

Methods for Agrifood Transformation Research: Best Practices in Conducting Processed Food Inventories

D. Tschirley, C. Ijumba, S. Liverpool-Tasie, G. Mosse, J. Massingue, J. Snyder

Note: At the time of this writing, processed food inventories had been conducted under the Food Security Policy Innovation Lab (FSP) in Mozambique, Tanzania, and Nigeria. An additional inventory had been conducted by IFPRI under other funding in Ghana, and MSU was considering conducting an inventory in Mali. This write-up reflects a continuing evolution of thinking about the conduct of these inventories, with an emphasis on standardization across countries; it therefore does not exactly reflect what was done in any one country. The key aspects that have evolved are (a) more careful definitions of key concepts and (b) discussion of the level at which the inventory is done (city, or city-retail outlet type).

Background

The objective of processed food inventories is to develop a quick sense for (a) the range of processed foods available for sale at retail in urban markets, and (b) the number and relative prevalence of *companies* and *products* that are (i) manufactured locally, (ii) imported from regional neighbors, and (iii) imported from the “world market.”¹ The emphasis is on numbers of products and companies; no attempt is made to estimate volumes. Limiting the objectives in this way allows the work to generate valid data without statistical sampling, which results in much quicker data collection and much lower cost. Typically such an inventory would be done only as the first step in a broader research program that will later collect more detailed quantitative data based on statistical samples.

¹ In the work in Mozambique and Tanzania, imports from “the world market” were defined as those coming from outside of Sub-Saharan Africa (SSA) plus those coming from South Africa. We included South Africa in “world market” due to the vastly different level of development seen there, compared to most of the rest of SSA.

Additional information that can be obtained from the inventories includes:

1. Names and other information (phone, address, email, etc.) of companies selling in the city and the products they sell. The information on companies forms an ideal list frame that can be used for later sampling of food processors. The information on products can allow pre-programming of product selection (and associated information about it) in a later retail survey if the survey is done on a tablet.
2. Specific manufacturing and contact location (if an address or phone number is given on the label) and other identifying information for each product
3. Ingredients in each product
4. Type of packaging

To date, the inventories have been done at the level of cities; statements can be made at that level, and *not* at the level of type of retail outlet within a city. For example, the inventories to date would not allow comparison across supermarkets and other types of outlets regarding the numbers of processed foods, or differing proportions of products coming from local, regional, or world markets. This note is built around methods for inventories at city level, with additional explanations of what would have to be done to generate data at the level of city-retail outlet type.

This type of work is well suited for quick production of useful policy research briefs, providing broad and new information about the food processing sector, and doing so quickly and at low cost. If the inventory is done at city-retail outlet type level across more than one city, then the comparative view across cities and outlet types can, with proper contextualization, lead to publishing in an applied peer-review journal such as *Ag Outlook* or other.



Methods

The essential approach is to visit different outlets within each retail outlet type, to take photos of all labeling on all products in the defined *processed food groups* you have decided to focus on, to enter the data after the visit, and to continue visiting a range of outlets until few if any new products are being found in your defined processed food groups. Multiple outlets in each retail outlet type should be visited even in a city level approach to ensure that products found predominantly in only one retail outlet type are recorded.

Spatial considerations are also important. Since most cities have marked spatial variability in income levels that is likely to affect numbers and types of processed foods available in stores and markets, one should identify “high”, “medium”, and “low” income areas and cover outlets in each; this information can usually be easily obtained from several key informant interviews. As a further precaution, the team should be sure, within each area, to avoid selecting closely clustered outlets.

The work is built around photos, rather than recording of information on a form in the stores, because such an approach dramatically reduces the amount of time the research team needs to spend in each store. This is a major consideration especially among the first few stores visited, since many new products will typically be encountered in the first stores.

