visit

An annual account should help choose the next observation. It should not turn uncertainty into an instruction to add or remove a particular material. Review the largest or most consequential gap with the household and the relevant agronomic team. Is it an unweighed movement, a missing composition result, an uncertain stock, a boundary mistake or a process needing a different measurement method? Each calls for different work.

First reconcile the records already available. A purchased-feed delivery should connect to the animal enterprise, not vanish because only crop inputs were recorded. A manure sale should connect to its receiving destination and remain distinct from manure returned to the field. A jointly prepared batch should be allocated to its actual recipients. The seasonal-operation, preparation, material and harvest records in Instruments C, D, E and H provide the links; they do not automatically supply a laboratory composition or a measurement of fixation.

Next check the time basis. Material present at year-end may become available to a later crop, while a harvested crop may have used resources accumulated before the chosen opening date. An annual total is useful for consolidation, but it cannot establish whether a nutrient was available during a particular crop's critical period. Retain application, crop and sampling dates beside the annual summary. Use the actual agronomic assessment to examine timing and supply.

Then give every figure an evidence status. A weighed quantity with a representative analysis differs from an estimate based on a published composition. A participant's recollection differs from a delivery record. A blank is not a measured zero. Report the partial balance with its included terms and uncertainties, rather than presenting a precise net figure whose missing components are invisible.

A practical improvement may be better capture of an existing resource, a changed sequence, a service arrangement or a decision to try a smaller change. The account can identify what needs investigation; it cannot select the agronomic response by itself. Nutrient status, crop performance, feasibility and the household's priorities still belong in that decision. An apparently positive annual nitrogen balance does not establish that every crop received enough of every nutrient.

The same discipline applies when investigating phosphorus, potassium or another nutrient: retain the named nutrient and analytical basis, and build its own account. Do not copy a nitrogen-fixation estimate into another nutrient column. The Smith analysis itself identifies the need to examine nutrients beyond nitrogen; this book offers no universal replacement factor. [S13]

Before drawing conclusions, return the account to the household in terms it can use: which quantities are known, which movements need checking and which decision will wait for better evidence. A ledger that makes the next action clear has more practical value than a perfectly balanced diagram made from assumptions.

Before carrying the description into the next part, reconcile three things: which land and period the account covers, which internal transfers are consolidated, and which observed outcomes remain distinct. A balanced material ledger shows where material went; it does not establish a gain in profit, biodiversity or carbon. A workable calendar shows that a proposal may be deliverable; it does not measure its effect.

Chapter 10 follows the quantities into cash and full resource costs. Chapter 11 asks what production and transition evidence can support, including difficult seasons. Chapter 12 examines soil, water and biodiversity on their own measurement bases. Chapter 13 returns to the people who provide work, hold rights and receive benefits. These are connected decisions, not interchangeable measures of success.

The whole farm is the place where those decisions meet. Its value does not depend on every outcome being favourable at once or every practice earning its own credit. An honest account should help a household choose a feasible arrangement and help the proposed research explain what changed, for whom and under which conditions.

10

III · ECONOMICS AND ECOLOGY

Counting the true cost



Recording observations in a moong field. An illustrative scene, not a photograph of the proposed pilot.

The crop is sold, but the account is not finished. Some produce stayed at home. A family member worked without a wage. An owned machine was used. Money borrowed before sowing still carries a cost. A farmer deciding whether to continue a change needs to see those entries alongside the sale receipt.

The account should be recognisable to the family. It should explain where money went, what the household received and which resources made the harvest possible. A technical label is useful only when the reader can see what sits underneath it.

The saving changes when work is counted

Cash change	12,000 – 4,000	→	8,000
Count family work	8,000 – 5,000	→	3,000
Output value falls	3,000 – 4,000	→	–1,000

A wholly hypothetical change budget, all amounts in rupees. Not pilot results or local rates.

Keep the cash view and the resource view

Begin with two questions. What money actually came in and went out? What was the return after valuing the resources used? The first helps organise payments. The second helps judge whether an apparent saving depends on resources treated as free.

FAO's farm-management text distinguishes financial and economic budgets and discusses the valuation of family-supplied resources. Its concepts are useful here; its historical example prices are not current Indian reference rates. This chapter uses independently constructed examples instead. [S26]

Keep the definitions beside each result. A gross margin subtracts the costs included in its stated variable-cost basis. A cash operating balance may omit financing, asset purchases or loan repayments. A full resource account needs its stated treatment of labour, land, equipment and capital. None of these should silently replace another.

Keep two classifications apart. Cash or non-cash describes whether the item involved a money payment. Fixed or variable describes how its cost responds within the stated decision and period. They are not competing names for the same distinction. FAO's discussion shows that the classification of storage and labour can change with the actual arrangement and purpose of the budget. An item's name alone does not settle its treatment. [S26]

For example, a paid service may involve a commitment that remains due over the agreed period even when less output is produced. An own-farm material may involve no purchase while the quantity used changes with the operation. Establish the real arrangement before assigning a category. In the proposed account, retain payment status beside the cost classification, so a reviewer can see both why cash moved and why a cost belongs in the comparison. These are conditional accounting examples, not service agreements for the pilot.

For the proposed pilot, save both quantities and valuations. The original work hours, material amounts and harvest weights allow another analyst to examine the assumptions. A single net-income cell cannot reveal whether an item was absent, omitted, unpaid or valued at a different rate.

An illustrative account

All numbers below are wholly hypothetical. They explain one hectare for one season; they are not pilot results, local prices, wage estimates or forecasts. The example first excludes land and then shows how adding a land charge changes its interpretation. Subtotals are steps in the calculation, not additional costs to add again.

Entry	Illustrative rupees
Crop sales received	70,000
Retained food and fodder valued once	5,000
Total output value	75,000
Paid materials, water and operations	25,000
Paid labour	10,000
Cash operating balance before financing	35,000
Financing cost paid for the season	2,000
Cash balance after these listed payments	33,000
Family labour at a declared valuation	12,000
Owned-resource use and depreciation, excluding land	6,000
Total listed resource costs, excluding land	55,000
Return after these listed costs, excluding land	20,000

The operating balance is 70,000 minus 25,000 minus 10,000. Paying the listed financing cost leaves 33,000. The resource account includes 5,000 of retained output and deducts the additional 12,000 and 6,000 non-cash valuations, leaving 20,000. Neither figure is automatically the household's bank balance.

This is deliberately a declared cost basis, not a claim that every possible cost has been counted. Land is excluded at this stage. Household consumption, other income, asset purchases and debt principal are also outside this cultivation-return calculation. They may still matter greatly to the family's cash plan.

Value without counting twice

Retained grain has a quantity before it has an assigned value. Preserve the quantity and the valuation basis, then keep it separate from grain actually sold. If the family consumes it, do not also place an imaginary sale receipt in the cash book.

Fodder and manure need an explicit boundary. Separate enterprise accounts can show a crop supplying fodder to livestock and livestock supplying material to the field. In the consolidated whole-farm account, an internal charge and its corresponding internal receipt cancel. The material can have real value without creating a second external income.

Residue allocation follows the same physical discipline. One quantity cannot all be sold, fed and retained as mulch. Record what actually happened, including storage or loss, before valuing the allocations. Where a resource's value is uncertain, retain the quantity and show the assumption rather than hiding the uncertainty in the total.

The proposed material ledger and harvest account should agree. Investigate a mismatch while the people involved can still explain it. A tidy spreadsheet that reconciles only because an invented balancing quantity was inserted is a poor account.

Labour has a season and a person

Record the operation, date, time spent, worker or appropriate group and whether payment occurred. A reference rate can value family work for an analytical account. It does not establish that the person received that amount or had an equivalent job available elsewhere.

Keep actual paid work and imputed family work distinguishable. Where a task is exchanged with a neighbour, describe the arrangement and avoid recording the same exchange as both a cash wage and unpaid work. For shared operations, allocate time on a declared basis that can be checked against the total.

Annual totals also need a calendar. Four hours saved after harvest do not create four available hours during a crowded sowing week. A new operation can be feasible in total and difficult at the moment it must be performed. Record the relevant peak and who faces it.

Training, first-season setup and recurring work belong in separate categories. Show the real transition-year account. A later scenario can examine what might happen if learning time falls, but it must not replace what the family actually did and paid in the first season.

Compare prices as well as practices

A price difference may reflect selling date, quality, buyer, transport, deductions or payment delay. Preserve those conditions with the actual receipt. A comparison that gives one system its best sale price and another a different market situation can confuse the market with the management change.

A common-price analysis can help investigate production and cost differences, provided it is labelled and the actual receipts remain available. Use the same stated valuation basis for comparable output; retain grade and quantity differences where relevant. Do not present the analytical result as money received.

Berger and colleagues' supplement defines a particular annual field-profit account. It uses common wholesale price estimates, values family labour, spreads equipment purchase costs over reported useful life and excludes land-tenure costs. Those choices help interpret the reported benefit; they do not make it the same as actual cash received or this book's account including land. The study's labour valuation is also a method choice, not a proposed wage for the pilot area. Read the result with these definitions and the published correction. [S05] [S21]

An organic premium, special buyer or carbon payment belongs in actual receipts only when the receipt exists. A separate scenario can test such possibilities. The cultivation case should remain readable without an unagreed buyer or a promised future credit sale.

Test whether a saving can survive a difficult season

Sensitivity analysis asks how the conclusion changes when an important assumption changes. Begin with variables the household can recognise: saleable output, price, material access, hired operations, family work and transport. State what changes and what is held constant.

Test linked changes where they matter. A larger harvest may also need more picking, packing or transport. Cheaper purchased inputs may require collection and preparation work. A scenario that changes only the favourable side of an operation can overstate the gain.

A break-even calculation can identify where an accounting advantage disappears. It is not an acceptable-loss recommendation. Food needs, debt dates and the capacity to carry a poor season may constrain the decision well before a calculated threshold is reached.

Chapter 11 examines production risk in more detail. Here the purpose is to show how a specified change enters the account, including a result that turns unfavourable. Keep those possibilities visible before the household commits more land or work.

Return the account to the household

Return a statement the family can follow: area and season, output, actual receipts and payments, retained produce, declared resource valuations and unresolved entries. Explain a subtotal before asking the farmer to accept its conclusion.

Use the meeting to correct the record. Was a service paid later? Was part of the harvest retained? Did somebody's work disappear from the log because another person completed the form? Preserve the original entry, correction, reason and date. The correction history is evidence of care, not an embarrassment to remove.

Distinguish correction of a fact from disagreement over a valuation. The family may confirm the work hours while questioning the reference wage. Keep the confirmed quantity and show alternative valuations if useful. That is more informative than choosing a convenient total and calling it agreed.

A statement can help the farmer judge the next operation even while a research comparison remains provisional. The remainder of this chapter makes the main accounting choices explicit enough to support that conversation.

Look first at what changes

A full account describes the whole specified enterprise. A change budget asks what becomes different if the household adopts a particular adjustment. FAO discusses partial budgeting as a way to assess selected changes; it is not a substitute for checking the wider farm boundary. [S26]

For the proposed pilot, list four directions of change in plain language: costs avoided, additional output value, new costs and output value forgone. Keep the time period and comparison visible. An item unchanged between the alternatives need not be counted twice in the difference, but it remains part of each full account.

Here is a wholly hypothetical example with unchanged output at first. Purchased inputs fall by 12,000 rupees. New paid collection and service costs are 4,000. Extra family work is valued at 5,000. The cash improvement on those stated items is 8,000; the improvement after the extra family-work valuation is 3,000. Neither is a claim about the actual pilot.

If, in this same constructed example, saleable output falls by 200 kilograms valued at 20 rupees per kilogram, output value falls by 4,000. The listed resource advantage becomes a loss of 1,000. Assuming all that output would otherwise have been sold and paid for, the cash advantage becomes 4,000. The two conclusions differ because the accounts answer different questions.

At the stated hypothetical price, 150 kilograms of forgone output would absorb the original 3,000 resource advantage. At 15 rupees per kilogram, it would take 200 kilograms. These calculations describe sensitivity to assumptions; they do not prescribe a yield loss or a local price.

Add land without hiding the tenure difference

Return to the first account's 20,000 return before land. Suppose an explicitly hypothetical land charge of 8,000 is added on the same period and area basis. The return after that charge becomes 12,000. The arithmetic is simple; the cash consequence depends on the arrangement.

For an owner, an imputed land charge represents a declared resource valuation. It is not necessarily a current payment. For a tenant who actually pays the hypothetical 8,000 rent in the season, cash after the listed payments falls from 33,000 to 25,000. On the stipulated equivalent land-cost basis, the resource result can be 12,000 in both cases while their immediate cash positions differ.

Do not infer actual tenure rights or terms from this example. The local arrangement must be recorded and reviewed separately. A crop-share arrangement also needs its actual division of output and responsibilities; it should not be forced into a cash-rent template merely because that is easier to calculate.

This distinction matters for a transition. A resource improvement that takes time may not benefit the current cultivator in the same way as a landowner who retains the field. Chapter 13 follows that distribution question rather than assuming that a whole-farm gain reaches everyone equally.

A profitable season can still run short of cash

A season-end surplus says little about whether a payment could be made at sowing. Give the cash account dates. Record when inputs were paid, wages became due, the crop was delivered and sale money was received. Separate a receivable from cash already available.

For another wholly hypothetical example, begin with 5,000 rupees available. Before any crop receipt arrives, 18,000 must be paid. The temporary gap is 13,000. A later sale may make the season profitable, but it does not retroactively supply the missing money at the earlier date.

A proposed programme should ask how that gap would actually be met and what it would cost. Do not insert a grant, loan, supplier credit or buyer advance that has not been agreed. A financing scenario can test a stated option while leaving its availability unresolved.

The household cash plan can show other income and necessary spending on a separate, consented basis. Those flows help explain affordability; they should not be mislabelled as crop returns. Collect only the information needed for the agreed question and protect its access.

Borrowing, equipment and depreciation have different entries

Loan principal received is a financing inflow. Repaying principal uses cash but is not a second cultivation input purchase. Interest is a financing cost on its stated basis. Keep these entries identifiable so that the input purchase and the loan that financed it are not both charged as new production costs.

Equipment also crosses accounting periods. Purchasing a tool is a cash outflow when paid; attributing its use across seasons requires a declared allocation or depreciation basis. Charging the full purchase and a full depreciation amount to the same season's production account would count the asset cost twice.

If the field hires a machine service, preserve the actual service charge and what it covers. If an owned machine is used, state how operating expenses and ownership costs are treated. A bundled service rate and separate fuel or maintenance entries need checking for overlap.

The pilot should retain the original transactions and an accounting classification, not just a net result. An agricultural economist can then review whether the definitions match the comparison. No universal useful life, interest rate or machinery tariff is prescribed by this chapter.

Shared services need a workable unit

Shared preparation, transport, equipment or record support can change the household's work. Define the service actually delivered: a batch, an operation, a visit, an area or another appropriate unit. A membership fee and an operation charge may cover different things; state them separately.

Check the service provider's account alongside the farmer's. Include coordination, labour, materials, cleaning, transport and the capacity needed at peak times where applicable. A service can appear cheap to the farmer because somebody else supplies unpaid work or absorbs an unrecorded cost.

Grant support or volunteer time can be valuable. Describe it accurately and show whether a later operating scenario assumes that support continues. Do not advertise an unsupported recurring price as commercially demonstrated simply because one subsidised season was feasible.

The practical test is delivery at the required time and quality, at a cost the arrangement can sustain. If a service reduces a household bottleneck, record that benefit as well as its fee. If late delivery creates extra work, preserve that too.

Keep price risk and production risk visible together

A single expected revenue can hide two different uncertainties. The farmer must produce a saleable quantity and obtain a price on actual terms. An account that tests only yield can miss a difficult market; an account that tests only price can miss an operational failure.

Use a small set of stated scenarios rather than a page of unexplained decimals. For each, show the changed quantity, changed price and any associated cost change. A combined adverse case may be informative even when the separate one-variable cases look manageable. Do not attach a probability unless there is evidence for it.

Retained food also needs attention when saleable output changes. A family may preserve household consumption by selling less, or buy food after a shortfall. Those are different cash pathways. Record the actual allocation rather than assuming that every production change falls entirely on sales.

Keep the decision threshold personal to the household's stated needs and the reviewed project design. The study can describe the trade-off, but a favourable mean does not decide how much uncertainty a family can bear.

Harvested, sold and paid are different dates

A harvest can exist before it is sold, and a sale can exist before the buyer pays. Keep those events distinct. The production account records the relevant output; the cash account records money received. Record unsold stock and a receivable on their stated bases rather than treating either as cash already available.

If the reporting period ends with produce in storage, preserve its quantity, condition and valuation assumption. A later sale can help review that assumption, but it should not silently rewrite the earlier account as though the transaction had already occurred. Losses, household use and seed retained from storage also need identifiable entries.

The same discipline applies to unpaid bills. A service already used may have an amount still due. Cash has not yet left, but the commitment matters to the household and the economic account. Record the status rather than making the service disappear because payment falls in the next period.

Shared costs belong to one declared boundary

An annual equipment or coordination cost may support several crops. If enterprise comparisons allocate that cost, state the basis and reconcile the allocations with the actual total. Charging the entire cost to every crop would inflate the whole-farm account.

Area, operating hours or another relevant measure may be considered for allocation, subject to the purpose of the analysis. There is no universally correct share detached from use and context. Retain the total before allocation so a reviewer can examine an alternative basis without reconstructing the original transaction.

A whole-rotation comparison also needs a common period and area. Do not compare the return from one crop with another farm's complete year while giving both the same per-hectare income label. Keep crop-level results and the defined seasonal or annual aggregate beside each other. Different physical products should remain separately reported before any declared valuation combines them.

A cost per kilogram needs an equally explicit boundary. FAO defines unit cost of production by dividing the relevant total cost by the output obtained with it, while cautioning that this indicator alone does not describe the full economics. Before using the ratio, state which costs are included and which product, condition, quantity and period form the denominator. A cost per kilogram of the marketable product and a cost per kilogram sold during the reporting period need not be the same measure. [S26]

Where several products share production costs, retain their separate quantities and the original common cost. State any allocation or by-product treatment before reporting a product-specific ratio. Do not assign the full shared cost to each product and then add those product accounts as though they were separate expenditures. Nor should kilograms of unlike products be combined merely to make the denominator larger.

A low unit cost is a clue to investigate, not an automatic verdict of efficient management. FAO also warns that low expenditure can accompany neglected maintenance. The proposed review should therefore ask whether an apparent saving reflects a better operation, omitted work, support supplied elsewhere or an asset being used without adequate upkeep. Describe the condition and the unresolved future work; do not repair the account with an invented maintenance price. Keep the cost ratio beside total returns, cash timing and resource condition when discussing the next season. [S26]

Leave a trail from operation to conclusion

Use Instrument C for work and operation dates, Instrument E for material allocation, Instrument F for water/energy charges and Instrument H for harvests and account entries. Instrument L returns the statement and records actual payments. These links should prevent repeated entry of the same event as different costs.

Add a valuation flag where an amount is imputed, a payment date where cash changes hands and a status for an amount still due. Preserve the period, unit, evidence and revision. Reconcile the farm total before using it in a programme comparison.

At the final household review, ask whether the proposed change remains useful after counting work, timing and scarce resources. Show the answer on the stated basis, including unresolved facts. A credible account makes a real saving visible and reveals when that saving depends on work or support the family cannot continue.

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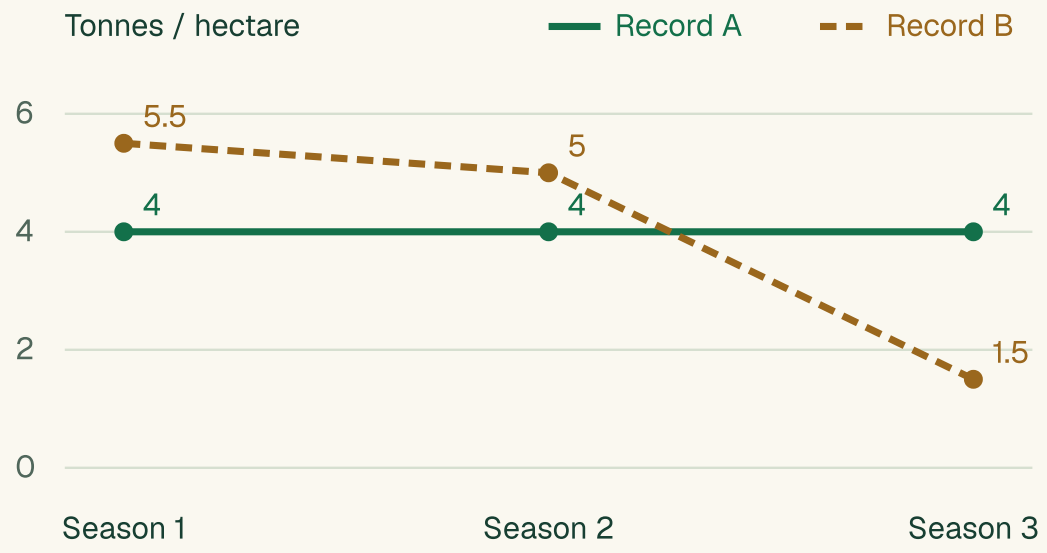
III · ECONOMICS AND ECOLOGY

Production and transition risk

A family needs more from a farming recommendation than a good average. It needs a harvest it can live with, work it can arrange and a response when the season goes wrong. The question is therefore larger than whether natural farming can produce a healthy crop. Under which conditions can a household maintain useful production while improving what remains after the costs?

That question gives both encouragement and caution a proper place. A promising result deserves attention. A difficult result deserves investigation. Neither should be turned into a verdict on every field in India. This chapter offers a way to read the evidence and use it in the next season's decisions.

The same average, different seasons



A wholly hypothetical example. Both average four tonnes per hectare; these are not pilot results or estimates for a farming system.

Three kinds of evidence

Different studies answer different questions. A controlled plot experiment compares specified treatments under its actual design. A programme evaluation examines farming as it occurs within a particular support arrangement. A nutrient analysis asks whether a proposed account of supply and demand is plausible. A field visit can also provide useful observations, but a photograph has a different evidential role from any of these studies.

Start by writing the question beside the result. Was the study comparing complete systems, a component, or participation in a programme? Was output weighed or recalled? Did it follow the same fields through time? What did its comparison farmers actually do? The answer makes a finding more useful, even when it makes the headline less simple.

The following is a deliberately compact reading map. It summarises the role of three sources, not the entire research literature.

Evidence	Crop or scale	Design and period	Comparison to keep visible
Duddigan and colleagues, 2023	Several crops; no rice trial	Replicated plots across three seasons, with changing participation	Defined natural, organic and conventional treatments [S04]
Berger and colleagues, 2025	Programme fields and harvests	Interviews, matching and modelling; annual recall	Natural-farming programme versus agrichemical farming [S05]
Smith and colleagues, 2020	Nutrient supply and potential production	Literature-based analysis and simulation	Starting nutrient inputs and the assumed farming system [S13]

An experiment cannot automatically explain a programme's support costs. A programme comparison cannot isolate the contribution of every preparation. A model does not become a measured harvest. These are reasons to connect evidence carefully, rather than reasons to discard a method we do not prefer.

Read a positive result carefully

The 2023 study covered 28 farms in six Andhra Pradesh districts, across Kharif 2019, Rabi 2019–2020 and Kharif 2020. Only three farms participated in every season. Organic plots lacked mulch, and all treatments were untilled. The first-season results overlap an earlier publication. These details define the comparison; three cropping seasons are not three years of following every new adopter. [S04]

Read the yield axis before carrying the finding into a farm plan. The authors measured the marketable product from each plot: fresh vegetables in the relevant crops, for example, but dry kernels for groundnut. Their statistical comparison then used a z score relative to the mean and standard deviation of the nine plots in that farm experiment. The score describes relative position within an experiment. A score of zero means its mean, not an absent harvest; a positive score is not a gain of that many tonnes or percent. Chapter 6 explains the transformation with a separate invented exercise. [S04]

The pooled result is encouraging for the specified treatment comparison, while its crop and district interactions matter to interpretation. Some crops appeared on only one or two farms, and crop choice often coincided with district. Groundnut and tomato were among the most frequently grown crops. A summary across these experiments cannot supply a separate, equally precise forecast for every crop or for the area where the pilot will run. The paper also cautions that changing farms and crops between seasons prevents a simple reading of the seasonal pattern as improvement through time. [S04]

Keep farms, experiments and available harvest records distinct. Table 4 describes the yield analysis as 44 farm experiments; that is not 44 separately enrolled farms. Table 1 distinguishes a season in which an experiment was not run from an experiment whose yield data were unavailable after product was lost in storage. Neither entry by itself establishes a measured zero crop yield. The numerical relationship between participation, available records and the fitted analysis still needs a full data-level reconciliation; this book has not performed it. [S04]

For the proposed pilot, use that distinction before a result is pooled. Preserve the field, season, crop, treatment history, original product weight and record status. If a record is unavailable, keep its reason and any known household consequence beside it. A storage loss may matter greatly to food or income even when it cannot provide the intended yield measurement. Compare continuing fields through time separately from changes in which fields enter the sample. That is an original reporting recommendation, not a reconstruction of the study's missing observations.

The 2025 programme evaluation reports a favourable economic result alongside an average yield estimate close to no difference. The two findings have different units. The following values are the authors' main estimates, not new calculations from their raw data. The comparison is with the study's agrichemical farming, not a universal conventional or organic treatment. [S05]

Reported main comparison	Estimated difference	Reported 95% confidence interval
Harvest-level food-energy yield	+1.5%	−5.6% to +19.3%
Annual field-level economic profit	+123.6%	+63.1% to +244.0%

The yield interval crosses zero. It does not establish that every farmer gained, or demonstrate a pre-agreed non-inferiority margin. The profit estimate is encouraging within its accounting boundary; it is not an amount that every household received. Chapter 10 explains why the valuation and cost definitions matter.

Collection counts, retained records and matched analysis are different stages. The study collected information on 128 fields and 206 harvests; its methods describe exclusions before matching. The larger collection counts should not be repeated as the final number of independent units in every model. Its published correction concerns equation notation, including the logged survey-area offset used in the bird models. [S05, S21]

For the pilot, the useful response is to make the comparison inspectable: crop and product, actual management, collection method, retained sample, estimate and uncertainty. Two papers sharing observations do not supply two independent confirmations. Nor does a reported average supply a household with a guaranteed minimum harvest.

Take the difficult question seriously

The full 2020 author manuscript distinguishes potentially favourable lower-input settings from nutrient constraints in higher-input settings. It combines literature and simulation rather than a new harvest trial. It also anticipates soil-restoration benefits; describing it solely as a prediction of collapse would misrepresent its argument. [S13]

For the farmer, the useful next step is an account of sources, removals and the intended production level. Ask what material enters, what leaves in grain and fodder, what may return and what is not measured. The word biological does not close that account, and a fertiliser purchase does not by itself prove efficient nutrition either.

The pilot should investigate the actual transition. A starting field with little purchased nutrient supply presents a different comparison from a field maintaining high output with substantial inputs. Record the quantities, timing and access arrangements. Income or a system label is not an adequate substitute for those records.

A good harvest should also prompt questions about continuation. Which resources supported it? Can the household obtain them again? Were any changes made during the crop? The purpose is to understand why the result occurred and whether its basis can continue, rather than demand a theory that explains every field before any useful observation is admitted.

A fair comparison through time

Agree what yield means before the first harvest. A crop's marketable product, total above-ground biomass, grain retained for food and fodder are different quantities. They may all matter, but one should not replace another silently. Retain the harvested area and the basis for moisture or other standardisation.

A small harvested section can support an estimate under an appropriate sampling design. It is not a weighed whole-farm harvest. A household's recalled sale quantity is not necessarily its whole production either. Keep the collection method beside the figure so the reader can judge its purpose.

Record partial and complete crop failure. Keep unharvested area, damaged produce, re-sowing and rescue work visible. Otherwise a treatment can appear successful because the difficult part of its season was removed from the denominator. A missing measurement needs its own code and reason; it should not be silently converted into zero production.

The same discipline applies to crop sequences. Define the period over which the system is compared. Where several products share land, report physical quantities separately before using a clearly explained aggregate. A better total sales value may coexist with less of the staple the household needs. The account should let the family see both.

What transition means operationally

Transition should describe a change, not excuse a result. Write down the previous management, the intended change, the support supplied and what was actually done. Date important operations. Preserve reasons for departures while they can still be checked.

The first season can involve learning, arranging materials and adapting familiar routines. Those demands are part of the programme being assessed. They should not disappear from the work account because a later season might be easier. Equally, the cost of a one-time learning activity should not automatically be charged as though it recurs unchanged forever.

Distinguish the practice from the way it was delivered. If material arrived after the intended operation, the record concerns both cultivation and service performance. If water could not be controlled, willingness to follow advice is not the only issue. If a family member became unavailable, the intended work calendar may no longer have been feasible.

These distinctions change the response. A biological question may need a component experiment. A late delivery may need a better service arrangement. An unsuitable water plan may need a different site or intervention. Repeating a general training message will not resolve all three.

A production threshold needs a reason

A household may need a minimum quantity of food, cash after harvest or dependable output for an existing commitment. These are decision thresholds. A research non-inferiority margin is a different, formally specified threshold used to ask whether a possible production loss is small enough for the stated purpose.

Do not choose that margin after the results arrive. Discuss the crop, household consequences, measurement and intended decision before setting it. This proposal has not fixed a universal tolerable yield loss. A family unable to absorb a small shortfall may need a different transition arrangement from one with a larger financial buffer.

A non-significant difference in an ordinary statistical test is not proof of equivalent production. The estimate may be too imprecise to exclude a meaningful loss. Ask for the estimated difference and its uncertainty, then ask what losses the study could reasonably have detected or ruled out.

An economic advantage does not rename a production decrease as unchanged yield. If a household finds a particular trade-off worthwhile, show the trade-off openly. If the production goal is maintained while costs fall, show those two findings separately. The analysis becomes more useful when it retains the distinction.

Respond without hiding the result

Before sowing, agree who receives a serious problem report and who can give suitable local agronomic advice. The farmer should know the contact, expected response route and how an emergency decision will be recorded. An informal promise that help will be available is difficult to rely on during a narrow crop window.

When action is taken, record the observed problem, timing, advice, material, labour and affected area. Distinguish a suspected cause from a confirmed one. A rescue treatment belongs in the management history and cost account, even if it complicates the original comparison.

Do not ask the farmer to preserve the appearance of a treatment by concealing necessary care. The study can report the original allocation and actual implementation according to its analysis plan. A crop protected through additional action can be valuable to the household while answering a different question from uninterrupted delivery of the intended protocol.

Follow the problem to its next decision. Did the response arrive in time? What remained unresolved? What should be arranged before the next crop? These observations can improve the service without pretending that an unfavourable result never happened.

The same average can hide a difficult season

Consider two invented production records for the same crop on one hectare in three seasons. Record A produces 4, 4 and 4 tonnes. Record B produces 5.5, 5 and 1.5 tonnes. Both total 12 tonnes and average 4 tonnes per season. These are teaching values, not observations or predictions for either farming system.

The arithmetic is identical at the average, but the household experience could be very different. The low season in B may arrive when a bill is due. Later or earlier high production does not necessarily provide cash at the right time. Nor does this tiny constructed example establish the probability of a bad year or a general stability advantage.

Add an explicitly hypothetical price of ₹20,000 per tonne and listed cash cultivation cost of ₹40,000 per season. At four tonnes, receipts are ₹80,000 and the balance before other costs is ₹40,000. At 1.5 tonnes, receipts are ₹30,000 and that balance is minus ₹10,000. Family work, land, financing and other costs are omitted from this narrow illustration.

The example explains why the pilot should report distributions and difficult outcomes alongside means. Do not infer household cash balances by smoothing several years into one average season. Record the actual timing, costs and support, and distinguish variation among farms from variation on the same farm through time.

Starting conditions change the meaning of the comparison

Two farmers may make the same named change from very different starting points. One already prepares local materials and retains cover. Another changes seed treatment, purchases, water decisions and labour at once. Both histories belong in the study; they are not identical interventions merely because the final label matches.

The baseline should therefore record the starting crop sequence, quantities and timing of inputs, irrigation access and relevant household resources. The comparison should also record support. A field receiving frequent technical help should not be described as proving that the same outcome will occur without such help.

For the proposed study, group or stratify the starting conditions through the reviewed design. Do not form favourable groups after observing harvests. Preserve enough description that a reader can judge whether a result is relevant to the next farm being advised.

An existing natural farmer may help explain mature practice and its work demands. A new adopter helps explain transition. A carefully managed institutional plot can help investigate a component. Their contributions are connected, but none automatically stands for the others.

A rotation cannot be judged from its best crop

A system may include a main cash crop, household food, fodder and a later crop using the same land. Plan how to record each before deciding which aggregate will be reported. Timing matters: a crop's successful harvest can delay another operation, and the full calendar should reveal whether that occurred.

Suppose a mixture supplies less of the principal crop and an additional product. The relevant account needs both quantities, their uses, the occupied area and the work. Adding unlike kilograms produces an impressive total without a clear meaning. A price-based or energy-based aggregate needs its declared conversion and the original quantities beside it.

Market performance should also remain visible. An additional product has a different practical value if it can be used at home, sold on reliable terms or left unsold. Do not assume every theoretical output receives the best available price. Chapter 10's account and the harvest instrument provide the places to retain those distinctions.

The proposed pilot should therefore report crop-level outcomes and the defined rotation outcome together. A single success deserves its place. It should not erase an unfavourable later crop or establish that every household food need improved.

Investigate a poor result in a useful order

Begin with what can be established. Was the relevant crop present on the recorded area? Did the observation occur at the intended stage? Were harvest and moisture records complete? A denominator or unit error can create an apparent biological problem that did not occur.

Then examine the operational sequence with the farmer and adviser. Review seed identity, establishment, water delivery, material timing, competing work and observed symptoms. These are investigation questions, not a diagnosis supplied by this chapter. Keep evidence for each explanation and record where expert assessment is still needed.

Possible issue to investigate	Record that helps	Appropriate distinction
Starting material or establishment	Seed lot, sowing and emergence records	Suspected cause versus confirmed finding
Water or weather interruption	Dated supply and event records	Intended management versus an imposed constraint
Delayed preparation or support	Batch, delivery and advice dates	Component performance versus service delivery
Harvest or area error	Weights, area, moisture and corrections	Measurement problem versus production loss
Unresolved biological concern	Reviewed observations and diagnostic referral	Field symptom versus established diagnosis

Several factors may coexist. Avoid selecting one convenient explanation that protects the preferred system. The next trial or service change should address the evidence found, rather than repeat the same operation with a stronger slogan.

Use resilience as a question to test

Resilience is attractive language, but the pilot should define what it wants to learn. Is the question about production during a specified disturbance, speed of recovery, a household's ability to finance the next crop or continuity of a service? These are different outcomes.

Record the disturbance and its timing independently of whether a plot performed well. Compare similar exposure as far as the design permits. A field that avoided a storm is not automatically evidence of better performance under the same storm. A record of one difficult season can be valuable without proving performance under every future shock.

A longer observation period may reveal useful patterns. The proposed research should still show its limits: which events occurred, which farms were followed, what was missing and whether the comparison remained credible. No universal drought or flood protection is promised here.

For the family, the immediate question remains practical. What support and financial room are available if the expected harvest does not arrive? Better management and a clear response arrangement can be pursued without pretending that uncertainty has disappeared.

Check production and the carbon account together

A lower absolute emission figure can coexist with lower output. To understand the relationship, retain the total and an appropriate production-based indicator where useful. Do not substitute one for the other.

For a constructed arithmetic example, 400 kilograms of carbon dioxide equivalent for two tonnes of product is 200 kilograms per tonne. A second account of 300 kilograms for one tonne is 300 kilograms per tonne. Absolute emissions are 25 percent lower, while the product-based figure is 50 percent higher. These values illustrate ratios; they are not pilot emissions, credit factors or predictions.

A real carbon method determines its relevant boundaries, sources, production effects and leakage treatment. The farmer's production account should remain available to support that assessment. A decline in output cannot automatically be ignored because one field's emission total fell.

Conversely, a measured production or income benefit should retain its value even if no carbon unit follows. The proposed whole-system framework exists to examine these connected outcomes without confusing their accounts.

Make the next-season decision inspectable

At the review meeting, begin with the household's original objective and the actual crop account. Show production, costs, work and relevant observations. Mark what was measured, recalled, estimated or missing. Include the support received and the problems that required a response.

Decide what can reasonably continue, what needs adjustment and what is still an experimental question. Expansion can be appropriate under stated conditions; a smaller learning area or a different arrangement can also be appropriate. No single mean should make that decision for every family.

For the proposed pilot, retain the decision and reason rather than recording only continued participation. A farmer who stops can explain a real constraint. A farmer who continues can identify which parts were useful and which depended on support. Both improve the evidence.

The next farmer should be able to recognise the conditions behind a result. That requires one more step: translate the study's estimate into a clearly bounded decision, without turning a programme average into a personal forecast.

From a programme finding to a transition decision

The recovered supplement helps explain whose experience the 2025 evaluation estimates. It targets the average effect among those who adopted the programme, with adoption voluntary. It also says that older recalled production was too unreliable for the intended analysis, so the most recent season's reports were used. This is not a measured sequence showing the same new adopters' harvests improving year after year. [S05]

There are two comparisons to keep apart. First, the researchers selected landscapes: they sought continuous natural-farming areas and nearby agrichemical areas with similar soil, terrain, climate and surrounding habitat. Some prospective sites were excluded when the continuous programme area proved too small. The selection also covered areas with different market access and farming histories. These decisions define the setting of the evidence; they are not random allocation of families to farming systems. [S05]

Next came statistical matching after the surveys. Yield was compared at the harvest level, while profit was compared at the field level. The same household can therefore contribute records with different roles. Chapter 10's annual field-profit account must not become a payment received by a person or a whole-household income estimate merely because the result is favourable. The supplement's balance plots show how the measured characteristics differ under alternative matching choices. A good balance on one characteristic does not establish balance on every relevant condition, including those not measured. [S05]

Crop identity deserves particular care. Most interviewed farmers could not name the exact variety, so it was not included as a matching characteristic. The authors considered a shared variety plausible because farmers in paired sites obtained new government seed in the same year and otherwise retained seed. That is a stated assumption, not a verified variety record. A local comparison should preserve whatever can actually be established about the variety, seed source and date, with unknowns left visible. [S05]

- Who could enter this comparison? Check the site criteria, exclusions and support setting before applying its average to a different village.
- What was compared? Keep each harvest, field, crop and accounting period attached to its result; an annual field account cannot describe every family's first season.
- What is known about my starting point? Separate verified records from assumptions, then identify which differences need observation or local advice before changing the plan.

The purpose is to make a promising result usable. A family needs the conditions behind it, the resources it would require and a route for help if its own season develops differently.

Read sensitivity work with the same care as the headline. Supplementary Tables 4 and 5 show that the estimates depend on the matching specification and subset; the profit table also contains a wide interval crossing the no-difference ratio in one alternative run. The supplement acknowledges remaining unobserved-confounding questions and incomplete treatment of repeated harvest dependence in the main yield model. These are matters to assess with a statistical reviewer, not evidence that the study should be either discarded or treated as a guarantee. No raw-data replication has been completed for this book. [S05]

The proposed pilot should make this translation visible in its decision record. Begin with the family and crop to which the advice applies. Identify which part of the earlier evidence is relevant, which starting conditions differ and which uncertainty matters to the household. Then state the actual support offer, the observation that will trigger a review and who can respond. Leave the size of the learning area and any production margin to the reviewed local design and the family's circumstances.

Keep the records connected without asking one to answer every question. Instrument H carries the harvest and farm account; the dated management history explains implementation; the exception record preserves rescue actions and departures. Chapter 21 describes analysis choices. Chapter 12 now takes up the ecological observations, whose methods and timescales need their own justification.

A credible productive case can therefore be positive and precise. It can identify encouraging evidence, show how costs and output were defined, and explain what would make the next comparison more informative. The farmer receives a decision with reasons and a route for help, rather than a favourable percentage left to carry the whole promise.

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Soil water and biodiversity

A field can change in ways that do not appear on a crop sale receipt. The soil surface stays covered for longer. Water behaves differently after irrigation. A farmer notices more life around a bund. These observations deserve attention. The next step is to find out what changed, how reliably it can be described and whether it helps the family manage the field.

That is a more useful ambition than giving every field a single soil-health score. A score can hide a dry root zone, a promising surface observation or a problem in one part of the holding. The ecological case for zero budget natural farming becomes stronger when its separate outcomes are visible.

Match each observation to its boundary

Soil	Sampled layer	→	Mass + depth
Water	Plot inlet	→	Irrigation applied
Selected life	Survey area	→	Effort + habitat

A map for proposed observations. No readings or carbon outcomes are represented.

Soil carbon is one part of soil condition

Start with the question on the laboratory sheet. Is it reporting organic carbon as a percentage of dry soil, or a stock per hectare? England and Viscarra Rossel's accounting review explains the roles of concentration, density, coarse material and depth; it also discusses comparable soil mass when density changes. A percentage alone does not supply those missing measurements. [S14]

The agronomic account is wider. A farmer may want to investigate compaction, nutrient availability or the condition of the seedbed. Select an indicator that can answer that question. Keep the sampled layer and method beside the result so a later reader can distinguish a surface measurement from a claim about the whole rooting zone.

FAO's published 2020 soil-carbon protocol makes the fine-earth mass and the volume used to express density explicit. Its Annex 4 also requires a comparable soil-mass basis. Chapter 14 follows those definitions through an invented calculation, including the risk of correcting the same coarse-fragment volume twice. [S09]

In Duddigan and colleagues' trial, moisture and earthworm outcomes differed between treatments, while organic carbon and bulk density had no significant treatment effect over the study period. The authors interpreted mulch as an important explanation; its separate contribution was not experimentally isolated. A favourable short-term ecological observation therefore need not imply demonstrated carbon accumulation. [S04]

For the proposed pilot, record both what went into the soil assessment and what it can support. If a laboratory result raises a concern, its practical value may be a better management question. It need not become a carbon number to matter.

Water observations need a scale

There are several water questions within one field. How wet is the soil at a stated depth and time? How quickly does water enter during a particular test? How much irrigation reaches the plot? How much water does the crop consume? What happens to drainage, runoff or the source from which water was drawn? Choosing a measurement begins with choosing the question.

A moisture reading taken soon after irrigation cannot be compared casually with another taken just before watering. Soil depth, crop stage, recent rain and the position of the probe all belong in the record. A single convenient point beside an irrigation inlet may describe that point very well and the rest of the field poorly.

The 2023 trial illustrates that boundary. Its moisture and temperature probes were inserted at 5–10 centimetres, and the main field measurements were taken initially, mid-season and after harvest. Those observations describe specified sampling occasions near the surface. They are not continuous monitoring of the whole root zone or measurements of the crop's total water use. The authors' interpretation of mulch and moisture should travel with that measurement scale, rather than become an unmeasured seasonal water-saving quantity. S04

An infiltration test observes entry under its test conditions. It does not directly measure water retained for the crop, total irrigation saved or replenishment of an aquifer. If the study investigates infiltration, specify the test and its repeatability with the water specialist. Keep soil disturbance and the starting moisture condition visible.

For the household, a dependable record of irrigation events can already answer useful questions: which plot needed attention, when water arrived and whether supply interrupted a critical operation. A mechanism study may need additional instruments. Match that effort to the decision it is intended to improve.

Biodiversity is not a single count

A visitor can record many organisms on a good morning. A survey must also record where, when and for how long the visitor looked. Seeing a bird depends partly on its presence and partly on the chance of detecting it. Different habitat, weather and observer skill can change that chance.

The earthworm evidence needs its sampling boundary too. In the 2023 trial, one soil block measuring 20 × 20 × 20 centimetres was taken from the centre of each plot and hand sorted. Earthworms were counted; the count was then expressed relative to soil volume. A density expressed per cubic metre is a conversion from that sample, not a census obtained by excavating the whole field. The reported dimensions describe the study's method, not an adopted sampling prescription for this pilot area. [S04]

Counts and biomass also had different collection conditions. The researchers weighed earthworms when a balance was available; they did not have one at every experiment. They also did not record ecological groups or whether the worms were juvenile or adult. Those limits matter when interpreting the result as a change in soil life. More individuals do not by themselves establish more species, a particular functional community or a measured increase in microbial activity. The paper identifies further information needed to investigate such links. [S04]

For the proposed soil-organism work, connect the location, sampled volume, collection date, sorting effort and identification basis before calculating a summary. If biomass is included, state which observations were actually weighed and on what basis. Map previous sampling disturbance so later visits can be interpreted consistently. These are questions for the locally reviewed protocol, not a demand to copy this paper's block size. Return the observed abundance and the unresolved function question separately; the record can guide further investigation without claiming a service that was never measured.

Berger and colleagues studied birds using repeated point counts across farming and forest landscapes, with distance-based treatment of detectability. Their evaluation concerned a particular natural-farming programme and landscape; it was not a census of every organism. The paper also stresses the continuing importance of natural habitat, and its published correction should accompany interpretation. [S05] [S21]

For the proposed pilot, first choose a question and a group that trained observers can identify reliably. More observed individuals, more species, a different community and improved conservation status are different findings. A larger total can be driven by a few common species. Retain the identity information needed for the question instead of allowing a single count to answer everything.

Do not imply that every organism is beneficial to every crop. If the question concerns a pest, a natural enemy or crop damage, assess that relationship explicitly. A photograph of an insect cannot establish a pest-control service. The organism, the relevant crop process and the observed outcome each need their own evidence.

