EMPIRICAL ANALYSIS OF THE DETERMINANTS OF DAIRY CONSUMPTION EXPENDITURE IN THE ACCRA AND KUMASI PERI-URBAN COMMUNITIES IN GHANA

BY

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Dedication

This masterpiece is dedicated to my dear parents: Mr. Paul Adu Kofi and Madam Felicia Afua Appiaah.

Mum and Dad, this is in recognition and appreciation of your investment in my education.

This work is also dedicated to Miss Regina Ama Pomaa Frimpong, my dear friend, who has brought a lot of meaning to my life.

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Abstract

The main purpose of the study was to examine the level of expenditure on dairy products and to identify the principal factors that influence the level of consumption expenditure on dairy products across households. Structured questionnaire was used to elicit primary information from a total of 303 households in the Accra and Kumasi peri-urban areas through a multi-stage sampling approach. A double logarithmic multiple regression model was used to examine the major determinants of household dairy consumption expenditure level. The principal determinants of the aggregate dairy consumption expenditure level were identified as income level, distance from home to purchase point and the level of urbanization of consumer's home location. A 10% increase in consumer income was found to result in 4.2% increase in the consumption expenditure on dairy products. This means that the marginal propensity to spend on dairy products is 0.42. Also a 1Km increase in the distance from home to purchase point results in 0.1% increase in aggregate dairy consumption expenditure level. The study revealed that urban consumers spend more on dairy products than their rural counterparts. Regarding the individual dairy products, the study further revealed that the elasticity of consumption expenditure with respect to own price is unity, suggesting a constant marginal expenditure on specific dairy products for successive increases in the levels of product's own price. However, the elasticity of specific dairy product expenditure with respect to income level and prices of substitutes was found to be less than unity, indicating diminishing marginal expenditure on specific dairy products for each percentage increase in income level and prices of substitute dairy products. It became evident from the study that raw fresh milk is an inferior commodity in Ghana as expenditure on it decreases with increasing level of consumer income. However, yoghurt and evaporated milk were found to be normal commodities. It was also found out that a 100% increase in the distance from consumer's home to purchase point will warrant a 5% reduction in raw fresh milk consumption expenditure. Apart from vigorous consumer education to erase the negative perceptions people have about fresh milk, the study also recommended that marketing agents and producer sellers should explore the possibility of increasing the selling/purchase points of raw fresh milk in urban communities which are dominated by low income earners so as to boost the consumer demand for the product.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Dairy production is an important feature of Ghana's agriculture, contributing largely towards meeting food needs of consumers and generating cash income for producers and marketing agents.

Though attempts are being made to promote the production and marketing of dairy products in Ghana, little or no empirical work has been done with respect to the examination of the structural relationships underlying dairy production and consumption in Ghana. Not only does the consumption of dairy products by households change with respect to personal, household, cultural and economic factors but the expenditures on dairy products also change in ways that are extremely important to agricultural planning and to the fortunes of farmers and marketers of dairy products.

The purpose of this study is therefore to examine the level of expenditure on dairy products and to identify the principal factors that influence the level of consumption expenditure on dairy products across households.

1.2 Problem statement

In spite of its important contribution towards Ghana's agriculture, the dairy industry has not developed to the state where the country can realize its full benefits. The few scattered production and marketing centers throughout the country underscore the under-developed nature of the dairy industry. There is an urgent need for improvement in the performance and growth of the industry if stakeholders are to realize and enjoy the full benefits of the dairy industry. This can be achieved when there is increased demand for dairy products in Ghana. Increased demand or ready market for dairy products will be motivating enough to boost dairy production in the country. It is generally agreed among economists that the demand for a commodity can be boosted through effective marketing

strategies. Thus, marketing agents in the dairy industry need to develop effective marketing strategies to promote the demand for and consumption of dairy products. But this can only be done when there is an empirical study on dairy consumer behaviour; an area which has not received attention in agricultural economics research. Such a study will give stakeholders in the dairy industry, especially marketing agents, a fair knowledge on how consumers behave towards different dairy products. Specifically, knowledge about factors which influence consumer demand or factors which govern the choices of dairy product consumers is very critical in an attempt to develop effective marketing strategies for improved performance and growth of Ghana's infant dairy industry. The development of the dairy industry will unlock its potential to contribute to the development of Ghana through employment generation, reduction in foreign exchange for importing dairy products, and improved nutritional and health status of the people of Ghana.

