Market-Oriented Smallholder Dairying Research

Working Document 2

A research methodology for characterising dairy product consumption systems

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Publications in this working document series include methodologies for, as well as preliminary results of, market-oriented smallholder dairy research conducted by ILCA scientists and their collaborators. This series is published informally to enable early dissemination of research outputs. It has not been prepared in accordance with the formal publication procedure of ILCA. Comments are welcome.

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1. INTRODUCTION

ILCA's Conceptual Framework for Market-Oriented Dairy Research (CF) was developed in response to the need for a practical methodology, grounded in experience and applicable by national agricultural research systems (NARS). Multi-disciplinary in design, the CF takes a production-to-consumption approach to the analysis of a dairy system, which in the context of the CF comprises the production, processing, marketing and consumption sub-systems. Development and implementation of research activities is phased, the information generated by each preceding phase determining subsequent directions and activities. Phase I is the typification of the dairy system with respect to its representativeness within and across sites. Phase II of the CF is the characterisation phase. Phase II entails "the detailed characterisation of dairy systems which includes quantification of their sub-systems, components and sub-components, at the household level for consumption, and at the firm or individual level for production, processing and marketing" (Rey et al, 1994). The objectives of this research phase are to:

1. Provide baseline data on the status of the consumption system;
2. Identify and understand factors influencing dairy product consumption, the constraints and opportunities to increased consumption, consumer rationale and objectives;
3. Understand linkages between the consumption system and the production, processing and marketing systems, and their influences on consumption; and,
4. Identify and prioritise researchable issues which can be expected to make an impact on dairy system development.

This document on characterisation methodology specifically refers to the dairy consumption system. The methodology developed and presented herein aims at guiding the activities of scientists who wish to investigate the dairy consumption systems at or around a specific site. Data collected and analyzed following this format will allow drawing conclusions about a particular location and its consumption system. It will also facilitate planning future research and development activities. By applying the same data-collection methodology across different sites, researchers and developers will derive additional benefit as they will be able to compare individual sites or to merge data for groups of sites regardless of location.

2. METHODOLOGICAL BACKGROUND

Some characterisation of dairy product consumption has been conducted at most ILCA zonal sites (Table 1). Pursued by different scientists at different times and places, a variety of methodological approaches have been employed in conducting these studies. This document is based upon ILCA's experiences at its zonal sites and incorporates the methodological lessons learned in the course of these studies. In particular:

1. Locations and samples should display readily identifiable characteristics; and,
2. While samples should be adequately large for sound statistical inference, the methodologies used for sample stratification, selection and data collection should not make inference complicated.

The development of instruments for characterisation of any system is an exercise that needs to be carefully undertaken. The steps below have been followed in constructing the Conceptual Framework instruments and in specifying the analytical methods. Experience has shown that following these steps will ensure maximum efficiency in data collection and analysis.

Table 1. Dairy consumption studies by ILCA scientists.

Study location and survey period	Observation units and sample size	Sampling methodology	Number of visits	Recall period	Results/Outputs
Ibadan, Nigeria (10/88 — 3/89)	Rural and urban households (1185)	Stratified, non-probability sample	1	1 week	Structure of consumption, household dairy expenditures and income elasticity by location/ ethnic group.
Bamako, Mali (10/88 — 9/89)	Urban households (240)	Stratified, purposive samples; multi-stage, panel-survey technique	24	1 week	Structure of consumption and estimates of consumption by wealth category; socio-economic determinants of consumption.
Kaduna, Nigeria (12/88 — 1/89)	Urban and rural households (737)	Stratified, non-probability sample	1	1 week	Structure of consumption, estimates of consumption by income groups; socio-economic determinants of consumption.
Mombasa, Kenya (5—8/91;1—3/92)	Urban, peri-urban and rural households (580)	Stratified, probability sample, panel-survey technique	2	1 week	Structure of consumption, consumption estimates and dairy expenditure by hh location and income class, nutritional contribution of dairy products in diet, food consumption frequencies.

Sources: Jabbar and di Domenico (1992); Jansen (1992); Mullins (1992); Sissoko et al (1992).

Step:

1. Formulate the questions and hypotheses to be answered or tested in this phase.
2. Determine the analytical methodology to be used to answer the formulated questions and to test the hypotheses, and define the data needs.
3. Define the sources of this data.
4. Determine the method of data collection most appropriate for these sources, and,
5. For primary data collection, design the survey including the sample design and questionnaires to be used.

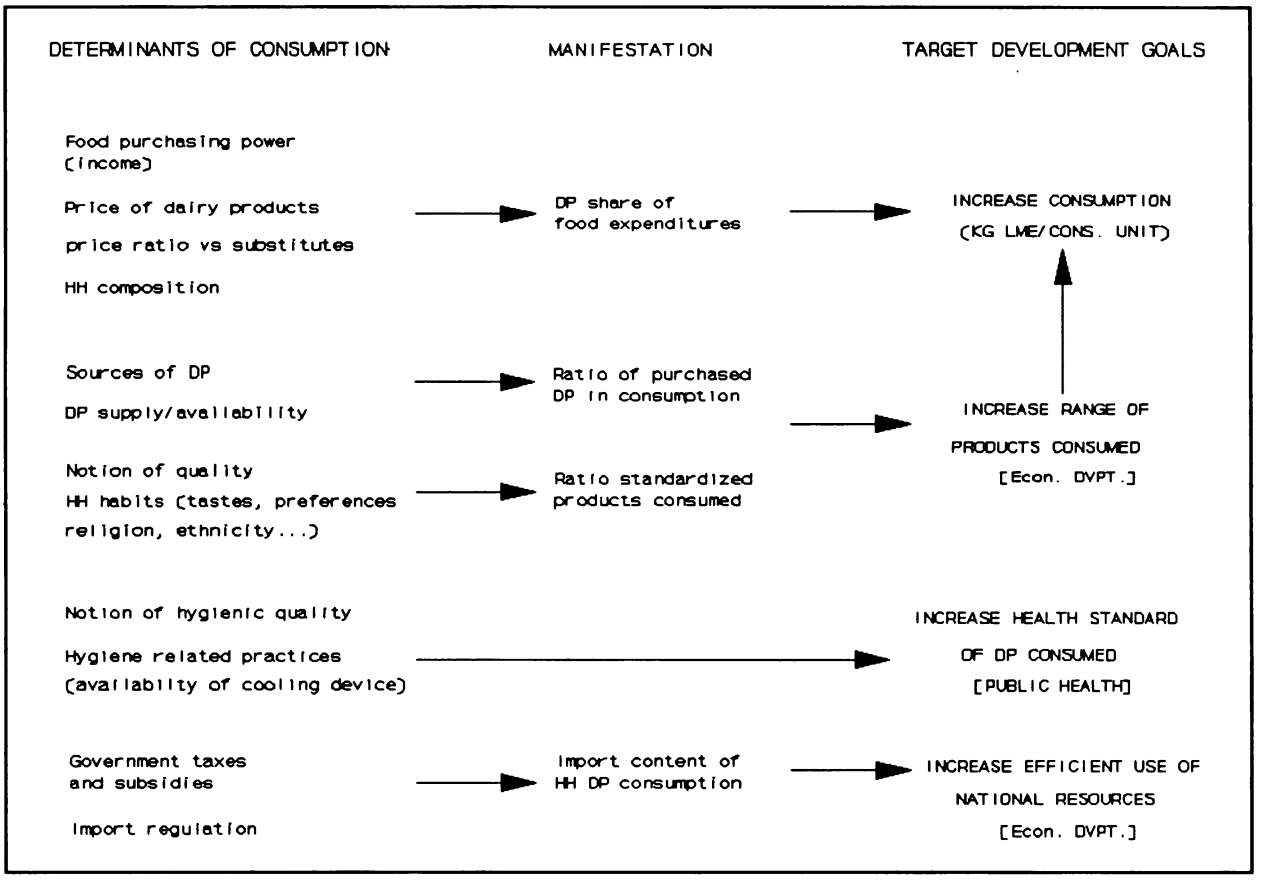
These steps are first discussed in general terms before describing their specific application to characterisation of the consumption system.

2.1 Analytical Framework for the Formulation of Research Questions and Hypotheses

Finding the correct solution to a problem requires that the problem be clearly identified and defined. It is a mistake to assume that everyone involved in a research effort has the same perception of the research problem. Divergent perceptions will also give rise to different beliefs or hypotheses about the problem. Members of the research team should specify the questions and hypotheses they perceive are critical to answer or test. By doing so at the outset, one will avoid the costs of changing research plans after they are already under way or repeating exercises due to missed information.

The schematic diagram in Figure 1 depicts the relationships between functional parameters, performance indicators, and conditions which compromise system performance, thereby thwarting achievement of consumption goals. The analytical framework is intended to stimulate thinking about these relationships, generate questions and hypotheses about the system under study, and to suggest starting points for data analysis.

Figure 1. Analytical framework for dairy product consumption.



2.2 Determine the Methods of Analysis

Because the method of analysis influences the type of data to be collected, they must be determined before embarking upon data collection. While it has been stated that characterization of a dairy system entails quantification of various parameters and performance indicators, in many instances descriptive statistics such as percentages, frequencies, means and variances will be adequate. Hypothesis testing will, however, require more advanced statistical techniques such as Analysis of Variance (ANOVA). Regression analysis may be employed to evaluate the relationships between particular variables and their statistical significance. Based upon the methods of analysis to be used, specific data requirements can be identified.

2.3 Define the Information to be Collected

Unfortunately, too many questionnaires have been based on the premise that, while in the field, it is best to gather as much information as possible with hopes that the use and relevance of the data will appear during analysis. Experience has shown the shortcomings of this approach:

1. Respondent-fatigue from long interviews leading to poor data quality and unwillingness to participate in subsequent surveys;
2. Overloading the survey instrument. This particularly becomes a problem when relevant information omitted is; and,
3. Analysis makes use of only 35—50% of the data collected!