An observation plan that can be repeated

The proposed ecological programme should have a manageable core and separately identified specialist work. The core is the set that can be repeated consistently across the agreed farms and seasons. Specialist work answers selected mechanisms or taxonomic questions at an appropriate subset of sites. That subset must remain visible in reports.

Outcome	Define before collection	Record with every observation
Soil condition	Indicator, layer and analytical method	Plot, date, handling and laboratory batch
Soil moisture	Instrument or sampling method and depth	Time, rain, irrigation and crop stage
Surface cover	Defined measured or visual protocol	Observation points, cover type and date
Selected biodiversity	Organism group and survey method	Effort, observer, season and habitat
Water applied	Flow measurement and event boundary	Plot, source, duration and interruptions

Repetition needs an operating plan. Who takes the measurement? What happens when that person is absent? Where is the instrument kept? How is a sample labelled before leaving the field? Which result must reach the farmer quickly enough to influence an operation? These are part of making a measurement useful.

Use the proposed ecological and water records in the field kit as starting forms. Final sampling intensity, laboratory procedures and species protocols remain subject to local technical review. A printed form does not by itself validate the method used to fill it.

Compare the field and its surroundings

A bund, tree line, water channel and neighbouring habitat may influence what is found inside a plot. Record relevant surroundings at the scale of the question. A plot-level treatment comparison and a landscape-level bird assessment need different maps and different independent units.

This matters when several fields share a boundary or water source. Their observations may share conditions. Counting more points in the same field increases information about that field; it does not automatically create more independent farms. The analysis and the stated sample size must reflect that structure.

The pilot should document habitat retained within farms and the surrounding land cover. It should also record changes during follow-up, rather than treating the starting map as permanent. If neighbouring land changes, that is useful context for interpretation, even when it lies outside the project's control.

A wider ecological gain can be pursued alongside productive farming. The book's proposal gives farmers a reason to make that contribution visible. It does not justify converting natural habitat in anticipation that a farm-management label will compensate for its loss.

Keep ecological outcomes in their own account

A useful report can show irrigation applied, surface cover, selected biodiversity and a soil-stock estimate alongside each other. Keep the units, dates and confidence of each result. Resist producing an ecological total merely because the measurements can be placed in the same spreadsheet.

For carbon crediting, the relevant outcome must enter an applicable greenhouse-gas account under the selected rules. Other outcomes can retain their agricultural and ecological value. If a separate recognition or funding arrangement is proposed for them, define its claim and evidence separately; do not imply an agreement or payment that does not exist.

This is central to whole-system recognition. The system can receive a coherent evaluation while the results retain their own meanings. A bird observation and a soil carbon measurement may both strengthen understanding of the farm. They cannot be added as interchangeable carbon tonnes.

Report what could not be observed

A cancelled survey is not an observation of zero birds. A lost sample is not a measured absence of carbon. A broken flow meter does not establish that no water was applied. Give each missing record a reason, date and follow-up status.

Distinguish the planned measurement from the usable one. If some sites are inaccessible in a difficult season, report which ones and consider whether the remaining sites give a misleading picture. Quietly deleting the hardest visits can make a programme appear more consistent than it was.

At review, show the family the result and its limit in ordinary language. Where evidence is weak, identify what would resolve the question. A useful ecological account supports care of the field as well as the preparation of a project report.

Follow a mechanism without assuming its result

A mechanism is an explanation to examine. It links an actual management change to an intermediate process and then to an outcome. The proposed research should retain that chain rather than jumping from a preparation's name to a promised environmental benefit.

Consider the mulch question. First establish what material was applied, where it came from and how much surface it actually covered through time. Next observe the chosen soil or crop response under comparable conditions. Then ask whether the result supports the proposed explanation and whether another explanation remains plausible. This is a proposed reasoning sequence, not a claim that the pilot area has produced those findings.

A whole-system comparison can evaluate the combined management package. It cannot usually identify the separate contribution of every preparation, labour change and residue choice. Where that attribution matters, plan a suitable component study. Be clear about the extra question it answers and the limits of transferring its result to whole farms.

The same discipline prevents repeated credit claims. If several practices contribute to one measured soil outcome, their relationship can be discussed without issuing a separate copy of the same outcome for each practice. A connected explanation and a duplicated carbon account are different things.

A percentage can rise without proving a stock gain

The following is a wholly hypothetical calculation for teaching units. Imagine one hectare with a sampled layer 20 centimetres thick, no coarse fragments and dry bulk density of 1.30 tonnes per cubic metre. The layer has a volume of 2,000 cubic metres and a dry soil mass of 2,600 tonnes. At one per cent organic carbon, that fixed-depth layer contains 26 tonnes of carbon.

Now imagine a second sample with 1.1 per cent carbon but a density of 1.10 tonnes per cubic metre, with the same stated area and depth and again no coarse fragments. Its calculated dry mass is 2,200 tonnes and the corresponding fixed-depth carbon amount is 24.2 tonnes. The concentration rose, yet these two fixed-depth calculations do not show a stock gain.

This is not evidence of a loss on an actual farm. Different masses have been compared, and a valid change assessment needs the appropriate soil-mass treatment, sampling design and uncertainty. No carbon-credit quantity follows from the example. It explains why the missing density measurement cannot be replaced by enthusiasm about a percentage.

A laboratory certificate should therefore travel with its sampling record. Preserve the method, depth, sample identity and required density/coarse-material information. Where those are insufficient, say which part of the intended calculation cannot be completed. Avoid repairing a missing measurement with an unlabelled assumed value.

Irrigation time is not a water volume

Here is another wholly hypothetical unit example. One irrigation runs for two hours at 10 cubic metres per hour, delivering 20 cubic metres. Another runs for three hours at six cubic metres per hour, delivering 18 cubic metres. The second event lasts longer and delivers less water. Duration alone would put the events in the wrong order.

For a hypothetical 0.1-hectare plot, those volumes correspond to average applied depths of 20 and 18 millimetres if the full stated volumes reach and are distributed over that area. This arithmetic does not tell us how evenly the water spread, how much the crop used or what happened below the root zone. It is not an irrigation recommendation.

In practice, identify where flow is measured and what happens between that point and the plot. Record supply interruptions and relevant losses or diversions. If flow varies, the calculation needs that variation rather than a convenient fixed rate. A pump's operating time or electricity bill can supply useful context, but it should not silently become a measured volume.

When comparing seasons, keep crop area, rainfall, crop sequence and production beside the water account. Less irrigation after abundant rain can have a different explanation from less irrigation under otherwise comparable conditions. A field-level saving also needs a wider water assessment before being described as a basin-level gain.

Give cover a date and a material account

Cover is a useful bridge between a visible practice and a testable ecological question. State whether the observation concerns living vegetation, retained crop residues or another surface material. Where categories overlap, define how they will be recorded so the same ground is not counted twice.

One attractive photograph cannot establish cover throughout a season. Repeated views or a defined sampling method should capture the periods relevant to the question. A field can have substantial cover on the inspection day and little protection during an earlier operation. Keep the sequence rather than selecting only its best frame.

Materials also have a history. Retained residues, imported residues, feed and other uses belong in the same physical account developed in chapter 7. If protection of one field requires removing scarce cover from another, investigate that displacement. The point is to understand the real resource arrangement behind the observation.

No universal residue quantity or species mixture is prescribed here. The proposed pilot must reconcile crop needs, material availability and competing household uses with local agronomic advice. The ecological measurement should help make that decision clearer.

Choose biodiversity questions that lead somewhere

Before adding another organism group, ask what a finding would change. Is the question about community composition, a particular group, crop damage or habitat retention? Each may need different expertise. Choose a feasible design and state the population or habitat to which its results can reasonably apply.

For birds, retain observation effort and the conditions that affect detection. For soil organisms, specify the sampled volume or area and handling. For a crop-related insect question, record crop stage and the relevant response. These are proposed design requirements; final local protocols need specialist agreement rather than copying an unfamiliar method from a paper.

Use uncertain identification honestly. An unresolved organism can remain at a reliable broader group, with a photograph or specimen record where appropriate and permitted. An expert may resolve it later. Inventing a species name makes the record harder to repair.

A conservation result should also be named accurately. More individuals of familiar widespread species is useful information, but it answers a different question from retaining species associated with a particular natural habitat. Keep the local species list and the ecological interpretation available for review.

Make disagreement between indicators useful

Imagine a proposed review in which cover is well documented, irrigation applied is lower and the carbon-stock comparison remains too uncertain to resolve. That combination is possible. The correct report preserves the measured observations and the unresolved stock question; it does not force them into a shared verdict.

Likewise, selected organisms may be observed more often without a measured reduction in crop damage. A soil assay may change without a detectable yield response over the same period. These are questions for investigation. Check timing, method, scale, sampling variation and alternative explanations before announcing that one result cancels another.

If the records disagree	First question for review	Useful next step
More cover, no clear moisture difference	Were depth and observation timing comparable?	Check event history and the chosen mechanism
Less irrigation, similar soil readings	Were rainfall, crop and area comparable?	Reconcile the complete seasonal water record
More observed organisms, unclear crop response	Was a crop-related service actually measured?	Define the organism/process question
Higher carbon percentage, unresolved stock	Is comparable mass and uncertainty available?	Review sampling and stock estimation

The response may be to improve a measurement, narrow the claim or continue observation. It may also be to change an operation with the farmer. None of those responses requires pretending that the current evidence is more complete than it is.

Water quality needs its own question

Less purchased input is a management observation. Cleaner drainage water is a different claim. To investigate water quality, identify the substance or indicator, the relevant location and the period when a sample would answer the question. A sample taken wherever access is easiest may miss the pathway being investigated.

For the proposed pilot, a water-quality specialist should decide whether a targeted study is warranted and feasible. Record other possible sources upstream or nearby. The identity, handling, storage and analytical limits of a sample matter as much as its result. A report should distinguish a substance not detected by the selected test from a claim that it is absent under all conditions.

A concentration also needs its context. A concentration in a collected bottle and a total amount leaving an area answer different questions; estimating the latter requires an appropriate flow and sampling account. No numerical reduction or health benefit is claimed here. Those outcomes need a design that can measure them, rather than being inferred from a farming label.

This additional question belongs beside water quantity. It should be added as a defined piece of work with capable people and a usable purpose. An ambitious list of uncollected indicators will not improve the evidence.

Choose a timescale that fits the outcome

The farmer makes decisions within a season. A laboratory may return results after a different interval. A stock-change assessment and a community survey may need still another observation schedule. Put these timelines beside each other before beginning, so nobody expects a single visit to answer every question.

The proposed study should retain seasonal context while protecting the comparability of its longer records. Record when management began, when each observation occurred and what relevant events happened between visits. A baseline measured after the change has started must be described accurately; it cannot quietly become a pre-change measurement.

Ask what the chosen duration can resolve. A short study may identify operational problems and describe immediate observations while leaving slower changes unresolved. An unclear result may reflect insufficient precision or duration; it is not a licence to assume an eventual benefit. Equally, an unresolved long-term question does not erase a well-measured current observation.

Agree the next decision point with the family and the technical team. Keep any continuation conditional on the actual evidence, resources and participation. A proposed monitoring timeline is a plan for learning, not a promise of a particular ecological result or carbon issuance date.

Return the ecological account to the farmer

An ecological review should end with decisions that a family can use. Begin with the original question, show the observation and explain its practical meaning. Give the farmer space to explain unusual events and correct a mistaken field history. Keep that explanation identifiable as farmer testimony rather than a measured instrument result.

Separate what needs action now from what needs another season or a specialist assessment. Agree who will make the next observation and when the result will return. Where the programme expects extra work, record that work and who performs it; a monitoring plan also has a household cost.

Follow the ecological claim back to its model

The 2025 programme study offers a useful distinction within one publication. Its matched comparison of farmland bird densities and its landscape density–productivity relationships answer different questions. The supplement explicitly says the latter relationships should not be interpreted as causal effects of agricultural intensification on bird densities. Its additional vegetation-adjusted trade-off model did not converge. That model cannot supply a separate confirmed explanation. [S05]

For a reader, a curve can make this distinction easy to miss. A relationship between more production and fewer birds describes how the variables vary together under that analysis. A causal claim asks what would happen to the birds if a specified operation changed while relevant alternatives were addressed. The second claim needs its own design and assumptions. An appealing curve does not remove that requirement.

The correction belongs to this trail too. It amends the logarithm of effective survey area in equations 1–3 and other equation notation. Effective survey area accounts for detectability in the bird models; it is not a measured stock of carbon or a carbon-project land boundary. Reading the corrected expression is necessary, but is not the same as rerunning the authors' data and code. [S05, S21]

Use the following proposed claim trail when assembling the pilot report. It is an editorial checking framework, not a list of outcomes already achieved.

Proposed statement	Evidence to retain	Boundary that must remain visible
Selected birds were more abundant	Survey, detectability model and estimate	Organism group, habitat and period
A production–bird relationship differed	Landscape definition and model specification	Association versus causal intervention
Less irrigation reached a crop	Measured event volumes and seasonal account	Rainfall, crop, area and supply boundary
Soil carbon stock changed	Comparable stock measurements and uncertainty	Soil mass, sampled layer and period
A pest-control service improved	Crop damage or service-specific investigation	Birds observed versus service demonstrated
A carbon unit could be issued	Applicable greenhouse-gas account and requirements	Ecological finding versus eligible verified outcome

An unresolved link should identify the next piece of work. For example, stronger bird evidence may justify a specialist question about crop protection; it does not fill in unmeasured crop damage. A water-volume comparison may inform a service decision while leaving a basin-level claim unanswered. The report should retain the useful result and state the narrower question still open.

Read the bird benefit at the right level

What does the favourable bird result look like when we open the evidence behind it? Berger and colleagues compared established natural-farming and agrichemical landscapes in northern Andhra Pradesh. Their site selection required natural farming to have been practised for at least four years, with a continuous study area and substantial adoption around it. These conditions matter when asking what the study can tell a household beginning a transition on one field. [S05]

The following figures come from the programme-response columns of Supplementary Table 9. They describe the modelled abundance response for the average species within each feeding group, relative to agrichemical farming. They are percentage differences, rather than counts of birds on a hectare. The intervals are the authors' 95% Bayesian credible intervals. [S05]

Main feeding group	Estimated difference (%)	95% credible interval (%)
Fruit eaters	+160.25	+9.47 to +374.10
Invertebrate eaters	+48.98	+1.44 to +100.69
Vertebrate eaters	+80.85	+0.89 to +176.85
Seed eaters	−20.25	−55.80 to +21.97
Omnivores	−0.20	−33.28 to +33.91

Invertebrates include insects and other animals without backbones; vertebrates include animals with backbones. The categories describe a main feeding habit. A species may also use other foods. Keeping the category definition beside the estimate helps prevent a broad dietary group from becoming a precise claim about a particular crop pest.

Three groups show a positive estimated response with the reported interval above zero. The other two intervals include both negative and positive responses. The table therefore supports a more informative account than saying that all birds increased. Its wide intervals also show how much uncertainty remains around the size of the estimated responses. These intervals belong to the fitted group comparison; they do not forecast the range of outcomes for each farmer.

The species-level result adds another layer. The authors reported 17 farmland species with higher abundance in natural-farming systems, six with higher abundance in agrichemical systems and 91 whose response did not meet their stated directional-posterior criterion. Here, the posterior is the model's probability distribution after combining the data with its assumptions. The criterion concerned at least 95% of that distribution sharing the median response's direction. These figures classify evidence across the 114 analysed farmland species. The unresolved category should stay visible alongside the favourable and contrary findings. [S05]

The ecological opportunity is substantial enough to investigate carefully. More birds belonging to groups associated with seed dispersal or crop protection can justify further study of those functions. To establish a crop-protection benefit, the next investigation still needs the relevant pest, damage or service outcome. The bird comparison supplies a reason to ask that question; the proposed pilot must collect the evidence that answers it.

The forest comparison sets a further boundary. Both agricultural bird communities remained very different from the forest reference, despite the relative improvement under natural farming. The authors found that forest habitats retained species and conservation value that the farming systems did not replace. A better-managed existing field can contribute to conservation alongside protection of natural habitat. Its improvement does not provide an ecological justification for clearing that habitat. [S05]

Keep survey visits attached to their landscape

The bird result depended on more than walking through a field and adding sightings. Across the two agricultural systems, the study used 26 landscapes, with four point locations in each. That gives 104 agricultural point locations. Four visits to each location give 416 agricultural point visits. The visits add information through time within those landscapes; they do not turn the comparison into 416 independent landscapes. [S05]

Keep three questions beside a proposed survey:

- Where is the management contrast defined: a field, a farm or a wider landscape?
- Which point and visit produced each record, and which records share that setting?
- What species and behaviours can this observation method reliably represent?

In the published study, ten-minute counts were repeated across winter and summer over two years. Distances, habitat around points and checks on uncertain identifications helped turn sightings into analysable records. Detection models then supplied species- or group-specific effective survey areas for the count models. The area represents how the observation method samples birds; it is not simply the farmer's holding size. [S05]

Try a wholly hypothetical reading exercise. These are invented records from one point, with the same observer and a ten-minute count on each visit. They are not findings from the paper or our pilot area.

Invented visit	Individuals recorded	Context written beside the count
Earlier visit	8	Tall vegetation restricted the view
Later visit	12	After harvest, the view was more open

The later record contains 4 more individuals: (12 – 8) ÷ 8 × 100 = 50% more recorded. That arithmetic describes the count. It does not establish 50% more birds living in the area. Visibility changed, and bird presence or activity may also have changed. Equal counting time has not made detection equally likely. Without the appropriate observations and analysis, we cannot separate these explanations or calculate the unseen birds.

A useful report would retain the two counts and the changed viewing conditions, then state the question still open. For a density comparison, the specialist must assess detection and the survey design. Merely dividing both counts by the mapped farm area does not supply that missing work. The claim-trail table earlier in this chapter keeps density, crop-protection services and carbon outcomes separate.

The published method also excluded largely aerial or transient species that point counts did not adequately sample. Its estimates therefore do not describe those excluded birds. For the proposed survey, retain original records and a defensible reason for any exclusion; an inconvenient response is not such a reason. [SO5]

A local sightings register can help a family notice seasonal activity and ask better questions. A management-related density estimate needs additional design and analysis. Agree which product the programme needs, who will do the work and how the finding will return to the family. Chapter 13 follows the work and its costs; a more elaborate indicator should earn its place by answering a useful question.

13

III · ECONOMICS AND ECOLOGY

Who benefits and who carries the work

A project can show an attractive total while somebody essential to the work is worse off. The person preparing materials may not control the crop receipt. A tenant may make the change while the owner signs a document. A farmer organisation may absorb coordination costs that never appear in a presentation.

A sustainable arrangement has to make sense to those people too. Follow the work, decisions, resources and money through the actual household and service arrangement. The question is not only whether value is created, but who can use it and who must keep providing the effort.

Whose work changed inside the total?

Total	18 → 17 hours	→ 1 hour less
Member A	10 → 4 hours	→ 6 hours less
Member B	8 → 13 hours	→ 5 hours more

A hypothetical example for one defined task period. No gender is assigned to the roles and no real effect is claimed.

Begin with actual roles

Start with the cultivator and the actual cultivation arrangement. Record the relevant period, people and evidence with consent and appropriate protection. Ownership, cultivation, preparation, buying inputs and receiving sale money may involve different people. A single name in a register should not erase those roles.

Identify who normally performs the operations and who would perform any additional work. Ask about access to materials, water, equipment and transport. A person can agree with the farming idea and still lack control over a resource needed to implement it.

Participation information should be understandable before a decision is requested. Explain the proposed work and allow questions. Provide a usable copy and a way to obtain an explanation later. The signature should record a decision that was actually discussed.

The accounting distinctions in chapter 10 help here. Valuing a resource in an economic account and recording an actual cash payment are different operations. FAO's discussion of financial and economic budgets supplies that foundation; the participation design below is a proposal for the pilot, not evidence of existing agreed terms. [S26]

Make each proposed benefit traceable

Keep crop receipts, avoided purchases, payment for a service, reimbursement and possible future carbon proceeds separate. They may reach different people at different times. An avoided purchase is useful, but it is not a cash transfer from the project.

For every proposed payment, identify its basis, payer, recipient, condition, timing and deductions. Where these are unresolved, retain that status. Do not turn a historical internal ambition into a publication promise. A payment for taking a sample should not also be advertised as the same amount of credit-sale proceeds.

Participant	Contribution to examine	Question before an agreement
Cultivator	Management, crop risk and records	What work and authority are required?
Other household workers	Collection, preparation and field operations	Who performs the additional work and controls its benefit?
Tenant or sharecropper	Cultivation under the actual arrangement	How do duration, obligations and proceeds fit that arrangement?
Farmer organisation	Coordination, services and representation	Which costs and decisions can members inspect?
Developer and technical team	Design, finance, data and market work	Who reviews delivery and conflicts of interest?
Buyer or funder	Payment for a defined product, service or purpose	What is funded, purchased and claimed?

This question map does not allocate rights. The actual arrangement must distinguish proposed responsibilities from those accepted.

Time has a distribution

An annual labour total can conceal a transfer of work onto one person. Use task-level records and suitable conversations to understand it. Ask when the work occurs, which other tasks it competes with and who can change the schedule. Collect sensitive personal information only where needed and voluntarily discussed.

Consider this wholly hypothetical teaching example for one defined task period. Member A previously worked ten hours and member B eight, a total of eighteen. Under a different arrangement, A works four and B thirteen, a total of seventeen. The total falls by one hour while B's work rises by five.

The example proves no effect of natural farming and assigns no gender to either role. It explains why the total cannot answer the distribution question. In the actual pilot, include women and other workers in an appropriate, consented way rather than relying only on the account of the person receiving the sale receipt.

If a task is too demanding, examine timing, equipment, sharing or a paid service. Count the revised arrangement and check whether it really relieves the bottleneck. Asking the family to find more unpaid time is not an operating solution.

Data should come back to the farmer

Explain what will be collected, why it is needed and who can access it. Return useful results in a form the participant can understand. A farmer should be able to question an incorrect plot or operation record while the original entry and correction remain traceable.

Use project identifiers in analytical files where appropriate, with the identity link kept under controlled access. A public research package can explain methods and aggregated findings without exposing contact details, private payments or a sensitive cultivation dispute.

Different roles need different access. A recorder may need an operation history; a laboratory may need sample identities and handling; a buyer may need a defined verification result. Do not treat a person's involvement in one task as a reason to disclose every household record to them.

Return the worker's relevant operation rows and statement with an explanation, using the access arrangement actually reviewed for the project. Keep other people's private records protected. Record who received which version, what they questioned and the response; receiving a copy is not accepting its contents. Instruments C and L supply the work and statement links.

Disagreement needs a route

Give participants a named contact and a usable way to raise a problem. Record the issue, dates, response and unresolved point. Provide a route beyond the person whose action is being questioned. Review who can decide what and how that decision is communicated.

Distinguish a factual correction, a service complaint, a payment dispute and a research concern. They may require different people and evidence. The participant should not have to understand the project's organisational chart merely to obtain a response.

Withdrawal also needs a clear explanation before agreement. Research participation, a farming service and a crediting arrangement can involve different responsibilities. The reviewed documents should state the actual consequences, including the treatment of existing records and any continuing obligations. This book does not invent blanket rights or penalties.

Keep an unresolved issue open across reporting periods, with the responsible reviewer, last response and next review recorded in Instrument J. Tell the participant where it stands. Closure requires a documented outcome or an explicitly retained disagreement, rather than the disappearance of the entry.

A fair carbon offer can be read

The proposed offer should explain expected work, the basis of proceeds, project costs and who carries each uncertainty. What happens if a measured outcome does not qualify, units are not issued, a buyer is not found or money arrives later than expected? State the actual agreed position for each case.

Show deductions in a way the participant can follow. A fixed charge, actual-cost recovery and a share of realised proceeds are different arrangements. Identify the base to which a charge applies. There is no universal revenue percentage in this book and no existing farmer offer is asserted here.

Keep any future carbon receipt separate from cultivation returns, completed work and present fees. The household needs that distinction before committing resources.

Readability means more than a short form. The person should be able to describe the practical commitments and locate the terms that matter. A document can be brief and still leave the most consequential question unanswered.

Who can make the next decision

Participation is not a single event at enrolment. Later choices may concern an operation, material allocation, sampling visit, service charge or change in cultivation. Identify which person can make each decision and where joint discussion is needed.

Ask separately about providing information and authorising an action. A household member may describe a field accurately without having authority to commit the land to a longer arrangement. A landowner may discuss ownership without knowing who performs each preparation. Record the role relevant to the decision.

The proposed pilot should maintain changes in roles over time. If the cultivator changes, do not simply replace the name in an old record and treat the history as continuous consent. Preserve dates and the relevant review. Scientific follow-up and participation arrangements both need the actual history.

Practical access matters too. A meeting held at the wrong time or an explanation available only through a smartphone can exclude somebody who does essential work. Use a way of explaining and responding that the intended participants can actually use.

A tenant's season and a project's horizon

A cultivation arrangement may cover a different period from a proposed research or carbon-monitoring plan. Establish the relevant dates before presenting a long-term commitment. Do not assume that the current cultivator can promise access throughout a period extending beyond the actual arrangement.

Record which operation and resource belongs to which period. A tenant may perform today's work while some later improvement remains with the field. The project must investigate how that timing affects participation and benefit, rather than treating the holding as a permanent single household.

If the arrangement changes, preserve what can still be learned from earlier records and review what further access or participation is appropriate. A change in tenure is a real event to understand. It should not be hidden by giving the next cultivator the previous person's code.

A crop-share arrangement needs its own description of output, work and expenses. The cash-rent example in chapter 10 cannot decide those terms. Actual local arrangements and proposed project commitments need appropriate review before anyone is asked to accept them.

Work valued is not work paid

Return to the invented A/B example above. Before proposing B's extra five hours, ask B about the operation window, other work and control of the required materials. Discuss a different schedule, shared work, a paid service or postponing expansion. Record the option actually chosen and who can authorise it; a lower household total cannot make that decision for B.

If the proposed arrangement is tried, Instrument C should record B's actual task and total thirteen hours, rather than only the five-hour increase. Keep family work, hired work and exchanged work identifiable. An economic account may assign a value to family time using a stated basis; Instrument L should show a work payment only with its actual basis, recipient and supported status. An unconfirmed receipt stays unconfirmed. Buying a service also requires checking whether collection, waiting or coordination still falls on B.

Return a dated explanation that B can use: the operation row, time, any analytical valuation and any separate payment entry. Ask whether a saving is actually available to the person carrying the extra work. Include women and other workers through appropriate, voluntary discussion; the sale recipient's account alone cannot establish their workload or control of benefits. A copy available only on somebody else's phone may not provide that access.

Now extend the same fictional exercise: the returned statement carries B's earlier eight hours instead of the thirteen reported for the new arrangement. Record the correction request against the operation and statement versions; preserve the original entry and supporting account. While the difference is unresolved, show it as disputed. Review any calculation that depends on those hours before treating it as settled. Resolving the time entry would not by itself establish a wage entitlement or prove a transfer. The route in the disagreement section above should let B obtain a response beyond the recorder being questioned.

This sequence is the book's proposed teaching exercise, not an interview or agreed pilot procedure. In the programme study discussed in chapters 10–12, family labour enters an annual field-profit estimate at farmer-reported minimum wage rates, separately for females and males. The supplement also excludes land-tenure costs and uses estimated crop revenues. That analytical boundary does not provide a household bank balance, a local wage rule or evidence that a worker received or controlled the estimated gain. Keep the valuation method and distribution questions separate. [SO5]

A shared service should not export hidden work

An FPO, group or local service provider may make collection, preparation, transport or records easier. Examine the organisation's work as well as the member's fee. Who schedules operations, keeps equipment ready, handles a late request and resolves a failed delivery?

Record unpaid coordination and temporary support where they exist. A low fee can be real for the user while the provider is operating with a grant or volunteer contribution. State that support so a later operating plan can judge whether the service can continue.

A shared service also needs a clear delivery unit and responsibilities. Distinguish the service price, membership contribution, reimbursement and any later project deduction. A farmer should not discover that the same work was charged in two places under different names.

When a service fails, preserve the consequences for the household and the provider. A missed delivery can change the farmer's work even if the service never sends an invoice. The monitoring account should be able to see that operational consequence.

Separate four kinds of money

Instrument L separates cultivation receipts, work/service payments, reimbursements and realised carbon proceeds. Identify other grants or support separately.

Use the status supported by the record: estimate, agreement, reported due, paid or disputed. Link it to the relevant evidence.

Record the gross basis, deductions and net amount as a connected calculation. If a deduction covers a cost already paid directly by the farmer, investigate overlap. If costs are shared, explain the allocation basis and provide a way to inspect it.

A project should also be able to say which uncertainty remains. There may be no eligible quantity, no issued units, no sale or no receipt yet. Keep those stages visible rather than compressing them into an expected carbon-income figure that looks like current money.

Read the offer under difficult outcomes

A useful review tests the arrangement when things go wrong as well as when they go well. Consider a crop problem, failed measurement, interrupted service, delayed assessment or change in cultivator. Identify who needs to act and which record explains the consequence.

These are review scenarios, not predictions that the pilot will fail or clauses already agreed. Their purpose is to expose an unanswered question before it becomes a dispute. If the proposal depends on somebody carrying a cost, that person should be able to see it.

Ask how a participant would understand a season with useful farming benefits but no carbon receipt. Ask the reverse question too: would a proposed payment conceal an unacceptable workload or resource loss? Keeping the accounts separate makes both questions easier to answer.

Do not solve uncertainty by inventing a guaranteed price, issue date or automatic compensation. Prepare the exact question for the people who can agree the terms, and continue independent research where an answer is not yet available.

Make representation and review practical

A group representative can help coordinate, but should not become the only source of every member's experience. Provide an appropriate route for individual correction or concern. Check how people hear decisions and whether they can obtain an explanation.

Record relevant decisions, the people involved, the evidence considered and any unresolved conflict of interest. Someone approving a charge may also provide the charged service. Identify that relationship and the reviewed way of handling it rather than assuming that a familiar local role removes the issue.

Give the group a readable account of shared costs and activities. Individual household records should retain appropriate privacy. Transparency of a service does not require publishing every member's personal information.

The proposed institutional arrangement should be proportionate to the work. A small pilot still needs clear responsibilities; it does not need an elaborate committee name in place of a reachable person and a documented decision.

Keep household choices and public claims distinct

The household may choose a practice because it helps a particular operation, suits available materials or reduces a troublesome purchase. A public ecological or carbon claim needs its own evidence. Participation alone does not prove that claim.

The project should not require every farmer explanation to sound like the book's argument. Record why a person continued, changed or stopped, with consent and the appropriate evidential label. Those reasons can reveal an implementation issue that a programme average misses.

Public reporting should preserve that distinction. An anonymised example must remain traceable to an authentic record before it is presented as real. A constructed teaching example should stay labelled as constructed. No participant testimonial or author encounter has been invented for this chapter.

This protects the relationship as well as the publication. People should recognise the work and the agreement they actually experienced when they see a project report.

People outside the participant list also matter

Shared water, residue purchases, transport and access arrangements can affect neighbours who are not enrolled. The proposed pilot should identify relevant interactions and a way to hear concerns. An enrolled-farmer total cannot describe every local effect.

If an operation changes access to a shared material or facility, record what actually changed and who was affected. A purchase by one group may create an opportunity for a supplier while changing availability for another user. Investigate that resource relationship rather than assuming that a financial transaction tells the whole story.

Keep the scale of the claim proportionate. A small pilot can document selected interactions and unresolved questions; it cannot promise a complete account of every village outcome. Where a material issue falls outside the study, identify the appropriate follow-up instead of declaring that it does not exist.

Workers need a clear account of the work

A reduction in one hired operation and an increase in another can change the people employed and the timing of their income. Record the actual tasks and paid amounts on the agreed study basis. Do not describe lower hired-labour expenditure as a benefit to every stakeholder automatically.

For proposed preparation or service work, identify the task, required training, equipment, payment basis and responsible supervisor before work is assigned. Locally reviewed safe procedures belong with the operation. The book does not turn an unverified formulation into a work instruction.

When reporting a service's success, include the provider's ability to deliver and the worker's actual experience where appropriately collected. A low recorded fee, a completed visit and a sustainable working arrangement are different observations. The full account should give each a place.

Review the distribution as well as the total

At a proposed review, place four questions beside each other: who supplied work and resources, who made decisions, who carried uncertainty and who received each benefit. Where the answers differ, investigate the arrangement rather than treating the mismatch as a statistical nuisance.

A revised cost classification can change a reported margin without changing what anybody paid. Keep that analytical change separate from a revised participation agreement. In the proposed review, retain the original quantity, payment status, classification and reason for revision, then show which result changed. Reallocating a shared cost does not by itself authorise a new charge to a worker or farmer. The actual payment arrangement and the person's ability to question it still need their own evidence. This is how chapter 10's clearer account can support a fairer conversation without pretending that an accounting label settles the terms.

Instrument A records participation and cultivation; C records operations and work; E follows shared materials; J records important changes; H and L connect the farm account and actual payment statement. Keep those links available without creating unnecessary duplicate personal records.

A benefit map can remain useful even when some payments are unresolved. Mark the gap and identify the person who must resolve it. Do not fill it with a percentage merely to make the diagram look complete.

The aim is an arrangement that people can understand and continue. A credible whole-system proposal should make productive and ecological value visible while giving the people who create it a fair, reviewable account of their own part in the work.

14

IV · CARBON RECOGNITION

Carbon accounting from the field



Moong fields with neem boundaries. An illustrative Indian kharif setting.

A laboratory report arrives with a carbon percentage. A farmer asks what it means for the field. A project developer asks whether it can become a payment. Between those questions lies an accounting chain that must be understood before a price is discussed.

Begin with what changed physically. Emissions are greenhouse gases released to the atmosphere. A removal takes carbon dioxide from the atmosphere and stores its carbon in a qualifying way. A stock is the amount held at a particular time. A large existing stock is valuable, but its presence alone is not a new removal caused by a project.

From a change to possible carbon units

1	2	3	4	5
Describe the change	Measure the outcome	Assess the method	Verify independently	Issue eligible units

A simplified route. Each project must satisfy the complete applicable programme requirements.

Concentration is not the whole field

A concentration tells us the share of carbon in the material tested. To calculate a stock, we also need the relevant mass of soil and the area represented. Bulk density, depth and coarse fragments enter that calculation. When management changes density, equal depths can contain different soil masses; comparisons through time need an appropriate mass basis. [S14]

The following calculation is deliberately simplified and hypothetical. It assumes a uniform layer, no coarse fragments and suitable matching between the concentration and density definitions. It is a dimensional example, not a complete sampling protocol or a credit calculation.

Hypothetical quantity	Value
Area	1 hectare = 10,000 square metres
Layer thickness	0.30 metres
Dry bulk density	1.30 tonnes per cubic metre
Dry soil mass in the layer	3,900 tonnes
Organic carbon concentration	1.00 percent = 0.010 mass fraction
Carbon stock on this simplified basis	39.0 tonnes of carbon per hectare

The arithmetic is 10,000 × 0.30 × 1.30 × 0.010. A later carbon percentage alone cannot tell us the change in this stock. A real calculation must use the reviewed soil method, relevant corrections, equivalent-mass treatment where needed, and a suitable uncertainty estimate.

Keep the laboratory sample and the stock calculation connected. Does the concentration describe fine soil on a dry basis? Which density and coarse-material definition matches it? What location, layer and date does the sample represent? A number copied from another field or a different layer cannot silently become this layer's measurement. Record missing information before completing the calculation.

Carbon and carbon dioxide have different masses

One tonne of carbon corresponds chemically to 44/12 tonnes of carbon dioxide, about 3.667. The conversion follows molecular masses; it does not establish that the tonne was newly removed or eligible for a credit. Greenhouse-gas inventories also distinguish carbon stock changes from the carbon dioxide represented by them. [S22]

For stock changes involving exchange with the atmosphere, the IPCC inventory convention uses −44/12: a stock gain becomes negative CO2 emissions. In the comparison below, the positive benefit magnitude is +5.5 tonnes CO2 per hectare over the stated interval; the project-minus-baseline emissions difference is −5.5. These are opposite-sign descriptions of the same comparison, not two benefits to add. Declare which convention the account uses. [S22]

Keep units in the column headings. Tonnes of carbon, tonnes of carbon dioxide and tonnes of carbon dioxide equivalent are not interchangeable labels. For methane and nitrous oxide, the selected programme's required warming factors and time basis must be used and recorded.

A baseline is a comparison through time

The question is not only whether the project field changed. What would have happened without the project also matters. Compare changes over the same interval and a compatible soil-mass and area basis. A favourable period may increase both stocks; the project's entire observed gain is not automatically its attributable effect.

Extend the chapter's invented one-hectare calculation solely as a teaching account. Assume that comparable, reviewed estimates give both scenarios a starting stock of 39.0 tonnes C per hectare. Five years later, suppose the project estimate is 41.0 and the baseline estimate 39.5 on that same basis. Equal starting values are an assumption of this exercise, not a requirement for every real comparison. The later stocks are invented estimates, not values inferred from a later carbon percentage alone.

Quantity and basis	Calculation	Result
Project stock gain over five years	41.0 – 39.0	2.0 tonnes C per hectare
Baseline stock gain over five years	39.5 – 39.0	0.5 tonnes C per hectare
Difference between the gains	2.0 – 0.5	1.5 tonnes C per hectare
Positive CO2 comparison magnitude over five years	1.5 × 44/12	5.5 tonnes CO2 per hectare
Mean annual comparison magnitude	5.5 / 5	1.1 tonnes CO2 per hectare per year

The 5.5 belongs to the whole five-year interval; the 1.1 is its arithmetic annual average. Keep both dates, the represented area and the calculation basis with the estimate. The IPCC stock-difference equation similarly divides the difference between two stock estimates by elapsed time and warns against confusing a change in represented area with stock change. Its inventory guidance supplies accounting definitions, not approval of this imagined project baseline. [S22]

The selected project method must establish the formal baseline and other required treatment. This exercise has not accounted for other emissions, leakage, uncertainty or programme adjustments. Its comparison is neither an issued-credit quantity nor a promised payment.

Add the relevant emissions

A field intervention can change more than one source. Materials may require manufacture, transport or processing. Water management may change methane or pumping energy. Nitrogen management may affect nitrous oxide. An apparent removal can coexist with additional emissions elsewhere in the project boundary.

Use a source-and-stock register. For every line, record the activity data, factor or model, units, period, location and evidence. Identify whether the quantity is measured, modelled or based on a permitted default. Avoid presenting a model output as a direct gas measurement.

State the sign convention beside the account. An emissions increase and an emissions reduction must not both enter as positive benefits. When two workbooks use opposite signs, translate them into one declared convention and preserve the original entries. A correct total needs compatible meaning as well as compatible units.

Uncertainty is part of the result

Sampling, laboratory analysis, activity records, factors and models can all introduce uncertainty. More decimal places do not make a result more certain. Report the estimate at a precision supported by the evidence and apply the selected programme's uncertainty treatment.

VM0042 v2.2 section 8.6 treats uncertainty by greenhouse-gas source and quantification approach. A single convenient percentage cannot replace the applicable procedures. The book's arithmetic examples explain accounting relationships; they do not calculate this methodology's uncertainty deduction. [S07]

If a confidence interval includes no change, explain that finding plainly. It may mean a small effect cannot yet be distinguished from variation. It does not justify replacing the estimate with a desired positive rate. Nor does it erase a separately demonstrated economic or water result.

From an account to an issued unit

Quantification is one step. A qualifying project also needs the applicable method and programme requirements, additionality, required validation, monitored evidence, independent verification and issuance. A buyer's later use brings its own requirements. The current VM0042 framework and its corrections illustrate the importance of keeping the entire chain visible. [S07, S08]

A purchase agreement is not an issuance record. A projected quantity is not a verified quantity. A payment for supporting research is not necessarily a sale of an offset. Clear names protect the farmer's expectations and the integrity of the offer.

The account should be inspectable

An independent reviewer should be able to follow a quantity back to a plot, period, sample or activity record. Preserve revisions and reasons for changes. Keep overlapping projects and material flows visible.

The farmer does not need to perform every technical calculation. The farmer should understand what is being claimed from the field, what work supports it and how the final payment relates to the eligible result.

Give every quantity an address and a period

A carbon quantity should identify the place, interval, source or stock and calculation basis. “The farm removed carbon” is too broad to reconcile with another account. A plot-specific stock estimate over five years differs from a seasonal energy-emission estimate.

The proposed attribution register should connect the quantity to the activity, evidence and any programme claim. If a material moves to another facility, retain the link. If a plot enters another programme, investigate the overlap before making a second claim.

The farmer-facing statement can stay simple while the technical record reconciles the represented land, interval and each physical outcome once.

A hypothetical net account

Consider a purely constructed arithmetic example. Suppose an assessment begins with eight tonnes of carbon-dioxide-equivalent benefit on a defined basis. Suppose two tonnes of relevant project emissions and one tonne of relevant displacement effects must be deducted on that same basis. The remaining physical estimate is five tonnes before uncertainty and other programme treatment.

The eight, two and one are invented teaching values. They are not estimates for a farming practice, recommended default deductions or a calculation under an approved methodology. Actual inclusion, signs, factors and uncertainty must follow the selected method.

Hypothetical accounting line	Tonnes of carbon dioxide equivalent
Stated initial benefit	8
Relevant project emissions	–2
Relevant displacement effects	–1
Remaining before other required treatment	5

If several lines share an activity or factor, their uncertainty may also be related. Do not assume all uncertainty is independent or subtract an arbitrary flat percentage because it looks cautious. Obtain an appropriate method-consistent treatment.

Even a correctly calculated five-tonne physical estimate is not automatically five issued units. Eligibility, required safeguards, independent assessment and programme decisions still matter.

Stocks, flows and an annual rate

A stock describes a time; a change connects two times. Dividing an interval change by its duration gives an average rate where that interpretation is appropriate. It does not reveal the path between the observations.

In the earlier invented comparison, 5.5 tonnes CO2 per hectare over five years averages 1.1 per year. Beginning and ending estimates cannot establish five identical observed annual gains. If a model allocates the change between years, name the model and assumptions; keep its trajectory distinct from the observations.

A monitoring or payment schedule needs its own basis. The annual average does not establish an annual amount due. Preserve actual terms beside the physical account.

A transferred material is not a second creation of carbon

When residue leaves a field for processing, its carbon has moved. When a product returns, carbon has moved again and may have changed form. The account needs the transformations and relevant emissions; it cannot count each arrival as a new atmospheric removal.

The same caution applies to a soil measurement after biochar addition. An increased measured stock may contain carbon already identified in a durable-storage account. The appropriate combination rules and material identity are necessary before another programme quantity is considered.

This is not an argument against combining interventions. It is the accounting needed to combine them credibly. A useful physical relationship can exist without producing an additional independent tradable unit at every step.

A declining baseline needs an explanation

A project field can be compared with a baseline that changes through time, if the selected method permits and justifies it. But a baseline decline cannot be assumed simply to enlarge the project result. The relevant history, model or comparison evidence must support the baseline and its rules.

Distinguish an observed research comparison from a modelled programme baseline. Their uncertainties and purposes may differ. Show why each is appropriate to the quantity it supports.

If later evidence changes the baseline interpretation, retain the revision history and assess the consequences. A transparent lower quantity is more defensible than an attractive estimate whose starting assumptions cannot be examined.

Reversal is a future accounting question

A stock gain can later be lost. The relevant route must address durability and any reversal treatment required by its programme. The project needs a record of the events and responsibilities that matter to this issue.

Do not describe a future liability as settled merely because the first measurement was favourable. Equally, do not tell the farmer that any ordinary crop decision automatically creates a debt without an actual applicable arrangement. The participant terms must explain obligations in understandable language.

The research record should preserve management and exceptional events after the first gain. That continuity helps distinguish a durable result from a temporary observation and supports any required programme response.

What the farmer should be able to ask

A farmer should be able to ask which activity is being claimed, for which land and period, and whether another organisation is making a related claim. The answer should identify the current stage: estimated, assessed, verified, issued, sold or retired where relevant.

These stages should not collapse into one green badge. A projected removal may be useful for planning; it should retain the word projected. A sale may fund a payment; it does not change how the physical quantity was measured.

The next examples make that chain more concrete: retain the layers, reconcile each accounting line and connect the calculation to the actual version of the rules.

Two layers sum to 37.5 t C/ha

0–15 cm	1,800 t × 1.50%	→	27.0 t C
15–30 cm	2,100 t × 0.50%	→	10.5 t C

Hypothetical dry-soil masses and carbon per hectare, assuming no coarse fragments. Not measured results or a credit quantity.

Keep layers with their own measurements

Return to the hypothetical one-hectare field. This time the profile has two different layers, each 0.15 metre thick. Suppose the upper layer has dry bulk density 1.20 tonnes per cubic metre and carbon concentration 1.50 percent. Its dry soil mass is 1,800 tonnes and its carbon stock is 27 tonnes. Suppose the lower layer has density 1.40 and concentration 0.50 percent. Its soil mass is 2,100 tonnes and stock 10.5 tonnes. The combined stock is 37.5 tonnes of carbon per hectare.

These are invented measurements with no coarse fragments and compatible dry-mass definitions. They explain dimensional arithmetic, not an actual field profile or an approved sampling design. Keep the two layers' original entries together with the calculation.

Hypothetical layer	Dry soil mass per hectare	Carbon concentration	Carbon stock per hectare
0–15 cm	1,800 tonnes	1.50 percent	27.0 tonnes C
15–30 cm	2,100 tonnes	0.50 percent	10.5 tonnes C
Combined	3,900 tonnes	Requires mass weighting	37.5 tonnes C

An ordinary average of the two concentrations is 1.00 percent. Combining that with an average density of 1.30 and the full 0.30-metre depth would give 39 tonnes, not 37.5. In this constructed example, averaging the inputs that way overstates the layer-summed stock by 1.5 tonnes of carbon, or 4 percent relative to 37.5. The lesson is to preserve the measurement basis and use the appropriate estimator, not to select the result that is larger.