At the same time, the taking of photos can arouse concerns among store managers or owners. We recommend the following procedures to overcome such concerns:²

1. Obtain a letter on institutional letterhead that explains the purpose of the work and the amount of time it might take, and requests the cooperation of the store owner or manager. The institution can be chosen based on the circumstances of your research team and what is most appropriate in the country. Explain in the letter that you wish to take photos in order to reduce the time that the team is in the store and thus minimize disruption to their activities.
2. Depending on typical procedures in your country, you may need an official from the Ministry of Commerce to accompany you and explain the purpose of the research to the store owners / managers. If not strictly necessary, we suggest that this be avoided.
3. Present the letter when entering a store, explain it verbally, and answer any questions the owner / manager might have. If you already have some photos, offer to show them to the owner / manager to better illustrate what you wish to do.
4. Respect the owner / manager’s decision: if they decline to cooperate, thank them and move on. In our experience, a large majority of owners / managers agree to allow the data collection, so some rejections are not a problem. Also, because the work is not based on statistical sampling, there are no procedural complications introduced by any rejection nor is the validity of the data compromised, as long as the team is able to get enough acceptances to conduct a full inventory.

Specific data collection procedures are as follows:

1. Identify the range of *retail outlet types* that exist in the city where you’re doing the inventory. We suggest the following, which follows breakdowns used in the literature:
 - a) Stalls in open air markets
 - b) Street vendors - stalls not associated with market places
 - c) Traditional shops (not self-service)
 - d) Grocery stores (self-service with only 1 register),
 - e) Modern, non-chain supermarkets (self-service with 2 or more registers)
 - f) Modern, chain supermarkets (self-service with 2 or more registers)
2. Decide the *processed food groups* you want to inventory. We recommend using the ISIC (Rev 4) categories of processed foods:³ (a) processed meats; (b) processed fish, crustaceans, and molluscs; (c) processed fruits and vegetables; (d) manufactured dairy products; (e) manufactured grain mill products;⁴ (f) other manufactured foods; and (g) animal feeds.

² Check with your institution regarding consent processes approved by an IRB for this kind of work; such processes may not be needed in this case since the work does not involve interviews or recording of any personal or identifying information of any kind.

³ <http://unstats.un.org/unsd/cr/registry/regcs.asp?Cl=27&Lg=1&Co=10>

⁴ Note that ISIC includes “vegetable milling” in this category, which it defines as “production of flour or meal of dried leguminous vegetables, of roots or tubers, or of edible nuts.” This category thus includes all milled food products, not just those popularly conceived of as “grain” products.

Inclusion of all groups would of course provide the most complete inventory but can be infeasible; choose those for which you expect to conduct further research in later phases of the program.

3. Decide the *product types* you wish to inventory within each processed food group. Visit a range of outlets prior to data collection to informally identify the types of products available and identify any that might be particular to your country and important to your broader research agenda. Product type is based on (a) the processed food group, (b) the particular raw material(s) used, and (c) the type of processing, resulting in a relatively homogeneous product:

$$\text{Product type} = \text{processed food group} + \text{raw material(s)} + \text{type of processing}$$

4. For example:

- a) Within the grain mill products group, one could find product types such as maize meal; wheat flour (same type of processing but a different raw material); meals made with multiple grains (also same processing but several different raw materials); bread (different type of processing resulting in an obviously different type of product); breakfast cereals, and so on.
- b) Within the dairy products group, one could find fresh pasteurized milk; UHT milk; cheese; yoghurt; and others.

5. Decide whether to distinguish between different flavors or other gradations within a product type. For example, maize meal often comes in two basic types (more- and less refined) that consumers clearly distinguish and that carry different prices; yoghurt can have many flavors based on secondary ingredients (peach, strawberry, plain, etc); similarly, fruit juice is intuitively treated as a product type, but can be made from different fruits; cheese also is intuitively treated as a product group since it uses the same basic ingredient (milk) and the same broad processing technique to result in a broadly similar set of products, yet many different specific types of cheese can be made.