The objective pursued here is that at least 80% of the information collected should be relevant and useful in answering the specific questions or testing the hypotheses of this phase. To achieve this level of efficiency, efforts have been made to define a minimum data set on dairy consumption which will characterise the system and permit its assessment. This assessment forms the basis for setting priorities with respect to researchable consumption issues. The information to be collected belongs to three categories:

1. **Functional parameters:** These are key descriptors of how the system functions, e.g. number of dairy products consumed, frequency of consumption, places where dairy products are eaten etc.
2. **Performance indicators:** These parameters allow assessment of the efficiency of the performance of the system and/or its components, e.g. LMEs/consumer unit/day[1], the ratio of standardised to non-standardised products etc; and,
3. Data essential for testing the **hypotheses** of this phase.

2.4 Define the Sources of this Information

The next step is to define the best sources of the information necessary for characterising the consumption system. Quality of a data source takes into consideration both the reliability and the accuracy of data. Potential sources for data on the consumption system are:

1. **Published materials, official statistics, "grey" literature:** This category of sources would include reports and publications of government statistics offices, dairy boards, Ministry of Agriculture/Livestock Section, Ministry of Planning, national and international research institutes, university departments (e.g. Agriculture, Economics, Sociology), the World Bank, the United Nations Food and Agriculture Organisation, World Health Organisation, bilateral development agencies (e.g. USAID, FINNIDA, ODA) and non-governmental organisations (Heifer Project International, FarmAfrica);

2. **Key informants:** This information source would consist of individuals who have great depth of knowledge about an area, are willing to share this knowledge and are accessible. Chains of informants also are particularly useful because each actor in the chain might view the problem differently and therefore provide additional insight into the problem. An example of a **key informant chain** would be children, wives and husbands of the same household, or individuals working for the Ministry of Agriculture

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[1] Liquid milk equivalent per consumer unit per day. The conversion factors for various dairy products and guidelines for calculating consumer units based on sex and age are given in Annex 3.

such as subject-matter specialists, dairy officers, veterinary officers, extension agents and development workers;

3. **Consumers**: In the broadest sense, this would include any individual who is the final user of any dairy product at any time of the year. It may be desirable, however, to establish a threshold only above which an individual would be considered a consumer; and

4. **Consumption unit**: The "unit" is determined by the level at which decisions on consumption are made, e.g. regarding product type, quantities or forms consumed etc. The consumption unit could be an individual, a group of individuals, most commonly a household, or a food institution such as a restaurant.

2.5 Determine the Method of Collection Appropriate for this Source

Several information-gathering techniques are recognised as particularly useful for the characterisation of a consumption system. After the definitions used by Mettrick (1993), these are:

Informal survey: A systematic, but semi-structured activity carried out in the field by a multi-disciplinary team, and designed to quickly acquire new information on, and new hypotheses about, rural life. Appropriate when the need is understanding rather than quantifying, it can be followed by a small-scale, focused verification survey to improve credibility;

Formal survey: A questionnaire-based survey of a sample of respondents who are representative of a particular population. Formal surveys are indicated when valid statistical inferences are needed. Sample size should be sufficiently large to allow making these inferences;

Case study: Detailed study of a small number of units, selected as representative of the target group(s) relevant to the issue under consideration, but not necessarily representative of the population as a whole (Casley and Lury, 1982). Appropriate when a detailed understanding of complicated relationships is considered more important than ensuring data representativeness;

Group interview: Open-ended discussion with a group of respondents sharing resources or activities, useful for tapping the collective wisdom or memory of a community.

The method for collecting the required information will, in part, be based upon the consumption unit selected. For example, one would not ordinarily use a group-interview technique if the consumption unit identified was at the food-institution level. Data-collection method will also be determined by such factors as the time, manpower and financial resources available, and the precision and representativeness required to make inferences about a population.

3. CHARACTERISATION OF THE CONSUMPTION SYSTEM: METHODOLOGY AND DEVELOPMENT OF FIELD INSTRUMENTS

The concept of consumption may be understood to have either of two related meanings, both involving the notion of an object's "disappearance" or transformation. In economic terms, consumption of an object may be considered to have occurred when it has been removed from the market by some exchange mechanism, such as when a transfer takes place between a seller and a buyer of a good. The more commonly understood meaning of consumption is

its physical meaning of having been eaten. It is this latter meaning which applies in this characterisation methodology. Some other important definitions are:

Dairy product: A dairy product shall be defined as milk or any product derived from milk. Within the general class of dairy foods, different products will be differentiated by their physical composition or form, or where the market or consumer differentiate them.

Consumption pattern: The combination of products consumed, the frequency of their consumption and the quantities consumed.

Mode of consumption: The manner in which the dairy product is consumed or used, e.g. milk may be taken directly or in tea and either cold or warm; butter may be used as a cooking fat, an edible spread, or a cosmetic.

Regulated market: A market in which government exercises control, for instance through price regulations, mandatory standards of hygiene, location-specific marketing licenses, etc. Conversely, an **unregulated market** is here defined as one which effectively operates beyond the control of government and is for all practical purposes "self-monitored", such as in dairy markets dominated by "over-the-fence" sales to neighbours.

3.1 Information to be Collected

The information necessary for the characterisation of the consumption system derives from three sources: i) the functional parameters necessary for the description of the system, ii) the performance indicators required for assessing the effectiveness of the system, and iii) the hypotheses to be tested in the characterisation phase of the Conceptual Framework.

Table 2 sets out the hypotheses contained in the Conceptual Framework which directly relate to the consumption system. In summary, they postulate that dairy product consumption is dependent on household location, consumer purchasing power, and consumer tastes and preferences. Also listed in the table are the data required to test each of the hypotheses. Not all of the hypotheses advanced will be tested during the characterisation phase but some will more appropriately be addressed at a later stage in the research process. The hypotheses in Table 2 have been identified as "core" hypotheses, and are considered essential for elucidating the forces underlying current dairy-consumption trends. Given, however, that consumption systems in different areas will exhibit their own unique characteristics, researchers are encouraged to formulate additional hypotheses, the testing of which will add to the collective understanding of dairy consumption systems.

Note that it is important at this stage to identify potential sources of the needed data. Not only will the identification process assist in evaluating the testability of the hypotheses, but it is also necessary for selecting the techniques to be used for gathering this information. Identifying the information sources and data-collection methodologies will furthermore facilitate organising the research.

Table 2. Phase 2 core hypotheses on consumer demand and dairy consumption.

Hypothesis	Phase 2	
	Data required	Sources of information
(20) Consumption levels of dairy products are positively correlated to population concentration	Quantities of domestic dairy products consumed/caput	Consumers
	Population density of the smallest administrative division where the house is located	Secondary sources
(21) Tastes and preferences are more important determinants of dairy consumption than HH income	Ranking of tastes and preferences for available dairy products HH income Per caput dairy consumption	Consumers
(47) Dairy product share of household food budget increases with household income	HH food expenditures Dairy product expenditures	Consumers
(C1) Household location is a more important determinant of dairy product consumption than household income	HH location HH dairy product consumption levels HH income	Consumers
(C2) Cooling facilities are a prerequisite for expansion of dairy consumption	Availability of cooling facilities HH dairy consumption levels	Consumers Secondary sources
(C3) Levels of HH dairy consumption are significantly correlated with the personal attributes, e.g. education, income, etc. of the HH food budget manager	Food budget manager personal attributes	Consumers
(C4) Price is the most important factor for consumers in deciding among dairy products	Dairy product prices Consumer decision-making processes HH dairy consumption levels for various dairy products	Key informants; consumers
(C5) Milk is regarded as a food only for children	Intra-household dairy product consumption/distribution Consumer beliefs regarding dairy products	Consumers; key informants; secondary sources
(C6) Negative cultural beliefs and misunderstandings about dairy products inhibit dairy consumption	Intra-household dairy products consumption/distribution Consumer beliefs regarding dairy products's	Secondary sources; key informants; consumers
(C7) Low per capita dairy consumption in SSA is by choice rather than the result of external constraints	Dairy consumption levels Consumer perceptions about dairy products Consumption constraints	Consumers; key informants; secondary sources
(C8) Among HH's producing milk, HH consumption needs take priority over milk sales	Ratio of milk sold to milk produced HH decision-making rules regarding production allocation	Dairy producers

N.B. Numbers in parentheses correspond to the hypotheses on consumption originally presented in the Conceptual Framework base document, "Improvement of dairy production to satisfy the growing consumer demand in sub-Saharan Africa: a conceptual framework for research", Rey et al, 1993. Those preceded by "C" have subsequently been added as core hypotheses.

Table 3 indicates the key functional parameters and performance indicators for the description and evaluation of the consumption system.

Table 3. Information required for the characterisation of the consumption system.

Data	Functional parameters	Performance indicators	Data sources
Structure of consumption (consumption pattern, consumption profile)	Dairy products consumed Dairy products purchased Percentage HH's consuming various dairy products Quantities of dairy products consumed Frequencies of consumption of dairy products Consumption mode of dairy products HH preservation practices HH quality notions Sources of purchase of dairy products Prices of purchased dairy products Dairy product preferences (cultural practices, ethnicity)	Kg LME/cons. unit/year Dairy products share of HH food expenditure Ratio of purchased to home produced dairy products Ratio: standardised vs non-standardised dairy products consumed Ratio: sales of home produced dairy products/dairy production	Consumer Dairy producers
Consumption environment	Urban population and pop. growth rate (persons/km² at administrative level for both national and site levels)		Gov't census
	Government taxes/subsidies on dairy products and their substitutes (Y/N)	Price ratios: dairy products to their substitutes Import content of national dairy consumption levels Import content of HH dairy product consumption	Key informants, secondary sources (Boards, Gov't.)
	HH location (urban/peri-urban/rural) HH income class Product availability and source (formal/informal markets) Distance of house to source of dairy products	Consumer perception of constraints to consumption	Consumer

LME: liters milk equivalent; HH: household.

These data, together with those required for testing the hypotheses associated with Phase II, generate the minimum data set necessary for the system's characterisation. Table 4 states explicitly the information to be collected. The table also identifies the *origin of the data need*, and in the far right column, notes the specific question(s) in the household questionnaire which will generate the data.