A field estimate has further questions about sample selection, area representation, layers, density and coarse material. This example does not resolve them. When the density or sampled mass changes over time, obtain the required comparable-mass treatment rather than treating this fixed-layer arithmetic as a complete change estimator.

Assemble quantities that belong in the same account

Before adding climate quantities, check four addresses: place, period, source or stock, and calculation stage. A whole-farm annual fuel figure cannot be subtracted from each plot's five-year stock change as though it were a separate complete fuel account on every plot. Shared quantities need an explicit allocation and reconciliation.

Keep a calculation register beside the field records. It should identify the input version, unit conversions, included sources, baseline and project scenario, calculation period and output version. Where a permitted factor is used, retain its source and the activity quantity to which it was applied. Where a model is used, retain the relevant model and input versions.

An output that already includes project emissions must not have those same emissions deducted again in a summary table. Conversely, an output labelled net may still be incomplete for the selected programme. Inspect what the calculation contains. The label alone cannot establish its boundary.

The existing eight-minus-two-minus-one example is a teaching account with declared, separate entries. It is not a template for entering any three convenient totals. In a real project, decide the inclusion, sign and allocation of each term under the applicable method before calculating the total.

Keep different deductions distinguishable

Several adjustments can affect a reported quantity, but they answer different questions. The following is a reading guide, not a complete classification under every programme.

Entry to identify	Question it addresses	What the record should preserve
Relevant project emissions	What emissions accompany the project activity?	Included activity, quantity, factor or model and boundary
Relevant leakage	What qualifying effects occur through displacement or diversion?	Source of the effect and selected calculation rule
Uncertainty treatment	How does estimation error affect the reported result?	Error sources, design and applicable procedure
Reversal or durability treatment	How is the risk or occurrence of later loss handled?	The route's actual rules and responsibility arrangements

Do not describe every difference between an estimate and issued units as a physical emission from the field. Do not call every programme adjustment a farmer payment deduction. The physical account, programme quantity and commercial statement should remain connected through named steps rather than one unexplained percentage.

If an adjustment is not yet calculable, mark it unresolved. A provisional estimate can be useful for research planning. It should retain the conditions still needed to become an assessed project quantity. A transparent incomplete account is more useful than an apparently final number assembled from invented defaults.

Read the applicable version as a set

The following selected requirements were checked on 22 October 2026. They illustrate why a method, its corrections and associated notices must be read together. This is not a complete eligibility or compliance review.

Selected source and location	Accounting consequence to retain
VM0042 v2.2, section 4, condition 7	Applied biochar's total organic carbon is subtracted from project-scenario SOC stock change at verification [S07]
June 2026 corrections, Correction 3	Production-displacement leakage is included in the allocation equations for reductions and removals [S08]
June 2026 corrections, Clarification 9	The model true-up sampling clarification is not a requirement to resample every field at every event [S08]
Verra 21 October 2025 depth notice	The 30 cm minimum applies to relevant quantification data; shallow data have only the stated conditional calibration/validation use [S37]

The depth notice also requires compliant project-specific SOC measurements before verification. An existing soil report should therefore keep its original purpose, layer and method visible. A useful agronomic record does not automatically satisfy a project's quantification requirements.

The practical task is to create a versioned requirement record: source, section, actual requirement, evidence needed, responsible person and review status. When a correction changes a calculation, identify which workbook and reporting period it affects. Do not leave the update only in an email or an analyst's memory.

Trace the added carbon once

Consider another invented arithmetic example. A project-scenario soil stock-change entry is 4.0 tonnes of carbon on a defined area and interval. Suppose the identified biochar applied within that example contains 1.0 tonne of total organic carbon. Subtracting that identified contribution leaves 3.0 tonnes of carbon for this adjusted entry. Its chemical carbon-dioxide equivalent is 11.0 tonnes.

This illustrates a subtraction, not a complete credit calculation. The remaining entry still needs the appropriate baseline comparison, other relevant sources, uncertainty and programme treatment. The 1.0 is organic carbon content, not one tonne of wet biochar product and not an assumed issued quantity from a biochar project.

The material record must identify the batch, organic-carbon basis, destination and application period. If a separate durable-storage account exists, retain its identity and status. Physical transfer, the adjustment in a soil account and any qualifying storage claim are related records, not three new removals.

Nor does this example grant permission to combine particular project methods. Their full combination rules and the actual source/stock/period must be reviewed. What it establishes is the discipline of following one identified carbon quantity instead of allowing it to disappear between spreadsheets and reappear as a new benefit.

Make uncertainty explainable

A useful uncertainty statement names the estimate, its unit and period; the main sources of error; the observation and model basis; material data gaps; and the method used for the required treatment. It should distinguish a measured value from an estimate derived from several measurements or assumptions.

Check whether the same error source has been counted twice or omitted. A laboratory result, a model input and a predicted stock may be connected rather than independent. The specialist analysis must reflect those relationships and the actual sampling design. A long list of possible errors is not itself a valid calculation of uncertainty.

Missing information also needs a decision. Can it be recovered? Does the applicable method permit a documented conservative treatment? Must a quantity be withheld? Record the answer and reviewer rather than using an arbitrary reduction to make an unsupported input appear acceptable.

Return an understandable quantity to the household

The technical calculation may contain many lines. The household's statement can remain readable: which land and period, what was estimated, what evidence supports it, which named adjustments remain, the current review stage and whether any payment has actually become due under real terms.

Show revisions with their reasons. A lower assessed result may follow better evidence or a corrected boundary. Explain that change without implying that the farmer necessarily failed. Preserve economic and ecological outcomes that were measured separately, rather than making their value disappear because a carbon quantity changed.

The next examples test whether an estimate still matches its represented land and soil mass.

Keep an expanding boundary beside the estimate

A result can remain unchanged while the land it is said to represent quietly expands. Imagine an explicitly invented teaching account: an assessed group covers 10 hectares and has an estimated average stock increase of 0.6 tonnes of carbon per hectare over its stated interval. Multiplication gives 6 tonnes of carbon for that group. Five additional hectares then enter the proposed programme, but their comparable evidence has not yet been assessed.

Multiplying 0.6 by the new total of 15 hectares gives 9 tonnes. The extra 3 tonnes come from extending the assumption, not from an additional observation. The calculation has changed the population represented by the result. Nor should the missing group's change simply be called zero: that would turn an unknown into a measured outcome. This exercise supplies no credit quantity or sampling rule.

The useful account retains the assessed group's quantity, area, interval and uncertainty beside the newly added area and its pending evidence. It states that there is no complete combined estimate on the new boundary yet. If a reviewed design later supports inference to that area, record how the inference is justified and what uncertainty it carries. The latest membership total alone cannot supply that justification.

This distinction helps explain why a household can appear in the participant register before its land is represented in a particular result. Participation, measurement and acceptance for a defined calculation are related stages with different evidence. Show their links without forcing them into one completion percentage.

For the proposed pilot, every published estimate should therefore point to a dated boundary version and the population it actually represents. Where an area is added, removed or reassigned, retain the previous version and reopen affected calculations. Do not replace an old map beneath a finished figure while leaving its caption unchanged. A smaller defensible estimate is more useful than a larger number whose represented land cannot be explained.

Ask which volume the density uses

Two laboratory sheets can report different density values for the same material and still be consistent. The question is what each value divides by. FAO's published 2020 protocol, Annex 4, distinguishes dry fine-earth mass per volume of fine earth from fine-earth mass per total sample volume. Its stock equations link the carbon concentration to the corresponding fine-earth mass. A worksheet headed only “bulk density” can conceal that distinction. [S09]

Consider a wholly invented, uniform-layer example. A sample represents 100 cubic centimetres of soil. Coarse fragments occupy 20 cubic centimetres, leaving 80 cubic centimetres of fine-earth volume. The dry fine earth weighs 104 grams. No carbon contribution is assigned to the coarse fraction in this example. These are teaching values, not a recommended sampling volume, a measured field result or an assumed stone content for the pilot area.

Dividing 104 grams by 80 cubic centimetres gives 1.30 grams of fine earth per cubic centimetre of fine earth. Dividing the same mass by the full 100 cubic centimetres gives 1.04 grams of fine earth per cubic centimetre of sampled soil. The second value already incorporates the share of the sample volume occupied by coarse fragments.

Now suppose the uniform layer covers one hectare, is 0.30 metre thick and contains one percent organic carbon on a dry fine-earth mass basis. The layer occupies 3,000 cubic metres. The two consistent calculation paths are:

Density definition	Calculation of dry fine-earth mass	Carbon stock
Fine-earth mass / fine-earth volume	3,000 × 1.30 × 0.80 = 3,120 tonnes	3,120 × 0.010 = 31.2 tonnes C
Fine-earth mass / total sample volume	3,000 × 1.04 = 3,120 tonnes	3,120 × 0.010 = 31.2 tonnes C

Grams per cubic centimetre and tonnes per cubic metre have the same numerical value. Here the 0.80 factor is a volume fraction: one minus the coarse-fragment volume fraction. Applying it again to the second path gives 24.96 tonnes of carbon. That lower answer comes from correcting the same volume twice. It does not describe a loss from the imagined field.

The concentration unit matters too. One percent is the mass fraction 0.010, or 10 milligrams of carbon per gram of fine earth. FAO's Equation A4.1 uses milligrams per gram, density in grams per cubic centimetre, thickness in centimetres and a 0.1 conversion factor. With the first density definition, 10 × 1.30 × 0.80 × 30 × 0.1 again gives 31.2 tonnes of carbon per hectare. Entering the numeral 1 as though one percent meant one milligram per gram would create a different error. [S09]

Before a calculation is accepted, retain four definitions:

- The dry material whose carbon concentration was analysed and the unit reported.
- The dry mass in the density numerator, including what was removed from it.
- The volume in the denominator: the whole sample or the fine-earth part.
- The coarse-fragment fraction's mass or volume basis and any correction already applied.

A reported percentage of stones by mass cannot simply replace a required volume percentage. Equally, a missing fraction is not evidence of zero stones. Ask the laboratory and soil specialist to reconcile the original observations and the selected method. The required record is a calculation basis that another person can reconstruct.

An equal mass needs a position in the profile

Equivalent soil mass adds a comparison question to the stock calculation. FAO's Annex 4 requires stocks to be expressed on an equivalent-mass basis to avoid confounding different compaction states. England and Viscarra Rossel likewise explain why a fixed-depth comparison can mislead when density changes. The chosen reference mass and the adjustment need their own documented procedure. [S09, S14]

Return to this chapter's earlier hypothetical two-layer profile, with no coarse fragments. Its upper layer contains 1,800 tonnes of dry soil at 1.50 percent carbon; the lower contains 2,100 tonnes at 0.50 percent. Total soil mass is 3,900 tonnes and total carbon is 37.5 tonnes per hectare. Suppose, solely to examine the arithmetic, that a comparison uses the uppermost 3,600 tonnes of this profile as its common mass. That mass is invented for this exercise, not a recommended reference for the pilot.

The retained mass contains all 1,800 tonnes of the upper layer and 1,800 tonnes of the lower layer. Under the example's uniform-within-layer assumption, the corresponding carbon is 27.0 plus 9.0, giving 36.0 tonnes. Equivalently, removing the bottom 300 tonnes at 0.50 percent removes 1.5 tonnes of carbon from the original 37.5.

Multiplying the whole profile's 37.5 by 3,600/3,900 instead gives about 34.62 tonnes. That proportional shortcut does not preserve the known carbon difference between the two layers. The example shows why the carbon concentration associated with an added or removed soil mass matters. It is not a complete change estimate, a claim of sequestration or a substitute for a reviewed equivalent-mass procedure.

The next section makes the within-layer assumption explicit and identifies where the calculation no longer has measured support.

The curve is part of the method

A common soil mass does not tell us how to estimate carbon between the sampled layer boundaries. Wendt and Hauser's original procedure builds a profile of cumulative soil mass and cumulative carbon. It compares a straight-line interpolation with a smooth cubic-spline fit; those choices make different assumptions about how carbon concentration varies within a layer. Their paper also stresses reporting the reference mass itself, rather than only its approximate depth. [S46]

Our two-layer teaching example deliberately assumes a constant concentration within each layer. Its 36.0-tonne answer can therefore be reconstructed by adding the carbon above the lower layer to the share needed from that layer:

27.0 + [(3,600 − 1,800) / (3,900 − 1,800)] × (37.5 − 27.0) = 36.0 tonnes C.

The fraction is the share of the lower layer's soil mass retained. It is not the fraction of the whole profile retained. All masses in this exercise are per hectare. The same invented profile supports the following distinctions:

Cumulative reference mass	Position in the teaching profile	What can be stated
1,800 tonnes soil	Boundary between the two sampled layers	27.0 tonnes C
3,600 tonnes soil	Inside the lower sampled layer	36.0 tonnes C under the stated constant-within-layer assumption
4,200 tonnes soil	Beyond the 3,900 tonnes represented	Carbon is not estimated from these observations alone

A smoother curve is a different calculation, not evidence that additional soil was sampled. The paper discusses limited extension beyond its measured profile; this book does not adopt that allowance as a pilot rule. For the proposed work, flag any requested mass outside the measured support for technical review before reporting a result. This is a proposed quality decision, not a claim that every published method prohibits extrapolation. [S46]

Nor should the pilot choose a new reference mass at every visit merely because that gives a convenient answer. Compare treatments and dates on a consistent, documented basis. Preserve the layer observations, interpolation rule, permitted range and calculation version so that a reviewer can reconstruct both the result and its limits. A method change should reopen affected comparisons. It should not silently replace the earlier series.

These distinctions also explain why the FAO worked table remains a review question. A whole-profile proportional adjustment and a layer-based adjustment need not agree when concentration changes with depth. The cited guidance is useful; its presence does not remove the need to inspect a formula's assumptions. Neither this illustrative interpolation nor a software output establishes credit eligibility.

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IV · CARBON RECOGNITION

Existing pathways and their limits

The carbon opportunity around a farm is broader than one soil sample. It can involve soil management, rice methane, trees, biochar, weathering or manure management. Each pathway asks a different physical question. Each also has a different set of eligibility, accounting and monitoring requirements.

The initial overview was reviewed on 21 October 2026; the dated selected-requirements map later in this chapter records further checks on 22 October. The chapter does not declare a particular farmer, facility or proposed CarbonVerse project eligible. That decision requires the complete applicable documents and project evidence.

Agricultural land management

Verra's VM0042 v2.2 covers greenhouse-gas outcomes associated with improved agricultural land management. Its official page lists v2.2 and v2.1 as active and requires relevant corrections. The June 2026 corrections address matters including baseline description, additionality, quantification and remeasurement. [S07, S08]

The useful starting question is whether the proposed new management and outcome fit the method. The farming-system label alone does not decide that. Keep the historical management, the actual new change and the quantified outcome together. An existing natural farmer may have a genuinely new intervention to assess; existing practice by itself should not be redescribed as a new project change.

Keep the method, corrections and sampling requirements linked to the actual farm evidence. The soil-depth notice is an additional check before an existing report is used as quantification data. [S37]

Methane from flooded rice

VM0051 v1.1 provides a route for improved management in flooded rice systems. On 22 October 2026, the official page records activation on 14 July 2026. Registration or crediting-period renewal requests from 1 August 2027 must use v1.1; the listed v1.0 request types have a 31 July 2027 deadline, with qualified continuation provisions. Record the actual request and project history before using a transition provision. [S15]

Begin with the rice system, the documented previous practice and who can control irrigation and drainage. Then identify the proposed change and its whole-rotation consequences. Water saving, practice implementation and a greenhouse-gas reduction are different propositions to test.

The method offers modelling, direct methane measurement and default-factor approaches, with source-specific conditions; section 8.1 requires a consistent approach for the same source in baseline and project scenarios within a monitoring period. A water log alone cannot select or complete that calculation. [S15]

The Indian route needs its own assessment. The BEE approved index links BM AG04.002, Version 1.0, published on 30 June 2026. It addresses specified changes in rice cultivation under the Indian mechanism. Naming this document beside VM0051 does not make their conditions, programme decisions or resulting units interchangeable. Record which programme and document edition the proposal would use before choosing a calculation. [S56]

BM AG04.002 requires evidence of the area's previous rice conditions, including pre-season water and organic amendments, and controlled irrigation and drainage under its ordinary applicability conditions. Footnotes allow representations to the administrator for specified departures; that discretion is not an exception already granted to this pilot. Its farmer-support requirement also includes verifiable training and technical assistance during the cropping season. A proposed irrigation change therefore needs a feasible service arrangement as well as a water calendar. [S56]

Trees and vegetative cover

VM0047 v1.1 describes area-based and census-based approaches to afforestation, reforestation and revegetation. The official summary identifies dispersed plantings such as suitable agroforestry or shelterbelts as a context for its census approach. [S17]

A project must still resolve its actual land condition, planting activity, baseline, rights, monitoring and other requirements. Counting seedlings distributed is not measuring surviving carbon stocks. Existing trees should not be presented as new project removals simply because they appear inside the farm boundary.

The farm plan must also consider shade, water, labour and continued crop production. Tree placement should answer the farmer's land-management needs as well as the project's carbon question.

Biochar

VM0044 v1.2 addresses removals from converting eligible waste biomass to biochar at new production facilities, followed by eligible use. The official summary identifies an investment analysis for additionality in this version. [S16]

The field and facility need a connected material record: source, prior use, transport, processing, tested product and destination. Biochar mass is not identical to stable carbon mass. The method's treatment of persistence, emissions and eligible use must govern the project calculation.

If biochar is later measured within a soil sample, its carbon identity must remain linked to the removal account. Measuring it in soil does not create permission to issue the same removal again under another route. The relevant methods and combination rules must be reviewed together.

Enhanced rock weathering

Puro.earth’s overview introduces enhanced rock weathering; its approved document library lists Edition 2025 v2. The process concerns carbon removal associated with weathering suitable minerals, with its own verification and quantification requirements. [S18, S38]

The research questions extend beyond spreading a mineral powder. Material identity and suitability, contaminants, processing and transport, field reactions and downstream fate can matter. A theoretical chemical capacity is not a verified removal quantity. Soil suitability and the farmer's agronomic needs must be assessed before application.

This book treats weathering as an additional intervention to study where appropriate. It is not a required ingredient of core natural farming, and no universal application rate or credit yield is supplied here.

Manure and biogas

India's Bureau of Energy Efficiency publishes BM AG04.001 v1.0 for methane recovery from livestock and manure management at households and small farms. Its applicability focuses on relevant manure that would decay anaerobically without the project; recovery, combustion and digestate handling have specific conditions. It does not make every quantity of dung a source of avoided methane. [S19]

A farm account should trace manure that would otherwise serve a preparation or field application. A digester changes that flow and creates an operating responsibility. Actual gas handling, leakage, energy use and the destination of digestate need their own evidence.

A compact route map

Pathway	Physical outcome to investigate	An early evidence question
Improved land management	Relevant soil-stock and emission changes	What new practice changes relative to the documented baseline?
Flooded rice management	Relevant emission reduction	Can actual water management be linked to the selected gas calculation?
Tree establishment or restoration	Qualifying biomass-stock increase	What is new, where does it occur and who holds the relevant rights?
Biochar	Qualifying durable carbon storage	Where did the biomass come from and where did the tested product go?
Rock weathering	Quantified net mineral-weathering removal	What reacted, by what evidence, and with what deductions?
Manure methane	Qualifying avoided methane and related outcomes	What would happen to the specific manure without the project?

A market is another assessment

An independent voluntary methodology, India's Carbon Credit Trading Scheme and an Article 6 transaction are not interchangeable approvals. BEE's programme information provides domestic context; a listed sector does not make every practice within it eligible. S20

International use may introduce authorisation and corresponding-adjustment requirements. Verra's Article 6 reporting guidance makes that additional accounting context visible. No such status is assumed for this proposed pilot. S23

The development sequence should therefore remain explicit: identify the actual activity and method; assess project evidence and current rules; establish monitoring and independent review; then determine issuance and permitted buyer use. Research all relevant streams together, but implement only those that suit the place and have a defensible route.

Begin a pathway visit with the farm, not a price

The first visit should identify a real management opportunity. What is already done? What could change? Who controls the relevant land, water or material? Which record can establish the starting situation? These questions come before multiplying hectares by a credit price.

The same holding may have several possible questions and only one feasible intervention. A farm may have no controllable flooded-rice system. It may have no uncommitted residue for a conversion unit. It may have useful tree opportunities but uncertain long-term access. A route map helps narrow these choices; it should not make them all look available everywhere.

Record the reason when a pathway does not fit. That information prevents repeated offers of an unsuitable activity and helps the programme concentrate on the opportunity the farmer can actually implement.

Six pathways, six different starting conversations

For land management, begin with the existing rotation, materials, water and soil history. Identify a genuinely new change and the outcome to investigate. The next task is to test its fit with the complete selected method.

For rice methane, begin with the rice system and actual water control. Identify who can deliver the intended management and what records show its implementation. A farmer willing to participate may still lack the physical control needed.

For trees, begin with the location, access period, intended products and responsibility for continued management. Seedling supply alone does not answer survival, growth, land rights or the effect on annual cropping.

For biochar, begin with feedstock identity and prior use, the proposed facility and the final product route. Connect field and facility records. Do not start from a total biomass estimate that assumes away existing fodder, fuel or cover commitments.

For weathering, begin with suitable material and site assessment, including the evidence needed to determine what actually reacts and what follows. The theoretical potential of the rock is not the field result.

For manure methane, begin with the actual management and baseline conditions of the specific manure. A household possessing cattle does not by itself establish an eligible avoided-emission quantity.

These are proposed scoping conversations based on the distinctions already described. They are not substitutes for a methodology assessment or instructions to install an intervention.

Build a separate evidence folder for each route

The proposed evidence folder should contain a dated method and programme reference; applicability assessment; activity and rights record; baseline; quantification plan; monitoring responsibilities; relevant safeguards; and unresolved decisions.

A version number needs a date and a reason for applying it. On 22 October 2026, Verra's programme page still listed VCS Standard v4.7 as active until 1 January 2027. The version 5 overview, updated on 10 September 2026, describes rule-specific effective dates and conditions for early use. The project's start date, request type and request date therefore matter. [S49]

Document layer	Record to retain	Decision it supports
Activity method	VM0042 v2.2 with its 11 June 2026 corrections	Actual activity, boundary and accounting treatment. S07, S08
Programme standard	Applicable VCS Standard and version	Multiple-activity requirements: v4.7 section 3.6; v5.0 section 3.5. S47, S48
Transition and programme corrections	September 2026 effective-date overview and June 2026 programme corrections	Which requirement applies to this project request, and when. S49, S50
Referenced modules and tools	Documents invoked by the selected calculation approach	Their versions, purpose and full checks still needed.

The June programme correction also changes references to documents and templates. A familiar filename is therefore insufficient evidence that the working file is current. Save the document and its applicable correction together. S50

Keep the whole-farm resource map alongside these folders. Shared land, residue, manure, energy or labour can create links among routes. Separate folders organise evidence; they do not remove overlap in the physical system.

Ask what can be combined and what must be separated

A project can contain multiple activities under the relevant rules. VCS Standard v4.7 sections 3.6.1–3.6.3 require the activities and applicable method requirements to be addressed separately, subject to stated exceptions. Version 5.0 sections 3.5.1–3.5.2 also accommodate multiple activities and specify when separate baseline and additionality demonstrations are required or may be combined. Establish the applicable version before relying on an exception. S47, S48

A narrower accounting provision answers a different question. VM0042 section 4, condition 7 excludes biochar application as the project activity, while allowing biochar as an amendment with its total organic carbon deducted from the project soil-stock change at each verification. Footnote 5 directs the carbon-content procedure to VM0044. That treatment must be resolved alongside any proposed biochar claim; the deduction alone does not establish approval for the combined project. [S07]

Version 5.0 section 3.21 prohibits seeking credit for the same reduction or removal with VCS and another greenhouse-gas programme. Moving an entry to another registry does not change the physical outcome being claimed. [S48]

The proposed attribution register should identify each plot, material batch, period, outcome and claim. For a returning product, preserve the connection to its original production account. For shared activity data, state which calculation uses it and why.

Do not solve overlap by inventing a fixed percentage split between pathways. A commercial division of proceeds does not establish a physically valid division of the climate outcome.

Choose a route on more than gross tonnes

Compare feasibility, evidence cost, timing, farmer obligations and the household effect. A route with a large theoretical quantity may require expensive measurement or a change the household cannot sustain. A smaller opportunity may fit the farm better.

The decision sheet should therefore show the physical question, current evidence, work required, unresolved cost and effect on other farm uses. Keep the credit quantity and price unresolved where the evidence does not yet support them.

Use a no-credit case in the farm decision. Does the activity still meet a cultivation or resource-management need? If not, what reliable financing or agreement would justify undertaking it? This makes the risk explicit without dismissing the possible climate value.

Domestic and international use are later decisions with real requirements

Method fit does not establish every market permission. A domestic programme assessment, voluntary issuance and a particular international transaction each need their actual current requirements considered. Record which proposition is being assessed rather than using the word approved without an object.

Likewise, a buyer's interest does not settle authorisation, corresponding adjustment where relevant, registry status or claim use. The proposed project should obtain a route-specific assessment at the time of development and transaction. The book's dated map supplies orientation; it cannot pre-approve a future sale.

The value of researching the full opportunity

Investigating all six pathway families together can reveal shared measurements, resource competition and useful alternatives. It can also show that an add-on should be left out. That is the practical value of the full-stack inquiry proposed here.

Its success should be judged by better decisions: which activities fit, which outcomes can be measured, which costs are justified and which claims can survive review. The following selected requirements turn those starting conversations into specific questions about boundaries, materials and claims.

Read this dated requirements map with its limits

The selected checks below were made on 22 October 2026. They locate decisions that a developer must resolve; they are not a certificate of compliance. The soil row draws on the selected clauses examined in the preceding chapter. Other rows distinguish a method clause from an official summary, so the reader can see the strength of the underlying inspection.

Route and document	Selected location examined	Question to carry into project development
Land management: VM0042 v2.2 and June 2026 corrections	Section 4, condition 7; sections 8.4.1/8.4.4; selected section 8.6; Correction 3 and Clarification 9	Have the soil-carbon entry, applied biochar and required adjustments been reconciled? S07, S08
Flooded rice: VM0051 v1.1	Section 4, conditions 3 and 7–10; section 5	Does the proposed rice-and-rotation plan fit this route's actual boundary? S15
Indian rice: BM AG04.002 v1.0	Paragraph 8 and footnotes 3–4; paragraphs 13–15, 39–44	Which ordinary conditions can be evidenced, and which decision or monitoring arrangement remains unresolved? S56
Trees: VM0047 v1.1	Sections 4.1 and 4.3	Is the chosen approach consistent with the actual planting and continued land use? S17
Biochar: VM0044 v1.2	Section 4, condition 4 and agricultural-residue criteria in Table 1	Can the proposed material be demonstrated to qualify, rather than merely called waste? S16
Weathering: Puro Edition 2025 v2	Sections 2.1.2–2.1.3, 3.5 and 5.2	Who holds the removal claim, and what field measurements support it? S38
Manure: BM AG04.001 v1.0	Sections 2.1–2.2, paragraphs 4–6	Which baseline manure fraction qualifies, and can operation and digestate handling meet the conditions? S19

The underlying documents include further conditions, exclusions, tools and programme requirements. A selected row can expose a problem; it cannot establish that no other problem exists. Preserve the exact document, its date and location with the proposed response. When the response is unresolved, leave it unresolved in the farmer-facing account too.

For the proposed pilot, use three decision states: ready for a full applicability assessment; evidence or a technical decision still needed; or outside the selected route as presently designed. These are proposed internal working states. None means registered, verified or issued. A later revision may move an activity between states, with the reason retained.

A rice season is not the whole rotation

VM0051 section 4 requires controlled irrigation and drainage and restricts off-season changes, subject to stated exceptions. It excludes specified systems and material soil-carbon declines; its footnotes direct soil-stock and biochar-removal claims to other methods. [S15]

Draw the actual annual calendar before assembling a claim. A rice-water proposal may also change residues, winter cropping, manure or cultivation. Keep each change in its season and connect it to the proposed account. Use the following original scoping sequence with the existing pilot instruments; it is not the method's complete monitoring template.

Decision in sequence	Evidence to connect	What remains a separate decision
Describe the starting practice	Plot and history in Instruments A/B; crop and water calendar	Whether the history supports the selected formal baseline
Check a workable change	Actual water-control responsibility, advice and resources	Whether the household can implement it and the route accommodates it
Record what happened	Instrument F water/energy events, C operations and H harvests	Whether implementation and crop consequences meet the reviewed plan
Build the gas comparison	Selected approach, included sources, inputs, period and calculation version	Whether evidence supports a net reduction after required treatment
Return the status	Review outcome, open issues in J and a dated statement in L	Validation, verification, issuance and any payment due under actual terms

Sections 9.3.1–9.3.3 connect monitoring to expert recommendations, including safeguards against soil-carbon loss. Obtain locally justified advice; this book supplies no drainage depth or timing prescription. Keep the expert's recommendation, actual response and any departure linked. [S15]

Consider a wholly invented implementation problem: an advised drainage event cannot be carried out because the cultivator does not control a shared water release. Record the intention, actual water condition and reason separately. Refer the departure for review; a filled appointment calendar cannot replace the event. The next action may be revising a feasible plan, rather than claiming that the intended practice occurred.

One document detail remains open. The July revision notice and document history describe five-year baseline reassessment or reassessment at renewal, while section 9.3.1, item 5 on page 70 still refers to a ten-year plan. Preserve both locations and seek an applicable-rule clarification before adopting a reassessment timetable. This book does not silently repair the wording or turn either phrase into an agreed farmer obligation. [S15]

For the Indian method, connect that practical problem to the seasonal area record. Paragraphs 40–44 require cultivation records and identifiable participating farms; paragraph 42 excludes fields from that season's aggregated project area when a relevant departure means the reference fields no longer represent them. Keep the original observation, reason and review decision. Do not delete a difficult season from the farm's history simply because its area cannot enter the selected calculation. [S56]

Build a proposed record chain around what must be reconciled: the field identity and measured area; sowing and land-preparation events; the dates when water conditions actually change; material applications with dates and quantities; and harvest. The method explicitly calls for water states and their change dates, along with yield and a statement about following fertilization recommendations. A scheduled drainage event, an observed dry field and a reviewed compliant field are different entries. Instruments B, C, F and H can connect them, but still need a method-specific data dictionary and review procedure. [S56]

Choose the calculation branch before commissioning measurements. The reference-field provisions group cultivation patterns and use representative baseline and project reference fields. The document also contains simplified approaches, country-specific factors and an optional modelling provision. Those headings are not permission to substitute any convenient factor or model. Preserve the chosen branch, evidence source, units, period and required treatment of uncertainty; the complete tools, current procedure and calculation still need specialist review. This book adopts no methane factor or drainage prescription. [S56]

Its digital-monitoring footnote also asks for an auditable account of data movement and alteration. If a water entry is corrected, retain who changed it, when, why and what evidence supports the change. Remote observation can contribute evidence; it does not by itself establish that every proposed field met the cultivation plan. The shared database should preserve the farmer's original record alongside the reviewed status, rather than rewrite history to match a preferred total. [S56]

Keep the farm and claim decisions connected throughout. A useful cultivation change may still need a different project design. Neither a natural-farming label nor the completion of these proposed records establishes eligibility, an issued quantity or a payment.

Count a planting before calling it a tree project

VM0047 section 4.3 requires direct planting and continued pre-project land use for its census approach. Where area and census approaches coexist, section 4.1 requires non-overlapping areas defined at the start. [S17]

The proposed farm register should therefore distinguish existing vegetation, newly planted units, replacement planting and any separate area intended for another approach. Preserve the connection between a mapped location and its field identifier. A planted unit that cannot be found is a monitoring problem; a bundle of nursery invoices cannot replace the missing field evidence.

This also improves the conversation with the cultivator. Which part of the holding will remain cropped? Who can inspect the planting later? Who maintains a boundary marker after cultivation or repair? What happens when access changes? These are operational questions to answer before presenting a projected removal as household income.

The book does not select a planting density, species mix or allometric equation for the pilot area. Those decisions require the actual land condition, farmer purpose, agronomic advice and full route requirements. A diagram of a farm boundary should never be mistaken for an approved planting plan.

A residue needs a history before it becomes feedstock

VM0044 section 4, condition 4 excludes purpose-grown feedstock. Its agricultural-residue criteria address soil-carbon/productivity protection or documented prior burning, with a conditional removal limit where documentation is absent. Those provisions do not establish an agronomic recommendation for this pilot. [S16]

The first evidence is therefore a material history. Identify where the residue arose, how its quantity was established, its existing uses, its proposed destination and who can authorise that change. The word surplus should be a conclusion from that record, not the label applied before asking the household about fodder, cover or fuel.

Follow the chain through storage, transport, conversion and eligible end use. A weighed load leaving a field is evidence of a transfer. It does not establish the dry carbon content of the resulting product or the amount of durable storage. Likewise, a product delivery receipt does not prove that all upstream conditions were satisfied.

Proposed contracts should preserve access to the records needed for the actual claim. If a supplier cannot provide a required measurement, identify the gap before the project relies on that material. Farmer payments and processor charges belong in the commercial account with their real terms; they cannot repair a missing physical record.

Read the weathering edition, not just its announcement

The weathering method and the programme rules have separate version histories. On 22 October 2026, Puro's library listed Enhanced Rock Weathering Edition 2025 v2, approved on 5 March 2026, alongside General Rules 4.4. The method's section 3.5 points to those rules, but footnote 16 still names version 4.2. Keep that older reference visible in the document record. [S38] [S51]

The General Rules history explains that facilities certified under 4.2 are deemed certified under 4.3; registered facilities preparing certification proceed under 4.3 from its approval. Version 4.4 is now the listed text. Its section 3.5 bars simultaneous registration of the same removal activity in another removal programme, requires rights records and addresses supply-chain claims. Permission for disclosed non-removal registrations, such as biodiversity credits, is not permission to combine two removal methods. [S51]

The method-edition transition is a different question. The November 2025 plan distinguishes already certified facilities, facilities preparing their first audit and new registrations. Earlier certification can continue within its existing crediting period; renewal requires the then-current method. A preliminary assessment under Edition 2022 does not carry over to Edition 2025. These are facility-specific histories, not benefits available to any new proposal. [S52]

Puro's later notice confirms that 18 February 2026 was the deadline for complete Edition 2022 audit packages from facilities registered before 15 December 2025. That qualified deadline is not a general extension for a pilot planned later. The transition plan's first page prints a conflicting year; retain it with the later clarification rather than silently changing the source. Our proposed pilot has no established registration or certification history here. [S52] [S53]

Before asking farmers to join a weathering route, the proposed evidence folder should answer three practical questions:

- Who holds the claim? Method sections 2.1.2–2.1.3 assign end-to-end verification data responsibility and sole CORC claim rights to the CO_2 Removal Supplier, with agreements across the chain. Identify the actual parties and explain the proposed farmer arrangement before seeking agreement. [S38]
- Which dates and documents apply? Record the method, General Rules, relevant requirements and the facility's actual status together. A library listing alone does not settle the complete governing set or establish pilot eligibility.
- What else is claimed on this field? Record each activity, outcome, period, programme and claimant. Different labels or separate samples cannot establish that overlapping claims are permitted.

Connect the mineral source, application location, monitoring period, samples and responsible record keeper before interpreting a chemical result. A delivery receipt establishes a material movement. A spreading record establishes a reported operation. Characterisation of the material and observations of what subsequently happens in the field answer further questions. Keep those identities connected without treating one document as a substitute for the others.

The inspected method's sections 5.3 and 6.2 separate stored carbon from baseline weathering, including what would have happened to the material without the intervention. Its overall account also includes losses, project emissions, leakage and an uncertainty-related conservativeness factor. These are distinct terms, not a single deduction chosen for convenience. [S38]

Section 6.1 distinguishes primary quantification from measurements used to validate it: the validation result checks the primary estimate rather than adding another quantity to the same calculation. Section 11.3.1 prescribes approach-selection and validation coverage. Two convenient laboratory tests are not automatically an eligible pair; the proposed project still needs a reviewed, site-appropriate plan under the complete requirements. [S38]

Use this original record-to-claim check when discussing that plan. It identifies what each layer can establish; it does not prescribe a laboratory procedure or calculate credits:

Evidence layer	What the record can support	What remains to be established
Material and application history	Identified material, amount, place and operation date	Suitability, the monitored reaction and its outcome
Measured weathering signal	An observation with units, sampling times, method and comparison records	Conversion into the defined carbon quantity using the applicable approach
Validation evidence	A check on the primary estimate under the required design	Whether the estimate is supported; a second measurement is not a second removal
Net removal account	A traceable calculation for a defined period and boundary	Complete deductions, uncertainty treatment, eligibility and independent assessment

Consider an explicitly invented case: a delivery receipt and application log exist, but the monitoring results needed for the proposed calculation have not arrived. The team may report the documented application. It cannot multiply the delivered rock mass by a guessed factor and call the answer measured removal. A chemical analysis of the delivered rock does not supply the missing field observations at the required times. Mark the calculation as unavailable, name the missing evidence and preserve the link to the operation; do not invent either a positive result or a measured zero.

The baseline question has to remain visible even when a field signal can be measured. What would the relevant field and material have done without this additional activity? An untreated comparison and the material's counterfactual history address different parts of that question. The proposed folder should identify the evidence for each, its period and the person responsible for reviewing the estimate. Do not quietly assume that background weathering is absent because the pilot purchased and spread the material.

Likewise, the net account needs the work beyond the field boundary. Identify which processing, transport and other relevant activity records enter project-emissions calculations, and which losses or leakage require separate evidence. Record the treatment of uncertainty as part of the calculation's method, rather than present it as a transport emission or commercial fee. The exact eligible approaches, loss terms, model assumptions and uncertainty computation remain specialist work; this discussion supplies no ready-to-use factor or validated local estimator.

A shared field creates another question: can the observations distinguish the weathering activity from soil-management outcomes and their interactions? Shared visits may reduce travel, but they do not establish that one sample or calculation suits both routes. Keep the removal account distinct from an agronomic assessment. A mineral intervention belongs in the proposed pilot only after local suitability, permissions, costs, monitoring feasibility and applicable requirements have been reviewed. Neither a traceable application nor a promising signal alone permits a promised credit payment.

A digester changes an existing material flow

BM AG04.001 paragraph 5(b) permits combinations where applicable. Paragraphs 5–6 still require the qualifying anaerobic baseline fraction, combustion and aerobic final-digestate handling, among other conditions. Permission to consider a combination does not establish this farm's eligibility. [S19]

Trace the manure before and after the proposed change. A holding may send different fractions to different uses. Preserve the evidence for each route rather than assign the whole supply to a baseline condition observed for only part of it. The baseline calculation uses livestock and manure-management information, including the share of annual volatile solids managed in each system. A bucket's wet weight is not that parameter. The proposed survey and calculation need compatible definitions, units and periods. [S19]

Installation and continued operation are also different records. BM AG04.001's monitoring tables distinguish the commissioned population from systems that remain operational, and monitor gas consumed and methane content. Paragraph 19 constrains reductions through the baseline- and combustion-based calculations with the applicable deductions. Gross gas production alone is therefore not the credited reduction. The referenced tools and sampling standard still need a complete, project-specific assessment before any calculation is adopted. [S19]

Use this original four-part check when assembling the proposed evidence folder:

Part of the chain	Records to connect	What the record does not establish alone
Earlier manure handling and the changed flow	Livestock history, surveyed management routes, feedstock and period	That all manure had the same qualifying baseline
Commissioning and continued operation	Unit identity, acceptance record, operating periods, interruptions and repairs	That every installed unit remains usable throughout the accounting period
Gas reaching the intended use	Consumption evidence, measurement basis, methane-content basis and relevant operating records	That a gross gas volume is an equal mass of methane avoided
Net account and returned digestate	Applicable emissions and leakage treatment, digestate handling and application records	A second methane claim, automatic soil removal or a payment entitlement

Consider an explicitly invented case: the digester is recorded as working, but the associated cooking burner is not. The installation record and an account of gas production cannot demonstrate the intended combustion during that interruption. The method's operationality table expressly addresses this situation as project emissions. Record the event, what was observed and the repair history; do not silently treat it as either normal successful use or an absent unit. The required calculation needs the actual method and evidence, not a guessed daily gas figure. [S19]

Where gas measurements are proposed, keep volume, methane content and the conversion basis connected. The method requires the gas-volume and methane-content measurements to use a consistent wet or dry basis. A displayed volume cannot be treated as a methane mass without the relevant composition and conversion information. Specify the selected permitted option and its evidence in the project documents; this book does not choose a default methane share or measurement campaign for the pilot area. [S19]

The operating record should be useful to the household as well as the accountant. Who notices a failure, records its duration, arranges maintenance and confirms restored service? Capture the operator's time, purchased energy used during interruptions and whether the household can actually use the resulting energy. Those are economic and service outcomes to investigate under chapters 10 and 13. They do not become extra methane reductions merely because the same visit documents them.

Keep the returning digestate connected to the original manure and digestion records. Its storage, handling and application belong in the material history; relevant emissions cannot disappear because it is described as a useful input. An application to a plot is a further event, not by itself a second avoided-methane claim or proof of additional soil-carbon removal. Any soil-account proposal needs its own compatible boundary, baseline and applicable rules, with overlap reviewed before quantities are added.

Before this optional route enters a farmer's plan, establish the actual manure supply, qualifying baseline, suitable service arrangement and feasible monitoring. Explain who will keep and return the records, pay for continuing support and review the calculation. Keep proposed roles distinct from agreed responsibilities. A functioning unit can offer a useful household service while a credit claim remains unresolved; neither a method listing nor an installed unit is a promise of farmer income.

Check three intersections before combining claims

Place and period	Shared field or interval?	→	Identify the boundary
Material	The same batch returns?	→	Connect the transfers
Outcome	The same carbon again?	→	Resolve the claim account

A proposed review sequence, not permission to combine methodologies or actual findings.

Test overlap before adding quantities

Imagine a proposed holding with improved land management, a suitable rice activity, new planting and a proposed conversion service. These are invented arrangements for explaining a review, not observations from the pilot area. Start with a map and material ledger, then write each intended claim in a sentence: the outcome, place, period, baseline comparison, calculation and responsible claimant.

Proposed intersection	Physical question	Decision record needed
Soil measurement and applied biochar	Does a measured stock include carbon already linked to the product account?	Preserve batch identity and the applicable subtraction/accounting treatment.
Rice and whole-rotation changes	Does the selected route accommodate the actual seasonal changes?	Locate each change and obtain a route-specific applicability decision.
New planting and cultivated land	Are planting boundaries, approach and continued land use consistent?	Retain the map, original vegetation record and chosen approach.
Digestion and returning digestate	Which material fraction, event and outcome does each entry describe?	Connect the baseline manure, operating and field-application records.

This is an original review worksheet, not a programme permission table. It intentionally has no green tick that means every listed pairing is allowed. A method may exclude an activity, require a special treatment or leave a question requiring clarification. The response must come from the applicable documents and a defensible assessment.

An evidence-reuse decision should also name what is being reused. A plot identifier may connect several records safely. A moisture reading may be relevant to a particular material calculation. A greenhouse-gas reduction cannot be copied into a second claim simply because the projects use the same identifier. Record the difference between shared provenance and shared ownership of an outcome.

If the proposed design changes, reopen the affected intersections. A new feedstock source can alter a material boundary. A changed crop calendar can alter route fit. A different planting arrangement can alter the approach assessment. The earlier review should remain visible as history, with the new decision and its evidence beside it.

Keep an unresolved combination out of the revenue total

For an invented planning exercise, suppose one folder contains an estimated 12 tonnes of carbon-dioxide equivalent and another contains an estimated 7. A shared 3-tonne component is suspected but has not been identified sufficiently to decide the correct accounting treatment. The arithmetic sum is 19. Subtracting 3 gives 16. Neither calculation establishes an eligible combined quantity: the physical overlap, method compatibility and each underlying estimate still need resolution.

The useful report is therefore the two provisional entries plus the named unresolved intersection. Do not choose 19 because it looks promising or 16 because subtraction looks conservative. Conservativeness is not a substitute for knowing what the quantities represent. Do not average them into a third number or convert them into a payment promise.

When review does establish an admissible combined account, retain the original estimates, the overlap evidence, the exact treatment and the reviewed calculation version. Then explain the result in the household statement: which activities remain, which quantity is still provisional, what work is required and which obligations would arise only under an actual agreement.

The material histories and supply review below help locate the unresolved link. An exclusion, a missing measurement, an unsuitable activity and a cost barrier need different responses.

Follow the material beyond the receiving gate

A delivery receipt can show that material reached a participating field. It cannot show what happened to the use it left behind. For the proposed pilot, follow both ends of that change: the receiving field and the previous destination. This is particularly important when the attraction of a new carbon opportunity changes who can obtain a scarce material.

VM0042 v2.2 section 8.4.1 addresses leakage from specified new or additional imported organic amendments, with documented exceptions to its deduction. Section 8.4.4 addresses diversion of manure or crop residues from baseline energy uses through TOOL16. Those selected provisions require more than a record of delivery. [S07]

Consider an invented case. A supplier previously delivered a material to one cultivator and now delivers it to a participating field. The new receipt establishes a transaction. The earlier recipient's response remains a question: was the use discontinued, supplied from another source or replaced by something else? Do not choose whichever answer makes the new account look better. Identify the relevant history and the evidence needed under the applicable route.