In the light of the foregoing, there is a critical need for an empirical research to find out and examine the principal factors that determine household demand for or expenditure on dairy products.

1.3 Objectives of the study

1.3.1 Major Objective

The broad objective of the study is to identify and examine the major factors that determine the level of household dairy consumption expenditure in Ghanaian urban and peri-urban communities.

1.3.2 Specific Objectives

To achieve the major objective, the following specific objectives are the focus of the study:

1. To identify the various dairy products on Ghanaian markets;

2. To examine the personal and socio-economic characteristics of consumers of these dairy products;
3. To estimate the average monthly household dairy consumption expenditure level; and
4. To isolate and examine the personal and socio-economic factors which influence household dairy consumption expenditure level.

1.4 Justification of the study

The success of dairy production and marketing decisions hinges on consumer choices no matter how irrational, ill founded or whimsical they are. Thus, a study of the factors that govern the choices made by dairy product consumers is imperative if the dairy industry in Ghana is to develop. As a result of this study, marketers of dairy products would understand factors considered by consumers before making dairy purchasing decisions. The study will again document the characteristics of dairy consumers. Knowledge of these characteristics would help marketers to segment the dairy market in order to develop marketing mixes specific to the various niches so as to serve them better.

The study results would also provide information on dairy product types that need promotion to boost their demand. Stakeholders in the diary industry can rely on insights from the study to develop strategies that will boost the consumption of dairy products in Ghana.

When marketers of dairy products excel in their business as a result of a better understanding of dairy consumer behaviour, the high demand for dairy products would stimulate the supply (production) of these products. The efforts of dairy producers would thus be rewarded adequately as a result of the ready market for their products. Consequently, every player in the dairy industry would be satisfied and the ultimate beneficiary will be the final consumer who would have value for the money used to purchase dairy products.

Information that would be generated through this study will lead to a deeper understanding of dairy consumer behaviour in Ghanaian urban and peri-urban communities. The study will therefore serve as a useful input in the evolution of strategies to improve the performance and growth of the local dairy industry.

1.5 Scope of the study

The study covers the Kumasi and Accra peri-urban areas of Ghana. Dairy products considered in the study include both fresh and processed products. Attention of the study is focused on purchases and consumption made by dairy consuming households in the immediate past month preceding the date of the questionnaire administration. Only cash expenditures on dairy products are considered in this study. The study relies on data collected in the wet season (June – July) of the year 2001 for analysis.

1.6 Organization of the study

The study is organized into five chapters. In chapter one, the author gives a brief background to the general area of study after which he narrows down to a well conceived research problem that would lead to findings that have widespread implications for the dairy industry. In this same chapter, specific objectives within the scope of the stated purpose of the study are clearly stated. A brief outline of the rationale and relevance of the study in terms of its contribution towards the improvement of the Ghanaian dairy industry are also provided in chapter one. The last section of chapter one provides the scope and the organization of the study.

An extensive and thorough review of relevant literature aimed at obtaining detailed knowledge of the subject matter being studied is provided in chapter two. This chapter demonstrates the existing body of knowledge regarding economic theories underlying the relationships between personal, socio-economic and product characteristics and dairy consumption expenditure. A brief review of the theory of consumer behaviour is also provided in this chapter.

Chapter three describes the procedure followed in the conduct of the study. Here, the type and source of data used, the sampling method adopted and the actual method and techniques used to collect the data for the study have been detailed. Also, the methods and tools employed in the analysis of data have been outlined in chapter three. In chapter four, the field data has been summarized, organized and illustrated with appropriate descriptive and inferential statistics. Here again, the results of the data analysis are discussed in the context of the study objectives and the literature reviewed in chapter two.

A summary of the main findings of the study as well as the conclusions drawn and recommendations made are covered in the fifth and last chapter of the study.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 The theory of consumer behaviour

Loudon and Della Bitta (1993) defined consumer behaviour as the decision process and physical activity individuals engage in when evaluating, acquiring, using, or disposing of goods and services. Katona (1960), based on empirical work with longitudinal consumer surveys at the University of Michigan, suggested that consumer purchase decisions appeared to be based on a combination of economic and sociological factors and could therefore be better understood if the concepts of the two disciplines were also combined for the purposes of analysis.

