Market-Oriented Smallholder Dairying Research

Working Document No. 3

A methodology for characterizing dairy marketing systems

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TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

ACKNOWLEDGEMENT

1. INTRODUCTION

1.1 Dairy production and marketing in the developing countries

In the traditional milk producing areas of Asia and Africa, dairy is an essential component of small-scale mixed crop-livestock farming. In the semi-arid and arid regions of these continents, milk is produced by pastoralists and agropastoralists who have large herds. In the non-traditional milk producing areas of Southeast Asia, Korea, and China, the situation is more varied. In the past, fluid milk had little value in these countries because the majority of the adult population were lactose intolerant. However, with urbanization and economic development, demand for processed dairy products that pose fewer lactose related problems increased. In response, both small and large-scale dairy farms have emerged, often with public sector initiative and investment. In Latin America and the Caribbean, 60-80% of the milk producers are small-scale accounting for 25-30% of milk production in these countries; the remainder are medium-scale farms with mixed beef and dairy operations and also specialized dairy operations (Schelhaas, 1995).

Although dairy production is widespread throughout the developing world, productivity and growth of output are low. In the developing countries, 115 million dairy cattle produce 88 million tons of milk annually, i.e. 763 kg per animal, compared to 107 million cattle producing 376 million tons, i.e. 3515 kg per animal in the developed countries (De Boer et al.,1994). Dairy consumption levels per capita are also low - 22 kg in Africa, 19 kg in Asia and 109 kg in Latin America compared to 270 kg in North America and 306 kg in Europe (Shapiro et al., 1995). Imports comprise a significant proportion of developing country consumption of dairy products. During the last three decades, dairy imports by the developing countries increased dramatically in response to rapidly increasing demand and the failure of the domestic sector to meet that demand. During 1986-88, net annual imports into the developing countries was 32 million tons, which was equivalent to 25% of domestic production (De Boer et al. 1994). Projected future demographic changes – population growth, urbanization – and income growth imply further rapid increases in the demand for dairy products and the desirability of substantially increased domestic production.

Increased dairy imports by the developing countries might have resulted from fiscal, monetary, and import policies of the importing countries as well as the subsidization and dumping policies of the exporting countries. However, poor marketing linkages between rural producers and urban consumers due to inadequate infrastructure and inefficient marketing system might have accelerated imports. Hammond (1990) has shown that marketing inefficiencies for a net importer of a finished or semi-finished consumer product such as dairy (powdered milk, butter, cheese, etc.) may lead to an increase in imports. Domestic consumers, particularly in the urban areas, are unaffected by marketing inefficiencies because increase in imports keep retail prices low or unaffected. All the costs of marketing inefficiency are borne by domestic producers in the form of reduced farm prices and reduced production.[1]

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[1] Hammond's analysis is based on the assumption of fixed marketing margins, which may not always be true. With variable marketing margins, the volume of imports would still increase although the magnitude might be different than that under fixed marketing margins.

In many developing countries, over 90% of livestock is managed by smallholders living in rural communities with inadequate marketing links to distant urban markets. In some instances large-scale dairy enterprises have been established with public sector initiative and investment to supply dairy products to urban centres and to compensate for the lack of marketing channels from more remote production areas. In many countries, small-scale urban and peri-urban dairy production has developed, responding to the urban market demand and profiting from the lack of links between the remote rural producers and the urban consumers. Urban/peri-urban dairying, while satisfying potential market demand, creates problems related to dairy production (health, fodder, water) and also creates potentially significant negative impact on the environment (manure, waste and sewage disposal) (Phelan and Henriksen, 1995).

In the mid 19th century, most European cities depended on urban/peri-urban dairies for much of their milk and beef. By the turn of the century these urban/peri-urban dairies disappeared because (a) increasing population led to urban expansion, (b) more land was required for consolidation of production into larger units to capture economies of scale, (c) regulations to reduce health risks and environmental hazards were introduced, (d) transporting fodder in and water/manure out of town became more costly, and (e) milk was available from rural farming areas through improved infrastructure and market orientation of rural producers (Glamann, 1992, quoted in Phelan and Henriksen, 1995).

Urban/peri-urban dairying currently practiced in the developing countries will eventually face the same fate as their European counterparts, but such a development is still a long way ahead. So long as urban/peri-urban dairy systems serve as major sources of dairy products for expanding urban centres, it is desirable that the systems function efficiently and the policy environment support domestic dairy development.

Weaknesses in physical and marketing links between rural producers and urban processors and consumers are among the major constraints to dairy development in the developing countries. It is important to be aware of and understand how such constraints can be addressed in order to devise mechanisms that can transfer growing urban demand into increased livestock production. Inadequate infrastructure and inefficient marketing may lead to increased transactions costs and/or market failure.[2] By better understanding these costs and identifying the ways of reducing their impact, policy prescriptions can be made to promote economic development by fostering production and trade.

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[2] Transactions costs are broadly defined to include *ex ante* costs of determining whether an exchange is advantageous, costs of actually carrying out the exchange (such as finding buyers or sellers, transportation costs) and, where applicable, *ex post* costs of ensuring that all provisions of the exchange were met. ... Among other reasons, market failure may occur when the costs of executing an otherwise advantageous exchange exceeds the net benefits realized, so the exchange fails to take place (Goeltz, 1995).

1.2 Specific features of dairy in relation to marketing in developing countries

The dairy industry in the developing countries has a number of specific features which distinguish it from the other sectors of agriculture and have particular implications for marketing (Jaffee, 1995; Schelhaas, 1995). First, milk consists of over 85% water, and produced daily. Consequently, high costs of transportation are incurred per unit of output marketed. Also, milk being highly perishable, it needs to be used within a short period or processed and transformed into a more stable, longer-storable form. The quality of milk depends on farm management practices, and milk is potentially subject to adulteration, so strict and comprehensive quality regulations may be necessary when marketing involves more than direct delivery by producers to consumers.

Second, the vast majority of the dairy farmers are small-scale producers, who produce milk as a source of regular cash income. Dairy production is a labour-intensive enterprise, and dairy marketing activities often provide substantial employment. However, because of asset fixity (high percentage of fixed costs), dairy enterprises often respond to market changes and incentives in a limited and gradual way.

Third, milk can be used to make a wide range of high quality palatable and nutritious products, which often imply substantial value added over the cost of the raw material. When production and consumption points are far apart and demand increase rapidly, processing of dairy products become very important.

Fourth, as a consequence of the above features of milk and the market vulnerability of its producers, cooperatives may assume a strong position in milk processing. A survey by the International Dairy Federation in 1984 revealed that in 21 developed countries together accounting for 55% of the world's milk supply, producer cooperatives marketed 86% of total sales of milk from farm to the first handler (quoted in Schelhaas, 1995). In some of these countries, cooperatives also handled 80-90% of the total processing activity. It may be noted that the history of development of dairy cooperatives in these countries are not always similar. However, in most developing countries, dairy producer cooperatives and cooperative processing are either non-existent or very weak. The need for cooperatives in these countries is driven by the need to capture some economies of scale in transportation and processing where numerous small producers are scattered far away from the consumption centres. In many countries, this gap has been filled by establishment of parastatal dairy enterprises for collection and processing of milk to promote domestic dairy production. In most cases, these enterprises ended up processing subsidized imported dairy products, neglecting the rural dairy sector. The monopolistic character of these enterprises often led to inefficiency thus they failed to serve the interests of domestic producers and consumers (Brokken and Seyoum, 1992; Staal, 1995).

7

1.3 Dairy marketing research at ILRI: background and objectives

Market-oriented dairy is an important focus of research at ILRI because it is considered to have a good potential for contribution to the process of economic development in the developing countries in several ways: through increased domestic production of dairy products to meet increased demand and reduce dependence on imports; through increased employment, income generation and food security among the poor. Realization of this potential will require an adequate understanding of the history and processes of dairy development in the developing countries, identification of facilitating factors where development occurred and constraints or inhibiting factors where it did not occur or occurred inadequately, and also find potential solutions to identified constraints.

In order to undertake research in a systematic manner taking a holistic approach, a conceptual framework for market-oriented smallholder dairy research, henceforth referred to as CF, has been developed. The CF takes a production-to-consumption approach to the analysis of a dairy system of which production, processing, marketing and consumption are subsystems.[3] It is assumed that the development of the dairy sector may be facilitated by research that documents the functional linkages among the four components, and performance of the industry as well as the various subsystems. A common framework for dairy systems analysis is proposed in the CF with a minimum data set for each component of dairy system, so that ILRI and the partner national research institutions together may generate information from a wide variety of locations and situations to compare experiences to learn from one another (Rey et al., 1993). Without a common framework and common data set, it is often difficult to compare studies conducted at different locations for drawing lessons of wider relevance. For example, Table 1 summarizes the methods and results of some dairy marketing studies. The results are not easily comparable because of the differences in methods used.

Within the CF, research activities are proposed to be phased. In Phase I, information on the general characteristics or types of dairy systems existing in various parts of the developing world and their history of development will be collected primarily using secondary data and literature review supplemented with rapid appraisal techniques, particularly where secondary data may be inadequate. In Phase II, detailed characterization of dairy systems and their subsystems at appropriate levels will be done, and constraints and opportunities for dairy development in different developing regions and countries will be identified. In Phase III, solutions to the constraints identified in Phase II will be sought to take advantage of opportunities for dairy development. Within the CF, separate methodologies will be developed for each subsystem (Rey et al., 1993).

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[3] Dairy marketing essentially includes processing as a function that creates form utility of products. The function involves bio-physical processes to convert raw milk into various products. In disciplinary terms, this is the domain of dairy technology. In the CF, the processing subsystem deals with the dairy technological aspects and options for dairy development. The existing processing functions that create form utility and involves costs and returns, are treated as marketing functions, and are included in the marketing subsystem.

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This document presents the methodology of characterization of dairy marketing systems to be used in Phase II. The objectives of characterization of the marketing subsystem in this phase are to:

- provide baseline data on the characteristics and objectives of market participants, and performance of the marketing system;
- identify and understand factors influencing dairy marketing, the constraints to and opportunities for improved marketing;
- understand the linkages between marketing, production, processing and consumption subsystems; and
- identify researchable issues which, if pursued, can be expected to produce information necessary for dairy system development.

