THE GRIPHAN ONLINE SCHOOL

UNIVERSITY LIBRARY

Sustainable Farming Systems

Farming that feeds this generation without starving the next

Nji Griphan

griphan.48hourrfprescue.com

Sustainable Farming Systems

Farming that feeds this generation without starving the next

Nji Griphan

The Griphan Online School — University Library

IMPRINT

This book is published for the Library of the Griphan Online School. Author and publisher of record: **Nji Griphan**. School address on the web: **griphan.48hourrfprescue.com**. Professional mailbox: **info@griphan.48hourrfprescue.com**. © 2026 Nji Griphan. This book was written for the students of this school. Students enrolled at the school may download and keep it for their own study. The library grows shelf by shelf until it carries the whole university.

A note on this book

A farming system is sustainable when it can keep producing, season after season, without eating the soil, water and knowledge it depends on. This book walks through the working parts of such systems — soil, water, crops, livestock, trees and people — and shows how they hold together on real farms, especially small farms in the

tropics.

Contents

Chapter 1 — What a Farming System Is

Chapter 2 — Soil — The Living Foundation

Chapter 3 — Water — Catching, Keeping, Using

Chapter 4 — Crops, Livestock and Trees Together

Chapter 5 — Seeds, Knowledge and Markets

Chapter 6 — Planning a Farm That Lasts

Appendix — Worked Examples and Practice

Glossary of Key Terms

Chapter 1

What a Farming System Is

A farm is not a collection of separate enterprises but a system, in which each part feeds or frustrates the others. This chapter teaches you to see the whole system before touching any part of it.

Parts and connections

List a farm's parts — fields, crops, animals, trees, water, labour, cash, knowledge — then draw the connections: manure flows to fields, crop residues flow to animals, trees shade and feed both. Most farm problems live in the connections, not the parts: the crop is fine, the animal is fine, but the residue that should link them is burned.

Household goals come first

A farming system serves a household's goals: food first for most smallholders, then cash, then security against bad years. Advice that ignores those goals — a cash crop on the family's only food plot — fails however sound its agronomy. Begin every analysis by asking the household what it is trying to achieve.

Flows of energy and nutrients

Sunlight, rain and nutrients enter the farm; food, cash and losses leave it. A system that exports nutrients in every harvest and returns none is mining its soil, however green it looks today. Sustainability is, in large part, the bookkeeping of these flows across years.

Resilience — surviving the bad year

Judge a system not by its best year but by its worst. Diversity of crops, stored food and fodder, savings, and several income sources are the shock absorbers. A single-crop farm may out-earn a diverse one in good years and collapse in the bad one that eventually comes.

Key points

- Analyse connections, not only components.
- The household's goals define what 'better' means.
- Sustainability is long-run bookkeeping of soil, water and nutrients.

Exercises

1. Draw the flow diagram of a farm you know: inputs, outputs, internal flows.

2. Interview a farmer about his goals for the farm; list them in his order.

3. Name three shock absorbers on a farm you know, and one that is missing.

Chapter 2

Soil — The Living Foundation

Soil is not dirt; it is a living community that feeds plants when it is fed itself. This chapter covers soil life, organic matter, erosion and the practical arts of keeping soil in place and in health.

Organic matter — the soil's savings account

Soil organic matter holds water and nutrients, feeds soil life, and gives soil its structure. It is built by roots, residues, manure and compost, and spent by burning, bare fallows and excessive tillage. Every practice in this book can be judged by one question: does it add to, or draw down, the soil's organic savings?

Erosion — losing the farm downhill

Rain on bare, sloping soil carries the farm away grain by grain. Contour planting, grass strips, terraces where labour allows, cover crops and mulch all slow water and keep soil home. Erosion control is cheapest before gullies form; a grass strip planted this year is a terrace you will not have to build in five years.

Feeding the soil

Plants need nutrients in balance — nitrogen, phosphorus, potassium and more. Legumes fix nitrogen from the air; manure and compost return many nutrients together; mineral fertiliser supplies precise amounts where soil tests or experience show a lack. The sustainable art is combining sources so none is wasted and the soil's life is

fed along with the crop.