According to Gary and Kotler (2000), consumers around the world vary tremendously in age, income, educational level and taste, among other factors and therefore buy an incredible variety of goods and services to satisfy their needs. However, the developing world context may diverge enormously from the developed world situation upon which the traditional writings on consumer behaviour are based. Because of differences in such aspects as income levels and the nature of demand and supply situation as well as cultural factors, there are also significant differences in consumer behaviour in the developed and the developing regions of the world (Kinsey, 1988).

According to Kinsey (1988), because majority of people in developing countries have low disposable incomes and because conditions of supply and demand are very different, it is assumed that biogenic needs are predominant in developing countries. She however pointed out that this may not always be the case because of people's self-concept and the cultural values and beliefs individuals subscribe to. Walter (1974) discovered that the poorer the economic outlook, the more important the small luxury of a flavoured soft drink or perfumed soap. He emphasized that to the dismay of the would-be benefactor, the poorer the malnourished are, the more likely they are to spend a disproportionate amount of whatever they have on some luxury rather than on what they so desperately need (i.e., physiological needs). Implication is that even though poorer people are

supposed to spend more money on their physiological needs, certain cultural and economic factors can compel them to purchase some luxuries they may not desperately need. Thus, consumer behaviour can sometimes be too complex to be predicted.

2.2 The theory of consumer demand

A consumer's demand gives the number of units of a particular product that the consumer would choose to buy at each possible price (Ekelund and Ault, 1995). Given any available set of bundles of products, the consumer chooses that bundle which maximizes his utility or satisfaction. Thus, consumer's demand for a good is the quantity chosen as a result of this utility maximization, which is also dependent on precisely what sets of bundles of goods are available.

According to Henderson and Quandt (1986), commodity prices and consumer income are the main determinants of the demand level for a commodity. They indicated that whereas commodity price has a negative effect on the demand level, there is a positive relationship between consumer income and the demand for a commodity. McKenna and Rees (1992) emphasized that prices of products, the consumer's income and preferences (i.e. tastes, habits, desires and drives) interact to determine the individual demand function. According to them, the law of demand is a fundamental economic principle which indicates that a decrease in the price of a commodity results in an increase in the quantity of the commodity that buyers are willing and able to purchase in a given period of time, if other factors are held constant.

Mansfield (1989) also indicated that the quantity demanded of some commodities is fairly sensitive to changes in the commodity's price. That is, changes in price results in significant changes in quantity demanded. He noted that price elasticity of demand is expressed in terms of relative (i.e. proportional or percentage) changes in price and quantity demanded. According to Colander (1998), even though it is generally assumed that demand curves are negatively sloped, there are exceptional cases in which the relationship between demand and commodity price may be positive. An example is

provided by ostentatious consumption in which case the demand function may have a positive slope if the consumer derives utility from a high price.

According to Ekelund and Ault (1995), when price is raised or lowered, the effect may be either an increase or a decrease in the amount spent on a commodity depending on the price elasticity of demand for the commodity in question. They explained that if the demand for a commodity is price elastic, the total amount spent on it will increase when the price is reduced and vice versa. However, in a case where the demand for a commodity is unitary elastic, a price increase or decrease results in no difference in the total amount spent on the commodity. Ekelund and Ault (1995) further explained that this is so because a price decrease (increase) of a certain percentage always results in a quantity increase (decrease) of the same percentage so that the product of the price and quantity is unaffected. Henderson and Quandt (1986) also emphasized that a numerically large value for elasticity implies that quantity demanded is proportionately very responsive to price changes.

The price of substitute product also affects the demand of a particular commodity. Two commodities are substitutes if both can satisfy the same need of the consumer (Theil, 1975). A rise in the price of a substitute increases the demand for the competing product whiles a decrease in the price of the substitute causes a reduction in the demand for the product. Thus, Prager (1993) contended that the price of a substitute product is directly (positively) related to the quantity demanded of a product and if a commodity has many close substitutes, its demand is likely to be highly elastic. Mansfield (1989) therefore explained that if the price of a product increases, a large proportion of its buyers will turn to the close substitutes that are available. On the other hand, if its price decreases a great number of buyers of substitutes will switch to this product thereby increasing the demand for the product.