In section 2, a framework for characterization of a dairy marketing system is described along with a brief discussion on the concept of market, marketing system and its efficiency, and hypotheses to be tested to assess marketing structure and efficiency. In section 3, data requirements and methods of data collection are described. This document is not intended to be a substitute for standard texts on marketing theory, research methodology and analytical technique. Users of this document will be expected to have basic background in these areas.

Table 1. Methods used in selected dairy marketing studies

Study location and period	Observation units and sample size	Sampling methodology	Source of sampling frame	Number of visits	Recall period	Markets involved	Results/outputs
Shewa, Ethiopia 02/85-07/86	Peasant producers (105) Peri-urban producers (18) Intra-urban producers (50)	Multistage stratified random sample	Secondary source: Central statistics Office	1 for baseline 7 for monitoring	1 year for baseline 1 week for monitoring	Formal Informal	Determinants of marketed surplus Market access (distance-km) Market outlets Product prices (price efficiency) Marketing channels
Bamako, Mali 06-09/1990	Marketing agents (150): Producers selling milk, Coop. members, Milk traders	Stratified random sample	Exploratory survey	2	Half a week	Formal Informal	Marketing channels used Market price efficiency Market discrimination
Addis Ababa Ethiopia 1984/85	Enumeration areas (25); Households: Exploratory survey (3888) Final survey (482)	Multistage stratified random sampling	Central Statistics Office Exploratory survey	1 for exploratory 7 for final survey	1 day for exploratory 1 Week for final	Formal Informal	Relative price efficiency Determinants of marketed surplus Consumers' perceptions of marketing systems
Addis Ababa Ethiopia 1993	Food institutions Private marketing agents		Secondary source Exploratory survey	1		Formal Informal	Products, volumes, prices, clients, outlets, organization of agents
Mombasa Kenya 1991	Producers (102) Food institutions (340)	Purposive	Ministry of Livestock, National Dairy Devt Programme	2 1	1 week 1 week	Formal Informal	Products, volumes, clients, outlets constraints, technical assistance

Sources: Achuonjei and Debrah 1992; Debrah and Anteneh 1991; Mbogoh, 1992; Mullins *et al*, 1994; Duteurtre, 1992.

2. A CONCEPTUAL FRAMEWORK FOR MARKET ANALYSIS

2.1 Definition of market and marketing

To characterize a marketing system, it must first be defined. The concept of a market has several meanings. It is often seen as a place or location where people meet to buy and sell goods. Conceptually, a market involves the exchange of goods and services for money or on a barter basis with or without spatial connotations. Marketing includes all the activities that are involved in moving products from producers to consumers. This includes all the exchange activities of buying and selling, the physical activities designed to give the product increased time, place and form utility, and the auxiliary activities such as financing, risk bearing and dissemination of information to participants in the marketing process. Abbott (1993) has summarized the tasks and responsibilities of marketing as finding a buyer and transferring ownership; assembling, transporting and storing; sorting, packing and processing; providing the finance for marketing and risk-taking; and assorting and presenting to consumers.

2.2 Approaches to measure marketing efficiency

Early attempts at assessing marketing efficiency focussed on the internal technical and operational efficiency of marketing firms. In this approach, management structures, motivation and incentive arrangements, and decision-making rules and processes were considered as important influences on the efficiency of operations (French, 1977).

Economists also recognized that, by their very nature, markets are systemic and all elements within them are interlinked. So analyses often emphasized the behaviour of groups of similar firms, and the influence the relationships among these firms has on market performance. This approach came to be known as the 'industrial organization' or 'structure-conduct-performance' approach to market analysis. The basic tenet of this approach is that, given certain **basic conditions**, the **structure** of an industry or market determines the **conduct** of its participants (buyers and sellers) which in turn influence its **performance**. Basic conditions refer to characteristics which are exogenous to the market, for example infrastructure, legal and policy environment, available technology. The structure of the industry, or market, is defined as "those characteristics of the organization of the market that seem to exercise strategic influence on the nature of competition and pricing within the market" (Bain, 1968). The characteristics usually stressed are (a) the number and size distribution of firms in relation to the size of the market, (b) the presence or absence of barriers to entry facing new firms; (c) physical or subjective, product differentiation; (d) degrees of vertical integration; and (e) ratio of fixed to total costs. Conduct refers to behaviour of the firm, for example, pricing and selling policies and tactics, overt or tacit inter-firm cooperation, or rivalry, and product or market related research and development activities. **Performance** is commonly measured in terms of **productive** and **allocative efficiency**. Progressiveness or innovation is also sometimes considered. Where equity and

11

employment creation are national objectives, these are also considered as criteria for performance assessment (Marion and Mueller, 1983).

Productive efficiency, usually calculated at the firm or enterprise level, is the combined result of technical and operational efficiency. Technical efficiency is measured in terms of physical input: output ratios, e.g. amount of butter or cheese per unit of milk. Theoretically, technical efficiency may be measured as the ratio of actual output to potential maximum output per unit of input, given technology, locational and environmental conditions. In practice, technical efficiency is measured in relative terms by comparing differences in input:output ratios of firms with similar resources.

Operational efficiency, also referred to as firm level allocative or price efficiency, is defined as the level of output at which the value of marginal product equals marginal factor cost for each factor of production or marketing. This is also the profit maximizing level of output.

Allocative efficiency, also referred to as pricing or economic efficiency, is usually measured at the market level. A market is considered economically efficient if (a) all enterprises in the market are productively efficient, (b) the distribution of enterprises, plants and infrastructure are organized in a manner which enables scale and location economies to be exploited, (c) prices provide incentives to producers and consumers that are consistent with available resources and demand. Economic efficiency is achieved when the sum of consumers' and producers' surplus is the maximum, and when Pareto optimality prevail i.e. no change in the economy or market can be made whereby an individual can be made better off without reducing the welfare of another individual. It is assumed that competitive market maximizes the efficiency of resource allocation (Cyert and March, 1983; French, 1977; Colman and Young, 1989).

The most important hypothesis generated by the structure - conduct - performance school of thought, and tested by a wide range of marketing economists, is that as market or industry structure moves away from perfect competition, output and allocative efficiency will decrease and prices will rise. Some of the major problems faced in its empirical application are the following (French, 1977; Scarborough and Kydd, 1992):

(a) Under some circumstances, a given structure may not lead to theoretically anticipated conduct and performance. For example, aggressive rivalry among participants in an oligopolistic market may result in conduct and performance similar to those found under perfectly competitive model. Also, where significant scale economies prevail, oligopolistic market structures may lead to better economic performance than competitive ones. So, any inference using the structure - conduct - performance links need to be made with care.

(b) Industrial organization studies focussed mainly on structure and performance, particularly on the link between industry concentration and firm profitability, on correlation between price movements over time, space and form, cost and return elements in unitary marketing margins, entry/exit conditions for firms, and access to market information. Much less attention has been

given on conduct due to data and measurement problems and the underdeveloped nature of the theory on conduct.

(c) Market performance depends not only on relationships among similar firms but also on the nature of relationships among different categories of firms within the marketing system, i.e. vertical market relations. Moreover, the basic conditions, considered as given in the industrial organization approach, may in reality impact on market performance, so they need to be studied in a dynamic rather than static framework.

In order to respond to these concerns and deficiencies, two approaches emerged. In the first case, the scope of the industrial organization approach has been broadened to include both horizontal and vertical market relations in assessing market performance, and to identify binding constraints on, or in, the system. This extended approach is known as the 'food or commodity system framework' (Schaffer, 1973 and 1980) and is similar to the French concept of "filiére", which means a commodity production and marketing chain (Lossouarn, 1992). Further, this approach recognizes the importance of joint products and services, and the existence of marketing firms and channels that handle a number of commodities or services using the same facilities.

In the second and more recent case, alternative theories of market organization are proposed. Prominent among these are the transactions cost theory, information theory and convention theory. In these theories, markets, firms, relational contracts, vertical integration, groups and associations are regarded as different forms of organization ruling transactions implying that market is just one form of organization in the process of transaction. Non-price relationships in transactions are given particular importance in these theories. Also, a distinction is made between institution and organization. Institutions are social rules, norms and conventions which determine the nature of social interaction. Organizations are units of coordination of activities of agents with a goal or a set of goals. In short, organizations are players of the game and institutions are rules of the game (for further reference see, Bardhan, 1989; Menard, 1990; North, 1990; Brousseau, 1993). There are few empirical applications of these theories in the less developed countries, particularly in the area of food marketing. Moustier (1996) gives a good review of the conceptual differences among the three strands of organization theory, and made an application to vegetable market organization in Brazzaville.

Theoretical developments in transactions costs economics is based on the premise that any operationalized version of competition cannot be safely used as a norm against which to evaluate real market structure and behaviour. However, all markets have to cope with transactions costs, asymmetric information and moral hazard, and these are hardly completely measurable (Harris - White, 1997; Timmer, 1997). Therefore, apart from competitive behaviour, evaluation of market efficiency may include other criteria such as the impact of market distance on agricultural productivity (von Oppen et al., 1997), dynamic and adaptive efficiency reflected in growth and investment via price integration and operational cost effectiveness (Palaskas et al., 1997; Timmer, 1997).

The primary interest in agricultural market analysis is to assess the impacts of marketing inefficiencies on consumer and producer prices, on levels of production and consumption, and on exports or imports. It is recognized that markets rarely, if ever, approach the optimum with respect to economic efficiency defined by competitive conditions. However, at the characterization phase, it is more important to describe how the dairy marketing systems function than to measure whether they function efficiently. Even if the concept of economic efficiency is inadequate or not fully empirically testable to guide policy makers or a society in organizing and using its resources, some of the methods or tools of economic efficiency may be meaningfully used to characterize marketing systems and assess how various participants and economic variables in a system are interrelated (Hammond, 1990).

2.3 Characterizing dairy marketing systems

A dairy marketing system may be characterized by:

- the range of dairy products marketed;
- the size, structure and organization of the enterprises participating in the market for each product and in the entire marketing chain;
- the conduct and performance of the marketing system; and
- the existing marketing policies, institutions and organizations, and the physical environment within which marketing takes place.