- a) **We recommend that these gradations be included and distinguished** in any inventory, especially if different gradations appear to carry systematically different prices. An example would be refined and less refined maize meals; different flavors of fruit juice (or of yoghurt) may have lesser price differences. Including the gradations

in an inventory can be done by adding "product sub-type" when needed. "Sub-type" would refer to a flavor or other variation on product type, as discussed above.

6. Define "product" as the intersection of processed food group, product type (and sub-type when needed), and the company producing it

$$\text{Product} = \text{processed food group} + \text{product type} + \text{product sub-type} + \text{company}$$

So, for example, a refined maize meal (the refined sub-type within the product type of maize meal and the processed food group of grain mill products) produced by two different companies is two different products.⁵

7. In a city level inventory:

- a) Conduct a first round of visits to 2-3 individual outlets within each retail outlet type, located in different areas of the city. Spreading the outlets across the city is important because some products may be highly localized in their distribution.
- b) In the first visited outlet (of whatever type), take photos of the labels of every specific *product* you find. You may need more than one photo per product to get all information. In the next outlet, take photos only of new products; any product already photographed is not photographed again.
- c) Proceed through the 2-3 outlets within each outlet type to ensure full coverage.
- d) If new products were still being found in the final visited outlet, conduct a second round, again visiting 2-3 different outlets within each outlet and taking photos of new products.
- e) End the inventory when no new products are being encountered within any product type.⁶

⁵Note that this intersection may also be viewed as defining a "brand". Yet "brand" does not lend itself to precise definition. At times company does determine brand, but some companies have multiple brands. If you find a company with more than one brand for the same product as defined by group-type-subtype-company, then each brand should be called a separate product. In practice this, this time to be rare in the agrifood systems of SSA.

⁶In Dar es Salaam, the team found a very large number of highly localized maize meal brands, eventually identifying more than 60 but still finding some new brands in new stores. Since all other product types were not generating new products, they chose not to continue the inventory and instead to note the situation with maize meals when publishing results.

8. In a city-outlet type inventory:
 - a) Visit several outlets within one retail outlet type, loosely spread across the city. Take photos of any product that is new *to this particular retail outlet type*. Continue visiting outlets and taking photos until no new products are being encountered within any product type.
 - b) Repeat the process in the each of the other retail outlet types, again taking photos of any product that is new to this particular retail outlet type.
 9. When many products are present in the market, it may be easy to miss a new one, or to re-photograph one you've already recorded. In this case, you may consider developing a consolidated list after the first day of work, with product type, sub-type, and product name. Sorted by product name and printed, this can serve as a reference to avoid such errors as the work proceeds and fewer new products are found in each outlet.
 10. Data can be entered in an excel spreadsheet or stata, whichever the researchers prefer. Typical variables include:
 - a) Country
 - b) City
 - c) Retail outlet type (if a city-outlet type inventory)
 - d) Processed food group
 - e) Product type
 - f) Product sub-type
 - g) Product name
 - h) Top three or four ingredients, if more than one
- i) Type of packaging: A key purpose of this variable is to distinguish between “simple” and “complex” packaging. The specific packaging encountered will vary by country, but examples from experience to date include clear plastic bag, polypropylene sack, colored plastic bag, paper sack, glass bottle, plastic bottle, hard plastic container, cardboard box, plastic cup, and tetra-pack (for UHT milk and other liquid products).
 - j) Does the package have a bar code? 1=yes, 2=no.
 - k) Is the bar code integrated (printed) into the labeling? 1=yes, 2=no, it is attached as a sticker.
 - l) Does the package include nutritional labeling information? 1=yes, 2=no.
 - m) Company name
 - n) Manufacturing location (within the country, regional, international): look always for the term “manufactured in” or some variant, since the location given on the label may simply indicate the local office of a firm that imports the product. If the phrase is not found, record the location but note this fact in the next variable.
 - o) Does the label explicitly state the country of manufacture? 1=yes, 2=no.
 - p) Other company information (address, phone number, web site, etc.)