3.2 Sources of Dairy Consumption Data

Table 4 is a compilation of the information needs identified in Tables 2 and 3 as interpreted at the level of the consumption unit. As can be seen from the table, the consumption unit in this case is the household, and it is at this "level of observation" that consumption data are collected, i.e. the focus is on the consumption behaviour of the household members as a group rather than on the behaviour of any particular individual.

Table 4. Minimum data set for characterisation of the consumption system.

Parameter to be measured	Origin	Question(s)
Number of household members (taking at least one meal a day at home)	PI	22
No. of HH consumer units	PI	23
Electricity supplied to house: If yes > > > fridge?	H-C2	8, 9
Household food budget manager: sex, age, ethnic group, religion, education level; is FBM the HH head?	H-C3	10, 11, 13-17
Age, sex, religion and ethnic group of HH head	H-C3	18-21
Types of dairy products eaten	FP, PI, H21	24, 25
Quantities of dairy products eaten	FP, PI, H20, H21	25
Frequency of consumption of each dairy product	FP, PI, H21	24
Source of each dairy product: regulated vs unregulated market, home production	FP	25
Purchase price of each dairy product	H-C4	25
Consumption form/mode of each dairy product	FP	25
Complementary foods eaten with each dairy product	FP	25
Substitute foods for each dairy product	FP	25
Shortage periods (number of months and specific months)	PI	25
Place and frequency of consumption outside home	FP	25
Intra-HH distribution of milk consumption	H-C5	30
Beliefs/taboos about dairy consumption	H-C6	27-30
Preferences within dairy product categories (liquid milk, sour/fermented milk, cooking fats, edible spreads, cheeses, cosmetic fats)	H21	31
Constraints to increased dairy product consumption	FP, PI, H-C7	25, 26, 32
Is consuming household also producing milk?	FP	33
Is producing household also trading/selling dairy products?	H-C8	33
Average weekly food expenditure	FP, PI, H47	34
Household income category or level	H21	35

PI = Performance indicator; HH: household; H: Hypothesis number; FBM: food budget manager; FP: Functional parameter.

For current purposes, the household shall be defined as being comprised of those individuals who take at least one meal a day at home. To maximise data accuracy, attempts should be made to collect consumption information from the individual who is responsible for acquiring food for the household, referred to here as the "food budget manager". While it is assumed that the majority of households will be purchasing the dairy products they consume, many households may also be dairy producers. This, however, should not prejudice the data collection. Similarly, it is expected that consumption of dairy products outside the household will vary across sites. Key informant surveys should provide insights on consumption of dairy products outside the household and thereby indicate whether or not a survey of food institutions is in order.

Although the household is identified as the primary level of observation, it is still important to consider using secondary data sources. Key informants are often reliable and accessible sources of information on population descriptors, income range, dairy products generally available and consumed, and cultural practices. Published statistics can also be valuable sources of information on distribution of income, retail prices, urban population density and population growth rates, and imports of dairy products.

3.3 Primary Data Collection

3.3.1 Survey method

For collection of information on household consumption, the method proposed is a formal survey of a representative sample of households within the dairy shed[2] under study. The characterisation survey is a single visit survey with a reference period of the last one week. Based on previous household level survey experience, information collected in this manner is sufficient for characterisation of the consumption system. Notice must be taken, however, of variation in consumption during the year, i.e. intra-annual consumption variation, due to such factors as production fluctuations between rainy and dry seasons, seasonal off-farm labour demand, and religious or traditional festivals, e.g. Ramadhan, Christmas etc. Unless there is special interest in consumption during high or low peaks, surveys should be planned so as to avoid these periods. At sites where there is evidence of strong seasonal consumption, repeat visits to the same household will permit better characterisation of the consumption system. Where feasible, repeat visits will also benefit survey efforts by permitting corroboration of previously collected data and improving estimates of consumption.

3.3.2 Definition of the population and sampling technique

Necessarily, the representative household sample must include non-consuming as well as consuming households, and the sample is therefore selected from the household population in the dairy shed. The households may be situated in urban, peri-urban or rural environments. Among the consuming households, however, the sample is intentionally restricted to those households which consume dairy products on a regular basis, which for purposes of the characterisation survey shall be any household having consumed any dairy product in the last week, excluding holidays or other special occasions. Because the size of this population of consumers is unknown in advance, the sample of households to be interviewed cannot be randomly chosen with a given sampling intensity. Based on previous sampling experience and

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[2] The "dairy-shed" concept applied in this working document series has both a geographic dimension and a specific market orientation. The dairy systems with which this methodological series is concerned are focused on supplying dairy products to urban consumption centres. Geographically, the dairy shed extends to that local area supplying dairy products to the urban area under consideration.

resource considerations, however, a sample size in the range 120—150 households is proposed.

The sampling methodology recommended for identifying the sample households is the adaptive cluster procedure (Thompson, 1992), a modified application of traditional cluster sampling (Cochran, 1963). Adaptive cluster sampling is appropriate in situations where the population size is unknown and is particularly useful for adoption or impact studies. The final sampling unit is a cluster of elements, in this case, a group of households. Depending upon the sample size to be drawn and the data required to test the postulated hypotheses, it may be desirable to stratify the population using pre-determined or naturally defined groups.

To begin the sampling process, individual households are randomly selected from the total list of household units. These households serve as the starting points for the formation of household clusters (see Figure 2) of sizes 1 to n (defined later). Sampling continues from these points according to specific rules. Two types of household units are defined - consuming units and non-consuming units. Eligibility rules of the adaptive cluster procedure for sampling of the consumption system are as follows:

A household is eligible for observation if:

1. it is part of a selected cluster, and;
2. it has consumed any dairy product during the past seven days, apart from festivities or holidays; or,
3. it constitutes an edge unit[3], i.e. a non-consuming household bordering a cluster of consumers;
4. it is a consuming household outside a selected cluster but does not lead to a sub-sample size greater than 5% of the total sample size; and,
5. the household is less than 1 km from the preceding household.

Bearing these rules in mind, the sampling procedure may then be described as follows:

1. Determine the number of primary consuming households, n, required (a sample of size n> =25 is suggested) [this defines the number of clusters];
2. If stratification[4] is to be applied, allocate the clusters to each stratum, e.g. urban, peri-urban or rural household clusters, in proportion to the size of that stratum in the population if known, i.e. if a particular stratum represents 50% of the population then it should be allocated 50% of the total sample clusters;
3. Sampling will be without replacement, i.e. a cluster will be surveyed only once, and only households having the desired attributes specified under eligibility rule 1 (specified above) will be interviewed. Households selected randomly that do not possess these attributes will not be interviewed; and
4. For each of the initially selected primary households, all surrounding household units will be interviewed that also meet the observation criteria. Terminate the cluster formation when an edge unit is encountered or a maximum 5% total sample size is attained.

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[3]Whether an edge unit is merely an infrequent consumer of dairy products or a complete non-consumer, there is still valuable information to be gathered from these households that will contribute to our understanding of determinants of dairy consumption. Information on household composition, education and income level, consumption constraints, food budgets and food consumption patterns may provide important insight into household consumption behaviour. The questions to be posed to edge units are designated in the proposed household consumption questionnaire found in Annex 2.

[4] For further comments on stratifying samples see Annex 4

The adaptive cluster method will lead to the formation of a maximum of n clusters varying in size from 1 (where the first household sampled fails to meet the interview criteria) to 0.05 x n. Figure 2 below illustrates the adaptive cluster sampling procedure. Details of computing the mean and variance of data values collected using this methodology are given in Annex 5.

3.4 Field Instruments

3.4.1 Dairy-shed level

As a preliminary step to collecting information on the consumption system, secondary sources should be reviewed and discussions held with knowledgable key informants. Information supplied by the key informants will, in some cases, fill data requirements of the characterisation process; in other instances, information from key informants will be needed to properly design the household survey instrument and to guide cluster sampling. Annex 1 describes the information which should be collected through key informants at the dairy-shed level. The example form presented in the annex suggests how the data collection can be organised to facilitate efficiency.