Consumer income has a significant effect on the quantity of goods demanded. A rise in consumer's income shifts the demand curve for normal products to the right; indicating that more will be demanded of that product at each possible price. However, for inferior

goods, a rise in consumer's income leads to a reduction in their purchases (Lancaster, 1971). Colander (1998) explained that when incomes rise consumers can afford to switch to more expensive and superior substitutes. According to Mansfield (1989), the income elasticity of demand for normal goods is positive whereas that for inferior goods is negative. Henderson and Quandt (1986) however noted that the income elasticity of demand for a commodity is likely to vary with the level of income under consideration. For example, if only families at the lowest income levels are considered, the income elasticity of demand for even well known inferior goods can be positive.

Though many microeconomics authors limit the determinants of consumer demand to product price, prices of substitutes and consumer income, certain sociological factors play very significant role in shaping consumer demand. According to Lipsey and Crystal (1999), sociological factors such as the number of dependants, the consumer's place of residence (e.g. city, urban, rural), religion, tribal/ethnic affiliation and educational background, among others, affect consumer demand.

2.3 Factors influencing dairy consumption expenditure

Consumer purchases and spending patterns are influenced by personal, household and product characteristics as well as economic, situational and cultural factors (Gary and Kotler, 2000).

Factors which affect dairy consumer demand will also influence consumption expenditure on dairy products. Any factor which causes an increase in consumer demand will thus cause an increase in consumption expenditure when all the other factors are held constant.

2.3.1 Personal and Household Characteristics

Buyers' decisions are influenced by personal characteristics such as age, sex, and educational level, among other factors (Gary and Kotler, 2000).

Buying decisions are shaped by the age of the consumer. Gary and Kotler (2000) revealed that marketers often define their target markets in terms of lifecycle stage and develop appropriate products and marketing plans for each age group. Jerome and Perreault (1991) also revealed that young people spend more on basic necessities than aged people who spend a lot more on durable consumer goods. Gender of the consumer also influences his purchasing decisions and hence consumption expenditure on goods and services. Evans (1998) noted that males and females have different purchasing and spending patterns.

Consumer's occupation affects the products he buys and consumes. Seyoum (1988) reports that results from consumer surveys in 1979 and 1981/82 in Cote d'Ivoire and Nigeria respectively indicated that clerks and wage earners are major consumers of dairy products. Gary and Kotler (2000), in recognition of the effect of occupation on consumption, suggested that marketers should try to identify the occupational groups that have an above-average interest in their products and target them as separate market niches.

The level of formal education is likely to be highly influential in either promoting traditional attitudes or introducing new attitudes towards product needs and wants (Jerome and Perreault, 1991). The higher the level of formal education and the more widely available it is, the more it will be an agent of change in the definition of wants and needs. As people become more conscious that a better standard of living is possible, new needs develop as old ones become satisfied (Kinsey, 1992). She contended that higher education will promote negative attitudes towards unwholesome or unhygienic dairy products as well as products perceived to contain high cholesterol content. However, consciousness of the nutritional values of dairy products through education may increase the use of and consumer spending on dairy products.

Dramatic increases in age of household members and family size have produced striking changes in families and household consumption expenditure patterns. Jerome and Perreault (1991) revealed that younger people often spend a greater proportion of their

income on discretionary items because they don't have the major expenses of home ownership, education and family rearing.

Household size has relevant implications for household purchasing and spending behaviour (Jerome and Perreault, 1991). According to them, households with large family sizes spend more on consumable goods than households with small family sizes, *ceteris paribus*. Evans (1992) emphasized that an understanding of household dynamics is important in consumer marketing as the household is the basic unit of consumption.

Loudon and Bitta (1993) reported that purchasing and spending patterns in rural, peri-urban and urban areas are different because of differences in such factors as income level, educational level and cultural factors, among others. They contended that because of the high level of disposable income and formal education in urban centers, consumers in urban communities normally spend more on consumable goods than their peri-urban and rural counterparts. According to Jaffee and Morton (1995), dairy consumption rate is high in urban areas than peri-urban and rural areas of Kenya. They revealed that whereas consumers in urban areas of Kenya consume 125 Kg/per capita of dairy products annually, Kenyan rural consumers consume on the average only 64 Kg /year of dairy products per capita.