The degree of vertical and horizontal integration in a dairy marketing system may vary from country to country, or between regions and milksheds within a country. For example, in one case most of the milk may be sold and consumed as raw milk while in another case, in addition to raw milk, several processed dairy products such as cheese and butter may be marketed and consumed. The structure and organization of dairy marketing and the marketing practices are likely to differ between these two situations. Since cross-site comparison is a major objective of ILRI dairy research, comparison of the entire dairy marketing system is likely to be more meaningful than comparison of a single product, e.g. raw milk, marketing , or of a sub-system e.g. a processing plant, assembly or transportation system (Hammond, 1990). Adoption of the 'food or commodity system framework' facilitates multi-commodity marketing system analysis. The distinction between organization and institutions made within the framework of the theories of organization may be recognized without necessarily adopting those theories at the characterization phase. These theories may be applied subsequently in any detailed investigation of particular dairy marketing system.

Several parameters or indicators may be used to characterize the system and each of its components. Such parameters or indicators may be classified into two broad groups:
Functional parameters: These are key descriptors of how the system operates. Examples include dairy products marketed, marketing agents, marketing outlets, prices at each marketing

14

node, modes of transporting marketed products, etc. Functional parameters combine characteristics related to market structure and conduct.

Performance indicators: These parameters permit assessment of the performance of the system. Examples are the percentage of total dairy products marketed, the ratio of standardized to non-standardized products marketed; the ratio of marketing to total costs; the ratio of farm gate to retail price. The importance of identifying performance indicators is that they form the baseline against which any changes in the efficiency or performance of the system can be measured.

Examples of functional parameters and performance indicators for each component of a dairy marketing system are given in Table 2.

Some important terms related to characterization are defined here. A **dairy product** is 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 differentiates them. Generally, product differentiation will occur at the marketing node (see below). A dairy product is considered to be **standardized** when it meets a legally accepted minimum standard or quality (e.g. pasteurized, homogenized milk with 4% butter fat content) as opposed to a **non-standardized dairy product** which does not conform to any such standards e.g. raw milk. In some less developed country situations, any legal standard may not exist for local products but informal local standard may exist due to consumer choice and preference established over a long period.

Formal market includes firms and organizations whose daily operations are guided by statutory rules and procedures, e.g. a parastatal dairy processing plant or a company engaged in dairy marketing. **Informal market** includes firms whose daily operations are not guided by statutory rules and procedures except for any trade license, e.g. dairy producers and itinerant traders.

A **marketing chain** defines the flow of commodities from producers to consumers that brings into place economic agents who perform complementary functions with the aim of satisfying both producers and consumers. A **marketing node** is defined as any point in the marketing chain where an exchange and/or transformation of a dairy product takes place. A **marketing chain** may link both formal and informal market agents.

A marketing chain may connect one or more **milk or dairy sheds.** A dairy shed is an area where milk production is a major activity. A milk shed may serve one or more consumption centres or cities. Also, a consumption centre may be served by more than one milk shed (see illustration Fig.1). For example, in Addis Ababa, raw milk comes from the Addis Ababa milkshed comprising about 100 km radius around Addis, but butter in Addis market comes from several milksheds located up to 600 km away.

15

Figure 1:   Illustration of a milk shed

C City
T Town
M Market
P Processing Plant

Milkshed A

Milkshed B

Table 2. Functional parameters and performance indicators for characterizing a dairy marketing system.

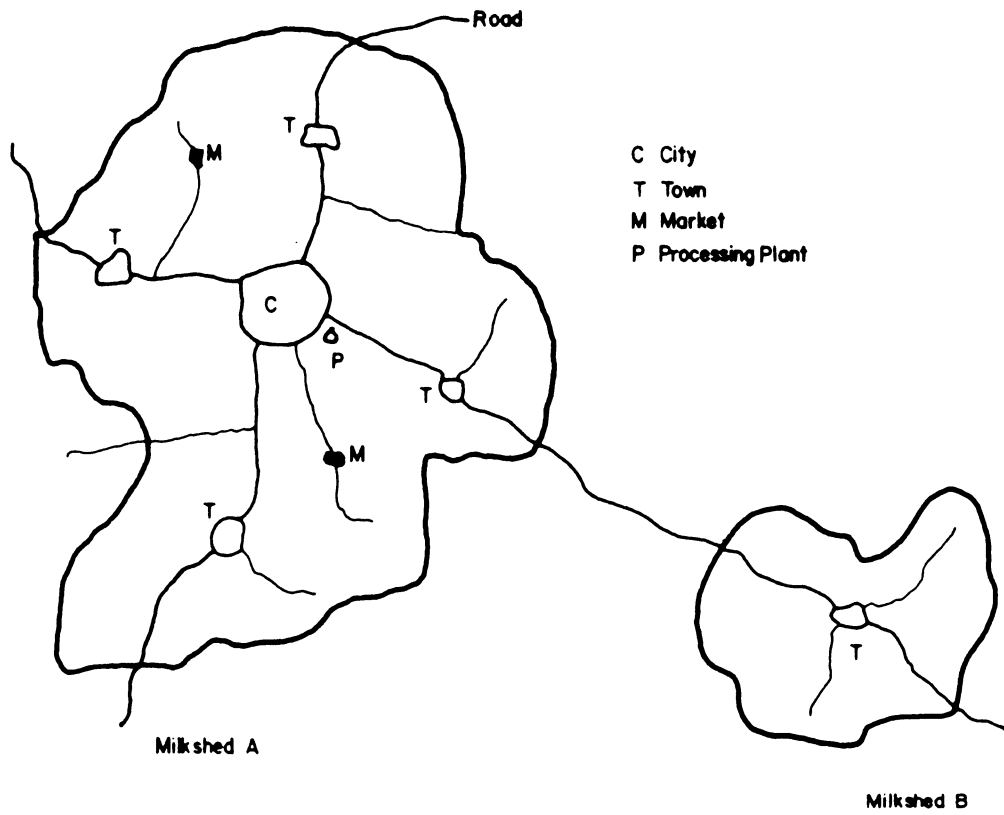| System component	Functional Parameters	Performance Indicators
Dairy products marketed	Dairy products marketed: Standardized vs non-standardized; Domestic vs imported	. Percentage of standardized dairy products marketed in total dairy sales . Self sufficiency rate . Consumer ratings of dairy products' quality and standards
Market size, structure and organization	. Marketing agents: number, functions performed, gender and socio-cultural attributes . Organization of agents . Seasonal variation: Product types (volume) . Organization of collection and distribution: geographical coverage (types of areas, distance in km and time) . Packaging . Storage . Modes of transporting marketed products . Market information mechanisms: types and sources of information, frequency . Marketing constraints by type of market . Equipment and technology . Labor including training	. Share of dairy products handled by formal vs informal markets . Number of marketing agents by type of market . Seller and buyer concentrations . Percentage of marketing agents performing single vs multiple functions . Distance (km) between marketing nodes . Percentage of producers who market their own produce . Percent of market agents and producers having access to market information . Frequency of marketing information
Marketing policy and environment	Institutions: . Regulations on quality e.g. minimum standards . Price controls . Licensing . Subsidies, Taxes . Import/export duties, levies, quotas, subsidies . Capital/credit supply Organizations: . Marketing board . Cooperatives for collection . Processing plants	. Entries/exits to/from dairy market . Levels of taxation and subsidization on dairy marketing . Rates of return on investment . Share of formal agricultural credit to dairy

17

Table 2. Functional parameters and performance indicators for characterizing a dairy marketing system (cont'd).

System component	Functional parameters	Performance Indicators
Market conduct and performance	. Prices at each marketing node . Marketing costs and returns by channel and season . Reliability and regularity of supply . Existence of contract (formal, informal, verbal, written, forward sale)	. Share of dairy product marketed in total production . Price differential: formal vs informal, standardized vs non-standardized . Price efficiency . Spatial and temporal (seasonal) price differences . Farm to retail price spread and marketing margins . Profitability and rates of return at different marketing nodes . Import parity price . Percent losses during marketing . Losses between marketing nodes . Percentage of producers/consumers served by each system . Percentage of marketing agents having received training in marketing . Equity capital and credit including sources

3. STEPS IN THE CHARACTERIZATION OF A DAIRY MARKETING SYSTEM

In the general Conceptual Framework for Market-Oriented Dairy Research (Rey *et al.*, 1993), the following steps are suggested for characterization of a dairy marketing system:

- formulate questions and hypotheses to be answered or tested in relation to perceived problems;
- determine the analytical methodologies to be used to answer the formulated questions and to test the hypotheses;
- in accordance with the questions, hypotheses and analytical methodologies selected, define the data needs;
- define the sources of the data required;
- determine the most appropriate data collection methods for these sources; and
- where primary data collection is deemed necessary, design the survey including sample selection procedures and the field instrument, then computerize data; and
- analyze.

The iterative sequence of these steps are shown in Figure 2. These steps will promote efficiency in the choice of analytical methods, data and data sources, method of collection, and sample design. Each of the identified steps is discussed below with reference to its application.

3.1 Formulate research questions and hypotheses

The search for a solution to any problem starts with a good understanding of the problem and its probable origin. Researchers in a team may differ in their perception of a problem but common ground about the system being studied is imperative to formulate the research questions and hypotheses to be answered or tested. Researchable issues can be identified by looking at the goals and objectives of the participants in the dairy marketing system and how various factors such as government regulations, infrastructure, size of market, credit, etc. interfere with or promote achievement of the marketing goals.

A number of possible hypotheses related to dairy marketing systems are presented in Table 3. The hypotheses are classified into the four aspects of a dairy marketing system mentioned earlier. While the objective is to describe dairy marketing as a whole, a specific hypothesis deals with only one portion or aspect of the system. The list of hypotheses is not exhaustive. Based on specific circumstance or location, some hypotheses may be dropped as not relevant and/or additional hypotheses may be formulated as required. For example, a marketing chain or a milk shed may not have any processing plant, any processing being done at producer level. In this case, the hypotheses related to processing enterprises are not relevant for that location. Subject to this adjustment, the list of hypotheses may constitute the minimum common set of hypotheses which together will characterize the system.

19

3.2 Determine the methods of analysis

The type of data to be collected is determined by one's research objectives and associated costs of data collection (Scherr and Vosti, 1993). It is essential to determine ahead of time the theoretical concepts and methods to be used to analyze the data and test hypotheses. Different analytical methods require different types of data. Based upon the method of analysis to be used, specific data requirements can be identified. For example, seller concentration may be used as one of the measures of market structure. Again, seller concentration may be measured in a number of ways, for example by fitting a Lorenz Curve or by the following ratio: $C = S/P$. 100, where C is the concentration ratio, P is the total output or sales of an industry or market, and S is the output or sales of a certain number, say 5 or 10, of the largest firms in the industry or market. Similarly, marketing margins, and spatial or temporal price correlations may be used as some of the measures of marketing efficiency. Each of these measures requires different data.

