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Post-Harvest Technology

Handling, storage and processing — keeping the harvest the field produced

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A note on this book

A harvest is not food until it survives the store. Post-harvest technology — the handling, drying, storage and processing of farm produce — is the third core subject of this school, and it matches my research home at the Centre for Food Technology and Research in Makurdi. This book follows produce from the field's edge to the table and the market, showing where harvests are lost and

how knowledge saves them.

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Chapter 1

Why Harvests Are Lost After Harvest

A sobering share of the world's food is produced, harvested — and then lost before anyone eats it. This chapter maps the post-harvest chain and its loss points, because each loss has an address, and what has an address can be fixed.

The chain from field to table

After harvest, produce passes through drying, threshing or shelling, cleaning, transport, storage, processing and distribution. At every step, quantity and quality can leak away — to mould, insects, rodents, spillage, heat and time. Post-harvest technology is the engineering of this whole chain, not of any single store.

Quantity loss and quality loss

Quantity loss is produce that disappears or is discarded. Quality loss is subtler: grain that remains but is mouldy, broken, discoloured or nutritionally drained sells for less and nourishes less. A store can show full sacks and still have lost a third of the harvest's value.

The enemies: moisture, pests, heat, time

Moisture above safe levels feeds moulds — some producing poisons such as aflatoxins — and lets insects multiply. Heat accelerates every decay. Time multiplies all of them. Nearly every technique in this book is an attack on one of these four enemies.

Losses are a food-security issue

Every tonne saved after harvest is a tonne that required no new land, seed or rain. For food security, post-harvest work is the cheapest production there is — which is why research centres for food technology exist, and why this school teaches the subject at its heart.

Key points

- Loss happens at every step of the chain; each step can be improved.
- Quality loss hides inside full sacks.
- Moisture, pests, heat and time are the four enemies.

Exercises

1. Walk one produce chain you know and list its loss points.

2. Give an example each of quantity loss and quality loss.

3. Rank the four enemies for a stored crop in your area, with reasons.

Chapter 2

Harvest Maturity, Handling and Drying

Post-harvest quality is largely decided in the first days: at what maturity produce is harvested, how gently it is handled, and how promptly and properly it is dried. This chapter teaches those first days.

Harvest maturity

Grains are harvested when mature and as dry as the field allows; fruits and vegetables at the maturity their market journey requires — firm for distance, ripe for the local pot. Harvesting immature produce guarantees losses no storage can repair: the quality was never there to keep.

Gentle handling

Bruises and cracks are doors for mould and insects. Handle produce as eggs are handled: clean containers, no throwing, no walking on heaps, shade while awaiting transport. Perishables suffer most — a bruised fruit rots from the bruise outward and infects its neighbours.

Drying — the master technique

Drying removes the moisture that feeds decay. Spread produce thinly on raised, clean surfaces — mats, tarpaulins, racks — never on bare earth where it picks up moisture, stones and contamination. Turn it for even drying, cover it against rain and dew, and bring it in at night.

Knowing when it is dry enough

Each crop has a safe storage moisture — maize grain around 13 per cent, for example. Where meters exist, use them; where they do not, learn the traditional tests: the bite, the sound, the salt-bottle test. Storing 'almost dry' produce is storing mould on a timer.

Key points

- Quality is decided in the first days after harvest.
- Handle produce gently; bruises are doors for decay.
- Dry thin, raised and clean — and verify dryness before storing.

Exercises

1. State safe storage moisture for two crops and how to test without a meter.

2. List five handling faults between field and store and their costs.

3. Design a drying setup for a small farm using local materials.

Chapter 3

Threshing, Cleaning and Grading

Between drying and storage stand the operations that turn harvested plants into clean, graded produce. This chapter covers threshing and shelling, winnowing and cleaning, and the grading that turns produce into a product a buyer trusts.

Threshing and shelling

Threshing separates grain from the plant; shelling frees maize kernels from the cob. Methods range from hand beating and pedal threshers to engine machines. Judge each by three measures: how much grain it recovers, how little it breaks, and how much labour it saves — broken grain stores badly and sells cheaply.

Cleaning and winnowing

Winnowing uses wind to lift chaff from grain; sieves sort by size and remove stones and debris. Clean produce dries evenly, stores safely and grades honestly. The few minutes cleaning takes are repaid at every later step of the chain.

Grading — sorting by quality

Grading sorts produce into classes by size, soundness and cleanliness, so each class can be priced and used appropriately: the best for seed or premium sale, the sound ordinary for food, the damaged for immediate processing — never silently mixed into the good.

Seed deserves its own road

Grain intended for seed is selected at harvest from the best plants, threshed gently, cleaned carefully and stored apart, labelled with variety and year. Seed mixed into the food store is seed eaten in a hungry month — and a variety lost.