2.3.2 Product Characteristics

Product characteristics such as product type and price have significant effects on dairy consumption expenditure as they determine the bundle of dairy products consumed (Campbell and Lasley, 1975).

The decision to buy less of one good depends in part on the availability of other product types, which serve as substitutes (Schiller, 1997). Consumers have different tastes and preferences for the various dairy products. Consumers who purchase and consume expensive dairy product types are likely to spend more than those who consume relatively cheaper product, given that quantities consumed remain unchanged.

All dairy product types do not command the same price on Ghanaian markets. Since different dairy product types have different prices, the amount spent on each dairy product is a function of its price, given the quantity of product consumed. When the price of dairy products increases, expenditure on them increases, *ceteris paribus*. According to Mansfield (1989) the greater the availability of substitutes the higher the price elasticity of demand. He explained that when prices of substitutes are lower consumers (economically rational as they are) would switch to the consumption of the low priced product types.

Usually, the prices of industrially processed and packaged dairy products like tinned evaporated and condensed milk are relatively high compared to traditionally processed or unprocessed products like local cheese (wagashi) and raw fresh milk. Schiller (1997) indicated that price is positively related to expenditure on condition that a predetermined quantity of the product is autonomously consumed. The implication is that expenditure on cheap dairy products is expected to be very low, *ceteris paribus*.

Even though economists maintain that when a product becomes cheaper a greater quantity is demanded, Evans (1992) contends that whilst this generalization has a lot of truth in it, there are some exceptions. He maintained that some individual customers and consumers often regard price as a mark of quality and in some situations more is purchased at higher prices. He stated further that in some situations, when delivery or immediate possession is an urgent requirement or where a particular price level is perceived to be the 'going rate', price becomes relatively unimportant in the buying process.

2.3.3 Disposable Income

It is important to note that desire is only the first step in the consumption process. To acquire the product one must be willing and able to pay for one's wants. Needless to mention, producers won't give you their dairy products just because you want to satisfy your freudian desires. Producers want money in exchange for their products. Income

and quantity of product consumed are therefore as relevant to consumption expenditure decisions as are basic desires and preferences. Hence, in explaining consumer behaviour, economists focus on the demand for products and services, which entails both the willingness and ability to pay for them.

According to Dernburg and McDougall (1972), national income statistics suggest that there is a close relationship between consumption expenditure and the level of disposable income. According to Keynesian economics, the level of disposable income principally determines aggregate consumption expenditure. However, according to Branson (1972), modern economists like Friedman and Modigliani have long disputed Keynes' position on consumption functions. These economists identified other factors such as personal characteristics, wealth or assets, rational expectations, and past income, among other factors, as very important determinants of aggregate consumption expenditure.

According to Baker (1981), having income or purchasing power implies having a choice not only between products but also between different versions of the same product. From the standpoint of Stanlake (1989), as incomes rise the proportion spent on basic necessities like dairy products tend to fall whereas the proportion of consumers' expenditure devoted to services and durable goods tends to rise. He observed that the most obvious limitation on consumption is the level of income, stressing that in the long run, most people cannot consume more than their real income. In the short run, however, there is the possibility of supplementing one's income by borrowing; but such debts have to be repaid so that a borrower, in the future, must spend less while the debt is repaid. In the long run therefore, income provides the upper limitation in the ability to consume.

According to Jerome and Perreault (1991), markets are made up of people with money to spend and thus consumer spending patterns are related to income. They revealed that consumer budget studies show that most consumers spend their incomes as part of family or household income. It is worthy of mention that a family's purchase of luxuries comes from discretionary income (income after paying taxes and paying for basic necessities). In view of this discretionary income, which varies from family to family and over time, is

an elusive concept particularly in the determination of expenditure on necessities such as dairy products. According to Kohls and Uhl (1985), a 1982/83 milk consumption survey in Kenya showed that urban dairy consumption level was very high due to higher disposable incomes of consumers, among other factors.

It is normal for a person to wish to eat until his appetite is completely satisfied. If his income is so low that he cannot afford his desired level of food consumption, any increase in income is likely to be spent mainly on food. On the other hand, at high income levels, food consumption becomes a less important factor in the individual's budget and any increase in income will not lead to an increase in the quantity of food consumed although it might result in extra expenditure through the purchase of better quality food (Baker, 1981).