Simple analytical tools such as descriptive statistics (percentages, mean, mode, median, standard deviation, coefficient of variation etc.) will often suffice in quantifying the descriptors of the marketing system. But where it is desired to test hypotheses or to explore cause-effect relationships, it will be necessary to employ economic and marketing theory and concepts, and statistical methods such as ANOVA, correlation and regression analyses. Collection of data required for the chosen analytical technique has to be planned ahead of time. A variety of methods for data collection and analysis in marketing research suitable for specific problem situations are illustrated in Scott (1995).

3.3 Determine the information to be collected

Sometimes questionnaires for field data collection are constructed to collect as much information as possible, with the hope that the use and relevance of the data will appear during analysis or that the data may be used for some future objectives (Malik, 1993). Experience has shown a number of disadvantages associated with this approach:

* respondents become bored with long interview/questionnaires resulting in poor data quality and unwillingness to cooperate in subsequent surveys;
* omission of relevant information due to overloading the survey instrument; and
* inefficient use of resources when analysis eventually makes use of only a fraction of the data collected.

All the information collected should be relevant and useful in answering specific questions or testing hypotheses already selected or stated. The data collected should also be compatible with the analytical methods chosen. In Table 3, each of the suggested hypotheses is matched with the data required for its testing as well as the source of data. Some data may contribute to testing several hypotheses. The data listed in Table 3 have to be manipulated to derive other categories of data for testing hypotheses. For example, market share of processed and non-processed products in total sales have to be calculated from raw data on volume of sales of different types of products.

20

Figure 2. Steps to be followed in characterizing a dairy marketing system.

Formulate questions (Q) and hypotheses (H) to be answered or tested — STEP 1

Are Qs and Hs answerable or testable?

NO / YES

Reformulate Qs and Hs

Determine analytical methodology (AM) — STEP 2

Can AM adequately answer Qs and test Hs?

NO / YES

Reconsider AM

Define data needs (DN) in terms of Functional Parameters (FP) and Performance Indicators (PI) and (H) — STEP 3

Can PIs be derived from FPs?

NO / YES

Redefine FPs and PIs

Define sources of data (DS) — STEP 4

Are DSs available and can provide adequate data for FPs and PIs?
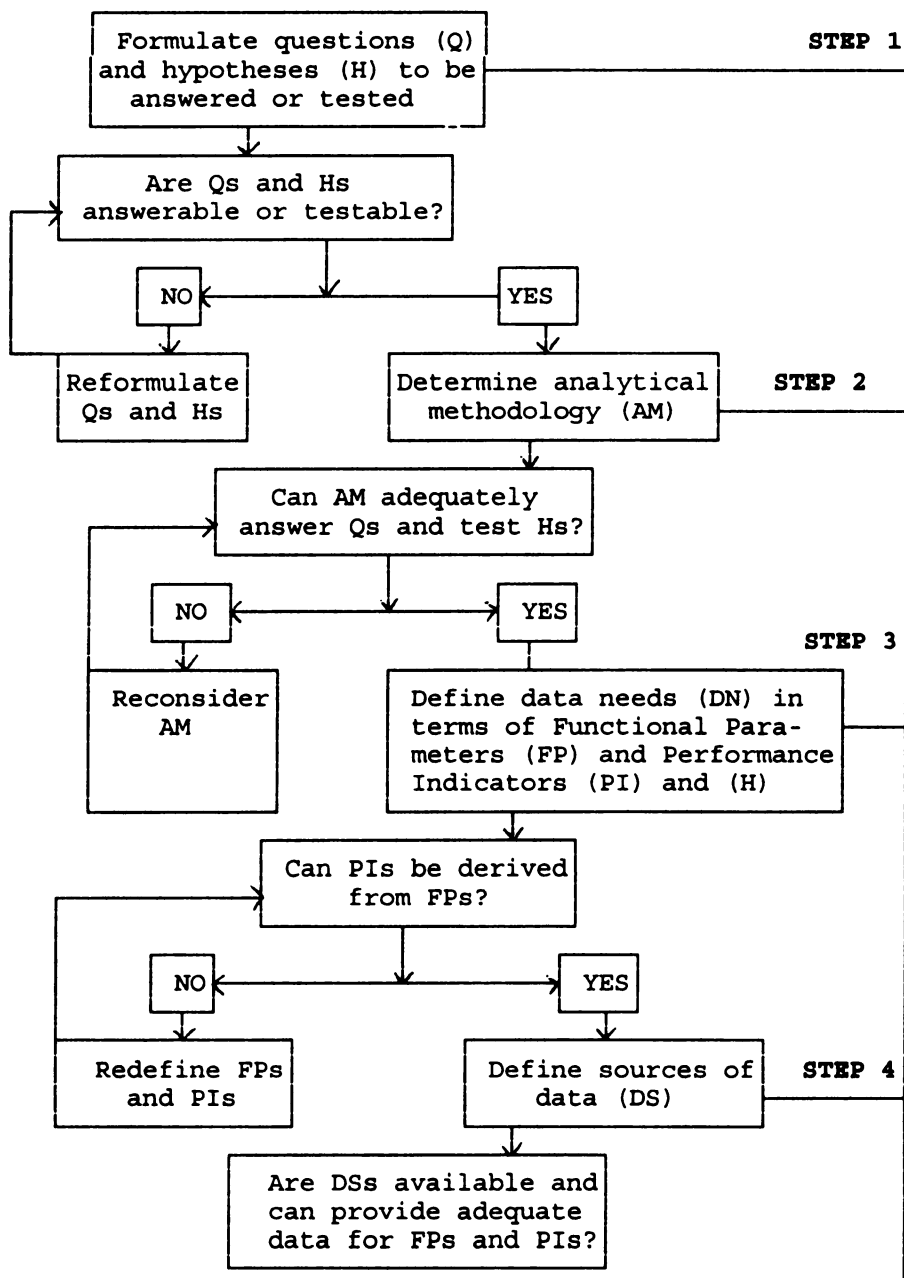
Figure 2. Steps to be followed in characterizing a dairy marketing system (con'td).
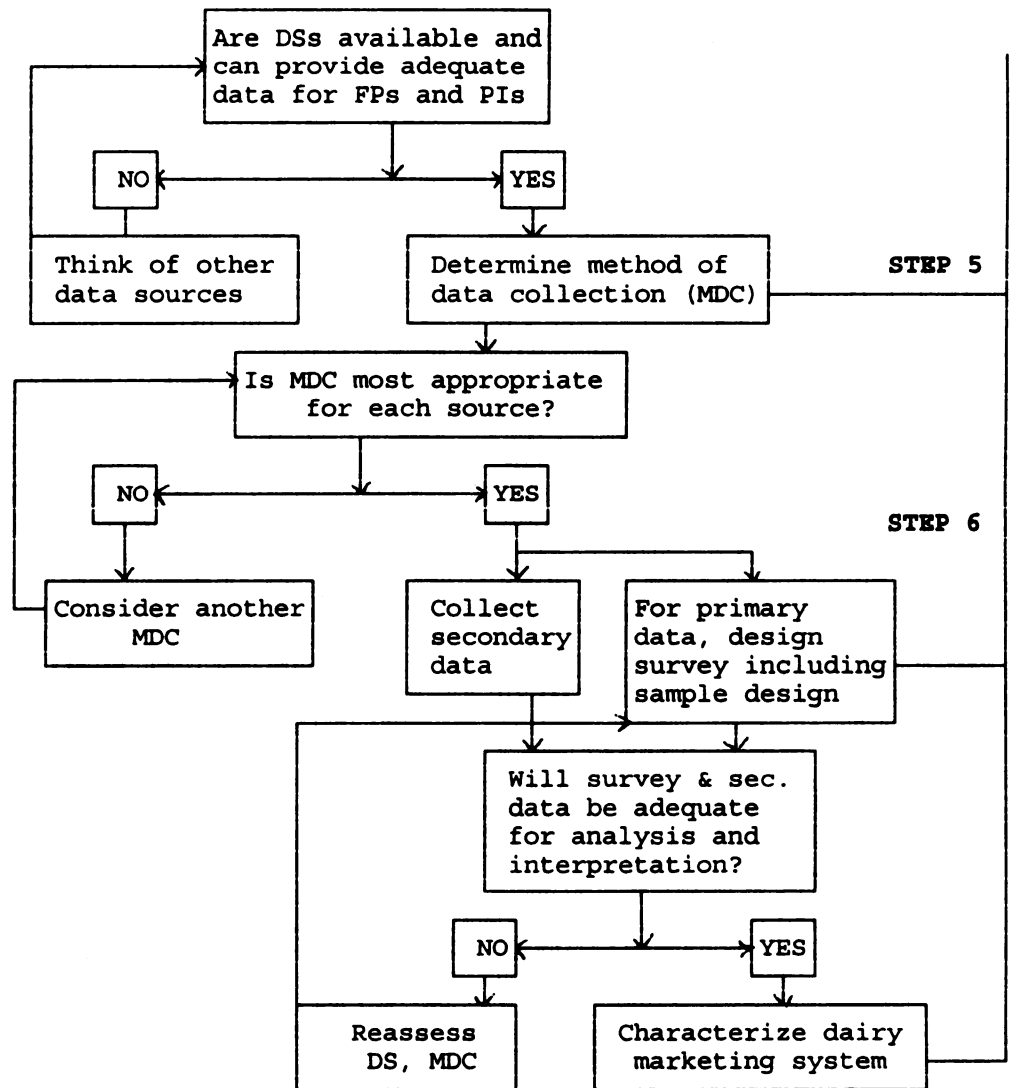
Table 3. Some hypotheses on dairy marketing, data required for their testing and sources of information.