3.4.2 Household level

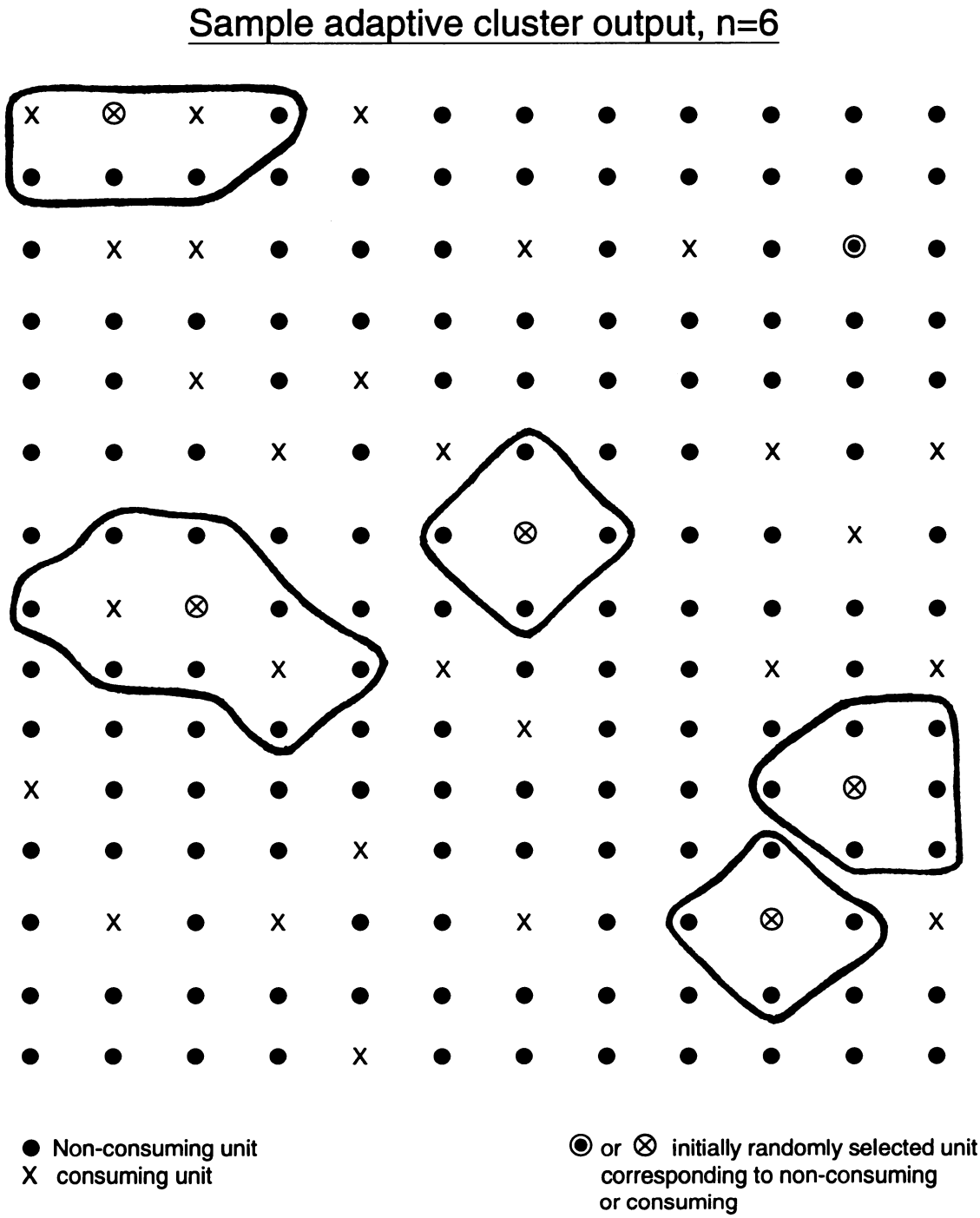
It is anticipated that much of the information required for characterisation of the consumption system will be gathered through primary data collection at the household level. In the preceding sections, the methodological background, hypotheses, minimum data requirements and sampling technique underlying this data collection have been described. The survey instrument, here a household questionnaire, brings these components together into a single, logically constructed document, the administration of which will generate the required data, it is expected, in an efficient manner. While there always exists the possibility of generating poor-quality data due to improperly worded questions, unskilled enumerators and other sources of non-sampling error, this possibility can be greatly reduced by closely following the preceding steps. Doing so will also result in the minimum number of questions that need to be asked. The probability of poor or unuseful data can be further reduced by ensuring that questions are to the point and unambiguous in their meaning. A proposed household level questionnaire developed according to the minimum data set (Table 4) is presented in Annex 2. In addition, ILCA will, upon request, furnish to users of the characterisation methodology, computer diskettes containing screen designs for data entry and a limited number of programmes for generating the functional parameters, performance indicators and hypothesis tests.

4. CHARACTERISATION OF A CONSUMPTION SYSTEM: AN EXAMPLE FROM COASTAL KENYA

Between 1991—92, scientists from ILCA and the Kenya Agricultural Research Institute (KARI) undertook a characterisation study of dairy consumption in the dairy shed surrounding the coastal city of Mombasa. Using the enumeration areas demarcated during the 1989 population census, the Mombasa dairy shed was stratified into rural, urban and peri-urban areas. An estimate was made of the overall sample size needed for statistically valid data analysis. The overall sample size was then proportionally allocated among the location strata, thus yielding the number of clusters to be sampled in each area. The clusters to be surveyed were then randomly selected. The household was determined as the consumption unit and primary level of observation. Four households were randomly selected from each identified

cluster, producing an overall household sample size of 630 households[5]. Adopting a formal survey technique, a structured questionnaire such as that proposed in Annex 2 was administered to the food budget manager of each household.

Figure 2. Household selection following the rules of adaptive cluster sampling methodology.



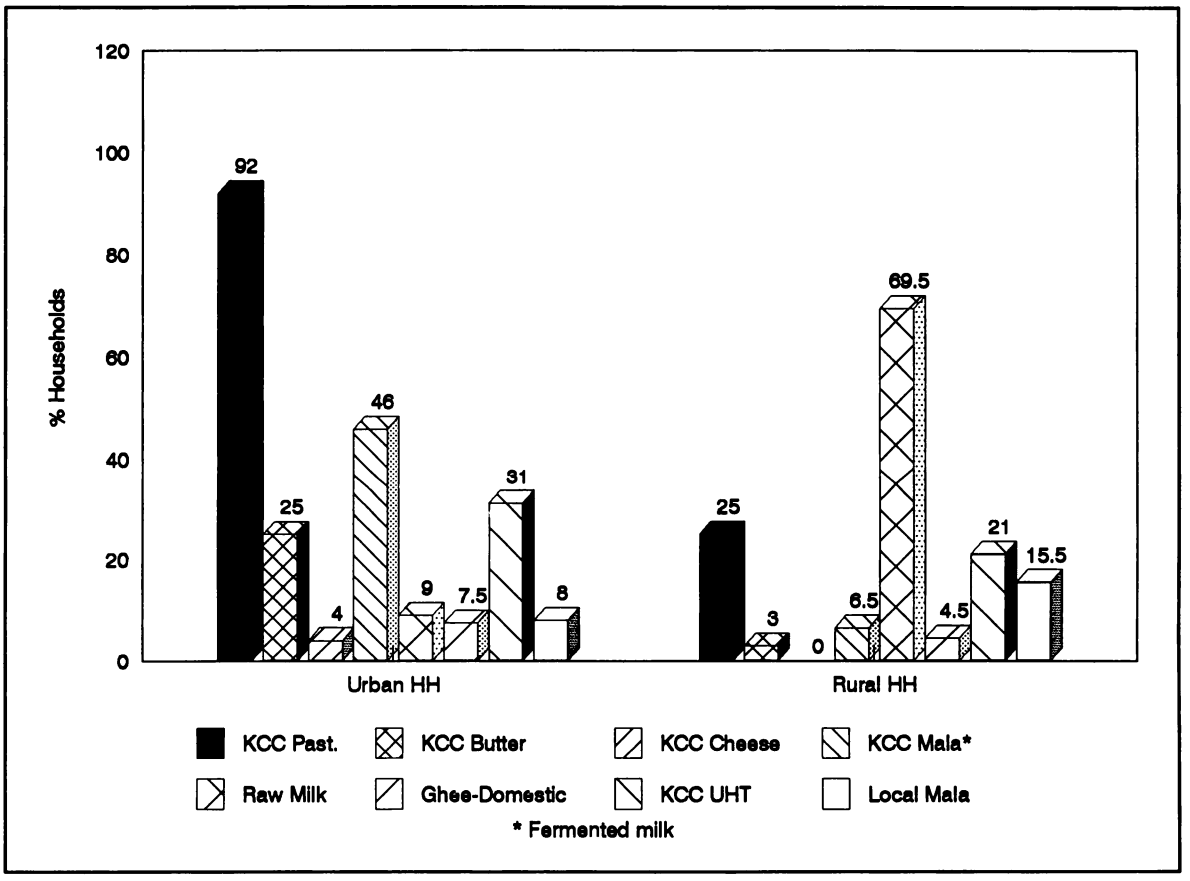
[6] In this particular instance, the size of the population from which a sample was to be drawn was known, and for this reason it was possible to use traditional cluster sampling rather than the adaptive cluster methodology. However, because this situation is not often encountered, the Conceptual Framework proposes the adaptive cluster methodology for drawing samples.

Presented below are selected results from the Mombasa dairy consumption characterisation study (Mullins, 1992). These are examples of useful data analyses which can be carried out at the characterisation phase based on the CF's recommended minimum data set. The examples are cross-referenced with the questions in the proposed household survey (Annex 2) which produce the data used in the analysis. The information generated is related to the functional parameters, performance indicators and hypotheses previously identified in the methodology. New hypotheses are developed about the relationships between households of different strata and their dairy consumption choices. Finally, research issues are identified.

4.1 Products consumed (Question 24)

Functional parameters. The consumption system of coastal Kenya is characterised by considerable product diversity (Figure 3). Unprocessed and processed, local and standardised dairy products appear among the items consumed. Milk consumption is, however, virtually exclusively cow's milk.

Figure 3. Dairy product consumption by household location, Mombasa and Kilifi Districts, Coast Province, Kenya, 1991.



Performance indicators. The percentage of households regularly consuming liquid milk is high, ranging from 70 per cent in rural locations to 92 per cent in urban locations. Quantity consumed rapidly decreases, however, as degree of processing increases, e.g. only 25 per cent and four per cent of urban households consume butter and cheese, respectively. Consumption of processed dairy products is observed even less frequently among rural and

low-income households, indicating that the majority of the population do not consume processed products to any substantial degree.

Hypotheses. Analysis of consumption data stratified by household location suggests that location exerts a strong influence on the types of dairy products consumed. While strengthening the hypothesis that there is a relationship between household location and dairy consumption, it is not possible, however, to conclude that location is a more influential determinant than household income as hypothesis C1 purports.

Researchable issues. Further research is indicated investigating the reasons which underlie non-consumption of particular processed dairy products. Non-consumption may be related to higher prices associated with these products. Alternatively, it might reflect a location-specific group of consumers without access to the product in question, which would suggest inefficiencies in the marketing system. It may also be due to lack of product appeal among particular groups. Perishability, storage and packaging may be additional factors.

4.2 Frequency of Consumption (Questions 24 and 25)

Frequency of consumption is another step in the process of identifying patterns among dairy product consumers. Although a group of households consumes the same set of dairy products, they may consume individual products with quite different frequencies. Table 5 looks at the frequency of consumption of different dairy products among coastal Kenya households.

Table 5. Frequency of dairy product consumption in households sampled in Mombasa and Kilifi Districts, Coast Province, Kenya, 1991.