It needs to be stressed at this point that it is only 'normal' goods whose demand increase as income level increases. It must also be emphasized that the economic terms of 'normal' and 'inferior' imply no value judgment on the items they categorize. The demand for 'inferior' goods reduces when income level increases (Walton and Wykoff, 1998). Walton and Wykoff (1998) cited dry milk as an example of inferior good in Kenya and hence concluded that as income rises, consumers switch to fresh milk consumption. The opposite may rather be true in the Ghanaian context where fresh milk rather than processed milk is considered an inferior good.

2.3.4 Situational Factors

A factor such as the distance from the consumer's homestead to the point of purchase of dairy products can have a telling effect on dairy consumption expenditure levels. Bearden *et al* (1995) contended that distance from home to purchase point could be an inhibitor or a motivator in determining purchasing decision. If consumers have their homes located very close to the points of purchase of dairy products, access to the products becomes easy and hence consumption is encouraged, all other things being equal. However, when consumers are located far away from purchase points, their access

to dairy products is limited and distance then constrains the buying behaviour of the consumer. Thus, there is a negative relationship between dairy consumption expenditure and the distance from the purchase point to the consumer's home. Jaffee and Morton (1995) reported that in rural Kenya, each household consumes dairy products because each household has at least a cow. This is an illustration of the effect of proximity on dairy product consumption.

One may also argue that when consumers are located far away from dairy product purchasing points, they are more likely to buy in bulk and store for future use. However, consumers located very close to purchase points are less likely to buy dairy products in larger quantities. This means that in a specified period, consumers located far away from purchase points might spend far more on dairy products than those who are close to purchase points. This implies a positive relationship between dairy consumption expenditure and distance from purchase point to consumer's home.

2.3.5 Cultural Factors

Culture refers to the values, ideas, attitudes and symbols that people adopt to communicate, interpret, and interact as members of a society. Kinsey (1988) described culture as one of the most significant factors that may be used to explain differences in consumer behaviour. She stressed that whilst basic needs are the same the world over, the drives to satisfy them are affected by the compulsion, checks and guidance systems, which originate in culture. It can therefore be said that the cultural overlay forms the foundation for all motivational differences between consumer groups. Gary and Kotler (2000) also revealed that cultural factors exert the broadest and deepest influence on consumer behaviour. In the light of this, they indicated that marketers always try to spot cultural shifts in order to discover new products that might be wanted. For example, cultural shifts towards greater concern about health and fitness have created an industry for health-risk-free products. From the viewpoint of Bearden *et al* (1995), the concept of culture has two primary implications for marketing; it determines the most basic values

that influence consumer behaviour patterns, and it can be used to distinguish subcultures that represent substantial market segments and opportunities.

The ways in which culture directly affects needs and wants may be understood with reference to the major aspects of culture: ethnic and religious affiliations. Ethnic groups may be formed around national, racial or geographical factors. Members of an ethnic group or tribe share similar values and patterns of behaviour, which make them attractive market targets for specific products or brands.

Religion, being the mainspring of culture, affects the type of products consumed by a certain group of people based on their religious belief and value systems. Because some religious groups discourage the consumption of certain animal products, religion might promote negative attitudes towards dairy products if taken to their logical conclusions (McCarthy, 1991). Kinsey (1998) however contended that in reality, rarely are religious ideals taken to their ultimate conclusions. She further indicated that there has been much watering down of traditional values and religious beliefs and values through the introduction of new values and products from other cultures. Nevertheless, Kinsey (1988) maintained that tribal and religious affiliations still affect tradition, superstition, taboos and perceptions and may help explain otherwise inexplicable consumer attitudes which determine how needs are fulfilled.

In the light of the literature reviewed, income level, product's own price, price of substitute dairy products, educational level, number of consumers in the household and the degree of urbanization of consumer location are expected to have a positive relationship with dairy consumption expenditure level. However, age of consumer and distance from home to purchase point are expected to have a negative relationship with dairy consumption expenditure. It is also expected that raw fresh milk will turn out to be an inferior commodity in Ghana.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Theoretical Framework (derivation of demand or expenditure function from utility theory)

Empirical demand analysis is not completely an application of the science of economics, but it also entails the artful eye of an econometrician (Ferris, 1998). It was noted that the estimation of demand or expenditure models involve the application of econometric and mathematical tools for estimating single equations and by systems of equations. Even though it is admitted that some "trial and error" efforts are inevitable, Ferris (1998) contends that strong logic is paramount in approaching demand and consumption measurements.