Reading your soil

A farmer reads soil with eyes, hands and nose: colour, crumbliness, smell, the worms a spadeful holds, how water enters after rain. Simple tests — a jar of soil shaken in water to see its texture layers, pH kits where available — add numbers to that reading. Record what you observe plot by plot, year by year.

Key points

- Organic matter is the soil's savings; build it, do not spend it.
- Keep soil covered and slow the water on slopes.
- Combine legumes, manure, compost and fertiliser wisely.

Exercises

1. Do the jar texture test on two soils and report the layers.

2. List every practice on a farm you know that adds or removes organic matter.

3. Sketch an erosion-control plan for a sloping field.

Chapter 3

Water — Catching, Keeping, Using

Rainfall totals matter less than timing: crops die in dry spells inside 'wet' years. This chapter treats water as a harvest to be caught, stored in soil and ponds, and spent with care.

Water harvesting

Roads, roofs and compacted yards shed water that fields thirst for. Simple structures — tied ridges, planting pits, half-moon bunds, small ponds — move that water from where it harms to where it helps. The principle is always the same: slow it, spread it, sink it.

Soil as a reservoir

The cheapest dam is the soil itself. Organic matter and mulch raise the amount of rain a field absorbs instead of shedding, and shade from cover keeps it there longer. A field that absorbs a 30 mm storm feeds its crop for days afterwards; a crusted field sheds the same storm into the gully in an hour.

Irrigation with care

Where irrigation is possible, water at the root, in the cool hours, in amounts matched to the crop's stage. Over-watering wastes the resource, waterlogs roots and can salt the soil. Small-scale drip lines from a raised drum can water a dry-season garden on a fraction of the water flooding uses.

Dry-season farming

Dry-season gardens near wells, streams and ponds turn the hungry season into a producing one — vegetables for the pot and for sale when prices peak. Their sustainability depends on sharing water fairly and never pumping a source below its recovery, lessons communities must agree together.

Key points

- Slow it, spread it, sink it.
- Soil organic matter is the cheapest reservoir.
- Irrigation: right amount, right place, right hour.

Exercises

1. Estimate how much water a 100 m² roof sheds in a 20 mm storm.

2. Design planting pits for a dry plot: spacing, size, and what goes in them.

3. List the rules a community should agree before sharing a dry-season well.

Chapter 4

Crops, Livestock and Trees Together

Integration is the signature of sustainable systems: each enterprise eats another's waste and answers another's need. This chapter works through the classic integrations and the rotations that keep pests and exhausted soil at bay.

Rotations and intercrops

Rotating crops — cereals after legumes, deep roots after shallow — breaks pest cycles and balances nutrient demands. Intercropping, such as maize with beans, uses light, water and space more fully than either crop alone and insures the harvest: if one fails, the other may still feed the family.

Livestock in the system

Animals convert residues and rough grazing into milk, meat, manure and traction. Their sustainability questions are feed in the dry season, manure returned to fields, and numbers matched to what the land can carry. One well-fed animal out-produces and out-earns three starving ones.

Agroforestry — trees that farm

Trees on farms give fruit, fodder, firewood, shade, windbreaks and nitrogen — some leguminous trees fertilise the soil beneath them season by season. Plant trees where they help crops rather than compete: on boundaries, contours and around the homestead, and prune them as deliberately as any crop.

Pests without poison dependence

Diverse systems suffer fewer pest explosions: rotation starves specialists, intercrops confuse them, and healthy soils grow plants that withstand attack. Reserve purchased pesticides for genuine need, use them exactly as directed, and protect the pollinators and natural enemies that work for you free.

Key points

- Rotate and intercrop to break pest cycles and balance nutrients.
- Match animal numbers to feed the land can give.
- Trees are crops with extra gifts; site and prune them deliberately.

Exercises

1. Design a four-year rotation for a two-plot farm including a legume each cycle.

2. Draw the waste-to-resource links on a mixed farm you know.

3. Choose three tree species for a farm and justify each by its gifts.

Chapter 5

Seeds, Knowledge and Markets

A system is also its seeds, its know-how and its road to market. This chapter covers keeping good seed, learning as a community, and selling without being robbed by distance or ignorance of prices.