The same question can arise inside one household. Suppose residue that served an existing fuel use is redirected to a soil-management activity. A field photograph could document the new use. The household account must also ask what happened to the former service. Additional collection, a purchase or a different arrangement would change the practical comparison. This is a question to investigate, not a claim that every redirection necessarily increases emissions.

Use this original tracing worksheet beside the material ledger. It asks the proposed field team to preserve the missing connection rather than assign a default consequence.

Point in the change	Question to resolve	Record to connect
Source	Which material and period does the delivery represent?	Batch, origin, quantity and measurement basis
Previous use	What would have happened to this material without the change?	History, recipient and supporting evidence
Former recipient	Has the earlier service continued, changed or stopped?	Actual response and any replacement source
New destination	Which activity actually received and used the material?	Transfer, storage and application links
Proposed claim	Which account addresses the resulting change?	Method clause, calculation and review status

The worksheet is not a complete leakage calculation. A household interview may identify a relevant change without supplying its emission factor or establishing a rule exception. Likewise, no observed replacement in one visit does not prove that the former use disappeared permanently. The technical assessment must identify the comparison period, evidence quality and treatment permitted by the applicable rules.

Keep the financial and physical accounts connected. A participating farmer may pay for an imported amendment, while another user bears a replacement cost. That does not, by itself, determine the carbon result, but it does matter to a claim that the transition benefits every stakeholder. The pilot should investigate who gains a service, who loses access and whether the arrangement can continue through the crop calendar.

A proposed sourcing change may therefore need redesign before a larger supply contract is considered. The next useful action could be recovering the previous destination record, assessing a different source or limiting the activity to what can be supported. A claim cannot be repaired merely by widening the map to include a name while leaving the affected material flows unexamined.

A supply balance must survive the new demand

A processor's demand does not create additional residue. Before assigning a material to a proposed pathway, reconcile availability, existing commitments, storage and the new request on one physical basis. Then assess whether the remaining material meets the relevant conditions. A positive balance answers an inventory question; it does not establish feedstock eligibility or a safe removal level for the field.

VM0044 v1.2 Appendix 2 examines five-year feedstock-use histories and distinguishes identified unused sources, identified sources with other uses and sources with unknown producers. Its section 8.3 treatment of biomass diversion relies on waste-biomass eligibility; it does not remove the sourcing assessment. [S16]

This distinction prevents two opposite mistakes. A supplier having another customer does not settle the status of every batch it supplies. Equally, calling a particular load waste does not demonstrate that it is available without affecting commitments or that the applicable conditions have been met. The evidence must identify the proposed material and the route by which its status is being assessed.

Take an explicitly invented planning ledger. All entries below refer to the same period and tonnes of dry material. Opening stock is 10 tonnes and the newly arising quantity is 90, giving 100 available before allocations. Existing delivery commitments use 50. Planned closing stock is 15 and separately identified handling losses are 5. The remaining unallocated quantity is 30 tonnes.

Invented ledger entry	Tonnes of dry material
Opening stock plus newly arising material	10 + 90 = 100
Existing delivery commitments	−50
Planned closing stock	−15
Identified handling losses	−5
Remaining before the new request	30
New processing request	40
Unresolved shortfall	10

The request exceeds the remainder by 10 tonnes. Do not silently take that amount from an existing customer, erase the planned closing stock or relabel a loss to make the proposal balance. Revisit the actual arrangement. A revised request, a separately evidenced source or a documented change in commitments would each create a different plan to assess. None is assumed to have occurred in this example.

The 30-tonne remainder is not a declaration that 30 tonnes can be removed sustainably or credited. The ledger is not an implementation of Appendix 2's regional surplus test, a field removal recommendation or a forecast of biochar output. Its purpose is to reveal a demand conflict before a project relies on a supply that the recorded plan cannot provide.

For mixed deliveries, retain the connection to each source category and its evidence. Combining loads should not make an unknown origin appear documented. Nor should a change of intermediary reset the material's history. If a required link cannot be established, record the affected quantity and the unresolved assessment rather than spread a favourable assumption across the whole consignment.

Finally, carry an accepted physical record into a claim only with its intended role intact. Raw material quantity, processed product quantity, product carbon and a net greenhouse-gas outcome are different entries. Connect them through the reviewed process and account; do not add them as separate benefits. That record gives the next chapter's gap analysis a precise question: which physical link, evidence requirement or institutional decision still prevents a defensible claim?

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IV · CARBON RECOGNITION

Where the evidence and institutions fall short

A farmer may have changed the way a field is managed and still have no carbon credit to sell. What stands between the work and recognition? That question deserves a better answer than either “the market ignores farmers” or “the science is settled”. The obstacle might be an unmeasured outcome, an unsuitable comparison, a rule the activity does not meet, a cost nobody has funded or a responsibility nobody has accepted.

Those obstacles lead to different decisions. A missing laboratory measurement calls for a measurement plan. A practice already covered by a method calls for an eligibility assessment. A genuinely uncovered activity may justify methodological development. A project with no defensible net climate benefit needs a different claim, however valuable its other outcomes may be.

This chapter proposes a way to diagnose the obstacle before proposing the cure. It is an editorial and research framework for the CarbonVerse pilot, not a report of decisions already received from a registry. Its purpose is to make the case for farmers more precise, useful and difficult to dismiss.

Three different evidence problems

Not measured	Observation absent	→ Plan collection
Unresolved	Precision or duration limits	→ Review the design
Not shown	Expected effect unsupported	→ Interpret and limit the claim

A proposed diagnostic map for the pilot, not actual study findings.

An evidence gap is a question we cannot yet answer

“More evidence is needed” is too broad to guide a field team. Evidence of what, relative to what and over which period? A useful gap statement names the outcome and the decision that cannot yet be made. For example: the project has adoption records but cannot reconstruct the previous residue destination; or it has carbon concentration measurements but lacks the soil-mass information needed to interpret a stock change.

Neither gap is repaired by adding more photographs of the current crop. The photographs may establish a dated observation, but the missing fact remains missing. A new soil sample also cannot, by itself, recreate an unrecorded historical baseline. The project must assess what can credibly be recovered and what prospective observation can establish from now on.

Distinguish three situations in the evidence register:

- Not measured: the relevant observation was never collected.
- Measured with insufficient resolution: the observations exist, but their precision or duration cannot distinguish the proposed change reliably.
- Measured without the expected result: the study did not establish the claimed improvement under its stated conditions.

The first calls for a collection plan. The second calls for a design and feasibility decision. The third calls for interpretation and perhaps a narrower claim. Treating all three as an information deficit creates an excuse to keep searching until a favourable number appears.

A gap can also concern transfer to another setting. Evidence from a different soil, crop sequence or irrigation system can inform a hypothesis without establishing the same effect in the proposed pilot area. The useful question is which differences could change the mechanism, and which local observations would test them. The pilot should identify that uncertainty before its results are known.

A boundary gap needs a map

The farm is connected; a carbon account must still say what it contains. Draw the plots, material movements and claimed outcomes on one map. Show which land is included, where materials originate, where they go and which period each record describes. Then mark the particular line that appears unresolved.

One irrigation event may inform the household's water and energy account, an expert's implementation review and a candidate gas calculation. Linking the same original record to those uses is sensible. It does not create a separate creditable quantity for each use. Conversely, different outcomes can arise from one change; they need their own supported quantities and the complete applicable account. Renaming a method or dividing a file does not make an already claimed physical outcome new.

The source boundaries show why the distinction matters. VM0051's Table 1 includes soil methane and requires nitrous oxide attributed to irrigation changes in all projects. A favourable methane component cannot stand in for that complete gas account. VM0042's Table 3 also contains soil methanogenesis, subject to its stated inclusion conditions. Two method names therefore do not establish two independent rice-methane outcomes or permission to combine them. Match the particular source, field and period before proposing an attribution. S07 S15

Biochar gives a different boundary problem. VM0042 condition 7 permits it as an amendment only with the specified subtraction of its total organic carbon from estimated project-scenario soil-carbon stock change at each verification event. VM0051 condition 10 excludes projects seeking biochar-use carbon-dioxide-removal credits and points to VM0044. These selected provisions are not a combined-project approval. A material receipt still needs its source, carbon basis, destination and accounting adjustment; a second heading labelled “soil improvement” cannot supply a second claim on the same carbon. S07 S15

Use the following proposed check beside the gap register. The wider observations remain useful while the candidate claim is being assessed.

Shared record	Wider use it can support	Claim question still to resolve
Irrigation event and field-water observations	Water applied, energy use and implementation review, where supported	Which gas sources, field, period and baseline are represented; does another account already include them?
Biochar batch and application record	Material allocation and amendment history	Is the carbon basis established, where is it accounted for, and which required subtraction or exclusion applies?
Residue movement and previous destination	Cover, feedstock and household resource accounts	Are material quantities compatible, and has the relevant displaced use or leakage been assessed?

The last row concerns completeness as well as overlap. The June 2026 VM0042 correction adds displaced-production leakage to the sums allocated between reductions and removals. Changing a claim's label must not make that required term disappear. Preserve the applicable corrected equation and its input links; do not treat this example as implementation of the linked leakage module. [SO8]

For each unresolved entry, Instrument K should link the candidate quantity, source or stock, field/period, method/version, adjustments and overlapping-account check to the actual review status. Use Instrument F for its supported water and energy observations. Return the accepted use and remaining gap through Instrument L in words the household can check. If authority or evidence remains missing, retain that status rather than issue an apparently complete total. Chapter 17's whole-system proposal starts from these connected records; it does not turn every recorded practice into a tradable unit.

An implementation gap can be costly

A measurement can be scientifically possible and operationally difficult. Repeated visits, specimen handling, laboratory capacity, record correction and follow-up all require people and time. The household may carry part of that work even when the project budget lists only a laboratory fee.

Start with the actual task. Who collects the observation, when is it needed, how is it checked and what happens if the visit is missed? A cheaper service with an unreliable schedule may create an expensive missing-data problem. Conversely, repeating a measurement that cannot change the decision may waste resources without improving confidence.

Aggregation deserves the same scrutiny. Sharing transport, training or a sampling team might reduce some costs. It can also create coordination, data-management and dispute-resolution work. Compare the complete service arrangement rather than divide one attractive headline quotation by the number of farmers. The number participating is not automatically the number supplying independent scientific information.

The proposed response should state the minimum evidence quality it must preserve. If a lower-cost option no longer answers the question, label that loss. If no feasible option meets the required quality, the immediate result may be a research-finance requirement, a smaller defensible activity or a decision not to pursue that credit pathway.

Separate a financing gap from an efficiency gap. A necessary cost may be affordable overall but due before any possible sale. Another cost may remain excessive even after the timing problem is solved. Advance funding can address timing; it does not prove that an uneconomic service has become efficient. Neither problem should be passed silently to the household.

Method development has a separate funding question. Under section 2.3.2 of Verra's process, funding development gives no control over decisions or assurance of a funder's future project eligibility. [S27]

An institutional gap needs an owner

A digital platform can store an observation. It cannot acquire every authority needed to act on it. Measurement, consent, scientific interpretation, project administration, independent assessment and issuance involve different decisions. For the pilot, a responsibility map should identify each decision, the proposed role, the evidence of authority and the unresolved appointment.

A laboratory supplies a result within its service scope. A research institution may advise on design or analyse data. A farmer organisation may coordinate field work. None of those roles, by itself, establishes the power to issue credits, promise payment or authorise an international use. Record an institution's actual agreed role only after the relevant evidence exists.

The pilot area is still a proposal, within the six states where CarbonVerse plans to start. Agricultural universities, ICAR research institutes, Krishi Vigyan Kendras and technical institutes near it are possible research partners. Naming a kind of institution identifies capabilities to explore; they do not establish partnerships, reserved laboratory time or approval of CarbonVerse's proposal.

Responsibility also has a handover problem. Suppose a field officer leaves during a crop cycle. Where are the records, who can explain a correction and who will answer a farmer's question? A named role without continuity arrangements may disappear when the named person changes. The proposed operating system should preserve a dated record, authorised access and a route for unresolved decisions.

Obstacle	Evidence needed to identify it	A proportionate response
Climate outcome is not established	Outcome definition, suitable observations and uncertainty	Improve the design or limit the claim
A historical comparison cannot be reconstructed	Dated records, source quality and remaining unknowns	Assess a defensible alternative; do not invent history
An identified activity may fall outside a method	Project facts matched to the actual clause	Assess clarification, revision or another route
Two accounts may claim the same outcome	Plot, period, material and outcome links	Resolve overlap before attributing units
Measurement service is unaffordable	Complete task costs, timing and quality options	Assess shared services, funding or a narrower scope
Farmers cannot sustain the proposed task	Seasonal work, support and missed-task records	Redesign the task or assistance
Payment or data authority is unclear	Actual documents and decision responsibilities	Resolve the role before making a commitment
Relevant research already exists	Current project descriptions and available outputs	Identify the remaining question and build on the work

The table is a proposed diagnostic tool. It does not declare that any institution has refused the pilot or that every listed obstacle will occur. Its value is in directing the next useful action rather than turning every difficulty into a general demand for recognition.

Recognise the work already underway

TERI's project page, dated 1 December 2025, describes intended soil-carbon, microbial and livelihood investigations in Andhra Pradesh. Its objectives are evidence of a defined research agenda; the page supplies no completed field results or issued quantities. The question has already been framed in an identified project. [S10]

For CarbonVerse, a contribution should therefore be expressed as a specific question: what can the comparison in the proposed pilot area establish, under its own soils, management histories and household conditions? An independent local study can be useful even when the broad subject is already being researched. Replication, comparison and a clearer account of limits are worthwhile contributions.

Maintain a search record that separates a project announcement, a protocol, a working paper, a peer-reviewed paper and an available dataset. These are different objects. An announcement can show that a question is being pursued without supplying an answer. A paper can supply an answer within its design without giving permission to reuse unpublished participant data.

Do not turn an inaccessible document into evidence of absence. Record the title, access attempt, material actually inspected and the question still open. Equally, do not cite an available abstract as though the complete methods and supplements had been checked. The evidence register should make those limits visible enough that another reader can continue the investigation.

Make rejection informative

A refusal can be useful evidence if the actual reason is preserved. Record who made the decision, when, what was reviewed and whether the response was an informal explanation or a formal determination. Keep the question and the answer together. A reply to one narrow fact pattern should not become a claim about every natural-farming project.

Classify the reason before acting. Missing observations call for evidence work. A missed timing condition may require a different prospective activity or route. An unresolved methodological issue may justify development work. A failed net account may require stopping the carbon claim. These responses are not interchangeable.

A revised submission should identify what has changed and why it addresses the earlier reason. More persuasive language alone does not repair an unchanged fact. If the answer remains uncertain, preserve the uncertainty rather than record the case as accepted or rejected for a reason nobody has actually given.

Close issues that are resolved under an existing method. The project should not retain an obsolete “exclusion” merely because it supports the book's initial argument. The aim is a fair opportunity for defensible outcomes, including recognition that becomes possible through better implementation of an available route.

Check the rule before proposing its replacement

A method number is a starting point for review. For each candidate route, record the version, status, associated corrections, applicable programme documents and the date checked. Then assess the relevant activity, location, historical management, timing, baseline, additionality, monitoring and combination requirements. Keep unchecked clauses explicitly open.

Use the preceding chapter’s six-pathway map alongside this diagnosis. Its question is how to decide whether a problem is really a missing method. A farming-system name may be absent while an outcome-producing activity is covered. Conversely, familiar words such as soil or trees on a method page do not establish that a particular project qualifies.

Verra’s Methodology Development and Review Process v5.1 separates these routes in section 2.5.2. [S27]

Change being assessed	Review distinction in the inspected version
Major revision	Follows the new-method development process
Minor revision	No concept note or independent expert review required; consultation is discretionary
Corrections and clarifications	Apply from release to projects using that version, unless otherwise specified

Check the applicable version and route before treating a proposed change as approved.

For this book, clarification, revision and new development are therefore separate questions to assess, not promises to offer farmers. First describe the case. Then identify what existing text can resolve and what would actually need changing. The appropriate programme determines its process; CarbonVerse cannot assign itself an exception.

Build a case file another person can challenge

Each proposed gap should have a short decision file with the detailed evidence behind it. Begin with the decision sought in ordinary language. “Can this defined outcome be accounted for under this route?” is more useful than “Will you recognise natural farming?” The latter leaves the activity, unit, boundary and authority unclear.

The proposed file contains six linked parts: the claim being assessed; the relevant farm facts; the current rule or unresolved research question; the evidence actually available; the remaining uncertainty; and the proposed next test or decision. Include a dated version so later edits do not silently change the case that was reviewed.

Separate observation from interpretation. A dated record may show that a material was delivered. The conclusion that the delivery caused a net removal is a further inference requiring its own account. This separation allows a reviewer to agree with the observation while challenging the attribution, without having to reject the whole file.

Invite the strongest practical objection. What observation would contradict the proposed mechanism? Which historical fact could change the baseline? Which household burden could make the work unacceptable? Recording the answer before results arrive reduces the temptation to redefine success around whatever happens.

Ask whether the missing item can change the decision

Not every unknown deserves the next rupee or field visit. Prioritise an uncertainty by its consequence, its current size and whether feasible evidence could reduce it. A missing record that decides applicability can matter more immediately than a sophisticated measurement of a benefit outside the proposed claim.

Use a simple decision sequence. If the activity clearly fails a necessary condition, resolve that issue before paying for a full credit calculation. If the necessary facts remain uncertain, determine whether a modest check can establish them. If a material uncertainty cannot be resolved affordably, make the decision under that limitation explicit.

This is a proposed research-priority rule, not permission to omit an inconvenient emission or required measurement. Required information remains required. The purpose is to order work intelligently and prevent an attractive technical task from consuming resources before a basic condition is understood.

Keep a route for non-carbon decisions. A household may need a cost or workload answer sooner than a long-duration soil result. The project can return useful seasonal findings without implying that the climate question has already been resolved. Research should serve the household while the more demanding account develops.

Explain the gap without promising an income

A farmer-facing explanation should identify what is known, what is being tested and what decision comes next. It should say whether the present work is research, an eligibility assessment or a later project stage. A prediction of future carbon income is not a substitute for that explanation.

For example, an illustrative explanation might say: “We can document the management change. We still need to establish the relevant net climate outcome and assess the applicable requirements. There is no issued quantity to allocate at this stage.” This is suggested wording for discussion, not a quotation from a participant or an account of a meeting.

If the project cannot yet state who funds a task, what data will be used or how a complaint will be answered, those are specific unresolved items. Answer them through the proposed operating arrangements before asking a household to rely on an implication. Keep actual participation and payment terms separate from this book's design proposals.

Define what would count as progress

The gap register should record outcomes as well as open questions. Useful progress may be a missing historical record recovered with a credible source, a cheaper service shown to preserve precision, an overlap removed, a role formally assigned or a claim withdrawn because the evidence does not support it.

It may also be a well-documented negative result. That result can prevent an unsuitable intervention from spreading or redirect research towards a better question. Its value depends on a design capable of answering the question and a clear account of what was and was not established.

For whole-system recognition, the strongest case will not be a list of everything a farm does followed by a request for a credit for each item. It will be a connected account of the field, an honest diagnosis of each obstacle and a practical route for every independently supported outcome. The comparison and intake decisions below apply this diagnosis to the farmer's actual history.

Two comparisons can give two different answers

Imagine two neighbouring fields in a research trial. The team wants to know whether a defined natural-farming package changes harvest, labour and soil indicators relative to another specified management system. That is a worthwhile comparison. Now imagine that one participating farmer has already retained residues for years. A carbon assessment of a newly proposed residue intervention must confront that history. The neighbouring research treatment cannot simply replace it because it produces a larger apparent difference.

VM0042 v2.2 requires a new management change. A quantitative adjustment must exceed 5% of its historical average; the look-back covers at least three years and a complete rotation where applicable. These are selected requirements, not the whole eligibility test. [S07]

Here is an invented arithmetic exercise, using an unspecified management quantity rather than a crop recommendation. The evidenced historical average is 100 units per hectare. Moving to 95 is a 5% reduction; moving to 94 is a 6% reduction. The first does not exceed the stated threshold. The second passes only that numerical comparison. Neither result establishes that reducing this quantity is agronomically sensible, causes a climate benefit or satisfies additionality. If the historical value is zero, this percentage calculation is undefined; it cannot establish the status of a genuinely new practice.

Write the two comparisons on separate lines:

- Research question: what does the specified intervention change relative to the study comparator, under this design?
- Crediting question: what outcome arises relative to the applicable project baseline, with the other requirements satisfied?

The research may help supply evidence for the second question. It may also reveal that the selected package reduces labour but leaves the measured climate outcome unresolved. That would still answer part of the research question. Changing the comparator after seeing the result would damage the usefulness of both accounts.

For the proposed pilot, retain a short comparison crosswalk beside the analysis plan. Name the study arms, the historical management of each candidate field, the proposed new change and the carbon baseline under assessment. Mark where they agree and where they differ. A reviewer should be able to discover that the comparison supports a household decision while remaining insufficient for a carbon claim. This is a proposed working document, not an assertion that the pilot already has an accepted baseline.

Give an early adopter an honest place

A farmer who changed management before a project arrived should not have to erase that achievement to fit an intake form. Record the earlier work, what it cost to learn and what can actually be observed now. Then assess any genuinely new change separately. The following invented situations show how the proposed intake could keep history intact; they are not registry decisions about real farms.

Recorded situation	Proposed assessment task	Useful place in the research
Some practices already used; another change proposed	Separate the old management from the actual new activity	Study the additional change and its practical burden
All proposed activities already used	Do not present programme enrolment as their introduction	Study persistence, constraints and household outcomes
Management changed in stages	Reconstruct dates and affected areas separately	Examine the transition without assigning every change to one date
Relevant history remains uncertain	Identify what can be recovered and what cannot	Retain the uncertainty when defining the comparison

The June 2026 clarifications separate the method-level justification for continuing previous management from the project records still required. They also clarify grouped-project entry and acceptable barrier evidence. Clarification 4 concerns evidence for the specified additionality barrier analysis. It requires publicly available, transparent and verifiable evidence relevant to the area and activity. Its independent-research category also specifies documented, reproducible methods and no direct financial, operational or governance relationship between provider and project entity. [S08]

This has a concrete consequence for CarbonVerse's proposed evidence folder. A survey commissioned to improve its own field services can be useful operational evidence. Before offering that same survey for a particular rule requirement, assess whether its provider and purpose meet that requirement. A respected name on the report cover cannot answer the relationship question. Keep the commissioning arrangement, methods, data access and relevant affiliations beside the proposed use.

Early-adopter fairness also raises a funding question that carbon accounting alone cannot settle. The book proposes examining support for training, reliable services and documented public benefits alongside any eligible carbon pathway. These would need their own real funding source, participation terms and assessment. They must not be financed on paper by assigning hypothetical credits to an old practice. A farmer may contribute to the research without being promised an issued quantity.

The intake team therefore needs two outputs: a credible route assessment for the proposed claim, and an explanation of what participation can offer at its actual stage. A route that cannot proceed should name the reason. A useful research role should name its purpose and work. This approach allows the pilot to learn from experienced farmers while preserving the distinction between valuing their contribution and establishing a new creditable outcome.

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IV · CARBON RECOGNITION

A framework for whole-system recognition

I propose that natural farming be evaluated as a connected system, while every claimed outcome remains accountable in its own terms. A farmer should be able to show how the field works without turning it into unrelated stories for different audiences. A buyer should be able to identify what an offered unit represents without being asked to accept the entire farming philosophy on trust.

The proposal joins those needs through one shared description and distinct outcome accounts. It asks institutions to make legitimate recognition workable for smallholders, and asks the project to supply evidence precise enough to support that recognition. This is the book's original research and institutional proposition. It is not an approved carbon methodology or an assertion that every practice deserves a separate tradable unit.

The practical ambition is substantial: useful field evidence should travel from the farmer's record to research, independent assessment and, where requirements are met, legitimate credit issuance and trading. At every step, the claim should remain understandable to the household whose work made the outcome possible.

The proposed framework

01 **One farm description**

Plots, history, work and materials

02 **Distinct outcome accounts**

Production, income, ecology and gases

03 **Traceable recognition**

The right claim, evidence and status

An original proposal: each account needs boundary, evidence and overlap checks; this is not credit approval.

One farm description, distinct outcome accounts

Begin with a versioned farm description: plots, cultivation history, crop sequence, material flows, household work and changes introduced. Use stable identifiers so that the soil team, economic team and project administrator can recognise the same field and season. Record corrections without silently replacing the earlier record.

From that common foundation, maintain three connected accounts. The production and household account describes output, costs, work, timing and distribution. The ecological account describes the selected soil, water and organism indicators. The climate account describes the relevant greenhouse-gas emissions and carbon stocks on an explicit boundary. Their indicators, units, comparisons and observation periods remain visible.

Sharing evidence is useful. A residue record can inform household costs, soil-cover interpretation and a carbon calculation. That is reuse of information. It does not create three carbon outcomes. The account should show the different questions answered by the same record rather than pretend that each use creates another physical benefit.

The common description also exposes contradictions. If the economic account records a sale of residue while the climate account assumes that the same quantity remained on the field, the discrepancy must be resolved before either interpretation is accepted. A shared record is valuable because it can reveal an uncomfortable inconsistency, not only because it saves data entry.

Describe the change before selecting the claim

For each intervention, describe what existed, what changes, when it changes, who does the work and how the change is evidenced. State the intended outcome and the mechanism being tested. “The farmer joined the programme” is an administrative event; it does not identify a physical management change.

Separate the core natural-farming transition from added measures such as tree establishment, biochar production and use, eligible rice-water management, enhanced weathering or manure methane management. A farm does not have to implement every addition to count as natural farming. An addition also does not become part of the historical natural-farming effect merely because both occur on the same holding.

For the research design, identify which changes occur together and which vary independently. If all participating farms introduce two measures at once, their combined comparison may be informative, but the individual contribution of each may remain unresolved. The project should not convert that unresolved attribution into a confident component claim.

Suitable streams can be researched in parallel where the site, capacity and design support them. The proposal does not impose a fictional sequence in which every farm must complete soil crediting before considering any other pathway. Nor does parallel research establish that the results can later be added. Implementation, scientific attribution and credit-account combination are separate decisions.

Use a recognition ladder

Recognition needs a vocabulary that matches the evidence. The following ladder is an original communication and governance proposal for the pilot. It is not a substitute for a programme's own statuses or a promise that every project will progress through all stages.

Stage	What has been established	What can responsibly be said
Documented action	A defined practice was implemented	The action occurred on the recorded area and dates
Observed outcome	A stated indicator changed under the study design	The measured finding, with its comparison and limits
Credible climate account	Relevant net greenhouse-gas outcome is quantified	The estimate and uncertainty on the defined boundary
Project eligibility assessed	A dated decision records whether applicable conditions are met	The decision's actual scope and outstanding conditions
Verified quantity	Required independent assessment of the specified account is complete	What the actual verification report covers; issuance remains separate
Issued units	Registry issuance is recorded	Actual issued quantity, registry identity and vintage
Recorded transfer	A change of holder is recorded	The supported transfer; it does not establish retirement
Recorded retirement	The registry record identifies units retired from further transfer	The claim supported by that retirement and applicable use terms

A field can have documented management without an established climate result. A research estimate can exist without an eligible project. An eligible project can still have no issued units. The record should show the stage actually reached, with the document and date supporting it.

The ladder also prevents a certificate from borrowing meaning from a later stage. An adoption document should identify the practice and its evidence; it should not resemble a carbon unit statement. A research summary should present its estimate and limitations rather than imply that the estimated quantity is available for sale.

There may be valuable early-stage evidence even if a later stage is never reached. A farmer can use a reliable cost account or an observed soil constraint without waiting for issuance. That value should be returned in its own terms, with no suggestion that useful research automatically creates a financial entitlement to carbon revenue.

Keep the assessment, issuance, transfer and retirement records separate, with their own dates and references. A hold, rejection or withdrawal needs its actual reason and scope; it is not a compulsory step towards success. Payment has its own record in Instrument L. Funding a service, making an advance or paying sale proceeds establishes only what that transaction supports; it does not move a climate claim to a later row.

Three routes through the methods question

Start by asking whether an existing method covers the actual activity and outcome. The six pathway families discussed in chapter 15—land management, rice-water management, biochar, trees, manure methane and enhanced rock weathering—make that an essential first question. Their existence does not establish the pilot's eligibility or permission to combine them. The rock-weathering route belongs to a different programme; a shared farm record does not merge programme rules. [S07, S15, S16, S17, S19, S38]

For the existing-method route, prepare a fit assessment rather than a promotional match. Match project facts to the selected method and programme requirements. Keep the version and corrections attached. Identify an unmet condition early, and do not spend money building a full quantity estimate around a condition the proposed activity cannot satisfy.

For an unclear case, define the question precisely. A request for clarification asks how existing text applies. A proposed revision asks for a change. Those are different requests. Show the case, the disputed provision, the evidence and the effect of the proposed treatment on conservative accounting. The relevant programme decides the appropriate process and response.

Under Verra's Methodology Development and Review Process v5.1, section 2.5.2 distinguishes major revisions, minor revisions and corrections or clarifications; section 3.1.13 assigns the major/minor decision to Verra. A local team cannot choose a lighter route simply by naming its proposal a clarification. For a new or revised method, final Verra review can approve, reject or put the process on hold. Method approval is separate from assessing an individual project. Chapter 16 explains the selected revision distinctions; other programmes require their own process checks. [S27]

Where a genuinely new method is necessary, begin with the outcome and the unresolved accounting problem. Develop a defensible baseline, additionality logic, net calculation, uncertainty treatment, monitoring, relevant leakage and reversal provisions, and independent assessment. These are design tasks, not headings that can be filled with assurances. A new title for the farming system does not solve them.

The three routes can lead to different decisions for different outcomes on the same farm. One might fit an existing method, another require further research, and a third have no suitable route. That mixed result is compatible with whole-system evaluation. The framework should display it clearly rather than force the whole farm into one all-or-nothing label.

Prevent overlap before issuing anything

Use a shared attribution register with plot, period, material, stock or emission source, intervention and proposed claim identifiers. Link a candidate quantity to its observations, calculation version and other projects that may affect it. The register is a proposed control; it does not itself establish that two methods are compatible.

Physical overlap is one problem. The same outcome may enter two calculations. Documentary overlap is another: two records may describe the same action under different names. A potential claim by another project raises a further question of participation, authority and duplicate attribution. The field record must help the reviewer distinguish these cases.

Consider biochar returned to a field also monitored for soil carbon. The added material must remain identifiable so that its carbon is not counted again as an independent new removal. There is already a specific rule to examine: VM0042 v2.2 section 4, condition 7 excludes biochar application as the project activity, while allowing it as an amendment if the applied biochar's total organic carbon is deducted from the estimated project-scenario soil-carbon stock change at each verification. Footnote 5 identifies procedures for estimating that carbon. This is a specified accounting treatment, not permission to combine projects or a reason to subtract an arbitrary fraction from two gross estimates. Check the applicable version, corrections and other relevant requirements before relying on it. [S07, S08]

Residue creates an earlier checkpoint. One physical batch cannot be left entirely as cover and also be removed entirely for processing. Record its destinations and any returning product on consistent quantity bases. Resolving a material contradiction before calculation is usually more useful than explaining it after a large combined estimate has entered a sales document.

A shared plot alone does not prove duplication, and different method numbers do not prove independence. The reviewer needs the physical source or stock, mechanism, period and calculation links. Until the combination is resolved, show candidate accounts separately and withhold a combined credit quantity.

Give non-carbon benefits a proper place

Production, household resources, irrigation observations and selected biodiversity indicators belong alongside the climate account. They can explain why a management change matters and whether it is workable. Their presence should improve the decision, not decorate a carbon claim with untested assurances.

Keep each result in its own unit. Hours of work are not tonnes of carbon dioxide equivalent. An irrigation-volume observation is not automatically a catchment water saving. A selected organism count is not a complete biodiversity assessment. Useful findings become stronger when the label describes what was actually studied.

The proposal allows a project summary to display several supported outcomes together without converting them into one universal score. Where a trade-off appears, show it. Lower cash purchases alongside greater unpaid work require a distribution discussion. A climate benefit alongside a production problem requires an agronomic response. One positive account should not erase another account's loss.

A separate service payment or support arrangement may recognise work without representing a carbon sale. If one is actually agreed, record its source, purpose and conditions as its own payment category. Do not imply that an unissued carbon estimate has been sold merely because somebody funded a useful field activity.

Test the proposal against adverse findings

A recognition framework is credible only if it still works when the preferred result does not appear. Before the study, specify how the project will report no detectable change, a negative net outcome, incomplete observations and unequal household effects. Those are different findings and need different explanations.

If soil carbon does not show a defensible gain, the soil-removal claim must reflect that result. It does not automatically erase a separately established cost benefit. If a climate account is favourable but an added task falls disproportionately on a household member, the climate result does not make that burden disappear.

A weak design can also prevent an answer. In that case report the unresolved question, not a successful zero and not a hidden positive effect. Explain whether better precision, a longer suitable period or a different design could help, and whether obtaining that evidence is justified by the decision at stake.

Keep unsuccessful pathways in the learning record. Removing them from the final story would make the apparent success rate misleading and deprive the next project of useful information. A transparent framework should reduce repeated mistakes as well as help successful outcomes reach recognition.

Define success in terms the farmer can recognise

For a household, success begins with information it can use: what changed, what it cost, who did the work, what was observed and what remains uncertain. Return that account in an accessible form and language. A technically elaborate report that nobody can explain to the cultivator is an incomplete service.

For the proposed pilot, a farmer-facing result should separate completed observations from estimates and pending decisions. It should identify the relevant field and season without exposing another household's private record. It should also provide a practical correction route when the farmer believes the record is wrong.

Where units are eventually issued and sold, trace the actual quantity and transaction through the agreed allocation and deductions to the farmer's payment. No fixed share, sale price or payment date is established by this framework. Those require actual terms. The earlier research account should not be rewritten to suggest that a later commercial outcome was guaranteed from the beginning.

I argue for recognition that a farmer can inspect and question, not merely a label displayed on the project's website. The shared evidence should help the household decide what to continue, what to change and which commitment it is prepared to make next.

Use a claim passport to carry the evidence

The pilot could test a short, versioned claim passport for each candidate outcome. This is a proposed document, not a new credit certificate or tradable token. It would link a plain-language claim to its detailed evidence without requiring every reader to start with the complete technical file.

Identify the activity, field and period; outcome and unit; comparison and accounting boundary; observations and calculation version; uncertainty and unresolved issues; overlap checks; and the next decision's owner. Keep the method/version and its status separate from the candidate quantity and its review status. Each item needs a supporting record or an explicit gap.

This distinction also applies to expert review. In Verra's process, section 2.4 describes methodology statuses, section 3.5 concerns independent review of a draft method, and section 3.6 concerns Verra's final methodology decision. An expert report on that draft is not verification of a participating field's quantity. Record the object, document and decision authority before using a word such as “reviewed” or “approved”. [S27]

The front page should let the household answer: which outcome is being described, which decision has actually been made and what remains pending? Link that decision to its date, covered field/period and exact document version. An appointment with a reviewer or a file submitted for assessment is evidence of that event, not a completed favourable decision. Instrument K retains the attribution trail; Instrument L returns the supported finding and next task.

Do not let the passport become an identity label for the whole household. Fields can have different histories and outcomes. A later calculation must preserve its link to earlier versions without overwriting the record of an issued unit. Actual issuance, transfer, retirement and payment retain their own records. A changed method status calls for review of the proposed use; it does not silently change the observed research finding.

Walk a hypothetical field through the framework

Imagine a field with a recorded natural-farming transition and a proposal to add another candidate activity. This is a constructed example; it supplies no actual pilot results. Begin by identifying the transition and the addition separately, including dates and the previous management. Build one farm record and identify the comparisons needed for each question.

Suppose the household account supports a reduction in cash purchases but also shows more household work. Report both, using the agreed cost boundary. Suppose the ecological observations are useful but still too short or imprecise to establish a soil-carbon stock gain. Retain the observations; do not turn them into a removal quantity.

The additional activity needs a route assessment and its own net account. In this invented case, suppose a cited draft method has an independent expert report but no final methodology decision. Its method record should show exactly that. The field's eligibility and quantity remain unassessed under the proposed route; the report does not fill those gaps. If a method later becomes available for the intended use, the actual project and quantity still need their applicable assessments. [S27]

Now ask whether the proposed addition uses a material or stock already entering the transition account. Resolve that relationship before combining anything. The final field summary may therefore show a supported economic finding, an unresolved ecological question and a separate candidate climate activity. That is an informative outcome, not a failure to put a single grade on the farm.

A short extract from this hypothetical field's passport would keep the decisions visible:

Account	Supported statement in this example	Next decision
Household	Lower cash purchases and more household work, within the stated comparison	Check who carries the additional work before deciding whether to continue
Soil carbon	Stock gain remains unresolved	Review duration and precision; offer no soil-removal quantity from these observations
Additional climate activity	Draft-method review exists in this invented case; field eligibility and quantity remain unassessed	Keep method and field decisions separate; resolve the route and material overlap before proposing a quantity

These are constructed record entries, not measured results. A positive finding in the first row does not advance either climate account to issuance.

Share records without giving every role every power

The shared description needs access rules. A field officer may need to enter observations; a scientist may need an analysis dataset; a farmer may need to inspect their own record; an independent assessor may need evidence. The proposed arrangement should specify those purposes rather than make every record available to everyone.

Keep a correction trail. Who requested a change, what evidence supports it and which analyses are affected? An honest correction should improve the record without erasing the history needed to understand earlier decisions. If an error could affect a claim, identify the claim and suspend reliance on the disputed part until it is resolved.

Scientific and commercial responsibilities should also be intelligible. Funding the study should not give a developer the right to replace an inconvenient finding. Providing a laboratory result should not make the laboratory responsible for a payment promise it never made. These are proposed governance commitments requiring actual agreements before operation.

The farmer-facing explanation should identify where a question goes: observation correction, participation concern, technical interpretation or payment dispute. A single contact point may help route the question, but the record should show who has the authority to decide it and what remains unanswered.

Make the proposal testable before asking it to scale

The pilot should assess this framework as well as the field outcomes. Does the shared record reduce contradictory entries? Can a reviewer follow an outcome from observation to claim? Can households distinguish research from issued units? Are overlap questions caught before quantities enter an offer? These are testable operating questions, not benefits to assume.

Record the effort required. A system that produces a beautiful passport by shifting unmanageable record work onto cultivators has not solved smallholder access. Compare the work retained by the household with the services supplied, including corrections and missed visits. Simplification should remove duplication while preserving the evidence needed for the decision.

Define what would require redesign: persistent incompatible records, unresolved attribution, unexplained household burdens, unclear authority or claims that outrun the evidence. A trial should be able to discover that the proposed operating system is too costly or confusing. That discovery should change the system rather than be hidden by a successful case elsewhere.

The demand at the centre of this book is that natural farming receive a fair, connected evaluation and that independently supported climate outcomes have a workable route into legitimate carbon markets. The corresponding responsibility is to make every offered unit defensible. The coordination review below connects that demand to the proposed pilot in the next part.

Put the research plan and the claim map side by side

Before the proposed pilot begins, hold one review around two documents: the scientific comparison plan and a map of candidate claims. This is an original coordination proposal. The purpose is to discover mismatches while the design can still change. A technically impressive soil study can answer the wrong crediting question; a route assessment can also demand records the household has never been asked to keep.

Walk one candidate field through the review. First, state the actual management change and the date from which it is proposed. Next, identify the observations the research design will compare. Then locate the physical pool or emission source in each candidate account. Finally, name the decision for which each record is intended. Use the same plot identifier throughout, but keep the different comparisons and decision responsibilities visible.

A useful review can end with a narrower design. Suppose an invented field is proposed for a package study and an optional tree assessment. If the planting arrangement changes, the crop comparison, shade observations, labour account and candidate tree boundary may all need reconsideration. The correction belongs in the linked plans before results are interpreted. This example prescribes no species, spacing, eligibility outcome or carbon quantity.

Three questions should remain on the meeting sheet:

- Does the proposed observation answer the scientific question, the claim requirement, both or neither?
- Where two accounts use it, are they reusing evidence or attributing the same physical outcome twice?
- Who must resolve the remaining mismatch before field work or an offered claim relies on it?

Give each unresolved item a consequence. A missing historical record might prevent a route assessment while allowing a prospective research comparison. An unreviewed sampling protocol might prevent that measurement campaign from starting. A proposed additional intervention might require a revised research arm. These decisions need different owners and cannot all be closed by marking a generic checklist complete.

Return the resulting plan to the field team in a usable form: the next task, its purpose, the record it creates and what remains provisional. Revisit the pair of documents when a material, participating area or intervention changes. Whole-system recognition becomes more credible when coordination can expose a conflict and alter the work, before that conflict becomes a quantity somebody expects to sell.

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V · THE PROPOSED PILOT

Research questions and comparison design



Recording observations in a moong field. An illustrative scene, not a photograph of the proposed pilot.

The proposed pilot must answer a question a farmer can recognise and a question an independent researcher can test. Does the defined transition improve the return to the household's resources? What happens to production and ecological conditions? Which greenhouse-gas outcomes, if any, can be established with enough confidence for a crediting assessment?

These questions share a field programme but do not share one interchangeable success measure. Before enrollment, the study needs a reviewed protocol, a feasible budget and a plan to report unfavourable findings as well as favourable ones.

The proposed comparison cohorts

Defined natural-farming transition

- Starting point
- Seasonal follow-up
- Remeasurement

Continuing conventional management

- Starting point
- Seasonal follow-up
- Remeasurement

Representative organic management

- Starting point
- Seasonal follow-up
- Remeasurement

Sites, independent sample size and final design remain subject to review. Additional modules stay separately identified.

Define what will be estimated

The proposed primary outcomes are the change in soil organic carbon stock on an appropriate equivalent-mass basis and the change in full-cost farm net returns over the monitored rotation, each relative to the defined comparison. Production, water, labour distribution, selected ecological indicators and the greenhouse-gas balance are separately reported outcomes.

Specify the population, management change, comparison, time interval and outcome definition. Decide whether the principal estimate concerns offering a transition programme, implementing the protocol as assigned, or another clearly stated intervention. Adherence and support records are needed to interpret these differences.

If the study asks whether production is maintained, specify the maximum reduction considered acceptable to the farmer before results are known. No margin or final effect-size target has been chosen for the actual pilot.

Where the first pilot would run

The first pilot is proposed for one area within the six states where CarbonVerse plans to start: Uttar Pradesh, Gujarat, Rajasthan, Madhya Pradesh, Maharashtra and Haryana. Exact villages, plots, crop systems and access arrangements are to be confirmed through field feasibility work. No place is an operating pilot site simply because this proposal describes it.

Agricultural universities, ICAR research institutes, Krishi Vigyan Kendras and technical institutes near the pilot area are prospective research partners. No signed partnership, available land or committed laboratory capacity is asserted here. Any role requires actual discussion and agreement.

Use credible comparisons

The proposed on-farm structure follows three longitudinal cohorts: a defined transition from conventional to natural management, continuing conventional management, and representative local organic management. Match or stratify on relevant starting conditions, including soil, irrigation, crop sequence, management history and household resources.

The organic comparison must be a credible system rather than a deliberately weak treatment. The conventional comparison must also describe actual local management. Collect the same quality of records from all groups and document support that might itself influence outcomes.

Where an institutional site and agreement become available, randomized blocks can strengthen component and management comparisons. If randomization does not happen, the report must remain explicit about observational allocation. A carefully matched farm study cannot be renamed a randomized experiment.

The operational description should say who makes each decision. In an observational cohort, the household's existing choices are part of the system being studied. In a researcher-managed experiment, the team may determine timing and application. In a farmer-managed intervention, the protocol may set boundaries while the cultivator makes permitted choices. Do not present these as equivalent implementation conditions.

The Statistical Services Centre's on-farm guidance distinguishes levels of farmer participation and links farm selection, treatment structure and replication to the research objective. It also warns that selecting only unusually successful farmers restricts the group to which conclusions can apply. These are design principles, not Indian effect estimates or a fixed sample-size rule. [S39]

Random selection and random assignment answer different questions. Selection concerns which farms enter and whose experience the study can represent; assignment concerns which eligible unit receives which condition. A randomly selected observational cohort still does not have randomized management. Record recruitment and treatment allocation separately. This distinction applies the design guidance to the proposed cohort; it does not establish that either procedure has occurred. [S39, S40]

For this proposal, record recruitment from approach to enrollment. Identify the eligible frame, invitation, refusal, exclusion and reason where appropriately obtainable. A programme that can observe only holdings with assured access and strong record support should describe that population. It cannot silently generalise its experience to every household in the pilot area.

Protect the core comparison

Keep additional biochar, trees, rice-water changes, weathering and methane modules separately identified. Where an interaction is a research question, use a design capable of estimating it. A package applied everywhere may answer a package question, but it cannot reveal every component's contribution.

The design should remain feasible. Too many treatment combinations can spread resources so thinly that none is adequately measured. Choose explicit primary questions and treat additional exploratory work as exploratory.

Write a management-and-support specification before comparing labels. It should identify the required core actions, permitted local adaptations, any prohibited co-intervention, who supplies advice or materials and how a departure is recorded. The comparison specification needs equal care. A farm's organic or conventional identity alone does not tell the analyst what was applied, when, with what labour or under which market arrangement.

Keep service delivery as an observable part of the intervention. If one group receives regular technical visits while another receives only measurement visits, that difference may belong to the programme contrast. If the question instead concerns a cultivation component, unequal support can obscure that component. Decide which question is primary; record the actual support in either case.

Sample size follows the question

Obtain local information about variability, clustering, repeat measurements and likely attrition. Select meaningful effects and the analysis plan before determining enrollment. Individual cores are subsamples; extra cores in one plot do not become extra independent farms.