Key points

- Judge threshing by recovery, breakage and labour.
- Clean produce dries evenly, stores safely, grades honestly.
- Keep seed on its own road from harvest to sowing.

Exercises

1. Compare two threshing methods on the three measures.

2. Write grading classes for one produce and the use of each class.

3. Design the seed road for one crop from field to store.

Chapter 4

Storage — Structures, Pests and Protection

Storage defends the harvest against its enemies for months at a time. This chapter compares storage structures, teaches store hygiene and pest management, and introduces improved methods that keep grain safe without poisoning the food.

The store itself

A good store is dry, ventilated as its design requires, proof against rain, rodents and thieves, and raised off the ground. Bags stand on pallets or dunnage, away from walls, in stacks that allow inspection. Most storage disasters begin as building faults, not pest miracles.

Store hygiene

Clean the store and repair it before the new harvest enters; remove old residues where pests overwinter; inspect incoming produce and never mix new grain onto infested old stock. The cheapest pest control ever sold is a broom, applied before the harvest arrives.

Insects, rodents and moulds

Weevils and borers eat grain from inside; rodents eat and contaminate far more than they eat; moulds follow moisture. Management is layered: dry produce, clean store, sealed or hermetic containment where possible, regular inspection, and chemicals only as directed, never loose-mixed with food grain.

Hermetic storage

Hermetic bags and silos seal grain away from air; insects inside suffocate and new ones cannot enter, protecting dry grain for months without insecticide. The conditions are strict — grain must enter truly dry and the seal unbroken — and where they are met, the method is among the finest gifts of post-harvest research to small farmers.

Key points

- Dry, raised, inspectable: the store's three duties.
- Hygiene before harvest is the cheapest pest control.
- Hermetic storage protects dry grain without insecticide.

Exercises

1. Inspect a real store against this chapter and write its fault list.

2. Explain how hermetic storage kills insects without poison.

3. Write a pre-harvest store preparation checklist.

Chapter 5

Processing — Adding Value and Safety

Processing transforms produce: milling, fermenting, drying further, parboiling, extracting oil. Done well it adds value, extends life and can add safety; done carelessly it subtracts nutrition and invites contamination. This chapter surveys the processor's craft.

Why process at all?

Processing makes produce edible (milling grain, cooking), storable (drying fruit, fermenting), transportable (oil from seed) and more valuable (flour from grain). Every farming community processes; the technologist's work is to make each step safer, less laborious and less wasteful.

Milling and the nutrition question

Milling grain to flour removes bran and germ along with their fibre, vitamins and minerals. Whiter is not automatically better: the processor balances the market's preference against the eater's nutrition, and fortification — restoring named nutrients — is one honest answer where diets need it.

Fermentation and traditional processing

Fermentation preserves and transforms — souring, flavouring and often detoxifying, as in properly processed cassava products where traditional knowledge carries real food-safety science. Respect and study these methods before improving them; they are research results, arrived

at over generations.

Hygiene in processing

Clean water, clean surfaces, clean hands, sound raw material: processing concentrates whatever enters it, including contamination. Aflatoxin in a raw lot does not vanish in the mill. Processors protect the public; their hygiene is a public trust, regulated for good reason.

Key points

- Processing adds value, life and safety — or subtracts them.
- Whiter flour is not automatically better food.
- Traditional processing embodies real science; study before improving.

Exercises

1. Trace one local processed food from raw produce to plate, step by step.
2. Discuss the milling–nutrition trade-off for one grain.
3. Write hygiene rules for a small processing shed.

Chapter 6

Quality, Safety and the Road to Market

The final chapter joins the chain's end to its purpose: produce that is safe, honestly graded and profitably sold. Quality standards, food safety duties and market knowledge complete the post-harvest technologist's education.

Standards and what they protect

Standards name measurable quality: moisture limits, defect tolerances, contamination limits. They protect eaters from harm and honest traders from unfair competition, and they open doors — larger buyers and export markets buy only what standards certify.

Food safety — the invisible quality

The most dangerous defects cannot be seen: aflatoxins from mould, chemical residues, microbial contamination. Safety is built through the whole chain — dry fast, store dry, process hygienically — and verified by testing where the stakes require. No label repairs an unsafe product.

Packaging and transport

Packaging protects produce from moisture, pests and damage, carries the label that identifies it, and presents it to the buyer. Transport continues storage: covered, dry, timely. Many a well-stored harvest has been lost in one rainy, uncovered journey.

The technologist's road

Keep records of losses and their causes, season by season; each figure is a research question with an address. Post-harvest technology advances exactly as agronomy does — by measurement, honest reporting and shared results — and this school's research volumes stand ready to serve it.

Key points

- Standards protect eaters and honest traders alike.
- Safety is built along the whole chain, not tested in at the end.
- Record losses with their causes; each is a research question.

Exercises

1. Find the standard for one produce: its moisture and defect limits.
2. List the safety duties at each step of one chain.
3. Design a label for a bag of graded produce.