Hypotheses	Main Data Required	Sources of data
Dairy Products		
1. The share of processed and standardized dairy products marketed in formal markets is greater than that in informal markets	- Volume of sales of standardized vs non-standardized dairy product per market	Marketing agents
2. As income and degree of urbanization increases, more standardized dairy products are marketed	- Number of dairy products marketed that meet minimum quality standards - Income levels, - size of urban population	Marketing agents Consumers
3. Marketed surplus of milk primarily depends on output level, family size, input and output prices, access to market, access to market information, nature of dairy development project (credit, input supply, sales obligations)	- Output, family size, home consumption, - Prices, sales obligations, involvement in dev. project, transaction costs - Type and sources of market information and credit	Producers Marketing agents
SIZE, STRUCTURE AND ORGANIZATION OF DAIRY MARKETS		
4. Number and types of intermediaries are larger in informal than in formal markets, and number of intermediaries are larger where dairy density (dairy output per square km) is higher	- Number of middlemen between producer and consumer for formal and informal markets - Types of middlemen and their functions - Dairy density	Marketing agents
5. Intermediaries in formal markets are more organised and vertically integrated than in informal markets	- Vertical links in the marketing chain - Product delivery terms - Association/organization of market agents	Marketing agents

23

Table 3. Some hypotheses on dairy marketing ... (Cont'd).

Hypotheses	Main Data Required	Source of data
6. Among producers and retail traders, women and children perform more dairy marketing activities than men	- Household size and composition of producers and retail traders - Men, women and children in dairy marketing activities	Marketing agents
7. Urbanization and growth in per capita income both contribute to increased dairy production	- Sizes of urban population and population growth - Size of milk sheds - Volume of dairy products sold/consumed - Real income growth	Secondary sources Key informants
8. Size and location of formal processing facilities determine size of milkshed and number of intermediaries	- Size and location of processing plants - No. of intermediaries	Marketing agents Secondary sources
MARKET POLICY AND ENVIRONMENT		
9. Regulations on price, quality and system of payment in formal markets influence the decisions by small-scale farmers to sell milk in that market	- Nature of regulations in formal markets - Size of dairy enterprise - Quantities of milk marketed in formal markets	Marketing agents Secondary sources
10. Type of dairy processing used is influenced by the availability of technologies (for storage, cooling, bulking), the size of the market, access to producers, access to credit and consumer preference	- Type of processing technologies available - Storage, cooling, transportation costs - Number of producers, volume of output marketed, number of consumers, number of traders - Consumer preference	Consumers Secondary Sources, Marketing agents

Table 3. Some hypotheses on dairy marketing ... (cont'd).

Hypotheses	Main Data Required	Sources of Data
MARKET CONDUCT AND PERFORMANCE		
11. Unit marketing costs of large-scale commercial dairy enterprises are lower than those for small-scale enterprises	- Quantities of dairy products produced - Processing and marketing costs - Type of technology used	Marketing agents
12. Price received and transaction costs are important factors for producers in decisions about the market outlet(s) to be used	- Formal and informal market price of milk - Transportation costs - Number and type of market outlets	Producers Marketing agents
13. Price of milk is inversely related to market supply in particular season of the year	- Quantities sold per season - Price by season	- Marketing agents
14. Spatial and temporal variations in farm gate prices are higher than those for retail prices	- Farm gate and retail prices by location, distance and season	- Marketing agents
15. Small scale processing units are more productively efficient than large scale processing units	- Processing plant size, volume of business - Processing costs, - Conversion rate	- Processing plants

Table 3. Some hypotheses on dairy marketing ... (cont'd).

Hypotheses	Main Data Required	Sources of Information
16. Private processing plants are more productively efficient than in parastatal plants	- Capacity utilization - Plant size, volume of business - Processing costs - Conversion rate	- Processing plant - Marketing agents
17. Underutilization of capacity in dairy processing industry exist due to lack of local supply, seasonal fluctuation in supply, small and scattered production units, poor and seasonally impassable roads, inappropriate transport	- Capacity utilization - Local vs imported supply - Supply by season - Distribution of suppliers - Road mileages and condition	- Processing plant - Marketing agents
18. In informal markets, market agents are competitive; margins reflect costs not excess profits. In formal markets, margins may fail to cover costs	- Marketing margins, marketing costs, profits of firm in informal and formal markets	- Marketing agents
19. Absence of excess profit does not imply marketing operations are performed at least cost or at consumers' satisfaction or that various market functions are operationally efficient	- Profits, costs, consumer preferences	- Marketing agents - Consumers

3.4 Identify the sources of information

In this step the best source(s) of the information necessary for characterizing the marketing system are to be identified. The data source(s) chosen should combine quality attributes of reliability and accuracy while considering access and ease of data acquisition. Potential sources for secondary and primary data on the marketing system are:

Published materials, official statistics, "grey" literature (documents with limited circulation). Sources included in this category are publications and reports prepared by government statistics offices, Ministries of Agriculture, Livestock, Cooperatives, Trade, Industry and Planning, the customs department, dairy boards, produce marketing organizations, urban councils, cooperatives, national and international research institutes, university departments (e.g. Agricultural Economics, Economics, Commerce, Business); development and cooperative banks, the World Bank, FAO, bilateral development agencies (e.g. USAID, ODA, GTZ, FINNIDA, IFAD); and non-governmental organizations.

Key informants. These are individuals who are knowledgeable about a subject, and are willing to share their knowledge. As with researchers, perceptions and views about a particular problem or issue may differ among key informants, so a chain of informants would be useful to achieve consensus of opinions. An example of a **key informant chain** for a marketing system would be a retail shop/supermarket manager, a dairy board or cooperative manager, an extension agents and a village head. Holtzman (1986) has given a comprehensive listing of key informants, particularly in relation to food grain marketing, including a description of the advantages and disadvantages of each key informant as a source of data.

Marketing agents. These are individuals, groups of individuals or organizations that facilitate the flow of dairy products from producers to consumers through various activities such as production, purchase, processing and sale. Examples of market agents include farmers selling dairy products, retailers, wholesalers, or supermarket owners trading dairy products, produce marketing organizations, dairy boards, cooperatives, importers and exporters.

In Table 3, possible source(s) of data for testing different hypotheses are shown. Marketing agents are the focal point for data collection. They constitute the unit of observation and it is at this level that most primary marketing data are collected. More importantly, the concept of a marketing system is largely built around the activities and arrangements made by marketing agents, individually or collectively, to move dairy products from producers to consumers.

3.5 Determine the method of data collection for each source

Dairy marketing systems may differ depending upon a number of factors (e.g. physical and policy environment, organizational arrangements, marketing channels, etc.) so that the appropriate method for collecting information will depend upon the marketing system being

27

considered. Group interviews that might be used to collect information from members of a dairy cooperative, for example, probably would not be used to interview dairy board or cooperative managers, supermarket managers or customs officials.

Data collection methods will also differ depending upon the type of data sought and the sources from which they are to be collected. Data are classified into two general types: qualitative and quantitative. Qualitative data produce descriptions of situations, events, policy environment, people and systems interactions. Quantitative data are collected when a number, ratio or proportion related to the target population is to be estimated (Casley and Kumar, 1988; Frankenberger, 1992). For the functional parameters and performance indicators identified in Table 2, quantitative data are appropriate and may be collected from secondary or primary sources. When collected from secondary sources, the method of collection is straightforward, being consultation of previously published and unpublished

records. Collection of primary data on a dairy marketing system entails more detailed methodologies and requires an informal or a formal survey.

Data collection methods are selected once the required data and their source(s) have been defined. Alternative methods should be considered before making a choice as more than one method may contribute toward proper characterization of the system. Mettrick (1993) recommended a combination of group interviews, case studies, formal and informal surveys as appropriate for collecting information on a marketing system. Brief description of these data collection methods are as follows:

Group interview: Open-ended discussion with a group of respondents sharing resources or activities. Group interviews are useful for tapping the collective wisdom or memory of a community or organization. For example, dairy producers and traders operating in a milk or dairy shed may constitute two independent groups for interview.

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; Pableo and Ignacio, 1986). Case studies are appropriate when a detailed understanding of complicated relationships is considered more important than ensuring a sample representative of the entire population.

Informal survey: A semi-structured but systematic activity designed to quickly acquire new information on, or to generate new hypotheses about, a subject of interest or an area. Often a multidisciplinary team conducts the survey to cover different interrelated dimensions about the subject. It is appropriate when the need is for understanding rather than quantifying a system. Informal surveys can be followed by a small-scale, focused verification survey to improve credibility. It forms the basis for decisions on the important information that should be quantified in the verification survey, how the questions should be structured and how a representative sample should be chosen (CIMMYT, 1980). Informal survey methods are most appropriate for collecting qualitative data. These data can be obtained during group or individual interviews with key informants or marketing agents. In relation to dairy marketing analysis, the following steps are suggested:

28

(1) Identify a set of key informants for each type of dairy product marketed in the different areas of a milk shed. This may be done by contacting the extension service of the Ministries of Agriculture and Livestock, dairy cooperatives, cattle breeders' associations, etc. Selection of key informants should ensure that there is adequate geographic coverage to permit a sense of variation in the information being collected from them.

(2) Develop a topical outline with questions targeted at each dairy product marketed but allowing for additional topics to be incorporated as they arise during the informal discussion with key informants. An example of the kinds of information to be collected is presented in Annex 1.

(3) Depending upon the number of key informants and their locations, convene group or individual meetings during which informal discussions are held with them on how the dairy marketing system for each product is organized, who is involved in the process, and the marketing nodes. Group meetings may be organized for farmers who produce and sell fresh milk whereas individual meetings can be held with managers of supermarkets and dairy processing plants.

(4) From the discussions, it should be possible to develop for each of the dairy products marketed, a list of their sources and outlets, estimate of the number and type of agents involved, their location, etc. A principal objective of this exercise should be to develop an idea of those variables which influence the structure, conduct and performance of the market. A critical part of informal survey by a team is the sharing and compiling of notes from the interviews to create a genuine and substantive consensus about the issues involved.

When sample units consist of farmers who produce and sell milk, or members of a dairy cooperative, convening group meetings to discuss marketing issues is often relatively easy. However, this may not be the case when sample units consist of traders, households or food institutions. In such cases, a moving key informant survey is necessary. Careful consideration must therefore be given to ensuring good geographical coverage of the dairy shed in order to avoid omitting units in some areas, and thereby possibly distorting or introducing "bias" into the survey.