Output

Specific output depends on the purpose of the inventory. The most basic output from a city level inventory done in a single city may look as follows:

Table 1. Number of processed food products and companies by product group and country of manufacture

Product Group	Country of Manufacture	Number of individual products	# of individual companies	Listing of product types (# of individual products)
“ABC”				
“DEF”				

If the inventory was conducted in more than one city, then an approach that compares across cities could be as follows:

Table 2. Number of processed food products and companies by product group, country of manufacture, and city of sale

Location of Manufacture	Total number of companies represented in:			Total number of products being sold in:		
	City 1	City 2	City 3	City 1	City 2	City 3
A Within the country						
B Neighboring countries						
C International						
D Total number						
E Percent local						
F Percent regional imports						
G Percent international imports						
H Percent total imports (F+G)						

See the policy research briefs produced in Tanzania and Mozambique (Snyder et. al. 2015a; Snyder et. al. 2015b; Massingue et. al. 2015) for more examples of output. Note that both these inventories were done in several cities but at city level, so do not include comparisons across retail outlet types.

Follow-on Work

We indicated above that a processed food inventory will often be the first formal step in a more in-depth program of research. A key contribution of the approach, in addition to preparing the researchers for the next steps, is that it provides output of wide potential interest much earlier than would otherwise be available. This can be quite helpful in stimulating interest in the work among key stakeholders (including policy makers) and thus in promoting uptake of research results into their thinking and behavior.

Typical survey work that might follow a processed food inventory could include:

1. A retail establishment survey based on a statistically designed (typically area-based) sample. Such a survey offers at least three key pieces of new information: (a) quantification of the volumes sold of the processed food group(s) that are the focus of the research, which could allow estimation of the market shares

within the food group of different retail outlet types (see above); (b) quantification of employment, which is a key area of interest in SSA now and for the foreseeable future; and (c) updating of the list of processed food products and companies producing them;

2. A survey of food manufacturers. The company list from the processed food inventory (updated, if needed, by the retail establishment survey) would serve as a list frame for this survey. Key data from such a survey includes quantification of sales volumes and employment for each firm; with a large enough sample, this data then allows estimating the size distribution of firms and the employment footprint by size. These structural issues, and their relationship to employment and competitiveness, are highly relevant to agrifood system research at this stage in these systems' development (Reardon and Timmer, 2012).

References

Massingue, J., G. Mosse, R. Uaiene, J. Mutondo, D. Tschirley, e E. Tostão (2015). “O QUE COMEMOS E ONDE É PRODUZIDO? Resultados do Inventário de Produtos Alimentares Processados em três Cidades Moçambicanas: Maputo, Chimoio e Nampula.” CEPPAG, U. de Eduardo Mondlane. Síntese para Políticas 02. Maputo.

Reardon, T. and P. Timmer (2012). “The Economics of the Food System Revolution.” *Annual Review of Resource Economics*, 4: 225-264

Snyder, J., C. Ijumba, D. Tschirley, and T. Reardon (2015a). “Local Response to the Rapid Rise in Demand for Processed and Perishable Foods: Results of an Inventory of Processed Food Products in Dar es Salaam.” Food Security Policy Innovation Lab. Tanzania Policy Research Brief #2. Dar es Salaam.

Snyder, J., C. Ijumba, D. Tschirley, and T. Reardon (2015b). “Stages of Transformation in Food Processing and Marketing: Results of an Initial Inventory of Processed Food Products in Dar es Salaam, Arusha, and Mwanza.” Food Security Policy Innovation Lab. Tanzania Policy Research Brief #3. Dar es Salaam.

This research is made possible by the generous support of the American people through the United States Agency for International Development (USAID) under the Feed the Future initiative. The contents are the responsibility study authors and do not necessarily reflect the views of USAID or the United States Government

Copyright © 2016, Michigan State University. All rights reserved. This material may be reproduced for personal and not-for-profit use without permission from but with acknowledgement to MSU.

Published by the Department of Agricultural, Food, and Resource Economics, Michigan State University, Justin S. Morrill Hall of Agriculture, 446 West Circle Dr., Room 202, East Lansing, Michigan 48824