Appendix — Worked Examples and Practice

From Chapter 1 — Why Harvests Are Lost After Harvest

Worked example: a farmer harvests 40 bags of maize and stores them undried on an earthen floor. By the fourth month, mould and weevils have ruined 9 bags outright, and the rest sells at a discount for discolouration. Field yield: 40 bags. Food and income: nearer 27. The loss was not in the farming — it was in the four months after it.

From Chapter 2 — Harvest Maturity, Handling and Drying

Worked example: the salt test for dryness — shake dry salt with grain in a sealed bottle for some minutes. If the salt sticks to the glass, the grain is still too wet for storage; if it flows freely, the grain is near safe dryness. A bottle and a spoonful of salt stand in for a laboratory — imperfectly, but honestly, and far better than a guess.

From Chapter 3 — Threshing, Cleaning and Grading

Worked example: a mixed lot of groundnuts sells at the lowest grade's price, because buyers price what they cannot verify at the worst they can see. The same harvest graded into two classes sells its better half at a premium exceeding the labour of grading — sorting is not cosmetics; it is information the buyer will pay for.

From Chapter 4 — Storage — Structures, Pests and Protection

Worked example: two neighbours store identical dry maize — one in a sealed hermetic bag, one in a woven sack in the same room. After five months the sack's grain is webbed and bored, its weight down measurably; the hermetic bag opens clean. The difference was not the room or the season: it was air, admitted or denied.

From Chapter 5 — Processing — Adding Value and Safety

Worked example: parboiling rice before milling drives nutrients from the bran into the grain itself, so even polished parboiled rice keeps more of the original goodness, and its grains break less in the mill. One traditional step, two gains — nutrition and recovery — which is why food technology studies tradition as carefully as machinery.

From Chapter 6 — Quality, Safety and the Road to Market

Worked example: a cooperative's maize is rejected by a large buyer for moisture at 15 per cent against a 13.5 limit. The rejection costs a season's premium — and teaches the cooperative to buy one moisture meter collectively, the cheapest capital purchase it ever makes. Standards, met knowingly, turn rejection into a checklist.

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 — Why Harvests Are Lost After Harvest

- Explain in your own words, with one example: Loss happens at every step of the chain; each step can be improved.
- Explain in your own words, with one example: Quality loss hides inside full sacks.
- Explain in your own words, with one example: Moisture, pests, heat and time are the four enemies.

Discussion: where does the subject of this chapter — why harvests are lost after harvest — 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 — Harvest Maturity, Handling and Drying

- Explain in your own words, with one example: Quality is decided in the first days after harvest.
- Explain in your own words, with one example: Handle produce gently; bruises are doors for decay.

- Explain in your own words, with one example: Dry thin, raised and clean — and verify dryness before storing.

Discussion: where does the subject of this chapter — harvest maturity, handling and drying — 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 — Threshing, Cleaning and Grading

- Explain in your own words, with one example: Judge threshing by recovery, breakage and labour.
- Explain in your own words, with one example: Clean produce dries evenly, stores safely, grades honestly.
- Explain in your own words, with one example: Keep seed on its own road from harvest to sowing.

Discussion: where does the subject of this chapter — threshing, cleaning and grading — 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 — Storage — Structures, Pests and Protection

- Explain in your own words, with one example: Dry, raised, inspectable: the store's three duties.
- Explain in your own words, with one example: Hygiene before harvest is the cheapest pest control.
- Explain in your own words, with one example: Hermetic storage protects dry grain without insecticide.

Discussion: where does the subject of this chapter — storage — structures, pests and protection — 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 — Processing — Adding Value and Safety

- Explain in your own words, with one example: Processing adds value, life and safety — or subtracts them.
- Explain in your own words, with one example: Whiter flour is not automatically better food.
- Explain in your own words, with one example: Traditional processing embodies real science; study before improving.

Discussion: where does the subject of this chapter — processing — adding value and safety — 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 — Quality, Safety and the Road to Market

- Explain in your own words, with one example: Standards protect eaters and honest traders alike.
- Explain in your own words, with one example: Safety is built along the whole chain, not tested in at the end.
- Explain in your own words, with one example: Record losses with their causes; each is a research question.

Discussion: where does the subject of this chapter — quality, safety and the road to market — 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

Post-harvest technology — The handling, drying, storage and processing of produce after harvest.

Aflatoxin — A poison produced by certain moulds on produce stored too moist.

Hermetic storage — Sealed storage in which insects die for lack of air.

Safe moisture — The moisture content at or below which produce stores without mould.

Grading — Sorting produce into quality classes for use and pricing.

Parboiling — Part-boiling grain in its husk before milling, driving nutrients inward.

Quality loss — Loss of value or nutrition without loss of quantity.

Dunnage — Material raising stored bags off the floor.

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