Product	Consumption frequency (Percent of households)			
	Daily	Weekly	Monthly	Never
Raw milk (cow)	44	12	0	44
KCC milk	40	12	8	40
UHT milk	21	21	12	46
Goat milk	1	2	4	93
Fermented milk	15	28	10	47
Butter	18	8	4	70
Cheese	5	3	4	88

Functional parameters. Consumption frequency of the two fresh milk products, raw milk and KCC pasteurized milk, displays a bi-modal distribution pattern, i.e. consumption frequency tends towards the extremes of either daily or never, with few respondents in between. The frequency distribution of UHT milk consumption is more even, although many respondents indicate that they do not consume UHT milk at all. Fermented milk is consumed with high to moderate frequency, but the processed dairy products, butter and cheese are regular parts of the diets of only a few households.

Researchable issues. The issue of non-consumption of dairy products is again highlighted. But, the bi-modal distribution of consumption frequency of raw and KCC pasteurized milk strengthens the hypothesis that separate markets exist for these products. The separation of the two product markets could result from bi-modal income distributions, marketing constraints, market interventions, or a combination thereof, and is an issue for research.

4.3 Levels of Consumption (Questions 22, 23, 24 and 25)

The quantity of dairy products consumed per individual per year is frequently used to summarise the status of dairy consumption at a point in time. The number of kilograms of milk consumed per capita per year can be used to: i) draw comparisons between groups of dairy consumers; ii) estimate overall consumption of dairy products in an area; and iii) identify determinants of dairy demand. Obtaining information on consumption levels is, however, not an easy task. There are difficulties in acquiring good measurements of consumption and problems in combining quantities of different products, e.g. milk and butter, into a single figure. An additional computational problem arises from the fact that products are consumed at different frequencies and that this consumption may vary considerably over the year. Overcoming these problems and arriving at reliable consumption estimates requires collecting the separate pieces of information, standardising products, quantities and frequencies, and then computing the estimates. Details of how dairy products may be standardised, consumption frequencies reconciled, and household members of different ages and sex converted to consumer units are provided in Annex 3. Table 6 presents estimated dairy consumption levels based on these standardization procedures for households in the Mombasa characterisation study.

Table 6. Dairy consumption among coastal Kenya households sampled by location and income group, Kilifi and Mombasa Districts, Coast Province, Kenya, 1991.

Location and income group	Urban			Peri-urban		Rural	
	High (N = 39)	Middle (87)	Low (78)	Middle (27)	Low (35)	Middle (76)	Low (178)
Mean lts*/consumer unit/day	0.78	0.62	0.43	0.54	0.28	0.35	0.30
Standard deviation	0.54	0.60	0.54	0.48	0.22	0.43	0.34
Median value	0.65	0.45	0.29	0.40	0.21	0.20	0.17

* Liquid milk equivalents (LME).

Performance indicators. Quantities consumed are generally less than a liter of liquid milk equivalent per consumer unit per day, however, there is considerable range across income classes and geographic locations, with the highest consumption level (urban/high income) being more than twice that of the lowest (peri-urban/low income). There is also notable variation in consumption within the defined strata as indicated by standard deviations which are equal to or greater than the means.

Hypotheses. The data support acceptance of hypothesis 20: "Consumption levels of dairy products are positively correlated to population concentration". Consumption levels increase as one moves from the sparsely populated rural areas to the densely populated urban areas, even within the same income classes.

Researchable issues. Assuming that the observed variations in consumption levels are not due to consumer preferences, there appears to be considerable scope for increasing the quantities and diversity of dairy products consumed, particularly among middle and low income households in peri-urban and rural locations. Subsequent research should therefore determine the respective influences of household income and product availability as constraints to dairy consumption. Answering this question will assist in allocating research resources between development of cost-reducing production technologies, and the design of more effective and efficient marketing systems.

4.4 Consumption Patterns

At the household level the consumption pattern is defined as the combination of the types, quantities and frequencies of dairy product consumption. Where dairy products are numerous and widely consumed, discerning consumption patterns may become complicated. Below are some of the more distinct consumption patterns identified in the coastal Kenya study. These results have lead researchers to examine more closely the consumption patterns of peri-urban households, some of which exhibit patterns resembling those of rural households while yet others display consumption patterns similar to urban households. Understanding the sources of these differences will yield important information on (1) the changing patterns of food consumption as populations relocate to peri-urban areas, and (2) the determinants of dairy-product demand.

Functional parameters. Twelve per cent of the households surveyed were not, or only on special occasions, consuming any dairy products. The coastal Kenya households which consume dairy products may be characterised as belonging to either of two broad categories: those consuming only liquid milk products 42%, and those which, in addition to milk, consume more highly processed products (58%). Within these two groups are subclasses of consumers differentiated by their intensity of consumption. Although only a small minority of the consuming households (three per cent) are classified as "very high" intensity consumers, 47 per cent are considered as "high" intensity. Highest intensity consumption is associated with households of Asian and Swahili ethnic and cultural backgrounds.

Performance indicators. As earlier identified, levels, range and frequency of dairy consumption - the combination of which determine consumption pattern - are closely linked to household location and income class. Analysis also reveals, however, the important role of ethnicity and cultural attributes in determining consumption patterns. It is therefore critical that system performance be set in its social context for proper evaluation as performance measures are likely to differ according to ethnic and cultural expectations.

Hypotheses. Among other factors, prices, household income and location, tastes and preferences, cultural beliefs and taboos, and personal attributes of the food budget manager are hypothesised as determinants of dairy consumption. Of these, the latter three in fact reflect the ethnic and cultural background of the household. Separate testing of hypotheses will provide statistical evidence of the role of ethnicity and culture in determining dairy product consumption. Initial analysis of consumption patterns strongly suggests, however, that these social characteristics are significant consumption determinants and substantially mitigate price, income and location factors.

Table 7. Dairy consumption patterns and associated socio-economic descriptors, Mombasa and Kilifi Districts, Coast Province, Kenya, 1991.

	Consumption patterns (number of households)	Litres milk equivalent consumed per year	Social characteristics
Consumers of milk only (including sour milk)	KCC pasteurized and UHT daily (once or twice). Fresh milk and fermented milk never or daily. (69)	1032 LME/family 264 LME/CU	Rural and peri-urban middle income house-holds; diverse ethnic affiliation.
	KCC pasteurized or fresh milk daily. Fermented milk at least once a week. (34)	636 LME/family 132 LME/CU	Rural and peri-urban, low and middle income households; coastal Bantu ethnic groups.
	Fresh milk between daily and once a month. Fermented milk occasionally. (131)	588 LME/family 120 LME/CU	Rural and low income, coastal Bantu ethnic groups
Consumers of milk and other dairy products	KCC pasteurized, UHT and fresh milk daily (up to 2 times a day). All other dairy products (cheese, butter, yoghurt, cream) at least once a week. (17)	1104 LME/family 204 LME/CU	Peri-urban, middle and high income households; Swahili and Indian ethnic groups.
	KCC pasteurized daily, UHT and fermented milk daily to once a week. Half of households consume fresh milk daily. Cream and butter occasionally. (174)	804 LME/family 204 LME/CU	Rural and peri-urban, middle and high income households; Bantu and lake basin migrant households.
	Fresh milk at least once a week. KCC pasteurized and UHT between once a week and every 2 months. Fermented milk weekly. Powder milk, cream and butter occasionally. (109)	516 LME/family 120 LME/CU	Rural and low income households; coastal Bantu ethnic groups.
	KCC pasteurized, fresh milk and fermented milk once a week at least. Occasional consumers of other dairy products including cheese, cream and yoghurt (once every two months). (18)	672 LME/family 216 LME/CU	Peri-urban low and middle income households; diverse ethnic groups.

LME: Liters of milk equivalent

Researchable issues. That the unique food habits of many ethnic groups persist despite long residence outside their native countries or regions, demonstrates the strength of "food cultures". Still, there is also evidence among the data from coastal Kenya that food habits have been adapted. Little information is available, however, on the process of changing food habits in coastal Kenya or other areas of sub-Saharan Africa. Research into this process could be expected to yield information of value for future agricultural research planning, market development, human nutrition, and government policy-making. This information also underscores the need to include socio-cultural considerations in research design and social scientists, e.g. anthropologists and sociologists, in the multi-disciplinary research team.

4.5 Consumption preferences (Question 31)

Data on consumer preferences highlight production and marketing opportunities. Table 8 presents some of the results related to consumer preferences.

Table 8. Milk-product preferences among households sampled by household location and income category in Mombasa and Kilifi Districts, Coast Province, Kenya, 1991.