Mansfield (1989) indicated that the independent variables in a demand or consumption function include price, income and sociological factors. However, Ferris (1998) pointed out that the consumer demand for a commodity is a function of many factors too numerous to measure independently by the Ordinary Least Square (OLS) approach. The task of the econometrician is thus to introduce conditions that will conserve on degrees of freedom, reduce multicolinearity and still meet certain *a priori* beliefs about demand.

The consumer's demand function gives the optimal amount of the commodities as a function of the price, income and some qualitative sociological factors (Varian, 1990). It was added that actual consumer behaviour is multidimensional and more complex. When a consumer goes shopping, his concern is not limited to how much of one good to buy; rather he must decide which of many available goods to buy at their respective prices. Thus, the presence of so many dairy products on the market complicates dairy consumption decisions. In all cases, the consumer wants to get maximum satisfaction from his available income. According to Schiller (1997), the economic explanation for consumer choice builds on the theory of marginal utility and the law of demand. Another postulate of consumer-choice theory takes into account the market of prices of goods that

are desired by consumers. Thus, rational behaviour requires one to compare the anticipated utility of each expenditure with cost and to choose those products that promise to provide the most pleasure for the amount of income available. Varian (1990) argues that the key to utility maximization is not simply buying what one likes best; instead, one must compare goods on the basis of their marginal utility and price. To maximize utility, the consumer should choose that good which delivers the most marginal utility per Cedi. Optimal consumption refers to the mix of products that maximize total utility for the limited amount of income one has to spend. The basic approach to utility maximization is to purchase the next dairy product which delivers the most marginal utility per Cedi. Varian (1990) concludes that all goods included in the optimal consumption mix yield the same marginal utility per Cedi. From the First Order Condition for Utility Maximization, the utility-maximizing rule is to satisfy the condition where the marginal utility per Cedi derived from one dairy product is the same as that derived from consuming another type of dairy product in the consumption basket of the consumer (i.e. $\{MUx / Px\} = \{MUy / Py\}$; where x and y are any two goods in the optimal consumption mix of the consumer). In other words, a Cedi spent on dairy product x must yield the same marginal utility as that obtained when a Cedi is spent on another dairy product y. This condition gives the greatest satisfaction from the limited income of the consumer.

3.2 Choice of Empirical Models

In the theory of econometrics, there are a number of mathematical forms that a demand or consumption function can take. Apart from the simple linear specification of a regression model, a function could also be specified in the quadratic form, power form (e.g. Cob Douglas function), and logarithmic form or in the exponential form. Linear specification of economic relationship is too simplistic a way of describing rather complex real life economic phenomena (Henderson and Quandt, 1986). Consequently, most empirical studies on consumption demand have tended to focus on the nonlinear specification, particularly the power form of the model.

According to Adesini (1978), economic theory provides little guide concerning the mathematical form of the regression model that suites a particular study. He revealed that in practice researchers have tended to follow either of two approaches. First, a strong assumption may be made concerning the particular mathematical form that would best characterize the problem being investigated. Second, if the researcher is unable to make such an assumption, *ex-post* criteria may be relied upon by fitting different mathematical functions to the data and selecting the best on the basis of R^2, t-values, and the "reasonableness" of the estimated parameters. The second approach has been widely used in consumption expenditure studies; notable ones being the studies conducted by Asenso-Okyere *et al* (1997) and Adesini (1978). Asenso-Okyere *et al* (1997) used the double logarithmic function to find the determinants of household food expenditure with satisfactory results. Adesini (1978) also recommended the double logarithmic regression function as the best model with reasonable and satisfactory results in his study to examine the structural relationships underlying household food expenditures in Ile Ife, Nigeria. He used the double logarithmic function as a logarithmic transformation of a Cobb-Douglas type of production function.