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. Formal survey methods are most appropriate for collecting quantitative data on functional parameters and performance indicators. If a random sample is desired, then the sampling method must ensure that the sample from which the data are collected is representative of the population. Choosing a representative sample generally requires a comprehensive sampling frame. A sampling frame is a complete list of the population about which one wishes to collect information. For a dairy marketing system, the population includes all the individuals and institutions (marketing agents) involved in the sale of dairy products. These can be classified into the following broad categories:

- farmers who produce and sell dairy products;
- individual traders or other plants and organizations that purchase, collect, process and resell dairy products; and
- facilitating organizations such as marketing boards.

Sample frames containing all of these sampling units are often difficult to find. When a suitable sampling frame cannot be found, one may be constructed through key informant surveys using the steps outlined above. Lists of the types of individuals and organizations needed may be compiled based on information from the key informants. This information can then be used to design and plan a formal survey in terms of choosing the sampling units, sample size, criteria for sample selection, and questionnaire design. When an adequate or reliable frame cannot be developed from informal interviews, sample may be taken by "select as encountered' method within the geographical area being considered.

In a few cases, however, sample frames may be available through the extension service, Ministries of Agriculture and Livestock, dairy cooperatives, or through development assistance agencies. Before one uses a sampling frame to select a sample, care should be

taken to ensure that the frame is up-to-date, complete and fulfills all predetermined criteria set for sample selection. Sample selection can be carried out as follows:

(1) Determine the unit of analysis. Examples include farmers who produce and sell dairy products, itinerant traders, food institutions (e.g. hotels, restaurants), retail and wholesale shops, supermarkets, public and private organizations (e.g. schools, hospitals), and processing plants.

(2) Define the boundary of a dairy shed, or a marketing chain which may be considered as the next higher level of sampling and analytical unit. Based on the information collected during the informal diagnostic survey, establish the geographical distribution of these sampling units within the dairy shed or marketing chain. Sampling units may be widely distributed within the dairy shed or they may exhibit particular patterns of distribution. Retail shops carrying dairy products, for example, may be concentrated in the city center whereas itinerant traders may be evenly distributed throughout the city. Farmers, on the other hand, may be found exclusively in rural and/or peri-urban areas. Dairy processing plants may be located in industrial areas.

(3) Identify important determinants of the distributional patterns of the sampling units. An example for agents who sell fresh milk is the distance from their collection point(s) to the market. For farmers who produce and sell fresh milk, their distribution may be determined by the size of their holding. Small farms (1 to 3 dairy cows) may be located in peri-urban areas whereas larger farms (> 3 dairy cows) may be found in rural areas.

(4) Form clusters of sampling units to cover the dairy shed such that the clusters are representative of the determining factors. For example, form clusters of dairy producers, processors and retailers then sample clusters on the basis of (i) the total number of clusters, (ii) their geographic distribution and (iii) variation of determinants, e.g. distance, type of products handled.

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(5) For each sample cluster, develop a list of sampling units from which a sample should be randomly selected. Sample size should be guided by the estimated population, number of units within the cluster, and variation within the population, bearing in mind that the overall sample size should be large enough to permit statistical analysis. To avoid over- or under-representation of particular characteristics, the number of units to be surveyed should be proportional to the distribution within the cluster.

(6) Where considerable variation exists among units to be surveyed within a sample cluster, the sample units should be stratified to account for this variation. For example, if wide variations exist in the size of dairy herd or the type of dairy products handled, the sample should be stratified accordingly.

(7) Decide on resource constraints. Although sample size should be sufficiently large to permit statistical analysis, financial, human resource and time constraints must be taken into account prior to sample selection and survey execution. For example, where wholesalers, retail shops and food institutions are found within the same vicinity, interviews could be conducted during the same survey period.

When *a priori* knowledge of the size of the target population is poor, a random sample selection with a given sampling intensity may be difficult to obtain. It may then be preferable to sample purposively, i.e. sample using a sub-set of the population but whose characteristics are known and meet desired criteria.

To maximize data accuracy at the individual or organization level, efforts should be made to collect marketing information from the individual directly responsible for the acquisition, processing or sale of dairy products. For example, dairy board, supermarket or wholesale shop managers, would be the appropriate sources of information on marketing if a questionnaire were to be administered. Regardless of whether it is a formal or an informal survey, efforts should be made to use experienced enumerators who are familiar with the language and culture of the survey units and who will be permitted access to them.

3.6 Develop field instruments

As a first step to collecting information on the dairy marketing systems, secondary sources should be reviewed and discussions held with key informants. The information provided by key informants broadens the understanding of the marketing system and permits a proper design of the marketing survey instrument(s) and the sampling procedure. The proposed methodology for characterizing the dairy marketing systems anticipates that much of the information specified will require primary data collection involving surveys. Designing and organizing survey is a complex task that requires a variety of techniques and organizational skills. Earlier, four major groups of marketing agents were identified: farmers, traders (wholesalers and retailers including supermarkets, grocery shops, and itinerant traders), processing plants, and facilitating organizations. Characterization of a dairy marketing system in a specific area or milkshed requires that all four types of agents and their linkages are

31

studied. A single survey instrument may not be appropriate or adequate for all four types of agents. However, in Annex 2 a sample questionnaire is proposed which contains the following four sections:

A: General information about a marketing agent
B: Information about producer-sellers
C: Information about traders
D: Information about processing enterprise.

Each section is designed to generate the minimum data necessary to provide the functional parameters, the performance indicators and test the relevant hypotheses listed in Table 3. For implementation of a specific survey, a separate questionnaire may be prepared for each type of agent by taking a combination of the four sections. For example, sections A and B may be combined to form a questionnaire to survey farmers who produce and sell dairy products, sections A and C may be combined to form a questionnaire to survey all categories of traders, and sections A and D to survey processing plants. The content of a questionnaire may also vary across locations. For example, in question 13 in Section B, butter, cheese and yoghurt are mentioned as products produced by farmers. In a particular location, there may be other and more specific products. Examples are *Wara* (a soft cheese), *Nono* (fermented milk), *fura de nono* (fermented milk with balls of cereal) found in West Africa and ayib (a soft cheese) found in Ethiopia. In this case, these local names should be used. The list of items included in various tables in the example questionnaire should also be changed according to prevailing condition in a location. Only a subset of the items may be relevant for a location. Actual list should be established on the basis of key informant interviews, secondary sources, and further by pretesting the questionnaire.

A formal questionnaire may or may not be needed to study facilitating organizations e.g. a marketing board, because there may be just one or two such organization in a given area. In such a situation, a case study may be appropriate.

The example questionnaire may be adjusted in order to collect data for the relevant hypotheses postulated for specific locations. No single questionnaire is adequate to collect all kinds of information. Information on the conduct of market agents is particularly difficult to illicit through surveys, and close observation and participatory methods may have to be supplemented to collect such information.

As mentioned in section 3.1, the adjusted list of hypotheses should constitute the minimum common set of hypotheses to be tested across locations. Therefore, the data listed against the hypotheses in Table 3 should also constitute the minimum data set for each location. A more systematic listing of the minimum data set, with cross reference to hypotheses is given in Table 4.

3.7 Coding and management of data

Once the survey is complete, the data should be coded, the coding plan documented and then the data should be entered into computer. Most statistical analysis packages such as SAS and

SPSS have built-in data entry and management mechanisms. This approach is suitable when a small volume of data is involved. For large samples with many variables, dBase or any other standard data management package is recommended. As far as possible, the latest version of dBase or other package should be used.

Computerized data should be clearly described and documented so that the nature of data can be understood and used not only by those who are directly involved in data collection but also by others who may be interested in them at present or in the future. Properly documented and archived data often prove to be valuable treasure to future researchers. An example coding plan for data to be collected through key informant interviewers (Annex 1) is shown in Annex 3. An important feature of this coding plan is that variable names are chosen in such a way that it appears as a series. Alternatively, each variable could be given a unique name composed of permissible characters and digits but finding separate names becomes difficult when there are many variables. The advantage of using a series type variable name is that it can accommodate any number of variables, and they can be defined in a consecutive manner as the data are recorded in the questionnaire. New variables created out of original data in the questionnaire may be easily added to the series of original variables.

Since the example questionnaire in Annex 1 generated data on less than 100 variables, the names are started with V01. When over 100 variables are involved, the name may be started with V01, but V001 might be better in order to maintain symmetry in names.

A coding plan for the main survey using the example questionnaire in Annex 2 is not shown because, as mentioned earlier, the content and size of the questionnaire will vary depending on the characteristics of a location. The final questionnaire for a location will likely be much shorter with fewer variables than is indicated in the example questionnaire. A coding plan for a reduced questionnaire may be easily constructed based on the illustration in Annex 3.

3.8 Data analysis

The type of analysis to be done will be mostly predetermined by the choice of hypotheses and the data collected to test them.

Table 4. Minimum data set to be generated by survey for characterization of a marketing system

Parameters to be measured	Related Hypotheses	Question No. in the questionnaire
1. Household size and composition	6	10
2. Education, religion, age, sex of agent, their functions	3	5, 6, 7, 8
3. Number, type, location of marketing agents	4, 6	3, 4
4. Type of dairy products produced, consumed, processed and marketed, standard, non-standard	1, 7, 3	13
5. Source of products marketed	3	19
6. Value of each product marketed	3	19
7. Functions performed by agents	4	13, 14, 19, 20, 27
8. Type of contracts and links (verbal, written, formal, informal, horizontal, vertical etc.) among agents	5	19, 21, 27
9. Price by season, type of product	3, 13	14, 19, 21, 27
10. Means of transportation	10, 12	14, 21, 19, 27
11. Transportation costs	11, 15. 16	20, 19, 14
12. Processing/packaging costs	10	20, 22
13. Storage losses and costs	10, 15, 16, 17	24
14. Size and location of processing plants, capacity and utilization	10	15, 21, 25
15. Processing technologies used	10	15, 22, 28
16. Source and terms of credit	10	17
17. Number of dairy products marketed that meet minimum standard	2	13
18. Sales obligation, involvement in dev. project, transaction costs	3	17
19. Association/organization of market agents, vertical links in the marketing chain	5	17
20. Product delivery terms, nature of contract	5	19, 21
21. Men, women and children in dairy marketing activities	6	10
22. Size of dairy enterprise	9	12
23. Quantities of milk marketed in formal and informal markets	9	14
24. Number of producers, volume of output marketed, number of consumers, number of traders	10	13

Note 1: Data on policy, organizational arrangement, entry barriers, population, income, size of milkshed, tax, subsidy, credit supply etc. may be collected through key informant interviews and from secondary sources (see Annex 1).