Seed — keeping the future

Select seed from the best plants in the field, not from the leftover grain; dry it well, store it dry and safe from pests, and test germination before planting season. Community seed banks and exchanges spread good varieties and rescue local ones whose adaptations no shop sells.

Farmer learning

Knowledge grows by experiment and exchange: farmer field schools, demonstration plots, visits between farms, and honest records kept season by season. A farmer who trials a practice on one small plot before committing the farm is doing research in the best sense.

Markets and prices

Production without market knowledge donates profit to whoever has the information. Learn prices before selling — by phone, radio or cooperative — store where safe to sell after the harvest glut, and consider group selling to reach better buyers and share transport costs.

Records that pay

A simple notebook — planting dates, inputs, yields, sales — turns memory into management. At season's end the records say which enterprise truly paid and which merely kept the family busy. Sustainability includes the farmer's labour and cash, not only the soil.

Key points

- Select seed from the best plants; store it dry; test it.
- Trial small before committing the farm.
- Know prices before you sell; keep records that show what paid.

Exercises

1. Write a seed-selection and storage plan for one crop.
2. Design a one-plot trial of a new practice, with what you will measure.
3. From a season's invented records, calculate which of two enterprises paid better per day of labour.

Chapter 6

Planning a Farm That Lasts

The final chapter turns principles into a plan: how to walk a farm, map it, choose changes in the right order, and review them year by year so the system improves instead of drifting.

Walking and mapping the farm

Walk every corner with the household, in the wet season and the dry, and draw a map together: soils, slopes, water, trees, problem corners. Problems hidden from the homestead — the gully at the far boundary, the plot that never yields — enter the plan only when the walk reveals them.

Choosing the order of changes

Begin where a small effort repairs a broken connection or stops an active loss: the gully, the burned residues, the manure heap in the rain. Quick, visible wins build the confidence and cash for slower investments like terraces and tree planting. Never load a household with five changes at once.

The seasonal calendar

Lay the year's work on one page: land preparation, planting windows, weeding peaks, harvest, dry-season tasks, and the labour each demands. A calendar exposes clashes — two crops demanding weeding the same week — while they can still be fixed on paper.

Reviewing and adapting

At each season's end, sit with the records and the map: what worked, what failed, what will we change? Sustainability is not a design achieved once but this habit of review, kept for decades. The farm that lasts belongs to the farmer who keeps asking.

Key points

- Map the whole farm, in both seasons, with the household.
- Repair losses and broken connections first.
- Review every season; adapt on evidence.

Exercises

1. Draw a resource map of a real or imagined farm, marking two problems and two strengths.

2. Build a seasonal calendar for two crops and one livestock enterprise.

3. Write a one-year plan with exactly three changes, in order, with reasons.

Appendix — Worked Examples and Practice

From Chapter 1 — What a Farming System Is

Worked example: on a two-hectare farm, maize stover is burned each year while cattle graze far commons and their manure is lost. Simply corralling cattle at night on next season's maize plot moves the manure flow onto the field: one connection repaired, no purchase made, and yields rise the following season.

From Chapter 2 — Soil — The Living Foundation

Worked example: a hillside plot loses its topsoil each early storm. The farmer plants two grass strips across the slope on the contour and mulches between them with stover. Within two seasons the strips have trapped soil into natural terraces, the mulch holds moisture a week longer after rain, and the plot out-yields its unprotected neighbour.

From Chapter 3 — Water — Catching, Keeping, Using

Worked example: a 100 m^2 roof in a 20 mm storm sheds $100 \times 0.02 = 2$ cubic metres — 2,000 litres — of water. A tank or a pond receiving it can carry a kitchen garden through weeks of dry weather. The arithmetic takes a minute; the habit of doing it changes how a household sees every roof and road.

From Chapter 4 — Crops, Livestock and Trees Together

Worked example: maize–bean intercrop on one hectare commonly yields the maize of about 0.8 ha grown alone plus the beans of about 0.5 ha alone — a land equivalent ratio of 1.3, as if the farm had grown by a third. The beans also leave nitrogen for the next crop. Two gains, one field.