The following calculation is only an illustration for a simple two-arm comparison with independent units, equal variance and no baseline adjustment. It is not the proposed pilot's enrollment requirement.

Suppose the outcome's standard deviation is 4 units and the meaningful difference is 2. At a two-sided 5 percent test and 80 percent power, the usual normal approximation gives about 63 independent units per arm: $2 \times 4^2 \times (1.96 + 0.84)^2 \div 2^2 = 62.72$, rounded up.

If, purely illustratively, equally sized clusters contain ten units each and the intracluster correlation is 0.05, the simple design effect is $1 + (10 - 1) \times 0.05 = 1.45$. Using 63 as the starting number and allowing 15 percent attrition gives $63 \times 1.45 \div 0.85 = 107.47$, rounded up to 108 units per arm. Rounding 63×1.45 up to 92 before the attrition adjustment gives $92 \div 0.85 = 108.24$, rounded up to 109. Neither is a local recommendation: real matching, cluster allocation, multiple comparisons, two primary outcomes and repeated measurements need an appropriate calculation or simulation.

The adjusted total counts units, not whole clusters. A real cluster design must still choose feasible whole-cluster allocation and account for the number and unequal sizes of clusters. This shortcut does not complete that design. Retain the unrounded calculation and the rounding rule so that a reviewer can reproduce the reported number.

Use two-sided 5 percent testing and 80 percent power as starting design assumptions, with 90 percent power sensitivity. Resolve multiplicity for primary outcomes before enrollment. If the feasible study cannot meet its intended precision, narrow the question transparently rather than publish a marketing participant count as statistical justification.

A comparison requires continuing access

Agree the observation period and how changes in tenure, crop choice or participation will be recorded. Do not replace a withdrawing farm with a successful new one and call the series unchanged. Track the reason, timing and available follow-up.

Separate the right to stop research participation from any independently agreed commercial obligations. The actual reviewed documents must explain these arrangements. Farmers should know what is expected before agreeing to a multi-year plan.

Decide before the first measurement

The protocol must identify allocation and matching, primary and secondary outcomes, measurement methods, analytical approach, missing-data rules, safeguards, data stewardship and independent review. Record the version and any later amendment.

The result will be stronger if the project can show what it intended to find out before it knew the answer. That discipline is how the proposed pilot can support a serious recognition proposal rather than merely produce a promotional harvest story.

Write the question as a sentence with five parts

Before choosing a sample size, complete this sentence: among these farms, this defined change, compared with this management, over this period, will be assessed using this outcome. Every part needs a usable definition.

For the proposed transition cohort, “these farms” should describe the eventual eligible population and starting conditions. “This change” should identify both farm management and programme support. “Compared with” should describe actual conventional or organic management. The period should cover the monitored rotation and relevant soil remeasurement interval. Outcomes need units and an agreed calculation.

A vague question can survive many meetings because each person supplies a different meaning. Writing the sentence exposes disagreement while it can still be resolved cheaply. It also prevents a later report from replacing the original question with whichever outcome looked most favourable.

Research eligibility and carbon eligibility need two lists

A farm can be useful for studying a farming system without being eligible to generate a new credit. An established natural farmer may provide valuable information about management, resources and longer experience. That contribution does not make past adoption a new mitigation activity.

Maintain separate records for participation in the study and assessment under a selected crediting route. The latter may need specific practice history, rights, timing, baseline and additionality evidence. Do not remove valuable research participants merely because they do not fit a commercial route. Do not promise commercial inclusion because they fit a research cohort.

The participant explanation should state which role is being offered. If it changes later, explain the new arrangement. One enrollment photograph should not be asked to serve as evidence of research consent, project eligibility and a sale agreement.

Decide where allocation really occurs

If a treatment is assigned to an entire village, individual farms in that village do not become independently assigned treatment units. If preparation is supplied through a group, common supply and support may also create shared influences. The design should identify these relationships before the statistical model is selected.

Conversely, a field plot experiment can randomize plots within blocks under a suitable design, while its results still apply to the setting and management studied. Institutional plots and household farms answer related questions at different levels. Keep their evidence streams distinguishable.

The allocation record should be reproducible. Preserve the procedure, eligible units, date and responsible person. Do not replace an inconvenient allocation with a more cooperative farm without documenting the change. An intact allocation history is more useful than a perfectly balanced-looking table assembled afterwards.

Add an allocation-unit code distinct from the participant and plot codes. Record whether the condition is assigned, chosen by the household or defined by matching. Identify linked service groups and any higher-level allocation. An allocation file should not be recreated later from the farmer's current management, because current management may differ from the original condition.

Where randomization is genuinely authorised in a reviewed experiment, preserve the eligible unit list before assignment, blocking variables, procedure, seed or equivalent reproducible record, allocation date and the person releasing the schedule. Keep replacements and deviations as new dated decisions. A record of a random-number generator is useful only if it is linked to the units and the procedure actually used.

Match before seeing the result

For the observational cohorts, choose matching or stratification variables because they affect the starting comparison and are measured before the relevant change. Candidate variables in this proposal include soil setting, irrigation access, crop sequence, area, management history and household resources.

Do not match on a post-transition outcome that the study is trying to estimate. Do not discard a difficult transition farm because a similar successful farm makes the table more attractive. Record selection and exclusions with their reasons.

Matching can improve comparability on measured characteristics. It cannot prove that every relevant difference has disappeared. The report should retain that limit and investigate available prior trajectories rather than describing matched groups as randomized.

Check whether comparable farms actually exist before promising a matched analysis. List the starting characteristics and the rule for an acceptable match. If a category has no credible counterpart, show that gap. Forcing a distant match can make a neat table while changing the question into a comparison between unlike settings.

Keep the pre-selection frame as well as the final matched set. Report which farms could not be matched and why. The estimate for the retained group then has an identifiable population. Comparisons excluded from the principal matched analysis may still inform a clearly labelled descriptive account; they should not be quietly reintroduced only when their outcomes are favourable.

Pilot the records before piloting the claim

A short feasibility exercise can test whether the proposed records are practical. Can the farmer identify the plot? Can the team reconcile a batch with an application? Does the harvest form handle repeated picking? Can the laboratory receive samples with intact identities? How long does each visit take?

Use the exercise to revise forms and estimate operating demands. Label it a feasibility exercise. It is not automatically an outcome trial, and changing the main protocol after seeing early outcomes needs transparent treatment.

Ask the household which questions felt difficult or unnecessary. A long record without an understood purpose does not guarantee useful information.

The exercise should include difficult ordinary situations: an absent participant, a split plot, a delayed irrigation turn and a missing receipt. A record system tested only on an ideal demonstration day may fail during the work it was built to describe.

A decision matrix for the proposed design

Question to resolve	Decision needed before enrollment	Evidence produced later
Core system performance	Treatment definition, credible comparators and support plan	Defined production, economic and ecological contrasts
Soil-stock change	Sampling design, relevant mass basis and precision	Stock-change estimates with uncertainty
Component contribution	Separately identifiable allocation and adequate resources	Component or interaction estimates within that design
Farmer feasibility	Actual work, access and response arrangements	Completion, departures and continuation decisions
Crediting prospects	Selected pathway and separate eligibility assessment	A reviewable evidence package, not automatic issuance

The matrix prevents a common confusion: a large participant count does not mean every question has been answered. Each row requires its own connection from design to evidence.

Protect the comparison through ordinary change

Over several years, varieties, prices, labour availability and water conditions can change. Record those changes across groups. If one group receives additional advice or a new market arrangement, make that support visible.

Some changes are part of the programme being evaluated; others complicate interpretation. The analysis plan should say how the principal question treats them. It should not assume that all changes after enrollment are either irrelevant or caused by the core farming practices.

Keep the original management identifier and the actual management record. This allows the study to report both the offer or allocation and what was implemented, according to the pre-specified analysis. It also gives the farmer an account that recognises the decisions actually made.

Distinguish a shared condition from a change crossing the comparison boundary. Common rainfall or a supply failure can make observations move together without showing that one group's intervention reached another. Water, material or advice passing between groups can instead change what was actually received or done. Both matter, but they do not present the same design problem. A line on a map prevents neither.

The historical on-farm guide discusses lateral interference from water or nutrient movement when considering plot size, and connects layout to field variation and study objectives. The Minnesota guidance distinguishes treatment replication from subsamples within a plot and warns about placement and unequal conditions. These support checking the actual comparison; neither supplies a universal layout for the pilot area or a complete analysis for spillovers. [S39] [S40]

Use this proposed check with the allocation map and the actual field records:

Situation to investigate	What needs to remain distinct	Record and design question
Shared weather, water availability or service constraints	Common conditions and the originally assigned or observed management	Record the shared event and affected units; review how the design and analysis represent their dependence
Water or material moves between comparison units	Intended delivery and actual exposure in each unit	Link the event, direction, timing and affected plots; can the intended contrast still be implemented?
Advice or support reaches another group	Access to information, actual management response and the question being studied	Record the advice and response; is this part of the programme contrast or a complication for the component question?

Consider an explicitly invented case: two neighbouring plots are meant to follow different water-management conditions, but one shared release changes water conditions in both. Keeping two plot codes does not establish that two separate conditions were delivered. Preserve the original allocation or cohort label, the release event and what was observed in each plot. The field team needs a review of whether the proposed contrast is workable; a larger number of samples cannot supply the condition that was never separately delivered.

Link supported water events and observations through Instrument F, operations or support through C, and the departure, response and review decision through J. Record what is known about the affected plots, time and connection, keeping an unknown direction or extent unknown. The proposed record is not a claim that every shared event affects every outcome. Ask the analyst to connect the recorded exposure and remaining uncertainty to the comparison defined in chapter 21.

Plan this review before outcomes are examined. A model that allows related observations does not, by itself, reconstruct a comparison with no cross-group exposure. Nor should the team delete affected farms or rename their treatment after seeing an inconvenient result. Preserve the history; use a reviewed primary analysis and clearly labelled sensitivity work suited to the actual design.

No universal buffer distance or restriction on neighbours sharing useful knowledge is proposed. If the intervention can only be delivered through a shared group arrangement, recognise that level before allocation, power assessment and enrollment. Where the original question cannot be implemented feasibly, narrow or redesign it with the affected households and specialists, documenting what the revised comparison can answer.

Set a stopping or narrowing decision

A serious design includes a point at which an unsuitable question is narrowed. If water cannot be controlled, a particular rice intervention may be infeasible at that site. If soil variability makes the intended precision unaffordable, the study may need a different scope or longer observation. If household work cannot be supported fairly, the service plan needs revision.

These decisions should follow recorded feasibility and technical review. They should not be disguised as a failed farmer's lack of enthusiasm. The project gains credibility when it can explain why one proposed module was deferred while the useful core study continued.

Treat the two proposed primary outcomes as separate planning problems. An affordable design for seasonal net returns may not be precise enough for soil-stock change. A design adequate for a whole-group contrast may be too small for tenant, crop or village subgroups. The protocol should identify the promised comparisons and which additional analyses are exploratory.

Before choosing enrollment, ask the statistician to show the calculation or simulation inputs, their evidence and sensitivity to less favourable assumptions. Distinguish a meaningful production-maintenance margin from an ordinary test for any difference. Failing to detect a loss does not establish that production has been maintained within an agreed margin. That question needs its own design and interpretation.

The following constructed examples make the allocation and comparison decisions concrete before they are handed to the baseline team.

Four assigned farms, 120 core observations

Assignment	Four whole farms	→	4 assignment units
Plots	Three per farm	→	12 observed plots
Cores	Five per plot	→	60 per visit
Visits	Two observation visits	→	120 core observations

A hypothetical hierarchy, not a recommended sample size, adequate power or 120 independent assignments.

More observations do not create more assigned farms

Consider a deliberately small, invented example. Treatments are assigned separately to four whole farms. Three plots are observed on each farm. Five soil cores are collected from each observed plot at each of two visits. This gives 4 × 3 = 12 observed plots, 12 × 5 = 60 cores per visit and 120 core observations across the two visits. There are still only four farm-level assignment units. These numbers explain the hierarchy; they are not a sampling recommendation for the pilot.

University of Minnesota Extension distinguishes subsamples within a plot from replicated plots. Its selected design guidance also explains why treatment placement matters. That distinction does not supply this pilot's independent sample size. [S40]

The four numbers belong in four different fields. Preserve farm code, plot code, sampling position and visit. If cores are combined before laboratory analysis, preserve that composite identity too. A database that contains 120 rows has not thereby acquired 120 independent treatment allocations. Nor does a second visit randomize the farms again.

Level in the hypothetical example	Count	What the count represents
Whole farm assigned a treatment	4	Assignment units; not a claim of adequate power
Observed plots	12	Three plots nested within each farm
Cores collected at one visit	60	Five subsamples per observed plot
Core observations over two visits	120	Repeated observations on the same farm structure

Subsamples can help describe variation and improve an appropriately designed estimate within a unit. The design still needs enough suitable assignment or comparison units to answer its main question. Shared village conditions, common supplies or service teams can introduce further dependence. Identifying four assignment units is not proof that all four are statistically independent in every respect.

If treatment were instead randomized among plots within farm blocks, the assignment structure would be different. That would need its own allocation record and analysis, including farm/block relationships and relevant interference. Do not switch between these designs in the report according to which gives the smaller uncertainty.

The analyst's first check should therefore be a reconstruction: can the table of observations be traced back to the design that generated them? Keep the hierarchy intact from the field form through the laboratory file and final analysis.

Four treatment cells answer a different question

Here is another constructed example, using an invented response scale. It is not yield, income, soil carbon or a forecast. Suppose a suitable reviewed experiment can compare a defined core-management change with its comparator, both with and without one separately specified add-on. Each cell below represents a hypothetical treatment mean, not one sufficient replicate. Actual replication, allocation, resources and uncertainty are not supplied by the four-cell layout.

Core-management condition	Without add-on	With add-on
Defined comparator	100	103
Defined core change	96	101

Without the add-on, the core contrast is 96 − 100 = −4 response units. With it, the core contrast is 101 − 103 = −2. The difference between these contrasts is −2 − (−4) = 2 units. Equivalently, the add-on contrast is 3 under the comparator and 5 under the core change, again a difference of 2.

The combined cell is only 1 unit above the no-change/no-add-on cell. Adding the two separate contrasts, −4 and +3, to 100 would predict 99, whereas the invented combined mean is 101. That is why an interaction question needs observations that identify the relevant contrasts. It cannot be answered by studying only the combined package and its comparator.

These are arithmetic contrasts, not a statistical test. No standard errors, significance claim or general farm effect follows from the table. The interaction is a property of this constructed response comparison. It is not an extra carbon credit that can be added on top of the component accounts.

For the proposed pilot, first ask whether the extra question is worth answering and can be supported. Some add-ons operate at a facility, village or long-lived planting level rather than a small plot. Their allocation and observation structure may make this simple layout unsuitable. A smaller set of well-defined studies can be more informative than naming a factorial design while leaving its cells unimplemented.

Retain the core study even when a proposed add-on study is deferred. Its interpretation should identify what was actually tested. An absent cell is missing design information, not a zero response or permission to borrow a result from another district.

Hand the agreed design to the baseline team

Before enrollment, the proposed handover should contain one controlled version of the research question, eligibility and recruitment process, allocation or matching plan, outcome definitions, support arrangements and analysis responsibilities. The baseline team needs operational decisions, not a slide saying that the study is scientific.

Handover stage	Records to connect	Question for the receiving team
Design, chapter 18	Question/protocol version; recruitment, allocation and support specification; Instrument A	What comparison is intended, and at which unit?
Starting point, chapter 19	Plot/map version, supported history and outcome-specific baseline; A, B and relevant measurement records	Which period and starting condition are actually supported?
Repeated work, chapter 20	Expected visit/work list; actual observations, sample/test links and accepted-use decisions; relevant C–J records	What was due, what happened and what remains unresolved?
Analysis, chapter 21	Frozen input list, outcome definition, inclusion decisions and calculation/code version	Can each reported quantity be traced to the intended comparison?
Funding and return, chapter 22	Work/expense identifiers, funding and approval records, household statement L	Who can commission the work, pay for it and explain its result?

Use a feasibility rehearsal to follow one proposed work item through this chain, including a deliberately missing link. Give it the question/protocol version, intended unit and period, the record expected and its receiving role. Trace it forwards to the analysis and funding files, then backwards from the household statement. A reference to a form is insufficient if nobody can identify the particular record or decision. Use only the records needed for that question; this map does not require every instrument on every visit.

The current proposal has not passed that operational launch review. Sites, crop systems, independent sample size, power calculation, reviewed SOPs and actual institutional arrangements remain unresolved. The next useful step is to obtain those decisions with their evidence, while keeping the study question and limits visible. A baseline can then establish the starting situation for a defined investigation rather than merely collect everything that happens to be easy to measure.

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V · THE PROPOSED PILOT

Establishing the starting point

The first useful pilot visit should leave more than an enrollment photograph. It should establish which plot is being discussed, who cultivates it, how it has been managed and what is about to change. Later measurements will depend on this starting record.

Collect the baseline before the relevant new intervention wherever the study and selected crediting rules require it. A record made today cannot by itself guarantee that a future method will accept the activity or allow retroactive crediting.

Identify the plot without confusing identity and ownership

Give each plot a stable project identifier and a documented boundary. Record the basis for area and location. Keep changes in boundaries versioned. Do not silently move an observation to a different area while retaining the old identifier.

The project identifier supports research; it is not a land title. Record the relevant tenure and cultivation arrangement through the reviewed process. Disputed rights must not be settled by drawing a polygon in a project application.

Keep personal identity links under controlled access. The analytical dataset can use plot and participant codes while the responsible team retains the necessary connection for consent, follow-up and payment administration.

Reconstruct history with evidence

Record crop sequence, irrigation, tillage, materials, residue use and relevant interventions over the required look-back. Link statements to available records and identify recall-based information. A farmer's account is valuable, but it should not be presented as an invoice or a measurement that does not exist.

Do not coach participants to describe their old practice as more emission-intensive to improve the projected credit quantity. Inconsistent information should be investigated and preserved in the audit trail.

The selected VM0042 section 6 assesses management before the project start date over at least three years, including a complete crop rotation where applicable. Its June 2026 Clarifications 2–3 specify baseline-description details and grouped-project distinctions. This is a method-specific requirement, not a sufficient history rule for every pathway or research question. [S07, S08]

The proposed history record should separate the stated event, its period, the supporting source and the review decision. If a document supports only the crop sequence, do not use it to certify an unrecorded material rate. A reviewer may accept one part and leave another unresolved. Record that outcome at the level of the actual statement rather than marking the whole household history verified.

Record resources as they are

The starting household account includes crop quantities, prices, work, costs, livestock-resource access, water arrangements and material allocations. Use the same definitions intended for later seasons.

If some economic information must be recalled, record the period and confidence in the estimate. Prospectively collected seasons should remain distinguishable from reconstructed history. A clean-looking spreadsheet is not a reason to erase that difference.

Record which season each economic item describes and whether it covers the entire intended area. A shared pump expense may include another plot; a receipt for purchased material may cover stock still in storage. Link the portion relevant to the baseline without treating purchase, delivery and application as the same event. Keep the original total and the allocation basis so that another reviewer can reconstruct the entry.

Plan the first soil collection

Before sampling, settle the plot and stratum map, depth layers, sampling design, handling and laboratory methods with the scientific team. The proposed research defaults investigate at least 30 centimetres, with 0–15 and 15–30 centimetre layers, and deeper information where needed for the comparison or selected method. These defaults require site and method review; they are not a universally approved carbon SOP.

Density and coarse-fragment information must be consistent with the stock calculation. Keep locations, dates, depth and sample identifiers linked. A label lost between field and laboratory can make an otherwise careful collection unusable.

Consent is an ongoing explanation

Explain the study's purpose, expected work, data use, access to results and how questions or withdrawal will be handled. Separate research participation from an offer to sell a future credit. Use the actual reviewed documents and provide a copy the household can use.

Record who explained the arrangement and which version was used. If the protocol later changes materially, assess whether participants need an updated explanation or consent. Do not assume the original signature covers every later commercial use.

Establish what is not yet known

Starting record	Required distinction
Plot and area	Measured or documented basis versus an unsupported estimate
Management history	Contemporary evidence versus recall
Tenure and rights	Recorded arrangement versus unverified assumption
Soil baseline	Collected sample versus usable stock estimate
Economic starting point	Actual season record versus reconstructed account
Proposed change	A future plan versus an implemented activity
Crediting status	Research eligibility versus programme eligibility

An unresolved field should remain unresolved until evidence arrives. It should not acquire a plausible number merely to make the form appear complete.

Return a starting statement

Give the participant a brief record of the plots, planned management changes, observation schedule and contact person. Invite corrections to the information the farmer can check. Provide technical results later in a usable form, with an explanation of what they do and do not show.

The starting statement gives the household something to check. The identifiers and timeline below connect that statement to the evidence behind it.

A participant, a holding and a plot are not one identifier

One household may cultivate several plots. A plot may change cultivator. A holding may contain land with different management histories. The proposed register should therefore distinguish participant, household where relevant, plot and season rather than trying to encode every relationship in one name.

Use stable, non-descriptive identifiers and a separate relationship table. For illustration only, participant P012 might cultivate plots L031 and L032 in a stated season. These are fictitious codes, not enrolled farms. A later change of cultivator should create a new dated relationship while preserving the plot's physical identity and history.

Keep direct identifiers and contact details in the controlled participant record. Do not put a farmer's name, phone number or sensitive tenure detail into every laboratory label or public analytical file. Necessary linkage can be maintained without copying personal details into unrelated records.

Prepare a short field dictionary that explains each code, relationship, unit and permitted missing-data status. A plot code should not contain a management label that becomes false after transition. A person's departure should end or change the relevant relationship, not cause their code to be reused for a new participant. These rules need to work in the collector's language and on the paper forms as well as in the eventual data system.

A split plot needs a new map version

If one plot is divided, record the old boundary, the new boundaries, the effective date and the relationship between them. Identify which observations belong to the earlier whole and which belong to the later parts. Do not compare changing areas as though they were an unchanged fixed plot.

The same principle applies to merged plots and corrected boundaries. A correction to a mapping error differs from an actual management-area change; preserve the reason. Area affects production per hectare, material application rates and carbon calculations, so a small-looking map correction can affect several accounts.

The field team should have a simple process for flagging a boundary concern before sampling or harvest measurement. A delayed correction is better than an unrecorded mismatch, but an early check avoids unnecessary work.

Consider a hypothetical correction, rather than a physical split. The same harvested field was initially recorded as 0.80 hectare; a documented map correction establishes 0.60 hectare. Its total harvested mass remains 2,400 kilograms. The initial calculation is 2,400÷0.80=3,000 kg/ha. With the corrected denominator it is 2,400÷0.60=4,000 kg/ha. The apparent rate rises by 1,000 kg/ha, or one-third of the original rate, without any additional harvest.

Hypothetical record version	Harvest mass	Area	Derived rate
Initial area estimate	2,400 kg	0.80 ha	3,000 kg/ha
Corrected area for the same field	2,400 kg	0.60 ha	4,000 kg/ha

These are invented values, not a crop result or area conversion factor. Keep the original mass entry and the evidence for the correction. Identify every derived rate affected by that area version, including relevant application rates or stock accounts. The change in a displayed rate is a correction effect, not a treatment effect.

An actual loss or addition of cultivated area is a different event. It may change what was harvested or sampled and which comparison is valid. The team must decide whether observations can be put on a common basis; it should not merely substitute the latest area into every earlier season.

Give each historical statement a basis

The history form can distinguish contemporary records, recall supported by another record and unsupported recall. These are descriptions of evidence, not judgments about the farmer's honesty. A household may remember the sequence accurately without retaining a receipt for each operation.

Ask neutral questions about what happened. Record the farmer's answer before discussing how it might affect crediting. If two accounts differ, retain the discrepancy and investigate. Do not lead the participant toward a more favourable baseline.

A useful management history includes absence as well as presence where it matters. If no particular material was applied, establish the period and basis for that statement. A blank form is not evidence of zero use.

Ask what a local bag or cartload denotes and record the basis for its estimated quantity. Keep the original unit; do not create a standardized amount without checking it.

Where two sources disagree, write the disagreement precisely. One person may recall an operation in one season and another in the next. A receipt may show purchase without proving which plot received the material. Ask what further evidence could resolve that particular question. Do not average incompatible dates or quantities and call the result a verified record.

Baseline means several linked starting records

A starting measurement and a crediting baseline answer different questions. The first records a condition at a stated time; the second defines the relevant reference scenario against which a qualifying change is assessed. In the selected VM0042 provisions, historical management informs an annual activity schedule, not merely a single opening soil value. Keep the measurement date, history and scenario specification linked without treating them as interchangeable. A research comparison group also does not automatically satisfy that method-specific scenario. [S07, S08]

June 2026 Clarification 3 also distinguishes a grouped project's eligibility-area description from the history of a new instance. It requires the area's qualitative baseline variations to be described, separates cropland from grassland eligibility areas, and allows other pre-project practices to differ when at least one practice impacted by the new activity matches the validated baseline scenario. This selected entry criterion is not the entire eligibility test. The proposed review file should link the instance, eligibility-area version, affected previous practice and proposed change; neither identical management across every field nor a shared group label can be assumed. [S08]

The soil baseline is one part of the starting point. The pilot also needs economic, management, water, resource and household-work records. Some can be collected prospectively over a baseline season; others may rely partly on history. Label their periods clearly.

A soil sample taken before a practice change does not make a recalled cost account equally prospective. A good cost account does not establish a valid soil stock. Each outcome needs its appropriate starting evidence.

The proposed enrollment statement should list what has been collected, what awaits laboratory work and what remains unresolved. This helps the participant and team avoid treating all baseline tasks as complete because one visit occurred.

Check a sample before leaving the field

Before a sample leaves the collection location, reconcile its label with the field sheet. Check plot, location or composite identity, depth, date, collector and requested work. Follow the selected handling SOP, including separate information required for density and coarse fragments.

A second check at transfer should reconcile containers and the dispatch list. At laboratory receipt, reconcile accession numbers and reported condition. Record missing, damaged or ambiguous samples and the decision about recollection or exclusion.

This chain is ordinary work, but it protects expensive evidence. If the team cannot connect a reported carbon concentration to the correct location, depth and relevant density information, the number may not support the intended stock calculation.

Give each transfer event its own date and responsible person. Reconcile an accession change through the laboratory's record rather than editing the field label to match a convenient result. If recollection is required, keep it as a new collection event with its reason. The new sample does not become the original sample merely because it replaces a missing result in the analysis.

Before using either result, review intervention timing and the selected protocol. A replacement collected after the management change may answer a different question from a genuine pre-change sample. Preserve that limit instead of filling the original baseline slot without explanation.

A consent conversation that can be recalled

After explaining the study, ask the participant to describe the main commitments in their own words. What work is expected? Who can see which records? Will the farmer receive results? Who can answer a complaint? What happens if participation stops?

The purpose is to check the explanation, not to examine the farmer. If an answer reveals confusion, explain again and record the relevant version and decision. Give time for household discussion where needed.

Separate optional uses such as identifiable photographs or public case histories from the measurements needed for the study. A person may agree to research without wanting a public story. The project should not make publicity an unspoken condition of useful support.

The proposed explanation should distinguish the person cultivating, the person supplying information and any other person whose agreement is needed under the reviewed arrangements. Do not assume one signature identifies all those roles. Ask which language and form of explanation the household can use, and retain a contact for corrections or further discussion.

For data handling, distinguish the controlled identity link, the coded scientific record, the participant's own statement and any material intended for public use. Give each a stated purpose and access responsibility. The eventual research and institutional review must settle the actual permissions and procedures; this chapter does not report that those approvals have been obtained.

End the visit with a correction route

The starting statement should contain the participant's relevant plots, intended changes, expected visits and contact. Explain how to correct an error. Keep a dated amendment rather than replacing the original entry without trace.

Some errors will be discovered later: an area was misremembered, an input unit was different or an old practice began earlier than first stated. Record the new evidence and assess its effect on the affected analyses or eligibility review. Do not treat a corrected record as proof that nothing was wrong.

The next steps connect these records, their timing and the remaining questions into a baseline account that another authorised team member can use.

From field note to usable entry

Field note	Observation, unit, date	→	Preserve the source
Received	Sample ID, condition	→	Connect the identity
Reported	Test, unit and basis	→	Retain the result
Used	Purpose and calculation	→	State use and limits

Proposed record links, not a laboratory SOP or a completed verification process.

A recorded value still needs a usable connection

A field note, a laboratory result and an analytical entry are related records, not interchangeable stages. The field note preserves the observation and its circumstances. Laboratory receipt adds an accession identity and condition. The reported result identifies the test and basis. The analytical entry links those records to the intended outcome and a calculation version.

The Statistical Services Centre's data-management guidance treats measurement units, design information, linked identifiers and a dated audit trail as part of a usable research record. Its historical software examples are not recommendations for this project. [S41]

For the proposed pilot, test the connection using one actual record once fieldwork is authorised. Start from a reported result and work backwards: which sample, which depth or observation unit, which plot and boundary version, which date and which protocol? Then work forwards to the calculation. If a required link is missing, name it. A row imported successfully into a file has not necessarily passed this check.

For this pilot, define what one row represents before choosing its identifier. A plot and date may identify a visit, but cannot distinguish several harvest pickings or repeat tests on that date. Preserve the collection/event identifier and a separate picking, sample, aliquot or test identifier where the actual structure requires it. A repeat test links to its original collection; it does not create another collected sample. Query conflicting plot links rather than accepting the first match. When records are joined, reconcile both row relationships and physical totals: repeated display of one harvest weight must not become several harvests. These are proposed controls for the record structure, not evidence that the forms have passed field testing.

Keep the source entry distinct from a derived quantity. A laboratory carbon concentration is not a field stock. An operation's cost is not the full season account. A mapped area is not proof that every harvested load came from that area. The intended calculation determines which additional connections are necessary.

This check should create a useful query rather than a silent repair. Record the question, affected entry, person responsible, evidence requested and current disposition. A mislabelled sample might be resolvable from independent transfer records; another might remain ambiguous. Do not select the location that makes the result more favourable.

The record's permitted use can also be narrower than its existence. An observation may support a description of farm management while failing the requirements for a particular carbon calculation. Preserve the original purpose, quality and limitation. Rejecting an unsupported use does not require erasing the observation itself.

Put the starting records on one timeline

The proposed baseline should show when the relevant change began, when a record was made, which period it describes and when the evidence became available. These dates can differ without the record being dishonest. Confusing them creates the problem.

For illustration, a household may describe an earlier season during an enrollment visit. The interview date is the date of collection, not the date of the farming events. A laboratory report may arrive after the visit even though its sample was collected before a new intervention. The report's arrival date does not move the collection date. These examples describe possible record relationships, not events at an enrolled CarbonVerse site.

Proposed record	Time information to preserve	Question left for review
Recalled operation	Event period and interview date	Is the historical statement sufficiently supported for its intended use?
Soil collection	Collection date, plot/depth and intervention timing	Does it meet the selected baseline and sampling requirements?
Delayed test report	Sample collection, receipt and reporting dates	Is the result linked and usable despite the later report date?
Revised boundary	Effective date, map version and reason	Is this an actual area change or correction of an earlier estimate?
New participant relationship	Start/end of cultivation or responsibility	Which person and period does each observation concern?

Avoid using one administrative enrollment date as the answer to all these questions. Each pathway and research outcome must be assessed against its own relevant timing. An attractive timeline does not cure an unsupported history or confer retroactive eligibility.

Consider an original hypothetical case: one household enrols two plots on the same day. Residues were already retained on one plot, while a new practice is proposed on the other. Keep each plot's actual history; neither enrolment nor a new cultivation agreement restarts the practice clock. If soil is sampled after the earlier practice but before a later amendment, it is a starting observation for that later change under the conditions already present. It is not evidence of the field before the entire farming system began. The research question must identify the change being compared, and the route review must identify the claimed activity. Instruments A/B/G preserve the relationships, history and collection; chapter 21 must retain those distinctions in the analysis.

Release a baseline account with its open questions

A useful baseline handover is a dated set of records with an explicit status for each intended outcome. It should say which identities and relationships have been checked, which samples or reports remain outstanding, which histories need corroboration and which calculated quantities are ready for the specified next use.

Proposed account	A clear status statement should identify
Management history	Period covered, evidence basis and unresolved contradictions
Production and economics	Harvest/cost periods, area and unit bases, incomplete operations
Soil starting point	Collected samples, linked reports, required companion measurements and calculation status
Participant relationship	Relevant cultivator, explanation/consent version and correction contact
Carbon-route assessment	Selected documents, missing evidence and actual review stage

The status is specific. A soil report still pending does not make a completed interview disappear. A complete interview does not turn a pending soil report into a usable stock. The study team needs this distinction to schedule work and to decide which comparisons can proceed. The participant needs it to understand what the visit achieved.

Keep the original submitted material, the checked working record and the dated version used for a particular analysis distinguishable. A later correction should reach every affected calculation and explanation. Store the reason and source of the correction with that change. Do not repair one chart while leaving its source table and farmer statement on an inconsistent version.

Test the handover with an ordinary question: if the collector is absent next season, can another authorised team member understand what was observed and what remains to be done? The answer should come from the records, with appropriate access, rather than from a private message that only one person remembers.

Return an understandable starting statement to the household and invite corrections. Its content should match the checked project account, including important unresolved items. It must not show a verified-credit balance or promised payment where neither exists. The next chapter follows these starting records into repeated measurement, where consistent methods and clear responsibility become just as important as the first observation.

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V · THE PROPOSED PILOT

Measuring change through time

A good baseline can be weakened by an inconsistent second visit. The new sample may come from another depth, the harvest may be weighed differently or a cost may be recorded on a new basis. Monitoring must therefore protect comparability as carefully as it collects more data.

The proposed programme follows the rotation and the household, with a more demanding soil-stock programme at reviewed intervals. No field measurements or pilot findings are reported in this chapter; it specifies the work proposed.

The proposed soil-stock observation timeline

Baseline — **Year three** — **Year five**

A research planning default, subject to local precision and selected-method review. Seasonal production and costs are recorded separately throughout.

A schedule with different clocks

Crop operations and economic records need seasonal continuity. Soil-stock detection may require a longer interval. Selected ecological observations may depend on season and survey conditions. One annual visit cannot automatically serve every outcome.

The research planning default is a soil baseline with year-three and year-five observations in comparable seasonal windows. Power, site conditions and the selected route must be reviewed before adopting an operational schedule; the route-specific distinction later in this chapter is essential. Annual soil-health observations may support agronomy, but they are not presented as proof of an annual stock gain.

A repeat window should describe the field's condition as well as a calendar month: the crop stage, recent tillage, irrigation, substantial rain and material applications may matter to the chosen observation. Preserve those conditions rather than claiming that two visits on the same date are automatically equivalent. If safety or access prevents the planned visit, record the actual date and the departure. A changed date is a question for interpretation, not a reason to manufacture a timely record.

Frequency in the proposed design	Main work	Decision it supports
Each relevant operation	Materials, labour, water and management	Whether the intended treatment occurred
Each harvest and season close	Output, receipts, losses and full costs	Production and household result
Defined seasonal survey windows	Selected ecological observations	Comparable indicator changes
Enrollment and reviewed remeasurement years	Soil-stock programme and quality checks	Detectable stock change on the agreed basis
Each amendment or exceptional event	Reason, affected plots and response	Transparent interpretation of departures

For ecological visits, distinguish the appointment from the observation. Instrument I links each point and visit to its observer, actual effort, raw records and later review. A visit stopped by weather can be rescheduled while retaining the incomplete visit and its reason. A completed visit with no target detections is a different record. The study by Berger and colleagues illustrates why count, distance, habitat and identification information belong together before modelling; it does not supply our local survey calendar. Agree that calendar and method with the specialist, then return an explanation that the family can trace to the visit. [S05]

Keep samples traceable

Use sample identifiers that connect plot, location, depth, collection date and planned analysis. The field label, transfer sheet and laboratory accession should reconcile. Record who collected, transported and received the sample, with the relevant handling conditions.

Composite samples and density samples serve different purposes. Do not lose the information needed for density by treating every collection as interchangeable loose soil. The final sampling and laboratory SOP must specify compositing, drying, sieving, coarse fragments, carbonate treatment where relevant and archival arrangements.

FAO's published protocol distinguishes fine-earth dry mass, total sample volume and coarse-fragment volume. Preserve the observations needed for the selected calculation, including the units and treatment of stones and roots. Chapter 14 shows why a fine-earth density calculated on total sample volume must not receive the same volume correction again. The example does not select a field sampling apparatus or validate the proposed repeat schedule. [S09]

Wendt and Hauser also describe calculating soil mass from the complete dry sample mass and the known area sampled by the probe. That route depends on retaining the collection geometry, core count and represented layer mass. A small laboratory aliquot is not the complete collected sample. Do not interpret “without separate bulk-density sampling” as permission to discard mass or sampling-area information. Any adoption must be reconciled with local coarse fragments, recovery losses, the laboratory workflow and the applicable accounting method. [S46]

The number of cores and composites follows the sampling design. No universal count is supplied here. Record unsuccessful collections and reasons for replacement locations so the procedure can be reconstructed.

Quality belongs inside the budget

Agree field duplicates, laboratory duplicates, reference materials and reanalysis rules with the technical team. Set acceptance criteria through the selected methods and laboratory quality system. A quality check is not useful if nobody has budgeted for the follow-up it may require.

Sampling uncertainty includes collection and preparation, not just laboratory analysis. Eurachem's guide considers that wider measurement process. It also distinguishes validation from continuing quality control: demonstrated performance must still hold during routine work. Close repeat results cannot by themselves exclude bias, and an out-of-control difference calls for investigation rather than diagnosing its cause. These principles do not set the pilot's acceptance limits. [S42]

In the proposed quality plan, name each check by the stage it repeats: a new field collection, separate preparation, analysis of a prepared-sample split or another instrument reading. Preserve the common parent and the operations actually repeated; a split shares the collection history of its parent. A close pair therefore cannot test stages that neither member repeated. Instrument G retains those links. Neither duplicate labels nor extra laboratory rows create additional independently managed farms.

Keep laboratory batches and analytical methods in the dataset. If a laboratory or method changes, investigate comparability and document the transition. Do not quietly combine a new analytical series with the old one because both columns are called carbon.

For this pilot proposal, a failed check should open a decision record before the affected results are released. Preserve the reported values and identify the work they share: collection team, preparation, batch, method or instrument, as relevant. Ask the technical reviewer which results require investigation and what use must wait. Retest, recollection, a qualified use and exclusion are different decisions; none should be selected simply to obtain a more favourable number. Keep the reason and any replacement linked to the original. A later successful test does not automatically resolve a wrong field identity, depth or collection history.

Harvests need an area and a basis

Record the actual harvested area, crop identity, marketable and other output, weighing procedure and moisture basis. Where household harvests occur in several collections, the collection log should allow a total to be reconstructed without counting a sale and its underlying harvest twice.

Record crop failure, damage, retained produce and co-products. The market value analysis can then use the stated valuation approach while the physical production record remains intact.

Work and money should be recorded promptly

Use a form short enough to complete during the season. Record task, duration, paid or family labour, materials, quantity, payment and plot. Review it with the household while memories and receipts can still be checked.

Separate a missing entry from zero cost. Keep borrowed materials and deferred payment visible. If records must be reconstructed, label their basis and uncertainty. The field team's missed visit should not turn into an invented farmer record.

Gas measurements and models need their own design

Direct gas-flux work requires specialist selection of instruments, timing and spatial replication. Emissions can vary around operations and weather events; a convenient isolated reading is not a seasonal total. If the research cannot support direct observations, define a suitable validated quantification approach and its limits.

For modelled estimates, preserve model version, inputs, calibration or validation domain, parameter choices and uncertainty treatment. Sensors and satellite images can support activity records or stratification, but they do not by themselves replace a validated stock or gas method. Current agricultural methodology documents distinguish quantification and monitoring requirements that an actual project must meet. [S07, S08]

Before a rice-water visit, name the quantity the team needs. A supply event can support an applied-water estimate when flow and duration are adequate. A field-water observation describes a level at a particular point and time. Instrument F now links those records while retaining the reference level, unit, method, observer and quality status. One should not be substituted for the other merely because both concern water.

VM0051 sections 9.3.1–9.3.3 connect the monitoring plan with expert recommendations and actual implementation. This informs the proposed record linkage; it supplies neither our local drainage schedule nor an automatic gas estimate. Link the advice version, actual action, departures and technical disposition before accepting the record for a named use. The expert and field team must agree the needed observation design. [S15]

Try a deliberately incomplete teaching record: pumping times are present, flow is missing, and a separate field-water level observation is available. The missing flow does not become zero, and the level does not supply the absent flow measurement. Leave the applied volume unresolved unless the reviewed method supports another documented estimate. Likewise, a single observation cannot establish every intervening field condition. Return the gap and the next action to the household; do not make a complete-looking seasonal total from incompatible entries.

Record departures rather than repairing the story

Flooding, drought, theft, illness, altered tenure, delayed inputs and unplanned rescue operations can affect the study. The exception record should say what happened, when, where and how the team responded. It should not contain a convenient retrospective classification chosen to improve the result.

Keep protocol amendments dated. Distinguish an adjustment made before seeing outcomes from an explanation introduced afterwards. Both can be reported, but they carry different evidential weight.

Monitoring should produce useful returns

After each review period, return a readable account of completed observations and unresolved issues. A farmer should know whether samples were received, when results are expected and what information can help the next crop.

The programme succeeds operationally when another team could follow the record and understand what happened. That is the quality needed for useful science, and it is the foundation for any later independent carbon assessment.

Concentration is only one part of a stock

The stock calculation needs a mass of soil as well as its carbon concentration. The chosen depth, density, coarse-fragment treatment and concentration basis must fit together. This is why a repeat carbon percentage alone cannot establish a change in the amount stored.

Consider a simplified hypothetical comparison over one hectare and 0.30 metre depth, omitting coarse fragments. At density 1.30 tonnes per cubic metre and one percent carbon, the calculation gives 39 tonnes of carbon. At density 1.20 and 1.05 percent carbon, it gives 37.8 tonnes. The concentration rose while the fixed-depth calculated stock fell because the represented soil mass changed.

These invented values illustrate a measurement issue; they are not a field trajectory or a complete stock-comparison method. The reviewed protocol needs an appropriate equivalent-soil-mass approach and enough depth and density information to apply it. Do not interpret this example as evidence that a particular management loses carbon.

A composite and a replicate do different jobs

A composite combines material from specified collection points according to a defined design. Its result represents that composite. It does not preserve a separate laboratory result for every component core. Independent replication concerns the units and allocation needed to estimate variation and effects.

Before collection, decide what information may be combined and what must remain distinct. Keep depth layers separate as the protocol requires. Retain the measurements needed for density and mass calculations. The field sheet should record how each composite was assembled.

For a repeat visit, retain both the intended sampling location and the actual collection location. The reviewed design must specify whether and how points are revisited or relocated; destructive collection, inaccessible ground and positional uncertainty need a rule. A phone coordinate alone does not settle whether the same sampling support was represented. Keep the plot map version and any relocation reason linked to the sample.

More cores can improve a particular sampling estimate under a suitable design. They do not create additional independently managed farms. Both sampling effort within a unit and replication across units need resources; one cannot be used as a convenient substitute for the other.

Build a reconciliation into every measurement round

At the end of a round, compare the planned list, collected samples, dispatched containers, laboratory accessions and reported results. Each difference needs a status: not collected, damaged, pending, reanalysis required or unusable, with the reason.

Do the same for harvests and household records. A total marked complete should be reconstructable from its entries. A harvest sale should link to produce without becoming another physical harvest in the production total.

This reconciliation is a proposed operating requirement, not an observed performance claim. Assign a responsible reviewer and retain the review date. Resolving a discrepancy while a sample or receipt is still available is easier than explaining it several years later. Follow the consequences into linked accounts: an area, mass or identity error may affect more than the entry in which it was found.

Use a consistent moisture basis for harvest comparison

The same grain can have two different moisture percentages without changing its water content. FAO distinguishes water mass divided by wet grain mass from water mass divided by completely dry grain mass. Its conversion table gives 20 percent on the wet basis as 25 percent on the dry basis. A percentage without its basis is therefore an incomplete comparison. [S57]

Keep the chapter's hypothetical 1,000-kilogram record at 20 percent wet-basis moisture. It contains 200 kilograms of water and 800 kilograms of dry matter; 200 ÷ 800 × 100 gives the equivalent 25 percent dry-basis moisture. Expressing the same 800 kilograms of dry matter at 14 percent wet-basis moisture gives 800 ÷ 0.86, approximately 930.23 kilograms.

Reference-basis mass = observed mass × (100 − observed wet-basis moisture percentage) ÷ (100 − reference wet-basis moisture percentage).

This calculation holds dry matter constant. It restates a mass on another moisture basis; it does not measure an actual drying operation or show that grain was lost. Cleaning, spillage or other removal needs its own record rather than being hidden inside a moisture adjustment. The chosen 14 percent is an arithmetic example, not a crop's recommended harvest or storage moisture.

For the proposed record, link the weighed lot, weighing time and moisture sample or reading. Retain original mass, moisture value and basis, measurement method, reference basis and derived mass together. An unrelated reading from a later sale should not silently stand for the harvest lot. A standardised mass remains another expression of that harvest, not additional output. Divide it by the stated crop-area denominator only for the yield question that uses that area. If moisture is unknown, keep that gap visible instead of making the groups appear comparable by assumption.

Make labour entries possible during a busy week

A practical work record needs task, people or worker category, duration, plot and payment or family-work status. Test whether the household and field team can complete it without confusing person-hours with elapsed hours.