Note 2: Data for performance measurement are to be derived from the raw data listed in this table. Those derived data are not listed here.

34

4. SUMMARY

The Conceptual Framework series, of which this document comprises a module, is intended to provide a common framework for market-oriented dairy research so that studies conducted by various institutions in different locations may be easily compared to draw important lessons for research and development. This methodology document on dairy marketing research begins with the formulation of research questions and hypotheses and the identification of functional parameters and performance indicators for characterizing dairy marketing systems. The methods of analysis, data requirements and potential sources are also suggested. Sampling techniques to generate necessary data along with alternative methods of data collection are discussed. A survey instrument is provided as a working tool for collection of a minimum data set for compiling the functional parameters, the performance indicators, and for testing the stated hypotheses.

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ANNEX 1

Key Informant Interviews to collect Information about a Milkshed

In order to undertake a detailed marketing study in a milkshed, it is necessary to first establish the boundaries and the size of the milkshed where size implies both area and population, then obtain a general idea about the types of products available. This information is complemented by the types and numbers of marketing agents operating, their locations, and the marketing chains in which they function.

Some of this information may be available from published sources, but key informants such as experienced farmers, traders, government extension staff, managers of dairy farms or processing plants, may be able to provide additional descriptive and quantitative information. Ideally, a number of key informants representing different segments of a marketing system or chain should be interviewed. A formal questionnaire is not always needed for key informant interviews but a list of questions or a check list in some form may help guide the interview. Even when a somewhat formal questionnaire is used, it is desirable that the interview is conducted in an informal manner, allowing scope for exploring relevant information which might not have been included in the original list of questions. New information and ideas may emerge during the interview process.

Guide for Key Informant Interviews   Sample No. _____

1. The key informant
    Name: _____   Location_____
    Occupation: _____
    Location: _____

2. Area and population of the milkshed
    Area of the milkshed   _____ sq. km
    Population: Households _____ Persons _____

3. Main population concentrations served by the milkshed

Name	Type (City/Town/Market)	Population
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____

4. Dairy animals and milk yields

	Cross-bred/exotic cow	Local cow
Number of farmers		
Average herd size		
Total animals in the area		
Av. lactation length (days)		
Av. lactation yield (kg)		

5. Dairy processing plant(s) in the milkshed _____

   Products produced in each _____

   Daily capacity for each _____

   How much capacity is utilized in each _____

   Sources of milk other than the milkshed _____

6. If there is no plant in the milkshed, does any outside processing plant collect milk from the milkshed?

   Yes _____ No. _____ If yes, where and how far is it located? _____

   What products are produced _____

7. Roads and means of transport for milk in the milkshed

   Paved (all weather) road _____ km

   Earthen (seasonal) road _____ km

   Means of milk transport _____

8. Marketing agents, products handled and volume

Marketing agent	Product(s) handled	Number of agents	Volume/day or week/head	Principal source of supply	Principal buyer(s)
Farmer	1.				
	2.				
	3.				
Itinerant Trader	1.				
	2.				
	3.				
Wholesaler	1.				
	2.				
	3.				
Processor	1.				
	2.				
	3.				
Retailer	1.				
	2.				
	3.				
Other (specify)	1.				
	2.				

43

Any tax paid by marketing agents?

Agent	Form of tax paid	Magnitude of tax
Dairy farmer		
Wholesaler		
Retailer		
Processor/plants		

10. Any subsidy received by marketing agents:

Agent	Form of subsidy	Magnitude of tax
Dairy farmer		
Wholesaler		
Retailer		
Processor/plants		

11. Is there any government or industrial control on prices of products?
    Which products? In what form? how is control on price implemented?

12. Is quality/standard of various products defined and enforced? How?

13. Is there any licensing requirement for farmers and traders? If so for what purpose?
    How much does it cost?

14. Sources of credit for market agents, interest rates? _____

15. Are producers organised into a group or cooperative? for what purpose?

16. Are traders organised or linked in any formal or informal organisation? for what purpose?

ANNEX 2

SAMPLE QUESTIONNAIRE FOR DAIRY MARKETING SURVEY

A. GENERAL INFORMATION

1. Date of interview [_____]
   Day/Month/Year

2. Name of enumerator _____

3. Location and identification of the marketing agent
   Name/designation _____
   Province/Region/State _____   District _____
   Town _____(___)   Village/_____(___)

4. Type of agent   1 = Producer   2 = Wholesaler   3 = Retailer   4 = Itinerant trader
      5 = Catering shop   6 = Private processing plant   7 = Govt processing plant
      8 = Cooperative processing plant   9 = Other (specify) _____

5. Sex: 1 = Male   2 = Female

6. Age of decision maker: _____ Yrs

7. Education: 1 = No formal   2 = Adult literacy   3 = Primary   4 = Secondary
      5 = Beyond secondary

8. Religion: 1 = Christian   2 = Muslim   3 = Hindu
      4 = Other (specify) _____

9. Ethnic group: _____

10. Household size and composition (for agent 1 only)

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

Milking mainly done by _____
Processing mainly done by _____
Selling mainly done by _____

45

B.   PRODUCER

11.   Type of Producer:1 = Specialized dairy farmer (dairy main source of income)

2 = Crop-livestock farmer (balanced income from crop and livestock)

3 = Small/landless dairy farmer (none or little crop land, 1-2 cows)

4 = Agropastoralist (crop-livestock farmer, cattle mainly grazed)

12.   Dairy herd size, composition and milk yield

	Breed	Number Milking	Yield per day (litre)	
			Season 1	Season 2
Crossbred cows				
Local cows				
Buffalo				
Camel				
Dairy Goat				
Dairy Sheep				

13.   Output and disposal of milk and milk products by season

	Local or St. Unit	Duration, day,	Season 1 *	Season 2 *

Milk
Total produced
Total Consumed
Total sold
Total processed
    into Butter
    into Cheese
    into yoghurt
    other				

Butter Total produced Total consumed Total sold				
Cheese Total produced Total consumed Total sold				
Yoghurt Total produced Total consumed Total sold				
Other (specify) Total produced, kg Total consumed, kg Total sold, kg				

* Specify months in each season.

14. Sales of Products and Prices

	Unit	Season 1		Season 2	
		Outlet 1	Outlet 2	Outlet 1	Outlet 2
Raw Milk					
Sales outlet					
Buyer type					
Qty per day or week					
Price/unit					
Mode of payment					
Distance travelled/day					
Time spent/day					
Transport cost/day					
Butter					
Sales outlet					
Buyer type					
Qty per day or week					
Price/unit					
Mode of payment					
Distance traveled/day					
Time spent/day					
Transport cost/day					
Cheese					
Sales outlet					
Buyer type					
Qty per day or week					
Price/unit					
Mode of payment					
Distance travelled/day					
Time spent/day					
Transport cost/day					

Codes for sales outlet   1 = Farm gate   2 = Market place   3 = Delivery to buyer

Code for mode of payment   1 = Cash   2 = Cash in advance   3 = Credit   4: _____

Codes for type of buyer   1 = Consumer   2 = Trader   3 = Catering shop   4 = Organization (hospital/school/hostel),   5 = Collection point of
Govt/private/Coop enterprise   6 = Govt/private/coop processing plant

47

15. Tools and equipment for processing, preservation, transportation and storage of dairy products

Name of equipment	% Used for dairy	Present market value	Remaining life	Salvage value
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

16. Main problem(s) in sale or disposal of dairy products

Product	Problem		
	Product related	Buyer related	Price related
Raw milk	1. _____ 2. _____	_____	_____
Butter	1. _____ 2. _____	_____	_____
Cheese	1. _____ 2. _____	_____	_____
Yoghurt	1. _____ 2. _____	_____	_____

17. Member of any Cooperative or Association or dairy development project. Yes/No
If yes, benefits and obligations e.g. Obtain credit, inputs, guaranteed sales outlet

48

C. TRADER

18. Type of trader: 1 = Wholesaler, 2 = Retailer, 3 = Catering shop 4 = Other (specify) _____

19. Purchase of dairy products in season _____

Product	Source	Nature of contract	Reason for choice of source	Qty/day /wk/month	Price/ Unit	Mode of payment	Distance travelled/day, km	Time Spent/day	Transport cost/day	How is product differentiated	How is price determined
Raw milk											
Pasteurized milk											
UH Milk											
Powdered milk											
Fermented milk											
Evaporated milk											
Yoghurt											
Table butter											
Cosmetic butter											
Cheese											
Ghee											
Cream											
Goat milk											
Buffalo milk											
Other (specify)											

Codes:

Source: 1 = Farmgate 2 = Processing plant 3 = Wholesaler 4 = Delivered at home/shop 5 = Coop/group

Reason for choice of source: 1 = Good price 2 = Short distance 3 = Product quality
4 = Reliable supplier 5 = Mode of payment 6 =

Mode of payment: 1 = cash 2 = cash in advance 3 = Credit 4 = Other (specify) _____

49

20. Processing and storage by traders

Product	Qty processed/ day or week	Processing labour/day or week or month	Other materials cost for processing/preservation/day or wk or month	Rent for storage space	Period of Storage before sale	Losses, Spoilage in storage
Fermented milk						
Yoghurt						
Table butter						
Cosmetic butter						
Cheese						
Ghee						
Cream						
Goat milk						
Buffalo milk						
Skimmed milk						

21. Sale of dairy products in season _____

Product	Sales outlet	Buyer type	Reason for choice of outlet	How price determined	Qty/day or wk or month	Price /Unit	Nature of contract	Mode of payment	Distance Travelled/ day, km	Time Spent/ Day	Transport cost/ day	How product differentiated
Raw milk												
Pasteurized milk												
UHT Milk												
Powdered milk												
Fermented milk												
Evaporated milk												
Yoghurt												
Table butter												
Cosmetic butter												
Cheese												
Ghee												
Cream												
Goat milk												
Buffalo milk												
Skimmed milk												

Codes:

Outlet: 1 = Own   2 = Market place   3 = Delivery to buyer   4 = Other (specify) _____

Buyer type: 1. Consumer   2 = Trader   3 = Catering shop   4 = Organization   5 = Processing plant   6 = _____

Mode of payment: 1 = Cash   2 = Cash in advance   3 = Credit

Reason for choice source: 1 = Good price   2 = Short distance   3 = Reliable customer   4 = Mode of payment   5 = _____