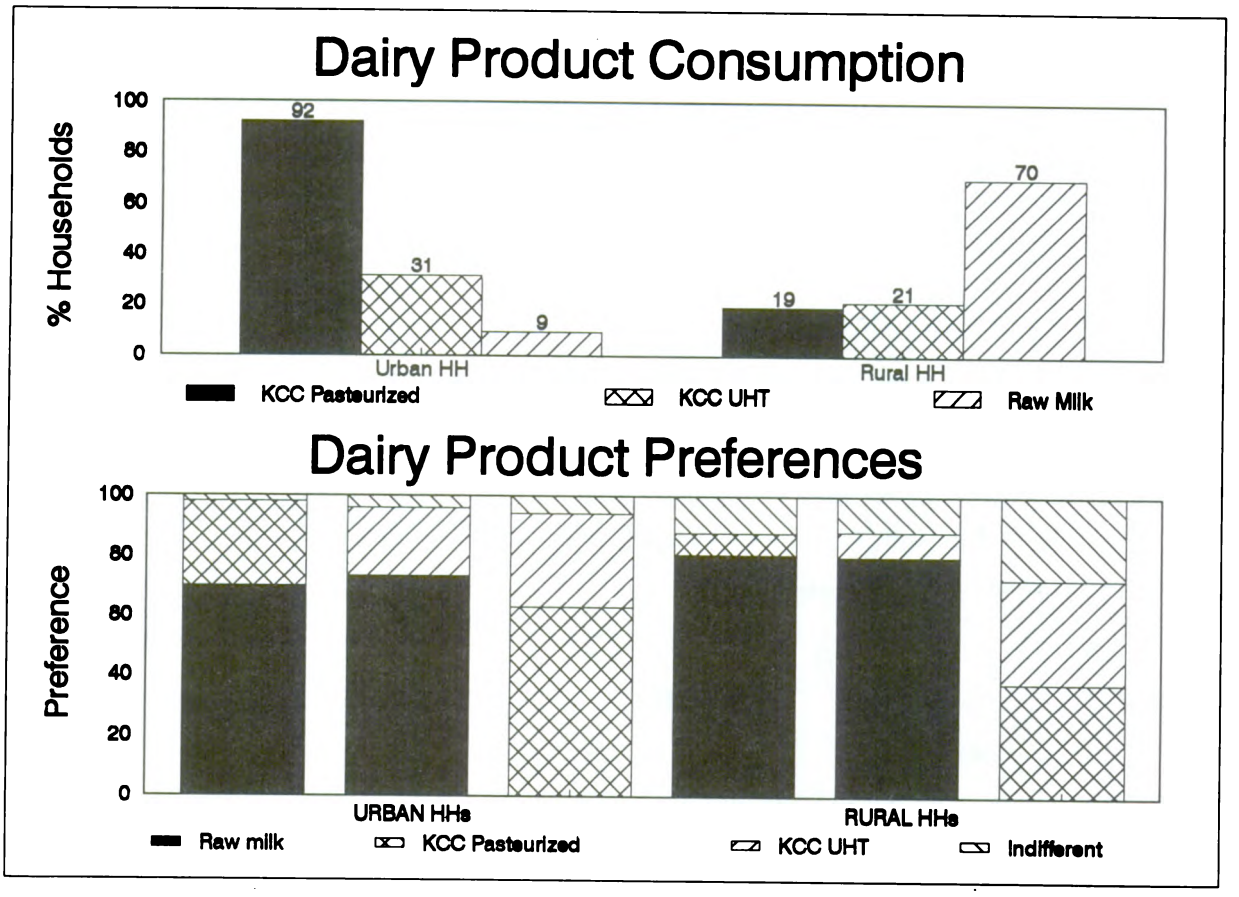
		KCC pasteurized vs fresh milk (%)		KCC pasteurized vs KCC UHT milk (%)		KCC UHT milk vs fresh milk (%)	
		KCC past.	Fresh milk	KCC past.	KCC UHT	Fresh milk	KCC UHT
Location	Urban	27	69	61	30	72	22
	Peri-urban	13	87	73	24	89	11
	Rural	8	78	38	34	77	9
Income class	High	35	58	50	31	61	27
	Middle	18	76	58	31	77	17
	Low	12	77	44	32	78	10

KCC: Kenya Cooperative Creameries
N.B. Inter-column rows totalling less than 100% reflect "Indifferent" consumer responses.

Functional parameters. Among the liquid milk products, a clear preference exists for unprocessed (raw) whole milk. This is true irrespective of household location or income class.

Performance indicators. Figure 4 comparing consumer preferences with actual consumer behaviour reveals that the two patterns do not coincide. The divergence implies that households are not consuming their preferred dairy products but rather are forced to choose among whatever products the market is offering.

Figure 4. Comparison of dairy product consumption with dairy product preferences among urban and rural households in Mombasa and Kilifi Districts, Coast Province, Kenya, 1991.



Hypotheses. While applicable, testing hypothesis 21 ("Tastes and preferences are more important determinants of dairy consumption than household income") with this data set will not yield valid results because consumption structures do not reflect consumer preferences.

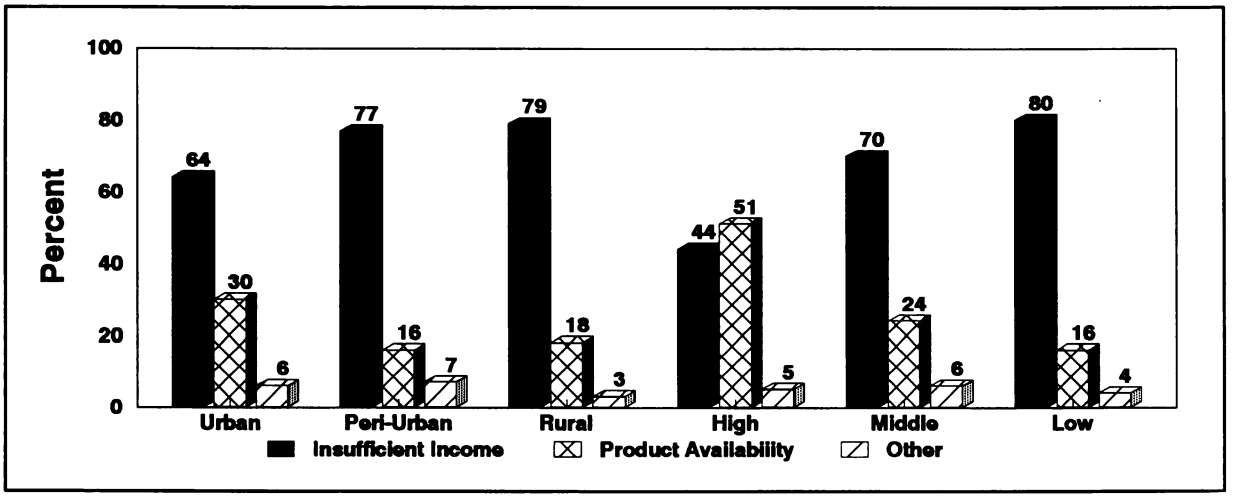
Researchable issues. It can be hypothesized that the discrepancy between consumption preferences and consumer behaviour results from supply factors such as lack of appropriate technology to increase production of raw milk, or, market failure. Market failure may result from government interference in the form of fixed prices, marketing restrictions, etc. which distort or impede the flow of goods and information between producers and consumers. Markets may also not be functioning well due to non-interventionary causes such as lack of infrastructure and technology.

4.6 Constraints to and Opportunities for Increased Dairy Product Consumption
(Questions 9, 24, 25, 26, 31, 32)

Improvement in the performance of consumption systems can be achieved through either removal of constraints on consumption or by capitalizing on previously unexploited opportunities. It is important in the course of research to remain aware of both avenues. Oftentimes, consumers know - or at least have firm opinions about - what prevents them from fully realising their consumption goals. In such cases, uncovering constraints may be as easy as asking consumers directly about their objectives and their problems in attaining

them. However, when constraints occur within the marketing system, or at the level of production, consumers may only partially understand the nature of the problem. They are capable of describing the symptom, e.g. unavailability of fresh milk on the market, but are in fact unaware of the "illness", e.g. no milk collection service. Consumers obviously can only speak from their individual experience and are poorly placed to see new opportunities. Researchers, who will generally have more information on such a problem, are better situated to perceive new opportunities. However, in attempting to discover the constraints to and opportunities for improving consumption systems, researchers must not only look for direct and obvious problems but also discern the indirect and subtle issues. That consumption constraints are here gleaned from a series of six questions illustrates the numerous ways in which performance of the consumption system may be impaired.

Figure 5. Dairy consumption constraints expressed by sample households by household location and income class, Mombasa and Kilifi Districts, Coast Province, Kenya, 1991.



Performance indicators. Figure 5 depicts consumer response regarding their consumption constraints by household location and income. "Insufficient household income" dominates the stated constraints to increased dairy consumption. Product unavailability is, however, a notable problem among the high and middle income communities.

Researchable issues. The stated constraints may be described as fundamental, and based on the size and uniformity of household response, they constitute substantial problems to be overcome. Household real income can be increased by reducing the prices of dairy products. Reducing dairy product prices relative to their substitute goods will in addition make them more price competitive. Research is therefore needed to isolate the principal cost components of dairy products with a view towards reducing them. Policy analysis should not be overlooked in this process as fixed price policies can create price floors that bolster prices above competitive market levels. Consumers' comments on the unavailability of dairy products underscore the discrepancy between their consumption behaviour and their stated preferences which has been described previously, as well as research activities needed to investigate the issue of market failure.

4.7 Determinants of Consumption

The preceding analysis has revealed three principal determinants of consumption among coastal Kenya households; ethnicity and cultural traditions, household income and household

location. Household location influences structure of consumption by influencing the availability of dairy products. Essential for realizing household consumption goals, household income has a more direct effect on dairy consumption. The relative effect of income and location will, however, vary depending on the aspect of dairy consumption under consideration, i.e. whether one is investigating determinants of levels of consumption or types of products consumed.

Income appears to predominate over household location as a determinant of dairy consumption (hypothesis C1). Still, where household income is a less binding factor, ethnicity and cultural attributes, and household location (the product availability issue) play a substantial role in determining dairy product consumption patterns (hypotheses C1 and 21). Analysis of the data from coastal Kenya refutes hypothesis C7: "Low per capita dairy consumption in SSA is by conscious choice rather than the result of imposed constraints."

Low levels of dairy consumption among the majority of coastal Kenya households and the high incidence of income and availability constraints indicate that even small changes in these areas could result in significantly improved performance of the consumption system. Cost-reducing dairy production technologies, and increased supply of dairy products through market development and marketing policy reform are identified as priority areas of future research aimed at improving performance of the dairy consumption system in coastal Kenya.

5. CONCLUSION

Based on ILCA's extensive experience, the foregoing methodology provides NARS and other institutions responsible for conducting dairy research with a general methodology for characterising consumption systems. The working document begins with the identification of functional parameters, performance indicators, and the formulation of core hypotheses, and then sets out methods of analysis, data requirements and potential data sources for filling these information objectives. Sample design is discussed, alternative methods of data collection are examined, and a household survey instrument is provided as a model for the collection of household consumption data. Screen designs for entry of data collected using the household survey instrument and a limited number of programmes for analyzing the data are made available to users of the methodology upon request to ILCA. The latter section of the document provides examples of useful analyses which can be undertaken using only the defined minimum data set. Finally, detailed attention is given in the annexes to a number of technical considerations important for those employing the consumption characterization methodology.

The consumption methodology will yield results of local application, in particular, in assisting research institutions to prioritize constraints to and opportunities for improving the performance of dairy consumption systems. While important in its own right, the clarification of research priorities will be of considerable assistance as well in management of research and the resources allocated to it. But moreover, it is hoped that by providing a generally accepted methodology for dairy system research, greater consistency will emerge in the research conducted at different sites, and that over time a substantial body of data will accumulate that will permit cross-site comparative studies. This ability would be of major significance in furthering the knowledge and understanding of consumption systems.