For illustration, two people working three hours each contribute six person-hours, even though the task lasts three hours. Record shared-task allocation so that the same time is not charged in full to several plots. Keep the method consistent across groups.

Where detailed daily recording is infeasible, agree an appropriate collection approach with the economic team and state its recall period and limitations. A short form completed reliably is more useful than an elaborate form reconstructed from guesses at season end. Do not leave family work blank because it was unpaid; preserve the quantity before applying the stated valuation rule.

Turn a laboratory change into a documented study event

If the laboratory, instrument or analytical method changes, record why and when. Obtain technical advice on comparability and any bridging work required. Preserve old and new method identifiers with results.

Do not treat a systematic change in measurement as a management response. A bridge may involve reference materials, retained samples or a planned comparison, depending on the methods and available material. Its design must be agreed with specialists rather than improvised in the spreadsheet.

The same discipline applies when a field instrument is replaced or an observer changes. Training and comparability checks belong in the monitoring commitment.

The NIST handbook describes monitoring check standards over time to detect degradation in instrument calibration. That principle supports checking the measuring system as well as field samples; the handbook's instrument-specific example is not a soil laboratory SOP. [S43]

For the proposed programme, distribute any comparison work across relevant sample types and measurement ranges under technical review. If every baseline sample went through one method and every follow-up sample through another, method and time are entangled. A convenient correction factor cannot separate them without suitable evidence. Where comparable measurement cannot be established, report the break and the affected inference.

A missed observation is a result about the programme

Record a missed visit, failed instrument or unavailable harvest measurement at the time it occurs. State whether any later reconstruction is possible and on what basis. Missing does not mean zero, and an estimate does not become an observation because it fills an empty cell.

Regular completeness reviews can reveal a pattern early. If one cohort is harder to visit or one form repeatedly fails, investigate the cause and amend operations transparently. Do not improve apparent completeness by weakening the record only for the inconvenient group.

The next step is to decide what can be released for analysis when those records disagree. The following examples make that decision visible without pretending that every discrepancy has the same cause.

From a result to an accepted use

Identity	Plot, layer and visit	→	Link to original records
Basis	Unit, method and mass	→	Suitable for the comparison
Quality	Reviewed criteria and checks	→	Decision and remaining limits
Use	Responsible role and version	→	Accepted for a stated use

Proposed project controls: receiving a report is not acceptance for use or issuance of a carbon credit.

Follow a result through four gates

Imagine a sample bag reaches the laboratory intact, but its label specifies a different depth from the field sheet. The laboratory may have measured its contents well. The project still lacks a secure link to the intended soil layer. Marking the result as received should not also mark it as comparable, checked and ready for the proposed stock calculation.

The pilot should therefore keep distinct decisions at four gates. These are proposed project controls, not registry approval stages. Instrument G holds the collection and custody trail; Instrument J records the investigation and decision. Preserve both when a problem crosses the boundary between field and laboratory.

Gate	Question before moving forward	If the answer is unresolved
Identity	Can the result be linked to the intended plot, layer and visit?	Hold that link; investigate original records
Basis	Are units, preparation, method and represented area or mass suitable?	Keep the result, restrict the intended comparison
Quality	Did the relevant checks meet their reviewed criteria?	Flag the affected scope and follow the agreed investigation
Release	Who accepted which use, with what limitation and version?	Keep the record pending rather than silently include it

A result can be useful for one purpose while unsuitable for another. An agronomic observation does not become a quantification input because a report needs a complete column. Conversely, an unresolved crediting use should not erase a potentially useful observation from the farmer's account. State which use is accepted, which is held and why.

Before dispatch, the team should agree what to do if a label is damaged, a container leaks or an expected result is absent. Before analysis, it should agree how a quality flag travels with an exported dataset. These decisions protect work already paid for and prevent a clean-looking spreadsheet from concealing an unresolved sample.

Two examples that should trigger an investigation

First consider an invented pair of carbon-concentration results from the same prepared material: 1.00 and 1.10 percent. Their mean is 1.05 percent; their absolute difference is 0.10 percentage point. Expressing that difference relative to the mean gives 0.10 ÷ 1.05 × 100, approximately 9.52 percent. The percentage-point difference and the relative percentage answer different questions.

These numbers are a teaching example, not an acceptable duplicate limit, a laboratory performance assessment or a soil-stock change. A decision needs the relevant method, concentration range, uncertainty and agreed quality criteria. Nor would two close results prove that the original field collection represented the plot: both analyses could share the same collection problem.

Now consider an invented measurement transition. At the first visit a field's carbon concentration is reported as 1.00 percent under method A; at the second it is 1.12 percent under method B. The apparent rise is 0.12 percentage point. Separately, a retained comparison material produces 1.04 under A and 1.10 under B, a difference of 0.06 percentage point.

Subtracting that comparison difference from the field difference would leave 0.06 percentage point. The arithmetic is simple; adopting it as a correction is not justified by these four numbers. One material does not establish a constant offset across all soils, concentrations, preparation histories and storage conditions. The example shows why a method change needs a planned bridge, rather than providing a bridge equation to use in the pilot.

Illustrative comparison	First value	Second value	Difference in percentage points
Field, first versus second visit under different methods	1.00	1.12	0.12
Comparison material, method A versus B	1.04	1.10	0.06

Keep unadjusted results and their method identifiers. If specialists later support a correction, retain its fitted relationship, applicability, uncertainty and version alongside the derived values. Never replace the original column with adjusted numbers that future users cannot reconstruct. A bridge's limits belong in the analysis report as well as in the laboratory file.

Close the round without closing the questions

A measurement round needs a denominator: how many observations were expected, for which units and uses? Count collection, reporting and acceptance separately. As a purely hypothetical example, suppose 24 scheduled sample records consist of 18 results accepted for a stated use, three reports awaiting quality review, two collected samples awaiting reports and one missed collection. The counts reconcile: 18 + 3 + 2 + 1 = 24. They do not mean that 24 usable observations exist.

The reported-result count is 21, or 87.5 percent of the schedule. The accepted-for-use count is 18, or 75 percent. Both statements can be true. Their labels must remain attached to the denominators; neither percentage measures the size or representativeness of a management effect. Review completeness by cohort, location, visit and reason before summarising it for the programme as a whole.

The round-closing record should connect five pieces of work:

- Freeze a dated expected list and record additions or removals with reasons.
- Reconcile collections, dispatches, accessions and reports, preserving unresolved links.
- Record quality decisions and accepted uses, including the reviewer and evidence.
- Export a versioned analysis file with flags and a record of exclusions or transformations.
- Return a household statement showing completed work, pending work and the next actual action.

Give each unresolved item a responsible role and a review trigger. A pending laboratory report and a missed field collection need different responses. Where a sample remains available, the agreed handling and retention conditions govern whether another test is meaningful; do not assume all stored material can reproduce the original measurement.

The farmer's copy should distinguish a received result from a checked interpretation. Explain whether the next action is a revisit, clarification, laboratory investigation or a later research comparison. Do not describe a pending carbon calculation as an earned payment. A correction should reach that copy when it changes information already shared.

For the chapter 21 handover, preserve the version of the expected-work list alongside actual event, sample and test identifiers. Link each accepted result to its named use and review decision; one collected sample may have several tests without becoming several farm observations. Keep pending work on that same list. The analysis team can then distinguish missing collection, missing report and unresolved acceptance instead of inferring completeness from the number of rows delivered.

Choose the measurement purpose before booking the visit

A field team can arrive with the right equipment and still collect the wrong evidence for the intended decision. Begin the booking with a question: is this an agronomic observation, a research comparison, a model check or direct project-stock quantification? One collection may serve more than one purpose, but that has to be established in the design. Its date alone cannot confer those uses.

The June 2026 VM0042 v2.2 clarifications distinguish two requirements. Approach 2 repeats SOC measurements in project areas and baseline control sites at least every five years, or before each more frequent verification. Approach 1 model true-up need not sample every field at every event; the sampling must address area changes and quantify sampling error. Updated model validation and independent modeling expert review are required; recalibration is optional. These are selected requirements, not an approved pilot protocol. [S08]

For the proposed pilot, the year-three/year-five research observations therefore remain a planning choice requiring review. A wish to seek earlier verification could change the operational work. A model-based route could require a different allocation of samples from a direct-comparison route. The scientific team and prospective project team should resolve that difference before presenting a field calendar as settled.

Use the following original review map to turn a broad intention into a task someone can schedule. The rows are questions for the proposed programme, not a substitute for method requirements.

Before the collection is booked	Decision the team must record	What the collector needs
A result will inform a farm decision	Which observation answers that question?	Purpose, field condition and requested analysis
A result will enter a research comparison	Which study unit and comparison does it represent?	Treatment, visit window and sampling-plan identity
A result will help assess a model	Which model, domain and checking task is proposed?	Linked sample set and intended data role
A result will enter a candidate stock account	Which account, population and comparison are intended?	Project/control role, depth and reviewed collection plan

A research treatment described as conventional farming does not automatically become an acceptable baseline control site for a crediting approach. The study arm was selected to answer a scientific question. The proposed control role needs its own documented assessment. Conversely, a control site maintained for a specific baseline may not represent the broader comparator population that the research question intends to describe. Preserve both labels when the same location is considered for both jobs.

Do not make the household decide which technical route applies. The proposed service team should translate the reviewed design into understandable work: which field, what collection, why now and whether a revisit remains necessary. If the route is undecided, give the visit an honest research purpose rather than implying it already fulfils a later verification requirement.

Budget the comparison as well as the project fields

A sampling budget can look complete while leaving out the observations that make the comparison interpretable. The project-field visits are visible because participants are enrolled. Linked control-site work, retained materials, quality investigations and records needed to explain a changed boundary can be easier to miss. Assign each task to the decision it enables before judging it unnecessary.

Consider an invented logistics exercise: a draft round contains 60 project sample records and 12 linked control sample records, giving 72 planned records before any separate quality-control work. If only the 60 project records are budgeted and collected, the round is missing 12 of its own planned comparison records. This is a completeness calculation, not a recommended sample count, a valid sampling design or a costing quotation.

The overall collection fraction is 60/72, approximately 83.3%. The planned control collection fraction is 0/12, or zero. A single headline percentage hides the particular work that is absent. It does not establish that the project estimate is 83.3% reliable, nor that the missing controls can be replaced by extra samples from project fields. Different records were meant to perform different jobs.

For this proposed programme, retain separate task lists for the project observations, the comparison observations and the quality work. Where a record serves two approved purposes, link it rather than count it twice as work completed. Where its use has not been accepted, keep the pending decision visible. A failed control visit is not repaired by relabelling a convenient nearby field after collection.

Put the response to failure into the schedule too. Who checks whether a missed visit can be repeated in a comparable window? Who assesses a changed control-site practice? What happens to the analysis if one comparison remains unavailable? The right response depends on the design and applicable rules. The operating plan should name the decision and responsible reviewer without inventing a universal replacement procedure.

Before closing the next round, compare the actual record set with its intended uses. A bag received by a laboratory, an acceptable concentration result and an observation fit for a particular stock comparison are different milestones. The traceable handover to analysis should preserve those differences, including work that could not be completed. That lets chapter 21 assess the evidence that exists, rather than the sampling round everyone hoped to obtain.

21

V · THE PROPOSED PILOT

Analysing and reporting the findings

The research question is not answered by selecting the best-looking plot. It is answered by applying the stated analysis to the evidence collected, showing the uncertainty and explaining where the study departed from its plan.

The proposed pilot should publish an analysis plan before results are examined. Later exploratory questions may be useful, but they must remain distinguishable from the questions specified at the start.

Begin with the people and plots retained

Show the flow from assessed farms to enrollment, allocation or matching, follow-up and analysis. Give reasons for exclusion and withdrawal where appropriately recorded. Compare missingness across groups rather than assuming it is harmless.

Do not allow a complete-case dataset to hide a pattern in which the most difficult transitions disappeared. Investigate how those missing outcomes could affect the conclusion. Protect participant identity while explaining the analytical issue.

Compare change, not just final appearance

For an illustrative explanation, suppose the transition group's outcome rises from 40 to 44 units and a suitable comparison rises from 42 to 43. The changes are 4 and 1; the difference in change is 3 units. These invented numbers explain an estimand, not a pilot finding.

An actual difference-in-change analysis depends on assumptions, allocation, timing and relevant covariates. A matched longitudinal design does not eliminate all confounding. Baseline balance and pre-intervention trends, where available, help assess interpretation. Keep observational and randomized results separate.

Respect the independent unit

Repeated seasons, several cores or several observations within a plot do not all become independent farmers. The statistical model must reflect the allocation or matching structure, clustering and repeated measurements.

Decide which units receive weight in the reported average. Giving every farm equal weight describes a different quantity from weighting by farm area; weighting by the number of available samples can unintentionally favour farms visited more often. The analysis plan should name the target population, period, outcome, comparison and weighting rule together. Keep the farm-level result and any area-based estimate identifiable rather than calling both the average effect.

Use an appropriate mixed-effects or equivalent longitudinal approach selected with the statistician. Pre-specify the main treatment-by-time contrast and necessary covariates. Document model diagnostics and departures. A complicated model cannot rescue a comparison whose management and sampling were poorly recorded.

Estimates need intervals

Report effect sizes in meaningful units with uncertainty. For economic outcomes, show the actual definition and valuation basis. For crop outcomes, retain the crop-level results. For carbon, distinguish physical estimates from any quantity that could pass programme deductions and issuance.

A non-significant result does not prove the effect is zero. A statistically significant result may still be too small to matter to a household. Discuss both precision and practical importance. If a production non-inferiority question was pre-specified, apply the agreed margin rather than infer equivalence from an ordinary difference test.

The American Statistical Association's six principles distinguish incompatibility with a specified statistical model from the probability that a hypothesis is true. A p-value is neither the chance that this farming method works nor its effect size. Read the estimate, design and assumptions together; a threshold alone cannot establish scientific or household importance. This statement does not choose the pilot's model. [S44]

Deal with many outcomes openly

The pilot examines several related outcomes and potentially several modules. The analysis plan must say how primary-outcome testing and multiplicity are handled. Secondary and exploratory findings should be labelled and interpreted with appropriate restraint.

Do not select a favourable subgroup after looking at many alternatives and present it as the principal result. A crop or resource subgroup may be important, but explain whether it was planned and whether the data support a reliable estimate.

A results table without invented results

The publication template should include these fields for each outcome: definition and unit, comparison, number of independent units, observation period, effect estimate, uncertainty interval, missingness and the main sensitivity result. Until data exist, those are form fields, not zeroes or illustrative pilot values.

Outcome account	Interpretation to report
Production	Crop-specific and rotation findings, including failures
Household economics	Cash and full-cost results, valuation and workload
Ecology	The selected measured indicators and their observation limits
Greenhouse gases	Net quantified outcomes, boundaries and uncertainty
Programme status	Eligibility and verification decisions actually obtained

Make the unfavourable finding useful

If net returns fall, examine production, prices and work rather than replacing actual receipts with a hoped-for premium. If carbon does not measurably increase, report it and distinguish an estimated null from inadequate precision. If a module is unsuitable, explain the evidence and the relevant conditions.

Publish the protocol, amendments, analysis code and suitably protected data or access arrangements to the extent feasible and agreed. Disclose CarbonVerse's proposed developer interest and the independence arrangements. The evidence package must allow scrutiny beyond the organisation that hopes the approach will succeed.

Give the household its own result

A journal table is not a farmer statement. Return the season's account and explain what the wider study can say about the field. Avoid suggesting that a group average determines the outcome of every household.

The strongest conclusion is the one the design and evidence can support. It may recommend expansion under stated conditions, adjustment, further study or stopping an unsuitable intervention. Each is a valid contribution when it helps farmers and institutions make a better decision.

Keep the analysis question connected to the design

The principal model should estimate the pre-specified comparison, with the independent unit and observation schedule represented correctly. A model should not be selected only because it produces the smallest probability value.

For the proposed longitudinal cohorts, the statistical plan needs a clear treatment-by-time contrast and justified adjustment variables. Record how matching, village or group structure and repeated farm observations enter the analysis. Institutional randomized plots require their own analysis reflecting their allocation.

Before examining outcomes, prepare a data dictionary and test the analysis code on synthetic data. Synthetic data can expose programming errors without supplying evidence about the pilot's effect. Keep that test material separate and labelled so it cannot appear in a results table as an observation.

Before choosing software commands, write the comparison in one sentence: whose outcome, over what period, under which management or programme contrast? An original assignment, an observed cohort and management actually received are different starting points. Chapter 18 asks whether the intended comparison can be delivered. Here the task is to say which question the resulting records can answer.

In a randomized study, an analysis by original assignment and an analysis restricted to those who followed it do not answer the same question. In the proposed observational cohorts, initial membership is not random assignment. Preserving that membership does not remove selection differences; regrouping farms by later adherence can introduce further selection. Keep the original label alongside dated actual management and reasons for change. Have the statistician specify the question and assumptions for each design before outcomes guide the choices.

Shared exposure makes that sentence more demanding. Hudgens and Halloran distinguish direct effects from effects arising through others' treatment and define comparisons under specified allocation strategies. Their framework allows interference within groups but assumes none between groups, assumes assignment equals receipt, and develops inference for two-stage randomization. These are substantive assumptions and design features, not properties acquired by adding a village code to a spreadsheet. The paper provides a conceptual distinction here; its estimators are not adopted for the proposed farm cohorts. [S55]

Use the following original reporting guide to keep the questions separate. It does not select an estimator or establish that any causal effect is identifiable:

Question in the report	Records to preserve	Boundary on interpretation
What happened in the original assigned groups or enrolled cohorts?	Original labels, design, follow-up outcomes and documented changes in delivery	State the actual contrast; cohort membership does not become randomization, and shared exposure needs design-specific review
What management or exposure was actually recorded?	Dated operations, supported exposure observations, changes and unknowns	Describe implementation; comparing farms by received management alone does not establish its causal effect
Can an own-treatment effect be separated from an effect through others' treatment?	A defensible exposure definition, relevant links between units, timing and a design supporting the specified comparison	Treat this as a separate analysis question; if records or assumptions cannot support it, report that limitation rather than a direct or spillover estimate

For the shared water-release case in chapter 18, begin the analysis handover with what is known: original plot labels, release timing and the water observations that are actually supported. Instrument F contributes those observations; C contributes operations and support received; J records the departure, response and review. Do not turn a suspected route into a complete exposure map. A record of water movement does not by itself give its amount, duration or effect on yield or emissions. The reporting guide asks what comparison remains supportable; it cannot reconstruct an intervention that was never separately delivered.

Also separate three problems that can coexist. Correlation concerns how observations vary together. Unknown implementation concerns what happened to a unit. A missing outcome concerns whether the chosen response was observed at the required time. A measured harvest can coexist with an incomplete water history; a complete operation log can coexist with an unmeasured harvest. Neither supplies the other. Preserve separate flags and denominators, including the units with both kinds of missing information, so readers can see the overlap. Do not code unknown exposure as no exposure or replace a missing outcome with zero.

Representing correlation in a model may improve the treatment of dependence and uncertainty; it does not, by itself, identify a direct or spillover effect. Nor can a later decision to call every neighbour exposed establish who was reached before harvest. Any proposed exposure classification needs a reason, evidence and timing appropriate to the outcome. If these are unavailable, give the supported implementation description and narrow the interpretation. Retain the original record and a dated account of analytic decisions rather than deleting inconvenient farms after seeing their results.

Adjustment needs the same discipline. A starting characteristic and a condition changed by the intervention can play different roles. Adding every available variable is not automatically a better comparison. Record why a variable is included, when it was measured and which contrast the adjustment is intended to estimate. Distinguish the primary analysis from labelled alternatives; do not present an exploratory exposure grouping as if it had been specified in advance.

The historical on-farm guide connects plot responses with farm circumstances and farmer assessment. Preserve relevant context for interpretation, without treating it as an instruction to collect every variable or search for a favourable adjustment. Its historical exclusion and zero-as-missing examples are not adopted as pilot rules. [S39]

The handover should therefore let a reader trace each reported estimate back to its comparison sentence, eligible units, observed outcomes and implementation information. Where a separate exposure-effect question remains unanswered, say which evidence or design feature is missing. That is a useful study conclusion: it tells the next study what to establish without converting this one's uncertainty into a result.

Show the denominator from enrollment to analysis

For each outcome, show the units in the planned population, the records obtained at each required time and the independent units contributing to the named estimate. These counts need not match. Record why a collected result was not accepted for that use, rather than treating every laboratory row as another usable farm. Preserve the relevant plan, observation and review versions so that the reported denominator can be reconstructed.

Suppose a hypothetical group begins with 40 farms and only 32 have a complete final record. The eight missing farms remain part of the study's history. A mean from 32 farms is not a complete result for 40. Investigate whether the missing records are associated with difficulties that matter to interpretation.

The analysis plan should specify appropriate approaches and sensitivity work for missing data. Do not assume that replacing a missing outcome with zero is conservative in every account. Zero return, zero production and zero stock change are substantive values, not generic codes for absence.

For this pilot proposal, distinguish a confirmed zero in the defined outcome from an unobserved value. If a documented crop failure leaves the defined harvested marketable output confirmed as zero, keep that zero; record other produce, rescue operations, work, costs and the evidence separately. If the team merely missed the harvest, its quantity is unknown. No sale does not establish zero production, and a failed crop does not imply zero work or cost. A pre-specified eligibility rule may affect a particular analysis, but preserve the original observation and report the reason. This is a proposed classification check, not a missing-data method.

Also distinguish a crop not grown from a crop whose defined harvest is confirmed as zero. In a hypothetical wheat record, the field might instead carry another crop, or sowing might never have occurred. Preserve the actual sequence, area, timing and reason. A crop-specific yield rate needs its stated crop-area denominator; do not divide by zero area or borrow the whole holding's area merely to fill a cell. Other crops, work and costs still belong in their relevant rotation or household accounts. The planned question must determine applicability and analysis, especially if crop choice is part of the intervention. Neither a missing wheat-yield entry nor a changed crop alone authorises dropping the farm from every outcome.

Extend the 40-farm example using invented final-outcome index values. Suppose the 32 observed transition farms average 50, while all 40 comparator farms have observed values averaging 48. The complete-record comparison is therefore 50 – 48 = 2 index units. It is a descriptive final-outcome comparison, not a baseline-adjusted treatment effect.

Now ask what the eight unobserved transition outcomes would have to average for the full-group description to change. The 32 recorded values sum to 1,600 index units. If the missing eight averaged 40, their total would be 320; the combined mean would be (1,600 + 320) ÷ 40 = 48. If they averaged 30, the combined mean would be 46. A favourable comparison among available records can therefore coexist with a less favourable full-group scenario.

Assumed mean for eight missing farms	Mean across the original 40	Difference from comparator mean 48
50	50	+2
40	48	0
30	46	−2

These are deliberately constructed sensitivity cases, not recovered observations, a recommended imputation method or a probability distribution for the missing outcomes. Nothing in the arithmetic establishes that 30, 40 or 50 is plausible for a particular study. That judgement needs the reasons for missingness, available records and specialist analysis. The exercise exposes an assumption that a complete-case mean alone leaves hidden.

In the real pilot, first distinguish a missed visit from an unusable laboratory result, a withdrawal and a lost linkage. Some factual gaps may be corrected from original records; others remain unknown. Preserve which remedy was possible. Do not infer that a missingness problem is solved merely because a model produced a complete output table.

A follow-up value and a paired change need different input checks. For each outcome, retain separate flags for a usable starting record, usable follow-up, a valid link between them and acceptance for the intended calculation. A later harvest record may support a harvest description while a missing starting record limits a change estimate. A missing soil pair does not erase a complete farm account. The reviewed analysis may use incomplete longitudinal records under stated assumptions; this checklist does not impose universal complete-case exclusion. Report which records actually enter each analysis and why, alongside the original recruitment and participation flow.

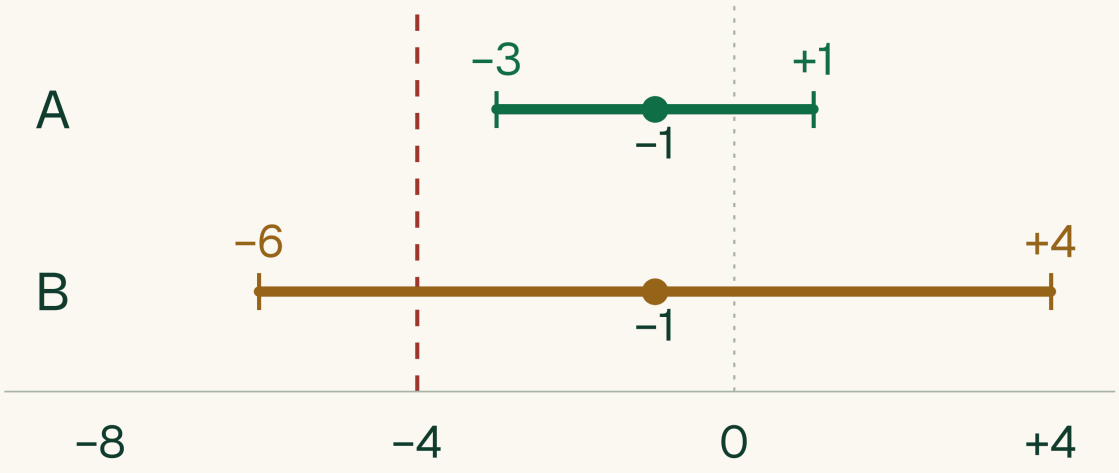
Read an interval in the outcome's units

Consider an invented estimate of three units with an uncertainty interval from minus one to seven, using a stated statistical procedure. The interval includes both a small negative difference and positive differences. Presenting only “three units better” hides the imprecision.

Now consider an invented estimate of 0.1 unit with an interval from 0.05 to 0.15. It is more precise, but its practical importance depends on the outcome and the farmer-relevant threshold. Precision alone does not establish a valuable improvement.

Neither example is a pilot result. An actual report must identify the interval type, calculation, model and assumptions. Avoid interpreting a confidence interval as a guarantee that an individual farmer's result will fall within it. It describes uncertainty about the specified estimated quantity under the procedure used.

Same estimate, different uncertainty



Dots are estimates; horizontal lines are intervals; the red dashed line is the invented loss boundary −4. All values are hypothetical index units, not pilot results or an approved margin.

Maintaining production is a question to design for

If the pilot asks whether production is maintained within a tolerable loss, the margin needs justification before results are known. It should reflect the crop, household consequences and the intended decision, with appropriate scientific and farmer input.

An ordinary comparison that finds no statistically significant difference does not establish that production is sufficiently similar. The design may simply have too little precision to exclude an important loss. Conversely, a small well-estimated loss may be unacceptable to a particular household despite savings elsewhere.

Report the production question separately from the economic result. A household may consider a particular trade-off worthwhile, but the researcher should not rename it unchanged production. No actual non-inferiority margin is selected by this book.

A visual example makes the distinction more concrete. Use an invented production index and define the reported difference as transition minus comparison; negative values mean lower production. Imagine that, for this illustration alone, a loss boundary of −4 index units had been justified in advance. This is not a proposed boundary for an Indian crop, a farmer offer or an approved pilot criterion.

Two imaginary analyses both estimate a difference of −1. Analysis A has an uncertainty interval from −3 to +1; analysis B has an interval from −6 to +4. A's whole interval is above the illustrative loss boundary. B's interval crosses it, leaving a loss worse than that boundary compatible with the interval. The point estimate is identical; the precision and resulting judgement differ.

Invented analysis	Point estimate	Interval shown	Relation to invented boundary −4
A	−1	−3 to +1	Whole interval above the boundary
B	−1	−6 to +4	Interval crosses the boundary

These intervals are drawn for explanation, not computed from pilot data. A formal non-inferiority conclusion requires a justified margin, suitable design, specified analysis population and a compatible statistical procedure and confidence level. This picture supplies none of those approvals. It shows why the same central estimate can leave very different uncertainty about a loss that matters.

Both illustrated intervals include zero. Saying that neither shows an ordinary clear difference would miss the question being asked: how much loss can the evidence exclude under the stated procedure? It would also be wrong to call A proof that no loss occurred, or B proof that the method failed. Keep the directional production question, statistical interpretation and household trade-off separate.

Test the economic result against its assumptions

A full-cost account uses valuations as well as observed payments. Show how the result changes under defensible alternatives for family labour, retained produce and shared resources. Retain the observed cash account beside these analyses.

Separate actual crop receipts from a common-price comparison. The first describes what households received. The second can help distinguish production differences from price differences, if its purpose and price basis are clear. Neither should be substituted for the other without explanation.

A projected premium or carbon payment belongs in an explicitly separate scenario until the relevant transaction occurs. If the cultivation account looks favourable only after adding an unconfirmed future payment, the report should say so.

Treat subgroups as questions with a cost

Crop, soil, water control and starting resource differences may matter. Identify important subgroup questions in advance and assess whether the design can support them. A small subgroup can yield an unstable estimate even within a useful larger study.

If an unexpected pattern appears, report it as exploratory and describe how it was found. Do not present a favourable subset as the whole result while leaving out farms with different outcomes.

The report can still use exploratory findings constructively: they may suggest a narrower next trial or a management improvement. The distinction is between generating a question and claiming that the original study has already settled it.

A report should let the reader follow the choices

Publish a main outcome table with definitions, units, denominators, estimates, uncertainty and sensitivity results. Accompany it with the participant flow, baseline description, actual management, missingness and protocol amendments.

Explain exclusions and corrections in a dated analytical record. Preserve the original data and controlled corrections with the appropriate privacy protections. A reader should be able to understand why an observation changed without accessing personal farmer details.

The farmer summary can be shorter. Show what happened to the household's crop, work and account; distinguish that individual description from the study estimate. Invite correction of factual records without inviting a rewrite of unfavourable results.

Decide what each finding permits

A favourable economic result may support continuation under stated conditions. A measurable climate outcome may justify further method or project assessment. A useful ecological observation may support management even when no credit follows.

An imprecise result may justify more evidence, but only if the next design addresses the cause of uncertainty. An unfavourable result may justify changing or stopping an intervention. “More research” should not become a way to avoid a clear adverse finding.

The recommendation should follow its evidence account by account. Before it reaches a farmer, funder or standards body, the team must also be able to reconstruct the result and its stated limits.

Make the analysis handover reproducible

A checked sample file is only one input to an analysis. The handover also needs the outcome dictionary, comparison definitions, plan version, exclusions, quality decisions and code that transformed accepted observations into a reported estimate. Freeze a dated input snapshot and keep its relationship to the original records. A correction should produce an identified new version, not silently change yesterday's published table.

For each main result, preserve a short chain: input version, population included, comparison estimated, model or calculation version, diagnostic review, sensitivity case and report location. An independent reviewer should be able to locate the relevant evidence without having to guess which of several files called final was used. This is a proposed operating requirement; the book does not claim that a pilot analysis has been reproduced.

The Statistical Services Centre's data-management guide connects a dated audit trail with keeping data, programs and supporting information usable for later users. That general principle supports the record chain proposed here; it does not establish that a local analysis has been reproduced. [S41]

Test code on deliberately troublesome synthetic cases as well as a tidy dataset. Include a repeated farm identifier, a missing visit, an impossible unit, a changed allocation record and an exclusion with no reason. The expected response may be a warning or refusal to calculate. A system that always prints a number can be less dependable than one that exposes an unresolved input. Such checks test implementation behaviour; they cannot validate the study's causal assumptions.

Before releasing a report, reconcile every displayed denominator with its analysis population and every unit with its outcome definition. Confirm that exploratory findings remain labelled, that a sensitivity result has not quietly replaced the planned main result, and that corrections have reached the household copy where needed. Keep the research estimate, carbon-accounting calculation, programme decision and payment statement linked but distinct.

Take chapter 19's invented area correction as a rehearsal. The same harvest mass acquires a different per-hectare rate when its supported area changes. Trace that correction from the map version through the harvest account, derived rate, analysis input and household statement. The recorded mass and original treatment allocation do not change merely because the denominator was corrected. Nor does the new rate prove a treatment effect: its comparison, period and uncertainty still require the planned analysis.

Keep the affected outputs and their replacement versions in the amendment record. Check whether any area-based work quantity or expense basis also needs review, but do not infer a new invoice or farmer deduction from a revised rate. A scientific correction and authority to incur or charge a cost are separate decisions. This proposed rehearsal connects the five pilot chapters; it reports no corrected field result or approved payment.

The farmer summary should make three points easy to find: what was observed on the household's field, what the wider comparison estimates and what remains uncertain. A study average is not an individual forecast. An observed benefit is not automatically a tradable credit. A negative or inconclusive result deserves the same clear explanation and access to factual correction as a favourable one.

That work has a cost in staff time, review and records. Chapter 22 turns to funding it across the whole commitment, including the possibility that no carbon sale occurs. Credible analysis should be affordable enough to continue and independent enough to report an answer the project did not hope for.

22

V · THE PROPOSED PILOT

Paying for credible evidence

The cost of a carbon project begins before a credit exists. Someone pays for field visits, sampling, laboratory work, data management and independent assessment. If the study promises several years of monitoring, the budget must cover those years rather than only the enrollment event.

No actual quotations or committed pilot budget are supplied in this book. The purpose of this chapter is to specify what must be priced and how the payment proposal should be made understandable.

Price the unit of work

A quote per sample is not a quote per farm. A price per hectare may exclude travel, density measurements or laboratory preparation. Record the unit, quantity, inclusions, tax treatment, validity date and repeat-measurement terms.

Cost line	Unit to establish	A common missing item to check
Design and statistical work	Reviewed scope and deliverables	Amendments and sample-size simulation
Field collection	Visit, plot, sample or team day	Travel, equipment and unsuccessful visits
Laboratory analysis	Test and preparation unit	Density-related work, duplicates and reanalysis
Training and support	Session, visit or service period	Follow-up when practice differs from the plan
Data management	System and stewardship period	Cleaning, correction, security and farmer copies
Independent assessment	Agreed review or verification scope	Responses, repeat visits and programme fees
Monitoring commitment	Season and remeasurement round	Inflation, replacement equipment and contingency

Obtain comparable quotes rather than selecting the smallest headline total. A cheaper package that omits the measurement needed for the primary outcome is not a cheaper way of answering the same question.

Separate research funding from credit revenue

Research may need funding even if no credits are ultimately issued. Show that commitment separately from projected sales. If a grant or sponsor supports evidence collection, do not describe the support as money earned by carbon removal unless that is the actual contracted arrangement.

Any sale scenario should identify the eligible quantity basis, price assumption, timing, deductions and risk. A gross market price multiplied by the farm area is not a farmer-payment calculation.

Some programme expenses precede approval. Verra's dated fee-update FAQs describe submission fees and non-refundable listing or registration payments after rejection. They also distinguish a review charge from a prepayment toward later issuance levies. The same dated FAQ describes a further review charge on resubmission after denied verification while retaining the earlier issuance-levy prepayment. This separates a new review expense from a prepayment already recorded; it is not a current pilot quotation. No rates are adopted here. [S45]

A useful funding file begins with the work, then asks what can pay for it. Available cash, a documented commitment with conditions, an application awaiting a decision and an unsupported expectation are different states. Keep them visible when deciding whether a field visit, laboratory order or participant obligation can responsibly begin. A programme's interest in natural farming is a reason to prepare a relevant proposal; it is not a balance in the pilot's account.

The examined NMNF guidelines illustrate the distinction. Sections 9 and 11 describe research support, institutional responsibilities and approved plans. Sections 20.2 and 21.4 connect fund releases with approval, accounts, utilisation and progress records; section 22 limits its cost norms to a specified finance-commission period. This is an inspected programme design, not a verified current call or award for this pilot. Chapter 23 discusses its learning and institutional roles. Here the question is which proposed work a documented approval would actually cover. [S28]

Use this original work-to-funding check before counting proposed support as money available to deliver the study:

Proposed work	Evidence needed before counting support	What to resolve if it is not covered
Training and continuing field advice	Agreed service, provider, period, recipients and covered costs	Who funds follow-up when a household needs help after the session?
Independent comparison, sampling and laboratory analysis	Approved research scope matched to the protocol and comparable quotations	Which measurements or quality checks still need a separate funding source?
Participant work, expenses or proposed payments	Clear payment category, responsible payer, conditions and evidence required	Which obligation is the pilot proposing, and can it meet it without a future credit sale?
Remeasurement, records and return of findings	Coverage period, responsible team and provision for later work	Who carries the commitment after the initial funded period ends?

For an explicitly invented case, suppose an institution offers a training session while the pilot needs a field visit for both advice and research sampling. First establish whether the offer is authorised and what it includes. A training commitment does not establish that soil collection, laboratory tests, duplicates, data cleaning or another visit are paid for. Equally, avoid budgeting a second full visit merely because a different team keeps the research records. Define the shared and additional work, obtain permission for the proposed arrangement and price the actual scope. The case supplies no local offer, quotation or promised saving.

Keep a record of who pays each covered item and which evidence supports that allocation. Where two funding sources contribute to a shared visit, show the agreed allocation and the work each receives. Do not claim the full cost of the same service from two sources. For permitted co-financing, disclose the sources and allocate the agreed portions. Keep household-provided time and resources visible even when no cash changes hands. Their value belongs in the study's full-cost account, while a sponsor's payment belongs in the financing account; the two accounts answer different questions.

This check is separate from avoiding duplicate carbon credits. A visit can support several legitimate measurements, yet each invoice and each claimed outcome still needs its own basis. Paying for a sample does not establish that the resulting carbon quantity is eligible, or that the funder owns it. Record any proposed rights over data, reports or future units separately and have the actual terms reviewed. Do not infer those rights from a programme's name or the fact that it supported training.

Timing also changes what a commitment can support. Separate approval, permission to incur a cost, work completed, evidence accepted and funds received. If payment comes after accepted reporting, identify who can carry the intervening expense and what happens if acceptance or release is delayed. A verbal assurance should remain a recorded discussion until the responsible authority documents the relevant commitment. Do not describe an application as a receivable or use a possible future release to conceal an unfunded obligation.

The same discipline protects participants. A programme incentive, reimbursement for an agreed expense, payment for a service and a share of eligible credit revenue are different arrangements. Explain which, if any, the pilot is proposing, who is responsible and what evidence or conditions apply. No household should have to infer a payment category from the phrase ‘support under natural farming’. Instrument L should connect an actual payment to its basis and receipt, rather than turn an unapproved provision into an entitlement.

Before enrollment or a new round of work, review the uncovered lines and the periods beyond each commitment. A shorter funded activity may be useful, but its completion is not completion of the longer study. If the next observation cannot yet be financed, record the gap, the responsible decision and the work that must wait or be redesigned. The financing file then becomes a way to protect an answerable study and an understandable participant agreement, rather than a list of possible sources whose totals cannot yet be spent.

Build a payment bridge

Begin with actual eligible units sold and the revenue received under the agreement. Identify programme and transaction costs, project costs and the method for allocating them. Show the amount available for participants and the basis of each participant's amount.

If an advance or fixed service payment is proposed, explain whether it is repayable, conditional or independent of issuance. Do not leave the household to discover this after a failed sale. The reviewed documents must state who carries which risk.

There is no universal farmer share in this book. Internal historical targets are not agreements. A proposed share becomes useful only when the definition of net revenue, cost deductions, timing and rights are also clear.

Do not spend the monitoring budget at the launch

Protect repeat visits, soil remeasurement and independent review. A study that begins well and cannot fund its later observations may fail precisely where the main question becomes answerable.

Budget the work of returning results and resolving record errors. Include the additional costs of retaining participants fairly, rather than assuming households will provide years of effort without explanation or recognition.

Scale changes both costs and governance

Aggregation can spread some fixed expenses over more farms. It may also increase travel, variation, data cleaning, coordination and the consequences of an error. The pilot should measure these costs instead of assuming that every additional hectare lowers unit cost automatically.

A larger programme needs a clear relationship among the farmer organisation, developer, laboratories, independent assessors and buyer. Account access and dispute procedures should grow with the programme, not remain an informal favour.

A decision before enrollment

Before asking a household to commit, confirm funding for the stated work, the payment terms, access to results and the response if issuance fails. If those terms remain unresolved, the project can continue its design and quotation work without presenting a completed farmer offer.

That decision needs the priced work, funding schedule and participant terms developed below.

Price the same work before comparing quotations

Compare quotations against one work specification. For laboratory work, name preparation, method, reporting units, sample identity, quality records, turnaround and any retention or reanalysis. For field work, name locations, access assumptions, sample types and returned records. Keep inclusions, exclusions, unit, quantity, tax treatment and validity together; leave the rate unresolved until an actual offer exists.

Check what the quoted unit buys: a collection, determination, visit or accepted deliverable. A farm can contain several plots; a laboratory test need not include collection or transport. Establish whether checks are included, who investigates a failed check and when additional work requires a revised quotation and spending approval.

Chapter 20's hypothetical depth-label mismatch makes a further distinction useful. The laboratory may have performed the requested analysis while the result remains unsuitable for the intended field comparison. Conversely, an invoice alone does not prove that the specified service was delivered. Link the technical finding to the commissioned deliverable and actual terms before deciding what work is outstanding or chargeable. The scientific-use decision does not, by itself, settle who must pay for a repeat or recollection.

A hypothetical workload illustrates the counting problem without supplying a price. Suppose a plan identifies 20 primary analytical determinations, two additional field-duplicate determinations, two laboratory-duplicate determinations and one repeat. That is 25 determinations, if each is separately counted under the quotation. It is not 25 primary field observations. A laboratory may include some checks within its quoted service; do not add them again merely because they appear on the quality list.

Now stipulate that all 20 primary reports arrived, 18 were accepted for the comparison and two remain held. The 25 commissioned determinations, 20 primary reports and 18 accepted primary results describe different stages. None establishes how many invoices were paid. Keep those statuses linked instead of changing the purchase denominator after the fact. These invented counts are not recommended sampling or duplicate frequencies, laboratory acceptance criteria or a pilot forecast.

For the same documented work scope and cost total, cost per commissioned determination and cost per accepted primary result answer different questions. State the denominator and retained quality flags. Use Instruments C/H for recorded work and accounts, J for the unresolved technical decision and L for any actual participant charge or payment; a held result does not create an authorised deduction.

Separate one-time, seasonal and remeasurement costs

A start-up form, a training visit and a year-five soil collection occur on different clocks. Put them in the years or seasons when payment is expected. Include staff continuity, equipment maintenance, data stewardship and independent review over the whole commitment.

A useful proposed budget has four views: initial design and setup; recurring crop-season work; scheduled remeasurement; and assessment or transaction work if a crediting route proceeds. Some costs may support several outcomes. State the allocation rather than charging each account the whole amount.

The total should reconcile with the schedule. A low first-year figure does not establish an affordable five-year programme. If later funding is not committed, the enrollment offer should not imply that all later work has already been secured.

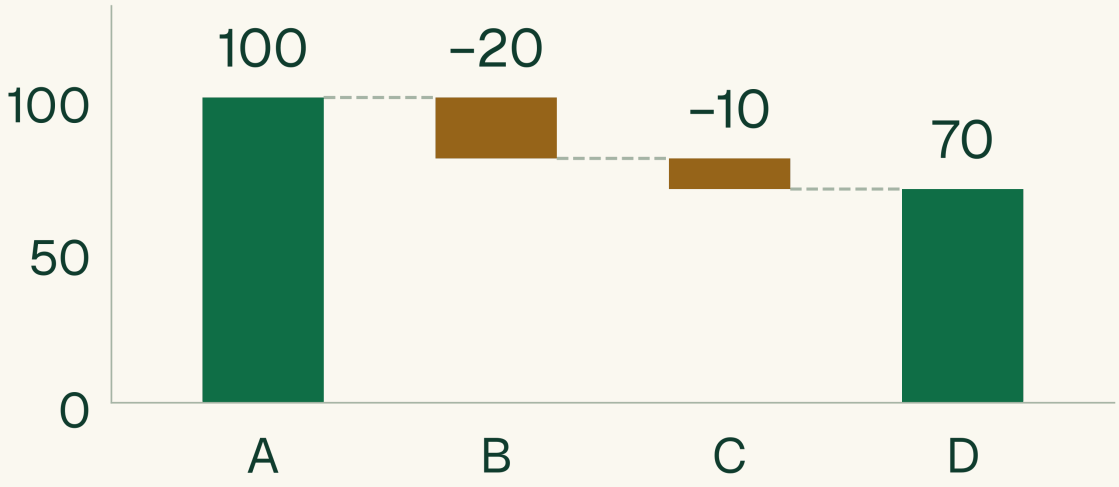
Keep three schedules beside one another: when the work is needed, when money is contractually due and when the funding can actually be drawn. A sponsor's total commitment may be large enough on paper while its disbursement conditions leave a field round unfunded at the required time. Expected sales can have the same timing problem even when a positive final balance is imagined.

The proposed finance register should distinguish funding status without pretending that any source already exists:

Status to establish	Evidence needed	What remains unresolved
Available for the named work	Accessible funds and permitted use	Whether the amount covers the full scope
Committed subject to conditions	Actual agreement and release conditions	Timing and satisfaction of those conditions
Requested	Submitted request and current decision status	Approval, amount and availability
Scenario only	Explicit assumptions	Whether any funding will materialise

Do not combine these categories into a single secured total. Reconcile restricted funding to the work it may support. A laboratory allocation cannot automatically pay participant compensation, and the same grant cannot be counted once for sampling and again as unrestricted money for verification.

From received cash to the remainder



A received 100; B project costs 20; C programme and transaction costs 10; D remainder 70. Unit-free arithmetic only, not a budget, recommended deduction or farmer share.

A hypothetical bridge from sale to available money

Use a normalised example in which cash actually received is set to 100 accounting units. Suppose the illustration deducts 20 units of identified project costs and 10 of identified programme and transaction costs. The remainder is 70 units before any participant-allocation rule. The calculation is 100 – 20 – 10 = 70.

