

Methods note · Everyday practice

Substitute the meal, not just the ingredient

Kaisa Lehtinen · 12 October 2026

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ABSTRACT

Food substitutions change recipes, yields, preparation, and the service diners receive, not simply the mass of an ingredient purchased. This methods note develops a complete-meal comparison for a fictional community kitchen using Poore and Nemecek's harmonised food assessment, FAO and WHO diet principles, and the GHG Protocol Product Standard. It examines raw and cooked units, nutritional constraints, retail boundaries, kitchen energy, losses, coproduct allocation, and the difference between average inventories and marginal consequences. A hypothetical stew comparison identifies missing observations without inventing acceptance results or footprints. No savings or dietary prescription are offered. The practical implication is to assess suitable eating occasions under consistent boundaries while retaining food safety, affordability, cultural acceptability, and access as independent requirements.

Keywords: food substitution · meal units · system boundaries · dietary services

A source-based editorial text, not a report of original Still North research. Examples and imagery are illustrative.

What exactly is being substituted?

A recipe change is not simply an exchange of equal weights. Replacing meat with pulses can alter water uptake, cooking time, portion size, flavour, nutritional composition, and the amount people leave uneaten. Comparing emissions per kilogram of purchased ingredients can inform the decision, but it cannot by itself establish the footprint of the meal actually served and consumed.

This methods note asks how a community kitchen can compare food substitutions without losing those changes at the system boundary. It draws on Poore and Nemecek's original harmonised food assessment, FAO and WHO's sustainable healthy diet principles, and the GHG Protocol Product Standard. The synthesis is selective and concerned with comparison design. Its worked menu is fictional, with no measured food footprints, acceptance results, or claimed savings.

The immediate decision is how to provide suitable meals within a real kitchen's constraints. Climate is an important outcome, but a meal must also be safe, nutritionally appropriate, affordable, acceptable, and possible to prepare. A change that reduces one footprint estimate by leaving diners hungry or excluding an allergy group has changed the service, not merely improved its delivery.

Choose a service unit before a food unit

For purchasing, kilograms can be a sensible operational unit. For dietary questions, energy, protein, or another nutrient may be relevant. For a kitchen, the functional description might be one hundred adequate lunches of a specified menu for a defined group, including required alternatives. None is universally correct. The choice should follow the decision, and a useful analysis may report more than one denominator.

Protein equivalence alone does not establish nutritional equivalence. Foods and diets supply multiple nutrients, and requirements differ across life stages and individual circumstances. The FAO and WHO guiding

principles place health, environmental pressures, affordability, cultural acceptability, and access within the same account. They do not provide a licence to prescribe one universal replacement recipe or to reduce a whole diet to a single nutrient.

In an institutional kitchen, appropriate nutrition and food-safety expertise should define the service constraints. Separate general menu design from individual medical dietary needs. A paper about emissions should not improvise allergy management or clinical advice. An alternative that satisfies the selected comparison unit must still meet the independent requirements that make the meal suitable.

A fictional stew comparison

Imagine a fictional kitchen considering two lunches for one hundred people. Menu A is a meat-and-vegetable stew with bread. Menu B is a pulse-and-vegetable stew with a different quantity of grain and oil. Both require professionally checked recipes and suitable alternatives. The comparison concerns the complete meal, not equal masses of meat and dry pulses placed in shopping baskets.

Write a recipe inventory for each menu. Record purchased mass, edible mass, cooked yield, and intended portions. Dry pulses absorb water, while other ingredients may lose water during preparation. A kilogram in a footprint database must be matched to the database's product state. Confusing dry, cooked, drained, raw, and edible weights can generate a large apparent difference without any genuine change in the meal.

For illustration, suppose each menu is planned for one hundred portions but the kitchen does not yet know acceptance or plate waste. It cannot assume every portion will be consumed, nor invent poorer acceptance for an unfamiliar dish. A small, consent-respecting menu trial could examine portion adequacy and leftovers. That trial would inform local service performance, not establish a general preference for either food category.