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ANNEX 1. Information required on dairy product consumption at the dairy-shed level.

i. Begin by listing all the dairy products known to be consumed in the dairy shed.

Dairy product categories	Dairy products consumed in the dairy shed	Production and processing areas	Consumption levels (lts/LMEs)	Typical use	Linkage to a particular social group or location	Seasonal variation in availability (shortage periods)	Gov't quality standards (Yes/No)
Milk							
Sour/fermented milk							
Cooking fat							
Edible spread							
Cheese							
Cosmetic fats/oils							

ii. Factors which could affect availability of dairy products.

Dairy product	Is there a government fixed price? (Yes/No)	Is there any gov't tax at any level prior to the consumer?	Is there any gov't subsidy at any level prior to the consumer?	Is the product imported?	Is it a standardised dairy product?

iii. Urban population density and growth rate.

Administrative division (of dairy shed)	Size (sq. km)	Population 19xx 19yy	Population growth rate (percent per annum)
Dairy shed overall:			

ANNEX 2. Proposed household questionnaire for the characterization of the consumptio system.

HOUSEHOLD LEVEL DAIRY CONSUMPTION SURVEY

Enumerator note: A shortened questionnaire is attached for "Edge unit" households, ie. thos households which have not consumed any dairy product in the last 7 regular days. Begin your interview by finding out if the household has o has not met this condition. If you determine that the household is an edg unit, use the shortened questionnaire.

---

1. Date of Interview [| | | | |] Location and Identification of Survey HH:
2. Name of Enumerator _____ [|]
3. District_____ [ ] 4. Division _____ [|]
5. Location _____ [| |] 6. Village _____ [| |]
7. Household Classification 1 = Rural 2 = Urban 3 = Peri-urban
8. Is there electricity in the house? Yes/No
9. If "Yes", do you have a refrigerator? Yes/No

Demographics

10. Who makes the decisions about what foods are purchased? ie. who manages the HH foo budget?

    HH Head: Male HH Head: Female Wife #1 Wife #2 Daughter Son

    Other (specify) _____

11. If the food budget manager is not the HH head, who is the HH head?
    Husband Grandfather Mother #1 Mother #2 Grandmother Daughter Son
    Other (specify) _____

12. Respondent's position in HH (if not the food budget manager or HH head)

13-16. FBM's: Sex [ ] Age [|] Ethnic Group _____ [|]
Religion _____ [ ]

17. FBM's education level No formal [ ] Adult literacy [ ] Primary only [ ]
Secondary [ ] Beyond secondary [ ] Other [ ]

18-21. Head of household's: Sex [ ] Age [|] Ethnic Group _____ [|] Religion_____[ ]

Household Size and Structure

22. Total No. HH members [|]

Survey Code [_ _ _ _ _]

23.	<2 yrs	2-10	11-15	16-30	31-50	>50 yrs
Male						
Female						

\+ + + + + = total HH?

Dairy Product Consumption

24. Below is a list of dairy products* commonly eaten in this area. How frequently is each dair product eaten by this household?

	More than once a day	Once a day	3-6 times a week	Once/ twice a week	Once/ twice a month	Special occasions	Not avail.	Sources (Circle one)
Raw milk	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Pasteurized milk	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
UHT milk	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Powdered milk	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Goats milk	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Fermented milk	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Yoghurt	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Butter (Edible)	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Butter Cosmetic	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Ghee	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Cheese	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Cream	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Ice Cream	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Others:	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both

*The list of commonly consumed dairy products can be compiled from information collected by ke informant survey.

Survey Code [_ _ _ _ _]

25. For each dairy product eaten more than once/twice a week, complete one of the following formatted pages.

Dairy Product:.....														
Quantity eaten by the household at a time		_____/_____/_____(No./unit/time)												
How is the product eaten?		by itself			used as ingredient			processed into: _____ _____ _____						
Complementary foods/beverages consumed with the dairy product?		Complements _____ _____ _____												
Sources of this dairy product	Source(s) (Note if Regulated/Unregulated market channel used for purchases)	Purchase source 1: _____ Reg/Unreg mkt (circle)			Purchase source 2: _____ Reg/Unreg mkt (circle)			Home produced/prepared						
	Quantity and frequency of purchases/home production	___/___/___ (no/qty/time)			___/___/___ (no/qty/time)			___/___/___ no/qty/time						
	Price/unit													
	Distance of source (minutes)													
Are there times when the product disappears from/is not available on the market?		J	F	M	A	M	J	J	A	S	O	N	D	Season
If this product is not available, what do you substitute for it?		No substitute (do without it) No substitute and stop consuming the complements: _____ _____												
Among the months when it is available, are there months when you cannot afford to purchase and consume it?		J	F	M	A	M	J	J	A	S	O	N	D	Why?

Survey Code [_ _ _ _ _]

26. Are there dairy products which you would like to consume but which the market does not offer?

> _____ [|]
> _____ [|]
> _____ [|]

Attitudes and Beliefs about Dairy Products and HH Food Budget

27. How do you prepare fresh milk before you drink it? (PLEASE NUMBER THE STEPS.)

Filter ____ Cooling ____ Boiling ____ Bottling/Packaging ____ Other (specify) ____

28. Are there times, or particular individuals who should not eat certain dairy products?

Who?	What dairy product?	When not to have it?	Why?
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

29. Are there times, or particular individuals who should eat certain dairy products?

Who?	What dairy product?	When they should have it?	Why?
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

30. Who is given or drinks the most milk in your household?

	< 2 yrs	2-10	11-15	16-30	31-50	> 50 yrs
Male						
Female						

31. Dairy Product Preferences

Below is a list of dairy products grouped in pairs. Assuming availability and price are not of concern, which dairy product would your household prefer over the other, and WHY?

(**Note:** Products MUST be equal substitutes! The products listed below are examples from Kenya of substitute dairy products. Actual products will differ by survey area and researchers must determine the products to be listed based on prior knowledge, e.g. key informant survey.)

Survey Code [_ _ _ _ _]

Dairy Products	Preferred	Why?
i. Milk Products		
> Cow or goat's milk	_____	_____
> Fresh (raw) cow's milk or pasteurized milk	_____	_____
> Fresh (raw) cow's milk or UHT milk	_____	_____
> Pasteurized milk or UHT milk	_____	_____
ii. Fermented/Sour Milk Products		
> Home-made yoghurt or commercial "BIO" yoghurt	_____	_____
> Home-made yoghurt or commercial "Mugumu" yoghurt	_____	_____
> "BIO" yoghurt or "Mugumu" yoghurt	_____	_____
iii. Cooking Fats/Oils/Ghee/Margarine		
> Local ghee or "Kimbo" cooking fat	_____	_____
> Local ghee or "Rama" cooking fat	_____	_____
> "Kimbo" or "Rama" cooking fat	_____	_____
iv. Edible spreads (e.g. butter, margarine, etc.)		
> "KCC" butter or "Irish Spring" butter	_____	_____
> "KCC" butter or "Blue Band" margarine	_____	_____
> "Irish Spring" butter or "Blue Band" margarine	_____	_____
v. Cheeses		
> "KCC" cheddar or "Rift Valley" cheddar	_____	_____
> "KCC" cheddar or "Ol Doinyo" cheddar	_____	_____
> "Rift Valley" cheddar or "Ol Doinyo" cheddar	_____	_____
vi. Cosmetic butters/fats/oils		
> Shoa butter or Debre Zeit butter	_____	_____
> Shoa butter or Addis butter	_____	_____
> Debre Zeit butter or Addis butter	_____	_____

32. What prevents you from consuming more dairy products? (If more than one constraint is mentioned, number the constraints in descending order of their severity.)

High price	Not available	Insufficient household income	Fear of disease/ contamination
Do not need/require more	Do not like taste	Spoilage	Other (specify)

Survey Code [_ _ _ _ _]

Dairy Product Disposal

33. Is any milk being produced by this household? Yes/No

If "Yes":

Milk Production	Daily HH Production	Daily HH Consumption	Processed	Sold
	(Qty/unit) [/]	(Qty/unit) [|]/____	(Qty/unit/time) ____/____/____	(Qty/unit/time) ____/____/____

Household Income

34. How much money are you spending on average each week for food (including dairy products) for the household? [\| \| \|]

35. To which of the following income categories does your household belong (Enumerators note! This is <u>total</u> household income from <u>all</u> sources.)

Example based on KENYA, 1992 minimum wage rate of shillings 1500 per month.

Household Income Range
< 1/2 monthly minimum wage
1/2 - 1 x monthly minimum wage
1 - 2 x " " "
2 - 4 x " " "
4 - 8 x " " "
8 - 16 x " " "
> 16 x monthly minimum wage

Household Income Range	Tick the appropriate box
< Shs 750	
Shs 750 - 1500	
Shs 1501 - 3000	
Shs 3001 - 6000	
Shs 6001 - 12000	
Shs 12001 - 24000	
> Shs 24000	

Survey Code [_ _ _ _ _]

36. Consumption Frequency Checklist

Food Item

	More than once a day	Once a day	3-6 times a week	Once/twice a week	Once/twice a month	Once every two or more months	Not in Season/ Avail.	Special Occasions	Never
Meat									
Beef	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
Chicken	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
Goat	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
Mutton	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
Duck	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
Camel	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
Tripe/ Stomach	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
Liver/ Kidneys/ Heart	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
Fish	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
Pork (Non-Muslims only!!)	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
Other meat: _____	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]

Survey Code [_ _ _ _ _]

"EDGE UNIT" HOUSEHOLD QUESTIONNAIRE

Enumerator note: The following shortened questionnaire is to be used for "Edge unit" households, ie. those households which have <u>not</u> consumed any dairy product in the last 7 regular days.