These are invented, unit-free teaching values. They do not state a carbon price, issued quantity, budget, approved deduction or farmer share. In an actual account, the permitted costs and allocation must come from real records and reviewed terms. Do not read the illustrated 20 and 10 as recommended percentages.

Normalised teaching account	Accounting units
Cash received	100
Identified project costs in the illustration	−20
Identified programme and transaction costs	−10
Remaining before a participant-allocation rule	70

A cost paid from another source must be reconciled before it is deducted here. Show whether it was covered by a grant, already invoiced elsewhere or legitimately recoverable under the actual terms. Funding a cost and charging that same cost again are different events. Keep their relationship visible so the same expense does not reduce the participant pool twice.

For the proposed ledger, give each expense one identifier. Connect its invoice and evidence of delivery to the payer, funding restriction, amount already settled and any recovery permitted by the actual terms. A shared cost can have allocations across research and crediting accounts, but those allocations must add back to the one expense. Record a prepayment's later use separately from a fresh charge; a balance still awaiting use is not money returned to the project. The programme example above shows why that distinction matters, without establishing whether any pilot payment will be refundable or recoverable. S45

Issued but unsold units are not received cash. Nor is an invoice to a buyer the same as collected proceeds. Record any buyer deduction, withheld amount, exchange conversion or transaction charge only when its actual basis is known. Equal division, area-based allocation and outcome-based allocation answer different questions; this example selects none of them.

Ask who pays if the sale never happens

The proposed financing plan should contain a no-issuance case and an issuance-without-sale case. Research costs may still have been incurred. Farmers may still have performed work. The agreement needs to state which payments remain due and who has funded them.

An advance can mean different things: a repayable amount, an advance against proceeds or an independent service payment. Give it the correct name and conditions. A household should not discover a repayment obligation only after a project fails to sell.

The same clarity is needed for price risk and delay. A projected receipt is not a fixed payment date. If a buyer arrangement later exists, use its actual payment conditions; until then, keep the timing unresolved.

Preserve the distinction between research and a business offer

A funder may support measurement because the evidence has public value. That support can enable a rigorous pilot even if no credit route succeeds. Account for it as the funding it is.

A commercial developer may assess a subset of eligible activities for a transaction. Keep its costs and incentives visible, including any related-party service. Scientific conclusions should not depend on an obligation to deliver a favourable commercial result.

The proposed governance needs a person or body able to question an expense, a measurement decision or a claim.

A cost register should name the supplier, scope, related-party relationship where relevant, approval basis and evidence of delivery. Separate permission to commission work from confirmation that it was delivered and from authorisation to pay. The proposed research programme needs review arrangements that can question poor evidence even when the developer has already spent money obtaining it. Independence has practical costs: time for review, access to records and a funded response to findings. Include them before promising that independent assessment will happen.

Make an understandable participant statement

The statement should identify the period covered, activities recorded, payment basis, amount due, actual deductions and timing. Distinguish a group result from the participant's allocation. Give a contact and correction process.

A participant should be able to connect the statement to the original terms. If a deduction changes, the reason and authority should be visible. Do not hide a new fee within the phrase net revenue.

Return a statement even where no sale occurred, explaining the status without presenting a zero payment as proof that the farmer produced no climate benefit. Physical outcome, programme decision and commercial transaction remain distinct stages.

The farmer organisation also needs appropriate access to the reconciled group account. That access should explain the group total and its allocation while protecting individual households' personal records.

Use the pilot to measure the cost of credible scale

Record travel, time per usable record, reanalysis, coordination and farmer support during the study. Identify fixed costs and those that rise with farms, plots, dispersion or complexity. A larger area may spread one expense while making another larger.

Evaluate a proposed scale using these observed operating demands and suitable sensitivity cases. Do not multiply a small demonstration's best unit cost across an entire region without examining the changes in logistics and governance.

The scale decision should use the service and evidence actually delivered. Before expanding, the programme also needs a clear way to handle delays, changes in scope and obligations that survive an unsuccessful sale.

Fund the obligation, then choose the next step

An unfunded measurement round is a decision point, not a blank to fill with hoped-for carbon income. Identify which activities protect already enrolled households and existing evidence, which can be rescheduled without compromising the research and which new commitments must wait. Record the revised scientific and participant implications. The right response may be to narrow recruitment, seek documented finance or stop taking on new work.

Make the gap visible at the point of decision: name the work due, its payment date, the money usable for that work by that date and the unmet obligation. Keep conditional funding outside the available amount until its release conditions are satisfied. Record who must resolve the gap and when it will be reviewed. Moving a payment date in the spreadsheet does not move a crop's measurement window or release a household from work already performed. Any proposed delay needs scientific and participant review, with the resulting change communicated before new promises are made.

Distinguish a change in scope from an unexplained overspend. Adding a technically necessary density measurement, replacing a lost sample and repeating work after a supplier error raise different questions about responsibility and payment. The cost record should identify the reason, affected deliverable and actual authority for the revised expense. Do not quietly lower the evidence standard to preserve an attractive headline cost.

Reserves, refunds and unused funds also need an account. If a contingency allowance was proposed, state its purpose and who may authorise its use; do not present it as an automatic deduction from farmers. If a funder restricts unused money, those conditions remain relevant when work closes. A saving on one line is not automatically money available for another promise.

Make each participant payment explainable

Before a farmer is asked to rely on a payment, the proposal must answer several distinct questions: what event creates the entitlement, who owes it, how it is calculated, what can be deducted and when it becomes payable. A reimbursement, a service payment and an allocation of realised carbon proceeds can have different answers. Keep each named correctly rather than calling all three carbon income.

The statement should distinguish eligible, approved, due and paid where those stages apply under the real arrangement. A transfer instruction can fail; an amount recorded as paid should link to evidence of the transfer and a way to resolve a disputed receipt. Record corrections without revealing another household's personal account. A participant needs an explanation they can use, not access to everyone else's data.

For a collective service, such as an agreed training or shared facility, explain who may use it, who manages it and what evidence confirms delivery. Do not replace an individually due payment with a communal benefit without the actual agreed basis. Likewise, an improvement in cultivation costs is a farming outcome, not proof that the project has transferred money.

These details belong in Instrument L and the actual participation documents, once reviewed. The book supplies questions and record fields; it does not create a contract, assign a percentage or approve a payment obligation. Until those answers exist, describe the offer as under development.

A financing file that another team can follow

Keep the funding file connected to the technical plan through stable work and expense identifiers. For each revised item, retain the affected protocol/measurement version, quantity and unit, reason for change, quotation scope when available, funding restriction and actual decision authority. Technical review decides what evidence the work can supply; spending approval decides whether and how it can be commissioned. Neither decision supplies the other. Reconcile one expense across shared activities and any participant deduction, preserving the original total rather than creating a fresh charge at every handover.

Keep all six pathway families in the research assessment, with separate scopes and cost assumptions. This does not commission six interventions on every farm. Implementation depends on local suitability and the applicable evidence requirements; neither an imagined sale nor a convenient funding sequence establishes that suitability.

At each review, ask whether the remaining work is funded through the promised period, which assumptions changed and what participants have been told. Keep a no-issuance case, an issued-but-unsold case and a delayed-receipt case alongside any successful-sale scenario. They test the resilience of the proposed arrangements; they do not predict what will happen or supply an unreceived commitment.

A credible financing plan makes room for an inconvenient research result. Farmers should receive an honest explanation of what was measured, what is still owed and what will happen next, even if no credit is sold. That is the practical bridge to the institutional proposals in chapter 23: ask for recognition with evidence, and ask for participation with obligations the programme can explain and support.

23

VI · FROM EVIDENCE TO ACTION

Recognition and institutions



Moong seeds and a trifoliate sprig. An original illustration of an Indian crop, not a documented farmer encounter.

A finding does not change a farmer's options merely because it has been printed in a report. Somebody must be able to act on it. A research team may need to improve a comparison. A farmer organisation may need to arrange a reliable service. A public programme may need to decide what learning to support. A standards body may need to resolve a precise accounting question. A buyer must know what is actually being offered.

Sending all of them the same promotional document leaves the important work undone. The next institutional step should begin with a decision, the person or body able to make it, and the evidence that decision requires. The ambition is to build a route from a field question to an accountable response.

This chapter sets out proposed actions for CarbonVerse and the institutions with which it may seek to work. These are recommendations for discussion and design. They are not a record of approaches already made, resources already committed or endorsements received.

Give researchers an answerable question

A useful research invitation should make its uncertainty clear. Instead of asking an institution to prove that natural farming is beneficial, ask what the proposed comparison can establish about a specified production, household or ecological outcome. Name the management being compared, the unit observed, the period and the decision the answer would inform.

Prepare the protocol, treatment descriptions, sampling logic, proposed analysis and source register together. Show where the design is still open. A statistician cannot assess the adequacy of a sample from a farmer count alone. A soil specialist cannot judge stock measurement from a carbon-percentage target. Each reviewer needs the facts relevant to their part of the work.

The invitation should also distinguish advice from delivery. Reviewing a sampling proposal is different from supplying a field team, laboratory work or continuing supervision. Identify the service being requested, its timing and the resources needed. If a capability has not been confirmed, leave it unconfirmed rather than assign it to an institution in a diagram.

For the proposed pilot area, this means asking specific questions of prospective institutions: agricultural universities, ICAR research institutes, Krishi Vigyan Kendras and technical institutes near the pilot. The pilot area itself is still a proposal. Listing an institution does not establish site access, reserved equipment or an agreement to participate.

A research agreement should address roles, data access, analysis, publication and conflicts before observations create a dispute. The project should preserve the ability to report an inconvenient finding. Commercial interest in future credits must not become an implied obligation to supply a favourable conclusion. These are proposed conditions to negotiate, not agreements this book claims to have secured.

Give standards bodies a specific case

A standards discussion needs an identifiable activity and outcome. Present the current candidate route, selected version and corrections, relevant farm facts, and the exact unresolved provision. Explain what answer is being sought: application of existing text, clarification of a case or consideration of a change.

Attach the physical boundary and the logic of the proposed account. Show the historical comparison, additionality question, observations, calculation and uncertainty that the case requires. Where another activity shares a material or stock, show the relationship. A general description of ecological value cannot replace the unresolved technical item.

Distinguish a methodological discussion from a project decision. A useful explanation of how a rule works is not project registration. A draft under discussion is not an active approved method. A project assessment is not issuance of a quantity. Use the actual status and the document supporting it, as set out in the recognition framework.

If an existing method provides a defensible route, recognise that answer as progress. If evidence is insufficient, record what is missing and whether it can be obtained. If a rule change is necessary, state the narrow change and the case for it. Do not offer farmers a future approval date that the project cannot determine.

The proposed contribution is a better technical case for whole-system evaluation and outcome-specific recognition. It is not a request to lower the standard of the carbon unit. A smallholder route must be workable, but the claimed physical outcome must remain independently defensible.

Give public programmes usable findings

Public support can be discussed around agricultural decisions as well as carbon markets. The useful evidence may concern learning, reliable advice, household work, resource access or the quality of measurement. Present the question and the proposed service before attaching an anticipated credit revenue.

The National Mission on Natural Farming operational guidelines offer a useful policy example. Sections 1.3 and 2.4 connect farmers' knowledge with scientific inquiry and locally relevant extension. The relationship matters: an institution can help investigate a field question, while the cultivator explains the work and conditions that made the question important. Neither contribution should disappear when a report is prepared. The government-hosted copy examined here describes a programme design; it does not establish funding, eligibility or approval for the CarbonVerse pilot. [S28]

Sections 8.2–8.6 describe field training through demonstration farms, institutions and experienced farmer trainers, with continuing support and farmer-to-farmer extension. Training is therefore more than distributing a preparation sheet. Somebody needs to see what a household can actually do, return when a difficulty appears and explain what remains uncertain. The proposed pilot should identify that continuing service and the person responsible for it. It cannot assign the service to a named KVK or university before participation is agreed. [S28]

The following is a proposed way to turn this learning emphasis into work that a household can inspect. It is the book's discussion aid, not a list of services already allocated under the Mission.

A question from the farm	Proposed institutional work	What comes back to the household
We attended the demonstration; what should we watch in our own field?	Agree the locally relevant observations and a follow-up contact	A short observation sheet, the next visit or contact arrangement and questions still open
The work changed during the season; was that recorded?	Reconcile the farmer's account with dated management and labour records	A corrected seasonal record showing the change and who checked it
Our field differed from the comparison; what can the study conclude?	Assess the comparison, missing information and uncertainty	An explanation of the supported finding and the limits on applying it here

Research has its own route. Section 9 describes research and documentation on farmers' fields and other Mission sites, envisaging competitive research grants. Section 11 identifies institutional responsibilities and links funds to the applicable guidelines, approved Annual Action Plan and utilisation documentation. The useful proposal therefore names an answerable question, research responsibility and output. Mention of a grant mechanism is not an open call, an award or an entitlement for this project; none has been verified here. [S28]

Monitoring also has a specific purpose. Sections 21.1–21.4 describe baseline and periodic field data, geospatial tracking, knowledge resources and progress reporting. Such records can help show what was implemented and what needs attention. For the proposed pilot, record separately whether an item documents a visit, a management change, an observation or a calculated outcome. A portal entry or an adoption count does not, by itself, establish causation, additionality or an issuable carbon quantity. Those conclusions need their respective evidence and rules. [S28]

Before discussing public support, check which current documents and approval route actually apply. The examined copy contains provisions limited to a stated finance-commission period. This chapter does not treat its cost norms or historical implementation timetable as a current funding offer. The request should distinguish support for learning, a research service, implementation work and purchase of an eligible outcome, with an agreed output for each. The relevant authority must establish the actual conditions. [S28]

Finally, report variation and distribution alongside averages. If an arrangement depends on resources some households cannot access, that difference belongs in the public decision. Return the crop, work and input records in a form participants can use. Useful public evidence includes the support an option needs, the questions still unanswered and the settings in which it should not yet be promoted.

Give farmer organisations a service they can inspect

A farmer organisation should receive a description of the work it is being asked to coordinate. Specify the tasks, seasonal timing, skills, records, equipment, correction work and follow-up. Then identify what support is proposed and what remains uncosted. Membership strength does not by itself supply a monitoring team.

Representation also needs a practical test. Who explains the proposal to cultivators, tenants and other workers? Who can raise a question without passing through the person whose work is being questioned? How does an organisation check whether its representatives have understood members' concerns? These are operating questions for the proposed partnership.

Keep participation information separate from recruitment language. A household should be able to identify what it would do, what information would be collected, what it would receive back and which commercial questions remain unsettled. The document should not use the possibility of carbon income to blur the current research stage.

The service needs a correction route as much as a collection route. A member may dispute the area, a work entry or a record of a material transfer. Show who receives the issue, what evidence is considered and who can amend the record. Where a decision remains unresolved, the uncertainty should travel with the affected claim.

Assess continuity before expanding membership. If the work depends on one volunteer, one device or one officer's memory, explain how it will continue through absence, staff change or a missed visit. The organisation should not be left carrying an indefinite obligation after the project has stopped providing the service needed to meet it.

Give buyers a claim they can defend

Begin with the object of the transaction. Produce, a research contribution, a service and an issued carbon unit are different things. An interested buyer may value more than one, but the documents should identify each separately. Interest in a future result is not evidence that the result already exists.

For any eventual unit transaction, link the actual quantity to the applicable registry identity, period, assessment and transaction records. Check the intended use against the relevant programme and jurisdictional requirements at that time. This chapter does not assign the proposed pilot a market authorisation or promise a permitted claim.

For a research contribution, state the research purpose and the output it funds. Do not translate support into an invented removal quantity. If the contribution helps collect evidence but the result is inconclusive, that should be a possible reported outcome rather than an accounting embarrassment to conceal.

Water and selected biodiversity findings can be described alongside a qualifying carbon outcome when they are supported. They do not become additional carbon tonnes. A buyer seeking to support them separately needs an accurately defined arrangement. A bundled presentation must not make the quantity or identity of the carbon unit harder to understand.

A proposed buyer discussion should also preserve research independence. A preference for a certain crop, result or publicity story should be visible before it shapes the study. The project should be able to explain what influence is appropriate, what would compromise the question, and who decides when a commercial request conflicts with the evidence.

A proposed institutional evidence package

The package should have a short common foundation and a decision-specific part. The common foundation identifies the proposed pilot, actual status, field context, main questions and source limits. The second part supplies the detail needed by the recipient. That avoids maintaining several contradictory descriptions of the same project.

Recipient	Core material	Decision sought
Research institution	Protocol, management descriptions, design and knowledge gap	Whether and how a defined collaboration is feasible
Standards body	Clause comparison, activity facts and unresolved account	Applicable treatment, clarification or development route
Public programme	Proposed service, household outcomes and implementation evidence	Whether support serves the stated purpose and under what conditions
Farmer organisation	Tasks, seasonal work, resources, representation and returned records	Whether members can participate on understood terms
Independent assessor	Traceable observations, methods, calculations and quality records	Whether the stated finding and requirements are supported
Buyer	Clearly identified object, actual evidence, status and intended use	Whether a properly defined transaction can proceed

Keep the detailed files behind the summary. A two-page introduction may help somebody decide which specialist should read the proposal. It cannot replace the protocol, records or calculation that specialist must inspect. Give each claim a route back to its evidence and each unresolved item a named next decision.

A good packet should also say what decision is not yet possible and why. That is useful preparation for a meeting. It allows an institution to identify the missing service or information instead of being pressed to choose between endorsement and rejection of the whole idea.

Record the response, including no

Maintain a dated decision log containing the material sent, question asked, recipient role, response and resulting action. Separate a conversation note from a formal determination. If the scope changes, preserve the earlier question so the answer is not later applied to a different case.

No response is not agreement. A meeting is not a partnership. A request for more information is not an endorsement. The prospective institutions named in the pilot should remain prospective until the relevant agreement is evidenced. Any eventual public description should match the actual agreed role.

A refusal should be recorded in the respondent's actual terms, without inventing a reason. If the response identifies missing evidence, ask whether an appropriate study can address it. If the issue is capacity or timing, that is different from a scientific rejection. If no reason is supplied, record that limit.

The project should also be able to close a request. Continuing to cite an institution after the proposed role has been declined creates a misleading impression. Update the next-action list and the public description rather than leave an impressive name attached to work it is not doing.

Make the evidence accessible

A technical report and a farmer explanation should answer the same underlying question. One may contain detailed methods and uncertainty; the other may use a field record, a diagram and plain language. Simplification should change the presentation without changing the finding or hiding an important limit.

Return information in a form the household can use. Identify the field and season, separate observations from estimates, explain unfamiliar units and show where a correction can be requested. An accessible account should not require the reader to accept a promotional interpretation of their own record.

The Hindi and English materials should be checked for meaning, not only for matching headings. A translation that turns a possible outcome into a promised one changes the agreement being understood. A number without its unit, comparison or period can also change the claim even when every digit has been copied correctly.

Make corrections visible. When a source is corrected, a calculation changes or a method version becomes unsuitable, identify the affected claim and issue a dated revision. The project should retain a path from old to new material so readers can understand what changed. Evidence that can be corrected is more useful than a polished statement that can never admit an error.

From discussion to a next action

Ask	Which decision?	→	The responsible role
Examine	Relevant evidence	→	Known limits
Record	Actual response	→	Owner and next step

A sequence for a proposed discussion. Keep unresolved decisions in the record too.

Make the first meeting useful

A proposed first technical meeting should have a finite agenda. Present the main questions, actual evidence, unresolved dependencies and decisions needed to begin the next stage. Invite the roles needed for those decisions rather than seek an impressive attendance list.

The outcome should be an action record. Which question is ready for design? Which measurement capability needs confirmation? Which farm facts must be established before route assessment? Who has agreed to prepare what, and which proposal still has no owner? Where nothing has been agreed, record that plainly.

Keep separate responses for the decisions that different people can actually make. Technical advice does not commit a laboratory's staff or equipment. A resource commitment does not establish a household's informed participation. An organisation's willingness to discuss the proposal does not decide a carbon claim. In the proposed meeting record, identify the role giving each answer, its scope and conditions, and the remaining authority or agreement needed. A shared attendance sheet cannot stand in for those separate answers.

Keep publicity separate from the decision to start field work. A public event can create expectations faster than a team can resolve sampling, household work or finance. A date announced on a stage should not silently become a promise that farmers will receive credits by that date.

A useful discussion ends with a specific, reviewable next step. The proposed agenda is meant to help the people involved reach that point and record what remains unanswered.

Set readiness conditions for the proposed pilot

Readiness is a set of answered questions, not a photograph of a launch. Confirm actual field access and cultivation histories. Agree the comparison and independent sampling units. Establish which observations can be made at the required quality. Review participant information and the distribution of work. Obtain real quotations and a credible plan for continuing monitoring.

The carbon assessment should identify which activity is being considered under which route, the timing constraints and the facts still needed. The research plan should remain useful if that route does not produce issued units. Do not finance necessary household support solely through revenue that has not been established.

Use readiness decisions to control scope. An unresolved specialist measurement need not always stop every independent observation. It may stop the claim that depends on it. Conversely, starting easy observations does not make a missing essential comparison acceptable. Document which part can proceed and which must wait for its dependency.

The proposed field instruments provide a starting structure, not a validated local operating manual. Before use, the team must settle definitions, responsibilities, training, quality checks and the response to missed or inconsistent records. A form is ready when people can use it correctly under actual conditions, not merely when every box has a label.

Fund learning without purchasing the answer

A prospective funder should receive the question, design, deliverables, unresolved costs and proposed reporting commitments. Separate the cost of credible evidence from an expected credit-sale scenario. Explain what useful information the work could return if the climate estimate is zero, negative or unresolved.

The funding discussion should cover continuing obligations. Sampling may be paid for while data checking, record return or later follow-up remains unfunded. An attractive first-season budget can therefore leave the research incomplete. Identify the full sequence of necessary work and which resources have actually been committed.

Payments for research tasks, services or verified outcomes should retain their separate purposes. A household should not have to infer whether money is support for work already performed, an advance subject to terms or proceeds from a completed transaction. Actual terms require their own documents and understanding.

The proposed independence test is straightforward: could the project still release a well-supported result the funder dislikes? If the answer is unclear, resolve the reporting and decision arrangements before treating the evidence programme as ready. A favourable finding earns credibility through a process capable of reporting the unfavourable one.

Give disagreements a practical route

Different participants may disagree about different things. A farmer may dispute a recorded task. An analyst may question a comparison. An assessor may identify an unsupported calculation. A buyer may misunderstand the transaction object. Sending all of them to a single vague grievance statement leaves the actual decision unresolved.

The proposed system should identify a first contact, the decision owner and the evidence needed for each type of issue. A common entry point can route a concern, but it should not pretend to hold every authority. Preserve the record of the concern and its response alongside the item affected.

Protect the distinction between correction and pressure. A substantiated correction improves the record. A request to remove an unwelcome finding because it weakens publicity does not. The project needs a way to recognise that difference and explain the resulting decision to the people affected.

Some disagreements will remain unresolved. Then limit reliance on the disputed claim and state the uncertainty. Escalation should have a purpose: obtaining the technical assessment, governance decision or actual agreement needed to resolve the issue. The aim is a usable answer, not a longer chain of meetings.

Keep a learning event distinct from a test

A field visit can help people understand a practice, inspect equipment or ask the cultivator a question. Those are useful learning purposes. If the same event is also presented as evidence that the practice caused an improvement, the claim needs the comparison and observation structure that supports that conclusion. The historical on-farm guide distinguishes research questions from an adoption objective; the event's purpose should be explicit. [S39]

Consider a constructed example with no result supplied. Visitors see a well-managed field after a change and compare it informally with another field nearby. The two may differ in history, water, crop or the support received. The visit can raise a question worth studying. Its visual impression alone does not settle which difference caused what visitors observed.

For an institution preparing an event, state what the event can deliver. Is it an introduction, a practical demonstration, a discussion of recorded results or part of a defined research design? Keep attendance, learning feedback and outcome evidence in their own records. A crowd is not an independent sample, and enthusiastic feedback is not a greenhouse-gas calculation.

This distinction leaves room for farmer knowledge. A cultivator's explanation can identify an important management detail or suggest a better question. Record its status accurately and, where appropriate, design an observation to test it. Respecting experience includes giving it a route into inquiry rather than turning every account into an unexamined result.

Plan the handover before the study ends

A proposed collaboration should explain what remains when the funded work stops. Which records return to households? Who retains the analysis files and can explain a later correction? Which equipment or services have continuing arrangements? Mark unresolved items before participants rely on a service that may disappear.

The Statistical Services Centre's data-management guidance treats an archive as more than the files used for analysis: relevant protocols, explanations and other records must remain understandable to a later user. Its on-farm-trial guidance also gives collaborating farmers priority among the audiences for reporting. These historical guides support the purpose of a handover; their software examples and analysis suggestions are not the project's approved operating plan. [S39, S41]

The final handover should separate completed work, continuing observations and claims still under review. A report's publication does not settle every candidate carbon outcome. If a later decision is required, identify its owner and the evidence still needed. Do not leave a farmer with an unexplained pending status after the team has moved on.

Prepare a closure account even if the project does not continue. Explain the finding, limits, resources actually used and unresolved concerns in an accessible form. The proposed arrangements should address any remaining obligations through their actual terms, rather than make participation depend on another round of hoped-for funding.

A useful handover allows the next team to build on the work and allows the household to understand its own record without depending indefinitely on the original field officer. That is part of the service being proposed, not an optional courtesy after the research has obtained its data.

Expand only what the evidence and service can carry

A larger programme needs more than a successful-looking pilot summary. Ask which result can reasonably transfer to another setting and which conditions made it possible. Describe soils, crops, histories, labour, support services and measurement quality sufficiently for the next team to assess the difference.

Expansion should also test operating capacity. A service that works with close attention to a few fields may struggle with travel, corrections, seasonal peaks and staff turnover as coverage grows. Record the work and costs rather than assume that a larger denominator will make every task cheaper.

Preserve information about households for whom the arrangement was unsuitable. Their experience may identify a resource constraint, an unequal workload or a setting in which the proposed approach needs redesign. Removing those cases from the expansion story would make the next decision less informed.

Receiving files is the first of four questions

Imagine handing the same folder to a new field coordinator, a research reviewer and the person deciding whether to fund another season. Each may need a different answer. A file list can confirm delivery. It cannot show that the recipient understands the units, can reproduce the result or has enough evidence for the proposed decision. Keep those statuses separate.

The following is a proposed handover check, not a record of completed review. Use it for a declared package version and purpose. A team may complete one step while another remains open.

Handover status	What the recipient checks	What completing that check means
Received	Listed items and versions match what arrived; missing items are named.	Delivery is acknowledged.
Readable and understood	An authorised reader can open the relevant files and interpret identities, units and explanatory notes.	The material can be read for its stated purpose.
Reproduced for the stated check	The designated checker can follow the documented steps from the permitted inputs to the identified output.	That calculation or transformation has been reproduced within the recorded scope.
Suitable for the requested decision	The responsible reviewer assesses the question, design, uncertainty, setting and remaining gaps.	A recorded judgement supports the specified use, with its limits.

Name the person responsible for each check, the date, the package version, the scope attempted and the unresolved items. Do not fill the final row merely because the first three have been completed. Reproducing an estimate does not repair an unsuitable comparison or make an uncertain finding decisive. Conversely, a request for further analysis should identify the question that work must resolve, rather than leave the entire package indefinitely marked pending.

The archive needs an explanation that survives the original team's absence. Tell a permitted reader where to begin, which records are the originals, which files are derived, which versions belong together and where exceptions are documented. Record where a necessary paper document can be located when it is not part of the electronic folder. These organisational principles follow the guidance's discussion of audit trails, consistent versions and archive planning. [S41]

Access should match the task and the actual arrangements. A household's own record, a technical reviewer’s extract and a public summary need not expose the same information. Identify who can provide authorised access and answer a query after staff change. This proposed handover does not require publication of participant identities, and the book does not claim that data-access or retention arrangements have already been agreed.

Test the packet before relying on it. Ask an authorised colleague who did not assemble it to locate one declared comparison, identify its included fields and season, and explain the route from the original record to the summary. This is a proposed rehearsal; no successful test is claimed here. A wrong unit, missing explanation or inaccessible file should become a named repair.

For example, if an authorised checker can open a table but cannot establish whether a mass is reported dry or wet, record the missing basis and the output affected. Opening the file has succeeded; interpreting or reproducing the relevant calculation may still be blocked. Identify who can supply the explanation, preserve the original entry and link any correction to the outputs that use it. Limit reliance on the affected claim until that check is resolved. This conditional example supplies no actual result and does not require discarding unrelated valid observations.

Tie the decision to the evidence it used

A reproducible report still needs a precise institutional question. Consider a wholly constructed example with no results supplied: a team asks whether to support another comparative season in a defined set of farming conditions. The request is about further learning. It is not a request to declare the system suitable throughout the pilot area or to approve a carbon quantity. A recipient should be able to identify that difference without reconstructing the team's intentions from a presentation.

The decision record should identify the request, the evidence package and version considered, the recipient's actual role, the answer supplied and any conditions. Keep the source response with the record. An internal note can explain the team's interpretation, but should not replace what the respondent actually said. Where an answer is informal, limited or still awaiting confirmation, retain that status.

Next describe the setting to which the evidence can reasonably speak. The on-farm-trial guidance connects farm selection to the intended recommendation domain and discusses variation between farms and treatments. That is a reason to examine the receiving setting, not to treat one study average as a universal recommendation. [S39]

For the constructed learning request, the packet might therefore identify which soil, crop, management-history and service conditions were represented and which were absent. Those are proposed information fields, not conditions this book claims to have measured. If the decision is to support another season, record what that season is intended to learn. Do not rewrite permission to investigate as confirmation of the eventual outcome.

A later correction must reach the decision, not merely replace a file. The data-management guide calls for dated changes and consistent links between source versions, analysis extracts and outputs. That principle supports the proposed review below; the institutional responses are the book's original discussion aid, not decisions already received. [S41]

Use the pilot's existing invented cases to rehearse what the recipient must reconsider:

Change in the evidence	What the revised packet must explain	Decision still needed
Supported harvested area changes while recorded harvest mass stays the same	Revised per-hectare rate, affected comparison and uncertainty, with the original area entry retained	Does the new analysis still support the particular research or advisory use?
A harvest previously marked unknown is established as a confirmed zero	Evidence for the status change, included observations and consequences for the specified analysis	Does the finding or its precision change? A zero is not permission to choose a more favourable population.
A laboratory result remains held for the intended comparison	The unresolved technical issue, usable evidence and any additional work actually required	Scientific use, authority to commission more work and any participant charge each need their own answer.

These are different repairs. The responsible reviewer may require a repeated analysis, a narrower interpretation or a pause in relying on the affected conclusion. A funder's willingness to continue learning cannot settle scientific acceptance; a technical hold cannot create a farmer deduction. Link each actual response to its role, evidence version and conditions through InstrumentsJ/K/L. The table supplies no field finding or agreed institutional action.

Keep the original response and a list of issued versions and authorised return channels. Mark the earlier summary as superseded and identify its replacement. Where the household's record or advice changes, explain that change through the agreed return route; the family should not need to compare spreadsheets to discover it. Access and communication follow actual permissions. Confirming receipt of the correction remains separate from accepting its implications.

Success for the institutional programme is a chain of decisions that remain traceable: a research question answered, a service made dependable, a rule applied or properly challenged, an unsupported claim withdrawn, and a qualifying outcome brought to legitimate recognition where possible. The next chapter returns that chain to its purpose: a better future for the field and the people who depend on it.

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VI · FROM EVIDENCE TO ACTION

A durable future for our fields

A harvest can be seen. What remains after the harvest takes more care to understand: the family's income, the work still unpaid, the materials needed elsewhere, the condition of the soil and the choices available for the next crop. This book began with that wider account of a field. It ends by asking what we are prepared to do with it.

The attraction of zero budget natural farming is easy to understand. It asks whether farming can depend less on purchased inputs and make better use of knowledge, biological processes and resources close to the farm. It brings attention back to relationships that a purchase ledger alone cannot describe. Those questions deserve serious research and practical support.

The opportunity is also larger than a change of inputs. A family needs a method it can learn, work it can carry, advice it can question and a result it can recognise. A field needs to be understood through its seasons. A climate claim needs evidence that can travel beyond the people who believe in the approach. Bringing these needs together is the work ahead.

I argue for a future in which the farmer's contribution is visible and its value can be examined fairly. That includes a legitimate route to carbon recognition where a qualifying climate outcome is established. It also includes the many decisions that remain valuable before a credit exists.

Make the farmer's decision better

The first test of this book is practical. After reading it, can a household ask a better question about its own farm? Can it identify a cost that was hidden, a service it will need or a claim that deserves closer examination? A useful book should increase that ability to decide.

The starting point is the farm as it is. Its soil, water access, crop sequence, livestock relationships, cultivation arrangement and household work cannot be replaced by a model farm that exists only on paper. A recommendation becomes useful when those conditions enter the discussion and the people doing the work can explain what is feasible.

The word zero should bring attention to dependence and resource choices, rather than make work disappear from the account. Farm-produced materials have a destination and a use. Household time belongs to somebody. Knowledge takes time to acquire. A more self-reliant system should be judged with those contributions visible.

A family also needs an account of timing. A saving at the end of a season may not solve a cash shortage before sowing. A worthwhile change may need help during a difficult learning period. A task that seems modest in an annual total may arrive when several other tasks compete for the same people. These are reasons to design support carefully.

Useful advice should leave the household with a manageable set of questions:

- What exactly would change in this field, and what would remain the same?
- Which materials, work and services would the change require, and when?
- What observations would help us decide whether it is working?
- Who will help interpret a problem, and what can we change if the result is difficult?

The answers should be specific enough to guide the next decision. They need not pretend to settle the future. A farmer can reasonably prefer an option that is understandable and adaptable to one presented with impressive certainty but little explanation of how to respond when conditions change.

The comparison with organic farming should remain fair. Both approaches deserve to be described through actual management, not through a caricature of the alternative. Shared ecological principles, different resource arrangements and variation within each system can all enter a useful comparison. Better evidence strengthens the choice available to farmers.

Readers do not have to treat the book's proposal as a finished answer to use its questions. Begin with records and locally reviewed advice that make a real decision clearer. A question honestly answered is a more durable gain than a favourable label that conceals the work needed to earn it.

Keep the whole system in view

The four familiar foundations belong within a cropping year and a resource network. Seed establishment affects the crop that follows. Cover occupies material that may have another use. Water management belongs with crop needs and the conditions around roots. Biological preparations enter a system that still requires a coherent account of nutrients and work.

Thinking in relationships changes what we look for. Before allocating residues to a new use, ask what depended on their old destination. Before describing a cash saving, ask whether the task moved to an unpaid worker. Before adding a new module, ask what it shares with the existing field account. The purpose is to recognise consequences while there is still time to make a better choice.

Whole-system thinking can also reveal an opportunity. A record collected for one necessary purpose may answer another question. A seasonal discussion may expose a practical constraint that a specialist measurement would miss. A partnership may make a service available that a household could not organise alone. These possibilities deserve testing under real conditions.

The system includes people beyond the person named on the plot record. Cultivators, tenants, women, paid workers, service providers and neighbours can experience different effects. A proposal becomes more credible when it can explain who does the work, who takes a decision and who receives a benefit. Their contributions should remain visible when the project grows.

A complete view also needs more than the attractive season. A cropping sequence includes difficult periods, failed operations and decisions made in response. Returning to the same question through time can show whether a change remains workable and whether the support around it is adequate. That is a reason to preserve the record, including interruptions.

Additional opportunities should enter with their own questions. A suitable tree activity, biochar pathway, rice-management change, weathering proposal or manure-methane measure needs its own local assessment. The farming system is not improved by requiring every household to adopt every possible addition. Select what serves the field and can be assessed responsibly.

The future I am arguing for gives the whole farm a fair hearing while keeping each finding understandable. Connections belong in the explanation. Quantities belong in accounts that state their units, boundaries and uncertainty. Together they can show more of the farm's value than either a collection of disconnected projects or an unsupported total.

Earn the climate claim

Where management produces an independently supported, qualifying climate outcome, farmers should have a credible way to seek recognition and reward. That is the central proposition of this book. The proposal asks for institutions and services capable of connecting field evidence with legitimate carbon markets.

The route begins with the physical change. It continues through the relevant historical comparison, net account, applicable method and programme conditions, independent assessment, issuance and appropriate use. Each part has a purpose. A weak link makes it harder for the farmer's work to be represented by a unit somebody else can trust.

The ambition does not depend on assigning a tradable credit to every practice. A practice may support several useful processes without being a separate unit-producing activity. Several practices may contribute to one eligible outcome. A material may inform several analyses while its physical carbon contribution is counted once. Clear attribution protects the contribution being recognised.

This distinction should be explained well enough for a farmer to use. An adoption record, a study estimate and an issued quantity should look and read differently. The household should be able to ask which one is being discussed, what evidence supports it and what decision remains. A project that answers those questions gives recognition a practical meaning.

Some useful results will sit outside a particular credit account. An economic finding may inform household planning. A water observation may change a management discussion. An ecological question may justify further research or a public service. Giving those results their own measures allows them to retain their value.

Carbon recognition should add a credible opportunity to the field's wider account. The household's production and work should remain central to the evaluation. A promising climate result must be considered alongside the practical conditions that made it possible and the commitments needed to maintain it.

A transparent payment account matters at the other end of the route. Where a transaction eventually occurs, the farmer should be able to follow actual units, proceeds, agreed costs and allocation to the amount received. This book supplies no guaranteed price, share or date. The proposed arrangement must become understandable actual terms before anyone relies on it.

Credibility is not a favour granted to a buyer at the farmer's expense. It is part of making the farmer's contribution durable. An unsupported promise can create an expectation quickly and leave the household with the disappointment. A defensible outcome has a stronger foundation for being recognised beyond one promotional campaign.

Let the pilot answer rather than perform

The proposed pilot should be an instrument for learning. It should give a fair test to the questions in this book, including questions whose answers may be inconvenient. An encouraging result, an unresolved result, a difficult trade-off and an unsuitable intervention each carry different information.

The comparison design is therefore part of the promise to participants. Management must be described, independent units understood and observations collected consistently. The analysis should preserve the distinction between what was planned and what changed in response to field conditions. A reader should be able to follow that history without being asked to trust a final chart alone.

The work now proposed has concrete dependencies. Actual sites and access must be confirmed. Research roles and local services need agreement. Sampling, precision and analysis require technical review. Participant information and the distribution of work need attention. Real quotations and continuing finance must support the monitoring. Candidate carbon routes need their own assessment.

These tasks should lead to decisions about readiness. Some questions may be answered through an initial study; others may need longer follow-up or a separate experiment. A necessary unresolved item should remain visible. Starting work should mean that the team can explain which questions it is ready to investigate and which claims it cannot yet make.

Participants should receive something useful from the learning process: accurate records, understandable findings and a way to correct an error. A household should know what the study found about its recorded season and what the design can establish more broadly. A group average and an individual observation are different forms of information.

The pilot should learn about the service itself. Can the field team maintain the records without creating unreasonable household work? Can specialists use the data? Can a farmer distinguish a proposed claim from an issued unit? Can a reviewer trace a result? Operational weaknesses should change the design before expansion makes them more costly.

A carefully documented negative finding can be useful. It may prevent an unsuitable recommendation or identify a resource condition that needs attention. Its value depends on a study capable of answering the question and a report that explains the limits. Hiding it would take away part of what participants helped create.

The proposed pilot area can contribute a local answer rather than stand for every field in India. Soils, water, crops and households differ. A clear account of the setting allows others to judge what might transfer and what must be tested again. That is how one study can help build a wider body of knowledge without claiming to be the whole of it.

What we owe the next season

A season should leave knowledge that can be used again. Keep the record of the change, the work, the observed result and the response. Give the next person enough context to understand why a decision was made. In a family, a farmer organisation or a research team, continuity depends on more than somebody remembering the discussion.

We also owe the next season an honest account of resources. Materials sent away have a destination. Water applied has a measurement boundary. Work assigned has a person behind it. The field's future should enter these choices before the attractive part of a proposal has already consumed the resources needed elsewhere.

The same responsibility applies to institutions. A service should have a clear purpose and somebody able to maintain it. A research commitment should be matched by capacity and reporting independence. A standards question should be stated precisely enough to receive a useful answer. A public programme should be able to see what support is being requested and what it could learn.

Progress can be made through ordinary, specific actions. A cultivator can question a record. A field team can correct an inconsistent entry. A researcher can improve the comparison. A farmer organisation can make a service more dependable. A standards body can clarify a case. A funder can support an unanswered question without buying the answer.

For CarbonVerse, the next responsibility is to turn the proposed pilot into a reviewable arrangement with real people, actual capabilities and understood terms. The institution names and field possibilities recorded here are starting points for that work. The framework should change where better evidence reveals a weakness, while keeping its central commitment to a fair account of the farm.

Our fields are places of work, knowledge and inheritance. Their wealth is expressed in what they produce, what a family can retain and what can continue growing there. The climate contribution, where it can be established and legitimately recognised, belongs in that account too.

The aim is a productive field, a better-informed household and an environment whose condition is taken seriously in every decision. Zero budget natural farming deserves to be examined with that ambition and that care. Its promise should be met by capable services, fair comparisons and a willingness to learn.

Take one proposal into the next seasonal discussion. Identify the field, work, materials, unanswered question and support required. Agree what observation would prompt another look and who can help interpret it. After that observation, return to the same note: what happened, what remains unknown and what should happen next? A difficult result may call for changed support, another comparison or stopping an unsuitable option. Record the reason and return the explanation to the people doing the work. This is a decision aid; the farming choice still needs local assessment.

The next harvest will arrive in a particular field, under particular conditions, with people doing the work. That is where this proposal must prove useful. Let the record become clearer, the choices become better and the field's contribution receive the recognition it can support.

Field instruments and calculation notes

These instruments are proposed starting forms for the pilot. Review their definitions, responsibilities and use with the local team before field testing. They do not replace consent review, laboratory SOPs or the selected carbon methodology. Keep the version, date and responsible person with each completed record. Empty fields mean information has not been entered; they do not mean zero.

Instrument A Participant and plot register

Use a participant code in working analytical records. Keep the contact and consent link in the controlled participant file. One participant can cultivate several plots; one plot can have a changing cultivation arrangement. Preserve those relationships over time.

Field	Entry or rule
Participant and plot codes	Stable identifiers; do not reuse a withdrawn participant's code
Village and location reference	Appropriate level for the working file and its access controls
Boundary version and area	Date, measurement/document basis and unit
Cultivation and tenure arrangement	Who cultivates, relevant duration and evidence status
Consent version and date	Link to controlled record; explanation and copy supplied
Cohort or treatment identifier	Actual allocation or match, with the decision date
Recruitment and eligibility trail	Frame, invitation, refusal/exclusion status and stated reason where appropriately available
Farm, assignment and observation links	Distinct codes for allocation unit, farm, plot, sample/composite and visit; retain higher-level grouping
Follow-up and correction	Date, author, old entry, corrected entry and reason

Before accepting a plot record, confirm that its area and identity match the field team map. Check that the person providing information can explain the cultivation arrangement. Refer unresolved rights questions through the reviewed process; do not decide them in the data form.

Keep assigned condition separate from actual management and support received. Link the allocation procedure/version/date or the matching decision; do not reconstruct original allocation from current practice. A nested sample or later visit does not create a new assigned farm. Record revised access or participation without silently replacing the original series.

Link the purpose and scope of each participation permission to its controlled record. Research participation, field access, identifiable photographs and later contact need their actual reviewed basis; one signature should not silently stand for them all. Record changed participation, its effective date and the response required under the actual arrangements. Preserve the history without inventing a right to retain or disclose information.

Instrument B Management history

Record a row for each crop or relevant period in the required look-back. Capture crop and variety where known; planting and harvest dates; tillage; materials and rates; water management; residue allocation; livestock access; and any existing trees, biochar or other relevant intervention. Where the focal crop was not grown, record the actual crop or land use, period and evidence; distinguish that state from an unknown history or a confirmed failed harvest.

Add an evidence-type field: contemporary record, receipt, remotely observed information where appropriate, participant recall or other stated basis. Record uncertainty and contradictions. The selected method determines whether the available evidence is sufficient; a completed row is not proof that every claim has been validated.

Keep event period separate from interview/entry date and the date supporting evidence arrived. For each disputed statement, preserve the source, question, requested evidence, responsible reviewer and disposition. Link a corrected quantity or boundary to its superseded entry and every affected derived calculation. Blank, reported zero, not asked, not applicable and unresolved must remain distinguishable; define the permitted codes before field use.

Identify the history period requested and the period actually supported. Keep the research starting observation separate from any candidate crediting-baseline scenario. Link the latter to the selected requirement and its reviewed evidence; completing a history form does not approve that reference or fill an undocumented year.

Instrument C Seasonal operation and labour log

Use one operation row with date, plot, crop, operation, material batch, quantity/unit, worker code or appropriate group, hours, paid amount and other cost. Link receipts where available. Record deferred payment or exchanged resources explicitly.

At each review, check that activity dates fit the crop calendar. Ask about work that was performed but not written down. Keep reconstructed entries identifiable. Separate training time, setup and recurring work so that the actual transition year remains visible.

Keep the worker or consented group, actual hours and required operation window distinct. Add paid/unpaid/exchanged-work status, payment date or amount still due, and any separate valuation basis used in analysis. An imputed labour value is not a wage receipt. Reconcile shared-operation allocations with the total time recorded.

Instrument D Preparation batch record

Record formulation version, ingredient source and quantity, collection and mixing dates, container identifier, responsible person, required preparation conditions and application/disposal. Link every receiving plot to the batch and applied amount.