The correct comparison may change if Menu B needs a separate side dish for some diners or if either menu uses ingredients already held in stock. Include the actual alternatives and explain what existing food would otherwise become. Throwing away stock to make room for a supposedly lower-impact ingredient is not the same intervention as changing the next procurement order.

Extend the boundary from retail to the table

Poore and Nemecek's 2018 study harmonises production and supply-chain information across foods and environmental indicators. Its described system runs from inputs to retail. That boundary makes it relevant to sourcing comparisons, but it does not include every kitchen process required for the fictional lunch. Cooking, storage after purchase, and local meal waste need additional treatment if they differ materially.

For each menu, identify refrigeration, freezing, preparation, cooking, hot holding, reheating, and cleaning. Use actual kitchen processes rather than stereotypes about foods. Batch cooking can have a different requirement from cooking a small portion repeatedly. A long cooking time is not enough to infer energy use without knowing equipment, load, temperature programme, and whether cooking is shared with other dishes.

Transport requires similar discipline. The distance from farm to kitchen does not by itself establish transport emissions or total impact. Mode, load, refrigeration, and upstream production matter. A local label is not an inventory. Where an ingredient database already includes distribution, avoid adding the same journey again. State whether the kitchen's own collection trip is additional or combined with an existing route.

Keep losses and substitutions symmetrical

Food losses occur at different stages and need different denominators. Retail loss embedded in a database should not be counted again as kitchen waste. Preparation scraps, unserved surplus, and plate leftovers are separate flows. Measure them safely and proportionately, and distinguish edible avoidable waste from unavoidable parts where that distinction matters. Do not interpret every gram in a bin as an equivalent missed meal.

The GHG Protocol Product Standard provides a life-cycle framework, but comparative claims need consistent rules. If one food inventory includes land-use change, packaging, and waste while another excludes them, placing their numbers in the same table does not align their boundaries. Document differences and seek compatible sources before claiming a precise local comparison.

Coproducts introduce another choice. Some agricultural systems produce several saleable outputs, and assessments allocate burdens using specified rules. A menu comparison should not select whichever allocation most favours each ingredient. Nor should it give an unverified credit for manure, leather, crop residues, or another displaced product. Follow a consistent method and disclose when an allocation assumption could affect interpretation.

Average footprints are not exact marginal effects

A database describes products under its sampling and modelling choices. It does not identify the exact farm supplying a particular purchase, and it does not automatically predict how a market responds when one kitchen changes its order. Poore and Nemecek explicitly examine producer variation and multiple impact indicators. Their work supports attention to supply-chain heterogeneity, not false precision about an undocumented supplier.

A purchasing assessment can consistently allocate emissions to the meals bought. A consequential question asks what production, land use, prices, or other consumption changes because demand changes. Those questions require different evidence. Do not describe an allocated difference as verified avoided emissions, or conclude that an individual order has no consequence simply because a supplier's short-term production schedule does not immediately change.

Climate should also remain distinct from other environmental outcomes. A lower greenhouse-gas estimate does not automatically imply a lower water-scarcity burden or every other impact. Use the indicators relevant to the decision and their proper geographical context. A kitchen can make a justified choice while acknowledging trade-offs rather than claiming that its preferred ingredient is environmentally superior in all respects.

What to document and what remains uncertain

A practical comparison record needs the complete recipes, service requirement, ingredient states, portions, data sources, included stages, and waste assumptions. Add cost, labour, access, and diner feedback as independent decision information. Prioritise the gaps that could change the choice. For example, uncertain cooked yield may deserve attention before small differences in delivery packaging.

This note does not estimate nutritional adequacy, local acceptance, or environmental impacts for either fictional menu. It cannot turn global average inventories into supplier certification or replace safe food handling. Seasonal sourcing, kitchen capacity, cultural expectations, and income constraints can alter feasible substitutions. A transparent comparison should retain those constraints instead of assuming an ideal kitchen and an interchangeable set of diners.

The useful implication is to substitute a complete, suitable eating occasion and examine the flows needed to deliver it. That keeps a promising ingredient change connected to actual nourishment and practice. A lower-impact meal becomes a defensible claim only when the units, boundaries, and evidence refer to the meal people can genuinely receive, rather than to an attractive number detached from the plate.

References

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