---

1. Date of Interview [| | | | | |] Location and Identification of Survey HH:
2. Name of Enumerator _____ [|]
3. District_____ [ ] 4. Division _____ [|]
5. Location _____ [| |] 6. Village _____ [| |]
7. Household Classification 1 = Rural 2 = Urban 3 = Peri-urban
8. Is there electricity in the house? Yes/No
9. If "Yes", do you have a refrigerator? Yes/No

Demographics

10. Who makes the decisions about what foods are purchased? ie. who manages the HH food budget?

    HH Head: Male HH Head: Female Wife #1 Wife #2 Daughter Son
    Other (specify) _____

11. If the food budget manager is <u>not</u> the HH head, who is the HH head?

    Husband Grandfather Mother #1 Mother #2 Grandmother Daughter Son

    Other (specify) _____

12. Respondent's position in HH (if <u>not</u> the food budget manager or HH head)

13-16. FBM's: Sex [ ] Age [|] Ethnic Group _____ [|]
Religion _____ [ ]

17. FBM's education level No formal [ ] Adult literacy [ ] Primary only [ ]
Secondary [ ] Beyond secondary [ ] Other [ ]

18-21. Head of household's: Sex [ ] Age [|] Ethnic Group _____ [|]
Religion _____ [ ]

Household Size and Structure

22. Total No. HH members [|]

23.	<2 yrs	2-10	11-15	16-30	31-50	>50 yrs
Male						
Female						

\+ + + + + = total HH?

Survey Code [_ _ _ _ _]

Dairy Product Consumption

24. Below is a list of dairy products* commonly eaten in this area. How frequently is each dairy product eaten by this household?

	More than once a day	Once a day	3-6 times a week	Once/ twice a week	Once/ twice a month	Special occasions	Not avail.	Sources (Circle one)
Raw milk	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Pasteurized milk	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
UHT milk	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Powdered milk	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Goats milk	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Fermented milk	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Yoghurt	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Butter (Edible)	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Butter Cosmetic	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Ghee	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Cheese	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Cream	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Ice Cream	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both
Others:	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]	Purch/Home/Both

*The list of commonly consumed dairy products can be compiled from information collected by key informant survey.

25. What prevents you from consuming more dairy products? (If more than one constraint is mentioned, number the constraints in descending order of their severity).

High price	Not available	Insufficient household income	Fear of disease/ contamination
Do not need/require more	Do not like taste	Spoilage	Other (specify)

Household Income

26. How much money are you spending on average each week for food (including dairy products) for the household? [| | |]

Survey Code [_ _ _ _ _]

27. To which of the following income categories does your household belong (Enumerators note! This is <u>total</u> household income from <u>all</u> sources.)

Example based on KENYA, 1992 minimum wage rate of shillings 1500 per month.

Household Income Range
< 1/2 monthly minimum wage
1/2 - 1 x monthly minimum wage
1 - 2 x " " "
2 - 4 x " " "
4 - 8 x " " "
8 - 16 x " " "
> 16 x monthly minimum wage

Household Income Range	Tick the appropriate box
< Shs 750	
Shs 750 - 1500	
Shs 1501 - 3000	
Shs 3001 - 6000	
Shs 6001 - 12000	
Shs 12001 - 24000	
> Shs 24000	

28. Consumption Frequency Checklist

<u>Food Item</u>

	More than once a day	Once a day	3-6 times a week	Once/twice a week	Once/twice a month	Once every two or more months	Not in Season/ Avail.	Special Occasions	Never
Meat									
Beef	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
Chicken	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
Goat	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
Mutton	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
Duck	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
Camel	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
Tripe/ Stomach	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
Liver/ Kidneys/ Heart	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
Fish	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
Pork (Non-Muslims only!!)	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
Other meat: _____	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]

Annex 3. Procedures for standardising product measures and consumption frequencies, and calculation of consumer units

In the unregulated, informal markets that predominate in many rural areas, dairy products are sold or traded in many forms and measures, some of which can be highly location- specific. Nevertheless, these measures are usually well understood by local consumers and are regarded as legitimate standards of measure. It is recommended that data collection involving quantities be gathered using local standards of measure. Doing so will have the twofold advantage of allowing respondents to use quantities with which they are familiar and can estimate accurately. In turn, this will facilitate collection of more accurate data and reduce the chances of non-sampling errors. It does, however, complicate the work of the researcher who must convert the local measures into standards which are widely recognised, such as litres, kilograms etc. This is not so difficult if the local measures are some form of commercially marketed container on which the volume is indicated. However, if the local measure used is not one of these, say for instance a calabash, then it will be necessary to calculate the volume or weight of the measure by emptying the contents into a calibrated container or weighing a reasonable number of samples and obtaining an average value. Furthermore, this will be necessary for each of the different dairy products as densities, and hence weights, will vary.

There still remains the problem of expressing total quantity of dairy products consumed: how does one add together products which are not of the same form, such as milk and butter? To resolve this problem, and to account for the fact that making a kilogram of butter requires an estimated 6.6 litres of milk, the concept of *liquid milk equivalents (LME)* is introduced. Quite simply, the LME of a dairy product is that quantity of whole liquid milk which is required to make the dairy product in question. Normally, LMEs are expressed in kilograms. Table 9 lists LME conversion factors calculated by the United Nations Food and Agriculture Organisation for various dairy products. The CF follows these conversion factors.

Table 9. Conversion factors expressed as kilograms of whole liquid milk equivalent (LME) per kilogram of milk product.

Product (1.0 kg)	Conversion factor (kg LME)
Fresh milk	1.0
Skim and whole milk powder	7.6
Condensed and evaporated milk	2.0
Cheese and curd	4.4
Butter	6.6
Butter oil	8.0
Other products	2.0

Source: FAO (1978)

Similarly, respondents should be allowed to answer questions using the time reference best known to them, i.e. daily, weekly, monthly etc. It will then be necessary to standardise these time references prior to analyzing the data .

From the standpoint of nutritional assessment, it is important to recognise that caloric requirements differ according to the age and sex of an individual. For this reason, the preferred human unit of measure is the ***consumer unit***. Table 10 provides conversion factors for translating per capita consumption into consumer units. This assumes, of course, that

information is available regarding the "structure" of each household, i.e. the composition of the household by age and sex of its members.

Table 10. Conversion factors for calculation of consumer units (CU).

	Age classes					
	< 2 years	**2—10 years**	**11—15 years**	**16-30 years**	**31—50 years**	**> 50 years**
Male	0.35	0.6	0.8	1.0	1.0	0.8
Female	0.35	0.6	0.7	0.8	0.8	0.65

Source: adapted from Leegwater et al (1990).

Having standardised the products, frequency of consumption and consumer units of measure, one can now sum, analyze and compare results from data involving dairy products of different types consumed at various time intervals by individuals of different ages and gender.

Annex 4. Sampling stratification: guidelines and comments

In applying the foregoing methodology, one will have formulated hypotheses regarding household consumption behaviour and its determinants. These hypotheses speculate on relationships between dairy consumption and various household attributes such as income, ethnicity, location and others. In order to properly test the hypotheses, it is important that the household sample drawn adequately displays the full range of these attributes, i.e. it is representative of the household population. Careful stratification will increase the likelihood that the household sample selected will reflect the variation of the desired attributes in the household population.

Key variables of interest are specified in the stated hypotheses. Begin the sample design by obtaining through key informants and secondary sources as much information as possible regarding the geographical distribution of these characteristics. Determine if these characteristics are distributed with any clear patterns. If they are, then these patterns should be taken into account when selecting the sampling clusters. For example, if income is hypothesised as a key determinant of dairy consumption, ensure that households of all income levels are represented in the sample to be surveyed. Moreover, to ensure that a particular income group is not over- or under-represented, apportion the clusters to be sampled in accordance with each group's occurrence in the population. Sometimes this information will be available from government sources such as the Central Bureau of Statistics, or possibly it may be extracted from previous surveys. Accord each group or stratum its appropriate number of clusters from among the total number of clusters to be sampled in the dairy shed. From the subtotal of clusters belonging to the given stratum, draw at random that number of clusters which has been apportioned to it. Continue in this fashion for the other strata to be sampled. The resulting stratified sample should reproduce the population mixture. Following this procedure will increase the likelihood of capturing key consumption determinants as well as ensuring the representativeness of the survey results. However, to avoid sampling errors and to ensure comparable data sets, it is imperative that identical stratification criteria are used across sites. The table below illustrates how, by careful definition, stratification can be uniformly applied.

Table 11. Criteria for stratification of households by location.

Location Type	Attributes
Urban	Within a town or city municipal limits
	Majority of homes have electricity
	Majority of homes have indoor, potable water supply
	Majority of population has ready access to telephone service
	Main roads are tarmac surfaced
	Majority of households infrequently or never engage in farming activities
Peri-urban	Outside a town or city/municipal limits
	Minority of the homes have electricity
	Minority of the homes have indoor, potable water supply
	Majority of homes have access to piped water
	Telephone service in the area is limited
	Main roads may not be tarmac but are all-weather roads
	There is feasible access to a town or city for a commuting (i.e. daily) work force
	Some households maintain farms but it is not a farming-based community
Rural	Fails to meet the foregoing tests for urban or peri-urban locations

N.B. In order to be classified as an urban or peri-urban location, it is required that the area under consideration meet all of the criteria specified for that location type.

Annex 5. Computation of means and variance for data collected using the adaptive cluster method

The computation of the mean per stratum (where stratification has been used) is given as:

$$\hat{\mu} = \frac{1}{n} \sum_{i=1}^{n} Z_i$$

$$\textit{where} \quad Z_i = \frac{1}{m_i} \sum_{1}^{m_i} x_j$$

for n primary units, m_i cluster size for i^{th} primary unit and Z_i is the cluster mean.

An unbiased estimator of the variance, if the initial sample is selected without replacement, is given by:

$$Var \ (\hat{\mu}) = \frac{N-n}{Nn\ (n-1)} \sum_{i=1}^{n} (Z_i - \hat{\mu})^2$$

If stratification has been used, then the above estimates will represent those of the strata. Estimates of means and variances may then be combined using known (well-documented) procedures (see Cochran, 1963).