From Chapter 5 — Seeds, Knowledge and Markets

Worked example: a germination test takes ten minutes: count 100 seeds onto damp cloth, keep them moist, and count sprouts after the crop's usual days. Eighty-seven sprouted means 87 per cent germination — sow a little thicker, or replace the seed lot, before the rains make the decision for you.

From Chapter 6 — Planning a Farm That Lasts

Worked example: a family's plan for year one holds only three changes: night-corralling cattle on the maize plot (manure flow repaired), grass strips on the sloping field (loss stopped), and seed selection at harvest (future secured). Each costs labour, not cash; each shows results within one season; together they fund and encourage year two.

Further Practice — Review and Discussion

Work through these prompts in writing; they are the revision spine of this book. Answer in full sentences, with examples from your own place of study wherever the prompt allows.

Chapter 1 — What a Farming System Is

- Explain in your own words, with one example: Analyse connections, not only components.
- Explain in your own words, with one example: The household's goals define what 'better' means.
- Explain in your own words, with one example: Sustainability is long-run bookkeeping of soil, water and nutrients.

Discussion: where does the subject of this chapter — what a farming system is — touch your own community, farm, school or workplace? Write one page, naming real places and real constraints, and end with one question you would research next.

Chapter 2 — Soil — The Living Foundation

- Explain in your own words, with one example: Organic matter is the soil's savings; build it, do not spend it.
- Explain in your own words, with one example: Keep soil covered and slow the water on slopes.
- Explain in your own words, with one example: Combine legumes, manure, compost and fertiliser wisely.

Discussion: where does the subject of this chapter — soil — the living foundation — touch your own community, farm, school or workplace? Write one page, naming real places and real constraints, and end with one question you would research next.

Chapter 3 — Water — Catching, Keeping, Using

- Explain in your own words, with one example: Slow it, spread it, sink it.
- Explain in your own words, with one example: Soil organic matter is the cheapest reservoir.
- Explain in your own words, with one example: Irrigation: right amount, right place, right hour.

Discussion: where does the subject of this chapter — water — catching, keeping, using — touch your own community, farm, school or workplace? Write one page, naming real places and real constraints, and end with one question you would research next.

Chapter 4 — Crops, Livestock and Trees Together

- Explain in your own words, with one example: Rotate and intercrop to break pest cycles and balance nutrients.
- Explain in your own words, with one example: Match animal numbers to feed the land can give.
- Explain in your own words, with one example: Trees are crops with extra gifts; site and prune them deliberately.

Discussion: where does the subject of this chapter — crops, livestock and trees together — touch your own community, farm, school or workplace? Write one page, naming real places and real constraints, and end with one question you would research next.

Chapter 5 — Seeds, Knowledge and Markets

- Explain in your own words, with one example: Select seed from the best plants; store it dry; test it.
- Explain in your own words, with one example: Trial small before committing the farm.
- Explain in your own words, with one example: Know prices before you sell; keep records that show what paid.

Discussion: where does the subject of this chapter — seeds, knowledge and markets — touch your own community, farm, school or workplace? Write one page, naming real places and real constraints, and end with one question you would research next.

Chapter 6 — Planning a Farm That Lasts

- Explain in your own words, with one example: Map the whole farm, in both seasons, with the household.
- Explain in your own words, with one example: Repair losses and broken connections first.
- Explain in your own words, with one example: Review every season; adapt on evidence.

Discussion: where does the subject of this chapter — planning a farm that lasts — touch your own community, farm, school or workplace? Write one page, naming real

places and real constraints, and end with one question you would research next.

Glossary of Key Terms

Farming system — The whole farm — parts and connections — managed by a household toward its goals.

Organic matter — The living and once-living fraction of soil that holds water and nutrients and feeds soil life.

Intercropping — Growing two or more crops together in the same field and season.

Land equivalent ratio — The relative land area under sole crops needed to match intercrop yields.

Agroforestry — Deliberate integration of trees with crops or livestock on the same land.

Water harvesting — Collecting and directing runoff for productive use.

Resilience — A system's ability to absorb shocks and keep functioning.

Rotation — The planned sequence of crops on a field across seasons.

End of book. Nji Griphan · griphan.48hourrfprescue.com · info@griphan.48hourrfprescue.com