51

22. Tools and equipment for processing, preservation, transportation and storage of dairy products

Type of equipment	% Used for dairy	Present market value	Remaining Life (yrs)	Salvage value
Milk Can				
Portable cooler				
Freezer				
Refrigerator				
Refrigerated tank				
Cooling room				
Warehouse godown				
Packaging equip.				
Other (specify)				

Contractual payment for processing; quantity _____ Cost/Unit _____

52

23. Main problems with sale and purchase of dairy products

Product	Problems related to purchase				Problems related to sale	
	Season 1		Season 2		Season 1	Season 2
Raw milk	1. _____ 2. _____		_____ _____		_____ _____	_____ _____
Pasteurized milk	1. _____ 2. _____		_____ _____		_____ _____	_____ _____
UHT milk	1. _____ 2. _____		_____ _____		_____ _____	_____ _____
Powdered milk	1. _____ 2. _____		_____ _____		_____ _____	_____ _____
Evaporated milk	1. _____ 2. _____		_____ _____		_____ _____	_____ _____
Yoghurt	1. _____ 2. _____		_____ _____		_____ _____	_____ _____
Table butter	1. _____ 2. _____		_____ _____		_____ _____	_____ _____
Cosmetic butter	1. _____ 2. _____		_____ _____		_____ _____	_____ _____
Cheese	1. _____ 2. _____		_____ _____		_____ _____	_____ _____
Ghee	1. _____ 2. _____		_____ _____		_____ _____	_____ _____
Cream	1. _____ 2. _____		_____ _____		_____ _____	_____ _____
Goat milk	1. _____ 2. _____		_____ _____		_____ _____	_____ _____
Buffalo milk	1. _____ 2. _____		_____ _____		_____ _____	_____ _____

53

D. PROCESSING ENTERPRISE

24. Type of enterprise 1 = Private 2 = Govt. 3 = Coops. 4 = _____

25. Products produced, installed capacity and utilization

Product	Plant capacity/day/week/month	Actual production/day or week	
		Season 1	Season 2
Raw milk			
Pasteurized milk			
UHT milk			
Powdered milk			
Evaporated milk			
Yoghurt			
Table butter			
Cosmetic butter			
Cheese			
Ghee			
Cream			
Goat milk			
Buffalo milk			
Skimmed milk			

54

26. Raw materials used, their sources and prices

Raw material	Source		Reason for choice of source	Qty/day or week	Price/unit	Mode of payment	Farthest distance, km
Raw milk	1.						
	2.						
Powdered milk	1.						
	2.						
Packaging materials	1						
	2.						
Other materials	1.						
	2.						

Codes: Source: 1 = Own production   2 = Purchased from trader

3 = Collected from local producer

4 = Direct import   5 = Purchased from local market   6 = _____

Reason for choice: 1 = Reliable supply   2 = Good price   3 = Short distance

4 = No alternative   5 = _____

Mode of payment: 1 = Cash   2 = Advance   3 = Credit

55

27. Sale of dairy products in season (_____)

Product	Outlets	Buyer type	Reason for choice of outlet	Qty/day or week or month	Price/ Unit	How price determined	Mode of payment	Distance Travelled/ day, km	Time Spent/ Day	Transport cost/day	How product differentiate
Raw milk											
Pasteurized milk											
UHT Milk											
Powdered milk											
Fermented milk											
Evaporated milk											
Yoghurt											
Table butter											
Cosmetic butter											
Cheese											
Ghee											
Cream											
Goat milk											
Buffalo milk											

Codes:

Outlet: 1 = Own shop 2 = Market place 3 = Delivery to buyer 4 = Other (specify) _____

Buyer Type: See question 21.

Mode of payment 1 = Cash 2 = Cash in advance 3 = Credit 4 = Other (specify) _____

Reason for choice of source: 1 = Good price 2 = Short distance 3 = Reliable customer 4 = Mode of payment 5 = _____

56

28. Equipment, machinery, building

Asset	% Used for dairy	Present value	Remaining Life	Salvage value
Land				
Building				

29. Manpower

Type	Number	Total monthly wages
Skilled		
Unskilled		
Managerial		

30. Problem with purchase of raw materials and sale of products

	Problems related to purchases	Problems related to sale
Raw material	1.	1.
	2.	2.
	3.	3.

57

ANNEX III

Coding Plan for Data Collected Through Key Informant Interviews

Variable name	Variable Label/Description	Value Label/Code	Type	Field Size
V01	Sample No.	-	Numeric	3
V02	The key informant name		Character	20
V03	The key informant location	1= 2= 3=	Numeric	1
V04	The key informant occupation	1= 2= 3=	Numeric	1
V05	Area of milkshed (sq. km)		Numeric	4
V06	Households in the milkshed (No.)		Numeric	4
V07	Persons in the milkshed (No.)		Numeric	4
V08	Population centres	1= Addis 2= Holleta 3= Debre-Zeit	Numeric	1
V09	Type of Centre	1= City 2= Town 3= Market	Numeric	1
V10	Population (No.)		Numeric	5
V11	Number of farmers owning crossbred cows		Numeric	5
V12	Number of farmers owning local cows		Numeric	5
V13	Number of farmers owning dairy goats/sheep		Numeric	5
V14	Average herd size of crossbred cows		Numeric	5
V15	Average herd size of local cows		Numeric	5
V16	Average heard size of dairy goats/sheep		Numeric	5
V17	Total crossbred cows in the area		Numeric	5
V18	Total local cows in the area		Numeric	5
V19	Total dairy goats/sheep in the area		Numeric	5
V20	Average lactation length (days) of crossbred cows		Numeric	3

58

Coding Plan for Data Collected Through Key Informant Interviews

Variable name	Variable Label/Description	Value Label/Code	Type	Field Size
V21	Average lactation length (days) of local cows		Numeric	3
V22	Average lactation length (days) of dairy goats/sheep		Numeric	3
V23	Average lactation yield (kg) of crossbred cows		Numeric	4
V24	Average lactation yield (kg) of local cows		Numeric	4
V25	Average lactation yield (kg) of dairy goats/sheep			4
V26	Names of dairy processing plant(s) in the milkshed	1= 2=		
V27	Products produced	1= pasteurized milk 2= Butter 3=	Numeric	1
V28	Daily capacity			
V29	How much capacity is utilized (%)		Numeric	
V30	If there is no plant in the milkshed, does any outside processing plant collect milk from the milkshed?	0= No 1= Yes	Numeric	1
V31	If V30 is yes, where is it located?	1= 2=	Numeric	1
V32	If V30 is yes, How far is it located? (km)		Numeric	3
V33	If V30 is yes, what products are produced?	1= 2= 3=		1
V34	Product(s) handled by farmer	1= 2=	Numeric	1
V35	Number of farmers		Numeric	3
V36	Volume/day or week/head handled by farmers		Numeric	5
V37	Farmers' principal source of supply	1=	Numeric	1

59

Coding Plan for Data Collected Through Key Informant Interviews

Variable name	Variable Label/Description	Value Label/Code	Type	Field Size
		2=		
V38	Principal buyer(s) from farmer	1= 2=	Numeric	1
V39	Product(s) handled by itinerant trader	1= 2=	Numeric	1
V40	Number of itinerant trader		Numeric	3
V41	Volume/day or week/head handled by itinerant traders		Numeric	5
V42	Itinerant trader's principal source of supply	1= 2=	Numeric	1
V43	Principal buyer(s) from itinerant trader	1= 2=	Numeric	1
V44-V58	Same as above			1
V59	Paved (all-weather road) (km)		Numeric	3
V60	Earthen (seasonal) road (km)		Numeric	3
V61	Means of milk transport	1= Head load 2= Truck 3=	Numeric	1
V62	Form of tax paid by dairy farmer	1= 2= 3=	Numeric	1
V63	Magnitude of tax paid by dairy farmer		Numeric	4
V64	Form of tax paid by wholesaler	1= 2= 3=	Numeric	1
V65	Magnitude of tax paid by wholesaler		Numeric	4
V66	Form of tax paid by retailer	1= 2= 3=	Numeric	1
V67	Magnitude of tax paid by retailer		Numeric	4
V68	Form of tax paid by processor/plants	1= 2=	Numeric	1
V69	Magnitude of tax paid by processor/plants		Numeric	4

60

Coding Plan for Data Collected Through Key Informant Interviews

Variable name	Variable Label/Description	Value Label/Code	Type	Field Size
V70	Form of subsidy received by dairy farmer	1= 2=	Numeric	1
V71	Magnitude of subsidy received by dairy farmer		Numeric	4
V72	Form of subsidy received by wholesaler	1= 2=	Numeric	1
V73	Magnitude of subsidy received by wholesaler		Numeric	4
V74	Form of subsidy received by retailer	1= 2=	Numeric	1
V75	Magnitude of subsidy received by retailer		Numeric	4
V76	Form of subsidy received by processor/plants	1= 2=	Numeric	1
V77	Magnitude of subsidy received by processor/plants		Numeric	4
V78	Is there any government or industrial control on prices of producers	1= No 2= Yes	Numeric	1
V79	If V78 is yes, which products?	1= 2= 3=	Numeric	1
V80	If V78 is yes, in what form?	1= 2= 3=	Numeric	1
V81	If V78 is yes, how is control on price implemented	1= 2= 3=	Numeric	1
V82	Is quality/standard of various products defined and enforced?	0= No 1= Yes	Numeric	1
V83	If V82 is yes, how?	1= 2= 3=	Numeric	1
V84	Is there any licensing requirement for farmers and traders	0= No 1= Yes	Numeric	1
V85	If V84 is yes, for what purpose?	1=	Numeric	1

Coding Plan for Data Collected Through Key Informant Interviews

Variable name	Variable Label/Description	Value Label/Code	Type	Field Size
		2= 3=		
V86	If V84 is yes, how much does it cost?		Numeric	3
V87	Source of credit for market agents	1= 2= 3=	Numeric	
V88	Procedures coop or group	Yes = 1 N0 = 0	Numeric	1
V89	If V88 yes, purpose	1= Collect 2= Process 3=	Numeric	1
V90	Traders group or association	Yes= 1 No= 0	Numeric	1
V91	If yes, purpose	1= Transport milk 2= Agree on price 3=	Numeric	1