Use the locally reviewed preparation instruction. Do not replace an unrecorded quantity with the standard recipe after the event. If actual practice departed from the instruction, that is part of the evidence.

For seed operations, link the seed lot and any divided portions, existing treatment, reviewed compatibility decision, handling date and sowing record. Keep the original counts, denominator and observation date for establishment checks. For material accounts, distinguish original preparation from added water, prepared from delivered quantities and wet from dry measurement bases. Identify leftovers, rejection and the destination of each transfer.

For a component comparison, record the actual omitted operation, the retained operations and any reviewed carrier-water or handling comparison. Keep application equipment and relevant plot traffic identifiable. Link departures and rescue work to the comparison; the batch name alone does not define the treatment.

Instrument E Residue and shared-material ledger

Field	Purpose
Material and source identifier	Trace the crop, plot, household or supplier
Date and quantity	Preserve the physical basis and moisture convention
Allocation	Mulch, feed, fuel, sale, processing, loss or other identified use
Destination and recipient	Connect the next enterprise or treatment
Price and transport/work	Make the economic transfer visible
Return material	New identifier, quantity and composition basis where relevant
Overlap review	Other project or claim that may cover the same material/outcome

Reconcile total allocations to the available material on a consistent basis. Investigate any excess before climate calculations are accepted. A conversion product has a new identity and mass; do not silently treat it as unchanged raw residue.

State the opening/closing stock dates and whether moisture is expressed on wet or dry mass. Link weighing and representative sampling times. Keep a mass estimate separate from a surface-cover observation, with its location, viewing area and date. Retain unexplained differences for investigation rather than inventing a balancing entry.

Link each transferred batch to its former use, earlier recipient and the evidence for any replacement or cessation. Record the same period and dry/wet basis for availability, prior commitments, planned closing stock, identified losses and a new request. A positive remainder is an inventory result, not feedstock eligibility or a sustainable removal recommendation. Keep mixed-source contributions identifiable.

Instrument F Water and energy log

Record irrigation date, plot, source, crop stage, start/stop time, interruptions and the flow-measurement basis. Calculate volume only where the method supports it. Add recent rain and the reason for the decision. Record fuel, electricity or service charge with its own unit and evidence.

The simplified physical calculation is volume = flow × duration when flow is suitably measured and approximately represented by that value. Convert units explicitly: a flow expressed per second needs duration in seconds. The result is water applied on that basis, not automatically crop consumption or catchment saving.

Use linked event and observation rows where the reviewed plan needs both. The following is the book's proposed record structure, not a locally approved rice-water protocol or the method's data dictionary.

Record to link	Information to preserve	Review question
Supply event	Event/plot IDs; source and actual controller; start/stop times; flow readings and intervals; interruptions; shared-supply allocation	Does the supported volume reconcile without assigning the whole supply to every plot?
Field-water observation	Observation/event/point IDs; date/time; observer; crop stage; measured quantity and raw value; unit, reference level and sign definition; method/device and check record	Is this standing water above soil, a below-surface level or another defined observation?
Advice and response	Recommendation/version; person able to act; intended work and actual response; rain or other context; departure and follow-up	What happened, and who reviews a difference from the plan?
Calculation and release	Input record IDs; represented area/period; conversion, factor or model version; quality review and intended use	Is the output water applied, an activity input or a separately supported gas estimate?

Keep a completed reading, an attempted but unreadable observation and a visit not made distinct. Record the reason for missing evidence in Instrument J. No visible surface water is an observation at that place and time; it does not, by itself, establish a below-surface depth or the duration of a dry period. Preserve the readings, gaps and reviewed inference rule behind any duration estimate.

For varying flow, retain interval readings and durations. Keep original values beside conversions and preserve corrections. Link any gas-account use to its source, period, boundary and selected quantification record. Pump hours, a water-level reading and a gas flux remain different quantities; an unresolved input stays visible in the affected calculation.

Instrument G Soil collection and custody

Link sample identifier, plot, stratum, point, depth interval, date/time, collector and analysis request. Record density and coarse-fragment collections according to the reviewed method. On transfer, record sender, receiver, date, condition and any problem.

For each stock input, retain the dry fine-earth mass, known total sample volume, coarse-fragment mass and volume where required, and the density numerator/denominator definitions with units. Identify whether a coarse-fragment correction has already been applied. Link the concentration's dry-material basis and the layer/cumulative soil mass to the calculation version. Record missing fields rather than assuming zero coarse material. These are proposed record fields, not a replacement laboratory SOP. [S09]

For a reviewed sample-mass/area route, link probe internal area, core count, represented depth interval, complete dry layer-sample mass and any loss or subsampling to the original collection. Distinguish whole-sample mass from the analytical aliquot. Preserve the reference mass, interpolation rule and permitted calculation range with the result. [S46]

The laboratory return should include accession and batch, analytical method, result, unit and quality flags. Preserve reanalysis and corrections. Keep the original result as part of the audit trail rather than overwriting it without explanation.

Retain the original sampling depth, laboratory/field method and quality record beside the intended data use: agronomy, model calibration/validation or project quantification. Record the applicable requirement and any missing evidence. Do not extend a shallow measurement to a deeper layer merely by relabelling its entry.

Record the intended and actual collection location, map version and any relocation reason. Identify which stage each duplicate repeats and link its parent record. Keep separate collection, report, quality-review and accepted-for-use statuses. A release record names the use, reviewer, date, criteria, limitations and dataset version. A later correction must reach linked calculations and any household statement already shared.

Record the selected route and version, intended quantification approach, project/control/research role, linked comparison identifier and population/boundary version for each planned collection. Keep the research visit window separate from any proposed verification trigger. Reconcile project, control and quality-work lists before dispatch; note missing comparison work explicitly rather than treating overall collection completeness as accepted evidence.

For an instrument check, retain the instrument identity, check date, reference or comparison used, result and applicable reviewed criterion. NIST's instrument-control example supports monitoring calibration through time; its linear-calibration procedure is not a soil-laboratory SOP adopted here. [S43]

A failed or unresolved check needs an Instrument J issue record: affected samples or shared batch operations, uses held, reviewer, investigation and disposition. Distinguish reanalysis of retained material from new field collection. Give a replacement its own identity linked to the original; retain both and explain which result is accepted for which use. Do not select the more favourable result merely because it improves the account.

Instrument H Harvest and farm account

Record each harvest collection with plot, crop, actual area, weight and moisture basis. Allocate output to sale, household use, seed, fodder, loss or other use without counting a quantity twice. Record actual sale price, grade, deductions, transport and payment date.

The cash account uses actual receipts and payments on its stated basis. The full-cost account adds declared valuations of non-cash output and resources. Reconcile internal transfers before consolidating the whole farm. Keep premium and carbon scenarios separate from realised revenue.

Separate harvest, sale and receipt dates; identify unsold stock, receivables and unpaid bills. Preserve the quantity and basis for retained output, family work, land and owned resources. Identify financing cost, debt principal and asset purchases separately. Do not count loan principal as another input purchase or charge both the full asset purchase and its depreciation to the same production period. Reconcile shared-cost allocations to their original total and retain the common period/area for rotation comparisons.

Keep each crop and enterprise output separately identifiable, with area/arrangement, occupation dates, quantity, quality basis and destination. Retain original quantities beside any value-equivalent or land-productivity calculation; identify prices/comparators and the period used. Do not treat an aggregate as a physical harvest of its reference crop.

Link the harvested crop area and occupancy dates to the physical plot/holding register. Label any total of crop occupations across seasons separately from physical land area. When consolidating enterprises, reconcile internal product/material transfers so they do not become a second external sale or purchase. Preserve the outcome's denominator and accounting period.

Keep a confirmed zero harvest, an unmeasured harvest and no sale distinct, with the observation or report supporting each status. Retain other produce, rescue work and costs even when the focal harvest fails. Link missingness and any analysis-use decision to Instrument J; do not turn an unknown quantity into zero.

Instrument I Ecological observation

Choose the indicator and locally reviewed protocol before collecting observations. Use a visit header with linked observation rows. The following is the book’s proposed record structure, not a completed survey or a prescribed bird-count method; chapter 12 explains the measurement distinctions.

Record layer	Fields to retain	Link or check
Visit	Visit and point IDs; parent plot or landscape; planned window and actual date/time; observer; protocol version; actual effort; complete, partial or not done	Keep a header even when nothing was detected
Observation	Row ID; visit ID; species or reliable broader group; identification confidence; raw count or indicator with unit; detection mode and distance where the protocol requires them	Link dated photographs or recordings, with consent where needed
Context	Weather, crop stage, vegetation or viewing restrictions, recent operations and departures from the protocol	Attach to the relevant visit
Review	Original row ID; reviewer/date; corrected identification or value; reason; included, excluded or unresolved	Preserve the original and revision history
Derived result	Dataset and method/model versions; retained record IDs and exclusions; estimate, unit, comparator and uncertainty; reviewer and permitted use	Keep model-derived effective survey area separate from holding and carbon-project area

A missed visit is missing, not zero. A completed visit with no target detections needs that explicit status; an absent species row is not automatically a measured zero. Let the reviewed analytical protocol define its use. Record reasons and follow-up in Instrument J.

Return a dated explanation to the family, linked to the reviewed records. State whether the finding is descriptive, associative or intended as a causal estimate. Crop-protection services and carbon eligibility need their own evidence; a count, a photograph and a modelled estimate are different products.

Instrument J Exception and amendment record

Use an event code with affected plots, dates, description, immediate response and later decision. Include crop failure, severe weather, changed tenure, missing material, rescue action, equipment failure and protocol departures. State whether an amendment was decided before or after outcome inspection.

Keep the responsible reviewer and decision date. Do not relabel a departure as normal adherence merely to preserve a clean dataset.

For an analytical departure, link the original plan, dated reason, responsible reviewer and whether outcomes had already been examined. Record affected populations, input/code versions, tables and household statements. Keep planned main results and exploratory or sensitivity results separately identified; a new calculation should not erase the original decision trail. Link the outcome-specific planned population, starting and follow-up record identifiers, their usable/link/acceptance flags and the actual analysis inclusion decision. A flow total must identify whether it counts participants, plots, records or independent comparison units. Keep a decision affecting one outcome separate from exclusion across the whole study.

For a quality or funding issue, identify the affected work and claim, what is held, who can decide and the next review. Record the actual basis for retesting, recollection, qualified use, exclusion or rescheduling. Link the scientific and participant consequences to the revised work and funding records; a later date in a spreadsheet does not change the crop’s measurement window.

For a cross-file correction, list the affected source records, derived outputs and replacement versions. Record technical disposition separately from spending or deduction authority, with their respective decision dates and responsible roles. Link any revised work or expense identifier and the household statement requiring correction; leave an unreviewed consequence open.

Instrument K Claim attribution register

For each proposed claim, record project and method/version, plot/period, intervention, physical source or stock, material links, quantity and unit, calculation version, uncertainty treatment, overlapping project checks and independent-review status. Later add actual registry identity, issued quantity, transfer or retirement record and payment link where they exist.

Use status fields that distinguish proposed, measured, assessed, verified, issued and used. Advancing one claim does not automatically advance all claims from the same farm.

Link the selected clause, corrections/notices, retrieval date and evidence-review status to the calculation version. Keep each adjustment identifiable, including its source/stock/period and whether it has already been included elsewhere. A prepared requirement record is not independent approval.

Keep a separate decision for source eligibility, displaced use and overlapping attribution. Attach each to the batch, account and clause it actually concerns. An exemption or zero term in one method is not permission to omit a different method's required assessment. Retain the reason and reviewed scope before changing a quantity.

Record holds, rejection or withdrawal with the actual reason and decision scope. These are not compulsory steps toward success. A research estimate, a programme assessment and an issuance decision remain separate records; a model-validation check is not programme verification. Link each actual decision to its authority, date, version and covered quantity. Issued but unsold units are not cash received, and a sale alone does not establish retirement or a permitted end-use claim.

Instrument L Farmer statement and payment record

Give the household the season, plots, work recorded, production, cash costs, full-cost basis and main observations. Explain unresolved entries and allow correction. For a payment, show the actual payer and recipient, gross basis, deductions, amount, date and transaction reference.

The farmer statement should also identify the contact for a question or dispute. It is not useful if the household can neither read it nor obtain an explanation.

Classify each entry as cultivation receipt, work/service payment, reimbursement, realised carbon proceeds or other identified support. Retain estimate/agreement/payment/dispute status as supported by the actual record, with payer, recipient and the relevant condition. Do not present an imputed saving or expected receipt as a payment. Explain the gross-to-net calculation and check deductions against costs already paid elsewhere.

Link the entitlement or payment basis to the actual terms and funding source. Keep eligible, approved, due, transfer-instructed, paid and disputed states distinct where applicable. Preserve transfer evidence and corrections; reconcile each deduction through one expense identifier with any grant, prior invoice or other payment covering it. Distinguish a prepayment's later use from a fresh charge or cash refund. A proposed reserve needs its purpose and actual authority; a failed sale does not itself establish which obligations disappear.

Record the statement's version, return date, explanation and unresolved correction; receiving a copy is not agreement with its contents.

Calculation note Units and boundaries

Preserve original units and a separate converted column. State area, time and moisture basis. Report crop quantities separately before any aggregate. State whether a carbon number is carbon mass, carbon dioxide or carbon dioxide equivalent. Document the selected warming factors for non-carbon-dioxide gases.

For a stock difference, retain the two stock estimates, their dates, represented area, comparable soil-mass basis and uncertainty. Link the accepted sample and review versions through Instrument G. Label an interval total separately from its annual average and declare the emissions or positive-benefit sign convention. In the net account, reconcile included sources, stocks, leakage and adjustments once; a chemical conversion alone does not establish eligibility.

Calculation note Data review before analysis

Before joining files, define one row and its unique identifier at each level. Link the question/protocol version, outcome, comparison unit and period in the review list; refer to the detailed plan rather than copying it into every row. Check that parent links resolve, that several legitimate tests or pickings remain distinguishable and that joining does not multiply a physical quantity or expense. Then check dates, area, units, missing evidence and material allocations. Send unresolved links to the recorder; preserve the response and correction history rather than creating a plausible value.

Freeze an analysis version with a date, file manifest and protocol reference. Keep later corrected versions identifiable. These ordinary practices make a study auditable and give participants a better chance of receiving an accurate account of their own work.

The historical data-management guide treats design and unit information as part of the evidence and calls for dated change records. These principles inform the proposed links here; its software examples are not the pilot's operating system. [S41]

Before field use, test an empty form and a deliberately incomplete practice record with the people who would enter and review it. Can they distinguish the missing item from zero, route a query, correct it without erasing the original and explain the result to a household? Record the issue and revision. This is a proposed rehearsal, not a completed validation or a request to collect every possible item regardless of the study question.

Words used in this book

Zero Budget Natural Farming

A particular farming approach emphasising reduced dependence on purchased cultivation inputs, farm-prepared materials and connected ecological management. Zero budget does not erase labour or resource costs.

Organic farming

An ecological approach whose certified production is assessed against the applicable organic standard. It is broader than replacing a synthetic input with a purchased organic one.

Beejamrit

A farm-prepared seed-treatment formulation associated with the approach. Its preparation, handling and crop suitability must be documented through the selected guidance.

Jeevamrit

A biological formulation prepared for farm use. Its name does not establish a universal nutrient replacement or a carbon-removal rate.

Mulching

Maintaining suitable material or managed living cover on the soil. Record its type, timing and competing material uses.

Waaphasa

Attention to moisture and aeration in the root environment within natural farming, translated into crop-specific observation and management.

Crop rotation

The sequence of crops and relevant fallow or cover periods on a plot. The full sequence matters to production, resources and comparison.

Nutrient balance

An account of relevant nutrient inputs, removals and other flows on a stated boundary and period. A biological indicator alone is not this account.

Cash balance

Receipts minus payments on the explicitly stated cash basis. It differs from a full-cost return and may differ from the bank balance.

Full-cost net return

Output value less the costs included by the declared full-cost definition, including stated non-cash valuations. Always show the basis.

Opportunity cost

The value associated with an alternative use forgone, such as residue that could have served as fodder or time that could support other work.

Soil organic carbon

Organic carbon in soil. State whether the reported quantity is a concentration or a stock and identify the measurement basis.

Carbon concentration

The proportion of carbon in the analysed material. It cannot alone determine the stock over a hectare.

Carbon stock

The carbon amount associated with the defined pool, area and measurement basis at a time. Existing stock is distinct from new project-attributable removal.

Bulk density

Dry soil mass per bulk volume on the stated measurement basis. Its definition must be consistent with coarse-fragment treatment in a stock calculation.

Equivalent soil mass

A basis for comparing soil stocks using equivalent amounts of dry soil, helping address changes in the mass represented by a fixed depth.

Baseline

The defined starting or counterfactual reference, depending on context. A research baseline observation and a crediting baseline scenario are related but distinct.

Additionality

Whether the proposed mitigation satisfies the selected programme's test of being additional. Adopting a label alone does not establish it.

Emission reduction

A reduction relative to the defined baseline in relevant greenhouse-gas emissions, quantified on the applicable boundary and rules.

Carbon removal

Removal of carbon dioxide from the atmosphere with storage meeting the relevant definition and durability requirements.

Leakage

Relevant effects outside the project boundary, such as displaced activity, that the applicable accounting rules require to be assessed.

Reversal

Loss of previously stored carbon relevant to the claim. Monitoring and treatment depend on the selected programme and activity.

Carbon dioxide equivalent

A common reporting unit for greenhouse gases using the specified warming factors and time basis. It is distinct from carbon mass.

Independent verification

An assessment independent of the project's own monitoring under the relevant programme requirements. It is distinct from issuance.

Issuance

Creation of actual units by the programme following its required process. An estimate, contract or field certificate is not issuance.

Double counting

Counting the same underlying outcome more than once in an incompatible way. Plot, period, material and claim identifiers help identify overlap.

Independent replicate

An independently allocated or sampled unit appropriate to the inference. Several cores within a farm are usually subsamples, not independent farms.

Statistical power

The probability of detecting the specified effect under the stated design and assumptions. Enrollment requires local variability and a suitable calculation.

Chain of custody

The traceable sequence of collection, transfer, receipt and handling connecting a sample to its result.

Pre-specified analysis

An analysis defined before inspecting the relevant outcomes. Later exploratory work should be labelled separately.

Wet-basis moisture

Water mass expressed as a proportion of the total wet material mass. State the basis beside the percentage. It differs from dry-basis moisture, even for the same grain lot and water quantity.

Dry-basis moisture

Water mass expressed as a proportion of dry material mass. The denominator excludes the water. A result cannot be compared directly with a wet-basis percentage without the appropriate conversion.

Person-hour

One person working for one hour. Add the time contributed by each worker; this total differs from the elapsed duration of a task. The book’s two-person, three-hour illustration gives six person-hours, not six elapsed hours.

Subject guide

Use these chapter references with the contents. The digital reader also offers topic navigation.

Additionality

Chapters 15, 17

Baseline

Chapters 14, 19

Beejamrit

Chapters 2, 5

Bulk density

Chapters 14, 19, 20

Carbon concentration

Chapters 14

Carbon dioxide equivalent

Chapters 14

Carbon removal

Chapters 14, 15

Carbon stock

Chapters 14, 20

Cash balance

Chapters 10

Chain of custody

Chapters 19, 20

Crop rotation

Chapters 9, 11

Double counting

Chapters 7, 15, 17

Dry-basis moisture

Chapters 20

Emission reduction

Chapters 14, 15

Equivalent soil mass

Chapters 14, 20

Full-cost net return

Chapters 10, 13

Independent replicate

Chapters 18, 21

Independent verification

Chapters 14, 17

Issuance

Chapters 14, 17, 23

Jeevamrit

Chapters 2, 6

Leakage

Chapters 14, 15, 17

Mulching

Chapters 7

Nutrient balance

Chapters 6, 9, 11

Opportunity cost

Chapters 7, 10

Organic farming

Chapters 3

Person-hour

Chapters 10, 13, 20

Pre-specified analysis

Chapters 18, 21

Reversal

Chapters 14, 17

Soil organic carbon

Chapters 12, 14, 20

Statistical power

Chapters 18

Waaphasa

Chapters 8

Wet-basis moisture

Chapters 20

Zero Budget Natural Farming

Chapters 2, 3, 4

Sources and evidence notes

S01 · Empowering Farmers Natural Farming Training Toolkit and Best Practices Guide

NITI Aayog · 2026

https://www.niti.gov.in/sites/default/files/2026-03/Training-Manual-English.pdf

Official natural-farming concepts and terminology; documented practice descriptions.

Guidance is not a primary field experiment. Do not copy categorical comparator rankings or untraced quantitative benefits as universal findings.

S02 · Definition of Organic Agriculture

IFOAM Organics International · 2008 definition

https://www.ifoam.bio/why-organic/organic-landmarks/definition-organic?result=5

Organic agriculture includes ecological processes and social principles; not merely purchased-input substitution.

A normative definition does not establish the performance of every organic farm.

S03 · What is organic

IFOAM Organics Europe · Undated

https://www.organicseurope.bio/what-is-organic/

Organic systems and principles extend beyond input avoidance.

European regulatory details are not transferred to India. Do not repeat health or numerical outcome claims without underlying studies.

S04 · Natural farming improves crop yield in SE India when compared to conventional or organic systems by enhancing soil quality

Duddigan et al. · 2023

https://link.springer.com/article/10.1007/s13593-023-00884-x

Context-specific yield and moisture findings. Yield comparison uses within-experiment z scores; changing farms and crops constrain temporal interpretation. No significant treatment effect on organic carbon or bulk density over the study period. Moisture probe depth and sampling occasions, hand-sorted earthworm count support and conditional biomass collection delimit the ecological observations.

Not a long-term transition panel, physical yield forecast or all-organic comparison. Organic plots lacked mulch; all treatments were untilled. Farm, experiment and available-yield counts differ; complete data/model reconciliation remains open. Small monocrop plots do not test diversified whole farms or establish certification. Earthworm ecological/age groups were not recorded; abundance alone does not establish microbial activity or an ecosystem service. Study dimensions are not a pilot SOP.

S05 · India’s agroecology programme Zero Budget Natural Farming delivers biodiversity and economic benefits without lowering yields

Berger et al. · 2025

https://www.nature.com/articles/s41559-025-02849-7

Programme-specific economic and bird-abundance findings in northern Andhra Pradesh. Modelled responses vary by bird feeding group and species; selected guild estimates and uncertainty intervals are reported in chapter12.

Matched observational programme evaluation, not a census of all biodiversity. Selected main/supplement sections inspected; no full supplement or raw-data/code replication, measured crop-protection service, whole-India effect, carbon issuance or soil-removal result. Site selection, outcome-specific matching and balance diagnostics are different stages. Exact crop variety was not verified; common seed-supply timing supported an author assumption. Figure7 field-profit title versus harvest-count caption remains a reporting question. No raw-data/matching/code replication or confirmation that all confounding was removed. The chapter12 invented two-visit example cannot identify population/density change or estimate unseen birds. Effective survey area is model-derived for the observation process, not a farm boundary.

S06 · Quantifying the contribution of individual inputs used in Zero Budget Natural Farming

Duddigan et al. · 2024

https://bsssjournals.onlinelibrary.wiley.com/doi/full/10.1111/sum.13126

Two-season within-package omission trial: main-crop yield and measured-process findings answer different questions.

Not a new organic/conventional comparison, proof of synergy or long-term nutrient sufficiency. Full supplement and raw-data/code review remain open. AppendixS1 Tables S1–S12 remain unread after bounded cycle 12R retrieval attempts; no supplementary findings inferred from the file listing.

S07 · VM0042 Improved Agricultural Land Management v2.2

Verra · Active since 21 October 2025

https://verra.org/methodologies/vm0042-improved-agricultural-land-management-v2-2/

Relevant framework for agricultural mitigation and the need for baseline, additionality, quantification and uncertainty assessment.

Selected requirements include material-leakage clauses. Full methodology, corrections, programme rules, linked tools and project evidence still require review. No farm or proposed pilot is declared eligible.

S08 · Corrections and Clarifications to VM0042 v2.2

Verra · 11 June 2026

https://verra.org/wp-content/uploads/2026/06/VM0042v2.2_CC_11JUN2026.pdf

Current v2.2 applications must account for the published corrections.

Selected baseline and remeasurement requirements explained within the recorded inspection scope. Complete programme, tool, sampling and project evidence review remains open.

S09 · A protocol for measurement, monitoring, reporting and verification of soil organic carbon in agricultural landscapes — GSOC-MRV Protocol

Food and Agriculture Organization of the United Nations · 2020

https://doi.org/10.4060/cb0509en

Selected published Annex3/4 definitions for fine-earth mass, volume-specific density, coarse-fragment treatment, layer stock arithmetic and comparable soil mass.

Selected sections of the September2020 publication inspected. Source example/reference inconsistencies retained for specialist review. No complete protocol audit, local sampling/laboratory SOP, validated equivalent-mass estimator or carbon-project eligibility is established.

S10 · C-SPOT assessment and agroecological-region natural-farming soil-carbon projects

TERI · 2025–2026 ongoing listings

https://teriin.org/project/agroecological-region-aer-based-variations-soil-carbon-sequestration-potential-c-spot-vis

An identified project describes a natural-farming soil-carbon research agenda.

A project listing is not a completed result. Do not claim nobody is investigating the question or infer issued credits.

S11 · National Programme for Organic Production Eighth Edition

APEDA Government of India · 2024

https://npop.apeda.gov.in/sites/default/files/2024-10/NPOP_Eight_Edition_2024.pdf

Organic crop management includes diversity and nutrient recycling. The inspected edition distinguishes operator scope and transaction certificates and identifies certified products; certification and a research treatment name have different evidentiary roles.

Selected 2024 clauses and scoped S54 update inspected; complete current amendments, certification/application, conversion and input-permission audit remain open. No farm, input or product declared eligible or certified.

S13 · Potential yield challenges to scale-up of zero budget natural farming

Smith, Yeluripati, Smith and Nayak · 2020

https://www.nature.com/articles/s41893-019-0469-x

Literature/simulation analysis distinguishes low/high-input settings, nutrient constraints and possible soil restoration. Not a new harvest trial.

Literature/simulation with a national fertiliser-application comparison, not a local nutrient-requirement measurement or harvest trial. Supplement calculations/model code not independently reproduced; no universal loss rate or locally validated forecast adopted. New annual ledger is an invented teaching example, not source data.

S14 · Proximal sensing for soil carbon accounting

Jacqueline R. England and Raphael A. Viscarra Rossel · 2018

https://soil.copernicus.org/articles/4/101/2018/soil-4-101-2018.html

Distinguishes concentration, density, coarse fraction, depth and equivalent soil mass for stocks.

No locally validated sensing calibration or field SOP is claimed.

S15 · VM0051 Improved Management in Rice Production Systems v1.1

Verra · 14 July 2026

https://verra.org/methodologies/vm0051-improved-management-in-rice-production-systems-v1-1/

Flooded-rice mitigation pathway and current version/transition context.

Scoping only; full applicability and monitoring review required for an actual project. Reassessment wording differs between revision summary/history and monitoring-plan item5; a project-specific clarification remains open.

S16 · VM0044 Biochar Utilization in Soil and Non-Soil Applications v1.2

Verra · 27 June 2025

https://verra.org/methodologies/vm0044-biochar-utilization-in-soil-and-non-soil-applications-v1-2/

Waste-biomass biochar removal pathway; v1.2 includes investment analysis for additionality.

Selected feedstock-history, sustainability and leakage provisions were inspected. Full facility, feedstock, end-use, tools and project review remains open; the book declares none eligible.

S17 · VM0047 Afforestation Reforestation and Revegetation v1.1

Verra · 14 May 2025

https://verra.org/methodologies/vm0047-afforestation-reforestation-and-revegetation-v1-1/

Area and census approaches; dispersed planting can require distinct treatment.

No tree project eligibility, land classification or approved allometry is asserted.

S18 · Enhanced Rock Weathering methodology and Edition 2025 update

Puro.earth · 2025

https://puro.earth/methodologies/enhanced-rock-weathering/

Existence of an ERW removal pathway and an updated Edition2025.

No complete edition audit or removal factor; do not use draft PDFs as final rules.

S19 · BM AG04.001 Methane recovery from livestock and manure management at households and small farms v1.0

Bureau of Energy Efficiency Government of India · 27 March 2025

https://beeindia.gov.in/sites/default/files/BM%20AG04.001.pdf

Specific CCTS household/small-farm manure route; qualifying baseline fraction, continued operation, gas consumption/composition, project emissions, leakage and digestate handling are distinct parts of evidence.

Selected provisions, not a complete governing-tool, sampling, parameter or project calculation. No local default factor, design, eligibility, credit amount or payment established.

S20 · Indian Carbon Market

Bureau of Energy Efficiency Government of India · Living page checked 21 October 2026

https://beeindia.gov.in/show_content.php?lang=1&level=1&lid=294&ls_id=116

Domestic offset mechanism and programme-specific methodology context.

No automatic conversion of independent voluntary units or approval of this proposed pilot.

S21 · Author Correction to India's agroecology programme Zero Budget Natural Farming

Berger et al. · 19 November 2025

https://www.nature.com/articles/s41559-025-02931-0.pdf

Correction concerns mathematical notation including the log effort offset; corrected HTML/PDF noted.

Not an independent replication; detailed supplement review still pending.

S22 · 2006 IPCC Guidelines, Volume 4, Chapter 2; 2019 Refinement index

IPCC Task Force on National Greenhouse Gas Inventories · 2006; 2019 Refinement with listed corrections

https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_02_Ch2_Generic.pdf

Inventory context for stocks, transfers and agricultural emissions. Selected 2006 sections explain the annual average stock difference, the 44/12 conversion and the emissions sign convention.

National inventory guidance is not project-credit eligibility or a substitute for selected project methods.

S23 · Article6.2 Corresponding Adjustments Reporting Tool

Verra · Living page checked 21 October 2026

https://verra.org/programs/verified-carbon-standard/article-6-2-corresponding-adjustments-reporting-tool/

Authorisation and corresponding adjustments are distinct requirements relevant to Article6 use.

No host authorisation or Article6 status is asserted for this pilot.

S24 · Components of Natural Farming

NITI Aayog natural-farming initiative · Webpage checked 21 October 2026

https://naturalfarming.niti.gov.in/components/

The webpage lists 1 kg bund soil while toolkit Table 6.1 lists 100 g. Both descriptions were inspected.

Conflicting official instructions are not reconciled by this book. No universal recipe, efficacy finding or crop compatibility follows from this comparison.

S25 · Glossary: multiple cropping and land equivalent ratio

Food and Agriculture Organization of the United Nations · Undated web glossary; checked 21 October 2026

https://www.fao.org/4/v9926e/v9926e0a.htm

Definition of land equivalent ratio as sole-crop land needed to match intercropped component yields.

Definition only. The manuscript calculation is independently constructed and hypothetical; this source supplies no effect size or India-specific crop recommendation.

S26 · Farm Management for Asia: a Systems Approach, chapter 4

Douglas J. McConnell and John L. Dillon / FAO · 1997

https://www.fao.org/4/W7365E/w7365e07.htm

Conceptual basis for distinguishing financial/resource accounts, stated cost boundaries and a budget of specified changes. Cash status differs from fixed/variable classification; unit cost requires an explicit numerator/denominator and does not alone establish good resource management.

Historical textbook, not current Indian prices, field outcomes, a validated local costing protocol or participant/payment terms. Book examples are independently constructed and hypothetical.

S27 · Methodology Development and Review Process, v5.1

Verra · 16 December 2025

https://verra.org/documents/methodology-development-and-review-process-all/

Programme-specific distinctions between method changes, their review routes and funding without control or assurance of project eligibility.

Not pilot approval or a complete programme eligibility audit.

S28 · National Mission on Natural Farming: Operational Guidelines

Department of Agriculture & Farmers Welfare · Undated; government-hosted Annexure VI copy

https://agrimanipur.mn.gov.in/wp-content/uploads/2025/07/agrimanipur.mn.gov.in_section-41bxii-program-implemented_compressed.pdf#page=715

Selected provisions connect local knowledge, field training, research responsibilities, approved plans and distinct monitoring functions; fund-release provisions require relevant approval, utilisation and progress records.

Government-hosted guideline copies, not verified as the latest operative text. The inspected cost norms name a finance-commission period. No current call, award, pilot eligibility, payment promise or institution agreement is established; no historical rates or release deadlines adopted.

S29 · Microbial and Metabolite Profiling Reveal the Composition of Beejamrit: A Bioformulation for Seed Treatment in Sustainable Agriculture

Panchal et al. · 2026

https://www.mdpi.com/2077-0472/16/1/133

Characterisation of eight preparation samples, laboratory triplicate processing, source/season map, and further crop-response/activity/risk-assessment questions.

Selected main-text inspection, not complete paper/supplement/raw-data replication, independent crop-efficacy trial, microbial safety or acceptance threshold. Reported preparation is not a resolution of the official soil-quantity conflict or a universal recipe.

S30 · Empirical observation of natural farming inputs on nitrogen uptake, soil health, and crop yield of rice-wheat cropping system in the organically managed Inceptisol of Trans Gangetic plain

Darjee et al. · 2024

https://www.frontiersin.org/journals/sustainable-food-systems/articles/10.3389/fsufs.2024.1324798/full

Package comparison and differing indicator/yield rankings.

Inputs, mulch and tillage vary together. Internal reporting ambiguities retained for review; no detailed quantitative effect imported. The site description (0–20 cm) and sampling method (0–15 cm) describe different contexts. Their relationship to Table 3 remains unresolved; this is not an established author error. The nutrient percentage basis, its relationship to liquid application volume, the unusual printed seed-treatment unit and earlier self-comparison wording remain open questions. No application rate, reconstructed conversion or quantitative effect has been imported. No correction, raw-data or supplement audit was completed.

S31 · Evaluation of microbial culture (Jeevamrit) preparation and its effect on productivity of field crops

Aulakh et al. · 2013

https://pub.isa-india.in/index.php/ija/article/view/4191

Defined cereal application comparison and its grain-yield finding; distinguish component addition from omission within a different package.

Original main-paper inspection, not raw-data replication, equivalence proof, all-farm conclusion, universal nutrient recipe, or validation of inferred microbial functions. Table/prose ambiguities remain for specialist review.

S32 · Soil organic cover

Food and Agriculture Organization of the United Nations · Undated guidance

https://www.fao.org/conservation-agriculture/in-practice/soil-organic-cover/en/

Surface-cover mechanisms and living-cover management.

Not field-specific effects or a complete ZBNF comparison.

S33 · Development and evaluation of the Turbo Happy Seeder for sowing wheat into heavy rice residues in NW India

Sidhu et al. · 2015

https://knowledgecenter.cimmyt.org/bib/57025

Technology-specific operating questions.

Full paper not inspected; no current specification, price or ZBNF outcome inferred.

S34 · Evaluation of the effects of mulch on optimum sowing date and irrigation management of zero till wheat in central Punjab, India using APSIM

Balwinder-Singh, Humphreys, Gaydon and Eberbach · 2016

https://pmc.ncbi.nlm.nih.gov/articles/PMC5035063/

A model-based example of interactions among mulch, sowing time, soil and irrigation; distinct irrigation and evapotranspiration productivity measures.

Simulated irrigated wheat under specified assumptions, including non-limiting nutrients. No whole-ZBNF trial, local crop calendar, nutrient-replacement result, machine recommendation, universal water saving or carbon issuance.

S35 · Development of a successful IFS model for livelihood sustenance of small households of Uttar Pradesh

Meena et al. · 2022

https://epubs.icar.org.in/index.php/IJAgS/article/view/101252

Regional research-farm systems-accounting context; price-based sugarcane-equivalent output, enterprise boundaries and approximate nutrient recycling. Chapter9 develops original household-record questions from these distinctions.

Not a controlled whole-ZBNF comparator, carbon outcome or pilot agreement. Abstract/Table1 whole-model B:C and Table1 gross/cost/net identities conflict; cost coverage, internal-transfer/family-labour/asset valuation and prices require clarification. Table2 remains approximate, not complete external nutrient replacement or demonstrated household cash saving. No source income, rate or historical price adopted as a local result/budget; no corrected source figure asserted.

S36 · Species diversification

Food and Agriculture Organization of the United Nations · Undated guidance

https://www.fao.org/conservation-agriculture/in-practice/species-diversification/en/

Rotation objectives and process questions.

Not a site-specific effect, nutrient quantity or ZBNF prescription.

S37 · Reminder: Depth Requirements for Using Soil Carbon Data in VM0042 Projects

Verra · 21 October 2025

https://verra.org/program-notice/reminder-depth-requirements-for-using-soil-carbon-data-in-vm0042-projects/

Depth and permitted-data-use distinction.

Not a complete sampling SOP or project eligibility decision.

S38 · Enhanced Rock Weathering — Edition 2025 v2

Puro.earth · 5 March 2026

https://7518557.fs1.hubspotusercontent-na1.net/hubfs/7518557/ERW%20Standards/ERW%202025/ERW%20Edition%202025%20v2.pdf

Dated version and responsibility identification; selected quantification distinguishes primary estimate/validation, baseline, losses, project emissions, leakage and uncertainty conservativeness.

Selected requirements only. No adopted measurement pair, local removal factor, baseline exception, uncertainty calculation, complete governing-set or cross-method permission. Local eligibility/suitability/rights and independent assessment remain open.

S39 · On-Farm Trials — Some Biometric Guidelines

Statistical Services Centre, University of Reading; ILRI-hosted copy · March 1998; hosted page updated 2003

https://biometrics.ilri.org/GoodStatisticalPractice/publications/guides/topoft.html

Connect farm selection and management context to the intended recommendation domain; retain farmer contributions and report to collaborating farmers alongside technical audiences.

Historical general guidance, not Indian farming effects, a current validated protocol, fixed sample size or credit eligibility. Its subgroup/exclusion and zero-as-missing examples are not adopted here; no handover or review approval claimed.

S40 · How to do research on your farm

Paulo Pagliari and Bruce Potter, University of Minnesota Extension · Reviewed 2022

https://extension.umn.edu/courses-and-events/for-professionals/on-farm-research/how-to-do-research-on-your-farm

Distinguish within-plot subsamples from replicated plots and attend to treatment placement.

Selected design concepts only; no universal replication threshold, statistical-test/CI recipe, Indian effect or reviewed project sample size.

S41 · Data Management Guidelines for Experimental Projects

Statistical Services Centre, University of Reading; ILRI-hosted copy · November 2000; hosted page updated 2003

https://biometrics.ilri.org/GoodStatisticalPractice/publications/guides/topdmg.html

Linked identities, units/design context, dated audit/version trails and a usable archive of data, programs and relevant supporting information for later users. Record identity must reflect the observation level; unique keys and version links support reconcilable joins and outputs.

Historical methods guidance, not a contemporary software/security/privacy/retention policy or approved pilot SOP. No actual dataset, handover receipt, reproduced result, institutional acceptance or credit eligibility demonstrated. Four-status handover table and decision/correction trail are original proposals.

S42 · Measurement uncertainty arising from sampling, second edition: guide and official overview

Eurachem / EUROLAB / CITAC / Nordtest / AMC; Ramsey, Ellison and Rostron (eds.) · 2019; overview updated 2026

https://eurachem.org/index.php/publications/guides/musamp

Collection/preparation within measurement uncertainty; selected distinctions between precision/bias, validation and ongoing quality control, and a failed check requiring investigation.

Selected overview/guide text only. Corrected worked examples not reused. No validated pilot uncertainty budget, duplicate limit, laboratory SOP or credit eligibility established.

S43 · NIST/SEMATECH e-Handbook 2.3.7 Instrument control for linear calibration

NIST/SEMATECH · Undated online handbook; accessed 22 October 2026

https://www.itl.nist.gov/div898/handbook/mpc/section3/mpc37.htm

Check standards can monitor instrument calibration through time.

Instrument-specific example, not a soil laboratory SOP or pilot schedule. The fieldkit's failed-check decision record is an original proposal, not a validated NIST soil protocol.

S44 · ASA releases statement on statistical significance and p-values

American Statistical Association · 7 March 2016

https://www.amstat.org/asa/files/pdfs/p-valuestatement.pdf

A p-value addresses compatibility with a specified statistical model; it is not the probability that a hypothesis is true, an effect size or scientific importance. Interpretation needs transparent reporting and context.

Interpretive guidance, not a pilot analysis model or non-inferiority procedure.

S45 · New Verra Program Fee Schedule — FAQs

Verra · 2024–2025 fee changes; page accessed 22 October 2026

https://verra.org/new-verra-program-fee-schedule-faqs/

Dated VCS examples distinguish request-stage payments, specified non-refunds and a review charge versus a prepayment credited toward later issuance levies.

Dated programme example, not a pilot quotation, future fee/refund/recovery guarantee, complete governing-fee audit or eligibility approval. Original proposed expense ledger/funding gate is not a Verra-required pilot design.

S46 · An equivalent soil mass procedure for monitoring soil organic carbon in multiple soil layers

J. W. Wendt and S. Hauser · 2013

https://doi.org/10.1111/ejss.12002

Cumulative mass/organic-carbon comparison, distinct interpolation assumptions, consistent reported reference masses and the information needed for a sample-mass/known-area route.

Historical research procedure, not current project eligibility or an adopted local sampling/laboratory SOP. No automatic permission to omit required density/coarse-fragment records or extrapolate. Independent book examples are invented.

S47 · VCS Standard, v4.7

Verra · 2024 update

https://verra.org/documents/vcs-standard-v4-7/

Multiple-activity design and separate method requirements, with stated exceptions.

Selected clauses only; complete programme, transition and project assessment still required.

S48 · VCS Standard, v5.0

Verra · 2025

https://verra.org/documents/vcs-standard-v5-0/

Multiple activities, baseline/additionality conditions and prevention of duplicate issuance.

Not automatically applicable to every project; complete transition and project assessment remains open.

S49 · VCS Version 5: Overview of VCS Program Updates and Effective Dates

Verra · updated 10 September 2026

https://verra.org/documents/vcs-version-5-overview-of-vcs-program-updates-and-effective-dates/

Rule-specific transition triggers and conditional early application of version5.

Selected overview, not every effective-date row or an eligibility decision for the pilot.

S50 · Corrections & Clarifications to VCS Program Rules and Requirements

Verra · 9 June 2026

https://verra.org/wp-content/uploads/2026/06/Corrections-and-Clarifications-to-the-VCS-Program-Rules-June-2026.pdf

Programme corrections have their own scope, references and effective dates.

Selected corrections only; distinct from VM0042 June11 corrections and complete project conformity.

S51 · Puro Standard General Rules — Version 4.4

Puro.earth · 7 May 2026

https://7518557.fs1.hubspotusercontent-na1.net/hubfs/7518557/Supplier%20Documents/General%20Rules%204_4.pdf

Selected registration, rights and double-counting rules; the transition from version 4.2 to 4.3 and identification of the current version, 4.4.

No complete governing-set or cross-method/pilot approval.

S52 · Methodology Transition Dates for ERW Edition 2025

Puro.earth · 18 November 2025

https://connect.puro.earth/hubfs/ERW%20Standards/ERW%202025/Methodology%20Transition%20Plan%20for%20ERW%20ed2025.pdf

Different treatment of certified, first-audit and new facilities; renewal and preliminary-assessment distinctions.

Facility-specific transition; the inconsistent printed target year must be read with S53. Does not establish our registration or certification.

S53 · End of Transition Period for Enhanced Rock Weathering Facility Audits against Edition 2022

Puro.earth · 18 February 2026

https://puro.earth/insights/post/end-of-transition-period-for-enhanced-rock-weathering-facility-audits-against-edition-2022/

The complete-package deadline of 18 February 2026 applied to facilities registered before 15 December 2025, with conditional review outcomes.

Notice for specified earlier facilities, not a general new-pilot extension or eligibility approval.

S54 · Amendment of Annex 3(17) of the NPOP 8th Edition

APEDA, Government of India · 18 May 2026

https://apeda.gov.in/sites/default/files/announcements/Notification_on_amendment_Annex3_17_NPOP_8th_Edition.pdf

Distinguishes a draft consultation from an operative amendment, effective 18 May 2026, covering additives in processed organic food.

Selected notice and annex scope only; no complete amendment, food-additive permission, field-spray approval or individual certification audit. Current applicability must be checked for the actual activity.

S55 · Toward Causal Inference With Interference

Michael G. Hudgens and M. Elizabeth Halloran · 2008

https://cdr.lib.unc.edu/concern/articles/td96k920p

Distinguishes effects under interference and makes the allocation mechanism and assumptions explicit.

Assumes perfect compliance and partial interference, and develops two-stage randomized inference. Not an Indian farming effect study or an analysis recipe for the proposed observational cohorts. No estimator, exposure map or farm effect is adopted.

S56 · BM AG04.002: Emission reduction through improved management practices in rice cultivation

Bureau of Energy Efficiency, Government of India · 30 June 2026, Version 1.0

https://beeindia.gov.in/WriteReadData/RTF1984/RTF-PDF-6928edf26e7d04da_1783086710.pdf

Indian rice route: applicability, seasonal evidence, farmer support and auditable cultivation records.

Selected provisions only. Complete programme, tools and calculation review remains open; no pilot exception, eligibility, factor, unit equivalence or payment established.

S57 · Grain storage techniques: Evolution and trends in developing countries — Chapter 5, Drying principles and general considerations

FAO; D. L. Proctor (ed.) · 1994

https://www.fao.org/4/t1838e/T1838E0u.htm

Wet-basis and dry-basis grain-moisture denominators differ; the selected conversion is20%wb=25%db. Representative moisture information belongs to the sampled grain.

Historical technical definitions only. Does not select a local crop reference moisture, validate a moisture meter/SOP, establish a pilot yield or prove a loss. The chapter1000kg/14% calculation and proposed linked-lot record are original teaching/proposed work, not a reported trial or FAO recommendation.