Peel (1975) also used the double logarithmic regression model to estimate the Keynesian and permanent income consumption functions for the United Kingdom from 1956 to 1966. In a study on consumption expenditure on alcoholic beverages, Duffy (1983) estimated demand equations in the log-linear form where he expressed the consumption of each alcoholic beverage as a function of real income, own price and advertising for the alcoholic beverages. Again, in finding the effect of advertising on consumption, Duffy (1982) used the same set of quarterly data for alcoholic beverages to estimate a log-linear demand equation. His model expressed consumption of alcohol as a function of real income, the relative price of alcohol and the relative advertising of alcohol. Further, Hagman and Waterson (1983) estimated a double-log demand equation, which expressed real expenditure on alcohol as a function of real income, the real price of alcohol, the stock of advertising and a lagged dependent variable. Luigi Marattin (2002) relied on data from the period 1980 – 2000 to conduct an econometric analysis of aggregate demand in Italy where the double log form of the regression model was used. The dependent

variable, consumer demand, was proxied with real private consumption expenditure. The explanatory variables included Gross Domestic Product (GDP) as a proxy for income, an advertising variable, and the price variable.

In another study however, McGuinness (1980) used data from 1956-75 to estimate a simple linear demand equation with total alcohol consumption as the dependent variable. The real price of alcohol, real income, real advertising of beer, wine and spirits (individually) and the number of licensed premises were the explanatory variables. In a subsequent study, McGuinness (1983) estimated separate linear demand equations for beer, wine and spirits with the volume of consumption of each beverage as the dependent variable. He however acknowledged that the simple linear regression model is a rather simplistic way of specifying a demand function which has income as one of the regressors.

Deaton and Muellbauer (1980) revealed that the double log functional form is the most common specification for consumption expenditure studies. The advantage with this specification is that the estimated parameters can be interpreted as elasticities or propensities. Deaton and Muellbauer (1980) also pointed out that there are several weaknesses in the linear expenditure system that makes it unattractive in applied work. As the name indicates, the demand functions are linear in expenditure and accordingly, Engel's law cannot hold. Moreover, it is not possible to test restrictions implied by the consumer theory, such as the hypotheses of symmetry and homogeneity. It was further explained that the functional form is restrictive in that only substitutes and normal goods are allowed if the system is to be theoretically consistent.

According to Koutsoyiannis (1973), the double logarithmic function (which is the linear form of the power function) can always be converted to the power form for economic interpretation. When this is done, the coefficients of the explanatory variables become the elasticities or propensities (Bordley, 1989).

On the basis of the literature reviewed on the specification of the consumption expenditure model and considering the fact that the double logarithmic model has been widely used in empirical studies with satisfactory results, the same econometric model was fitted to the data collected with monthly consumption expenditure as the dependent variable.

3.3 The Econometric Model

The implicit form of the double logarithmic model for the study is specified as:

$C.E = f(X_1, X_2, \ldots, X_{12}) + \mu i;$

Where:

C.E = Monthly dairy consumption expenditure

X_1 = Income Level of the consumer,

X_2 = Age of consumer,

X_3 = Sex of consumer,

X_4 = Educational level of consumer,

X_5 = Number of dairy products consumers in household;

X_6 = Price of product

X_7 = Price of substitute product

X_8 = Degree of urbanization of consumer's location,

X_9 = Ethnic affiliation of consumer,

X_{10} = Religious affiliation of consumer,

X_{11} = Distance from consumer's home to purchase point,

X_{12} = Storage of dairy products (whether a consumer stores dairy products or not); and

μi = Random Variable/Disturbance term.

The double logarithmic functional form of the model has the following specification:

$$\text{Log } E = (\text{Log } A + b_1 \text{Log } X_1 + b_2 \text{ Log } X_2 + \ldots + b_{12} \text{ Log} X_{12}) + \mu i$$

Qualitative variables such as sex, ethnic affiliation, religion, level of urbanization, product type consumed and storage of dairy products were included in the model as dummy variables. The dummy variables are defined in table 3.1.

The dummy variables are not logged, as they are categorical rather than actual figures. For interpretation, the estimated model is converted to the power form by taking the antilog of the parameter estimates. The coefficients of the quantitative variables are however maintained as the exponents or elasticities of the respective variables. For the dummy variables, the *antilogs* of their estimates are multiplied with the antilog of the constant intercept to obtain their coefficients in the power form of the model.

Table 3.1: Definition of Dummy Variables

Code	Variable definition	Definition of Dummy Variable	
		0	1
Sex	Sex	Male	Female
RGN	Religion	Islam	Christian
TRB	Tribe	Northerner	Southerner
EDU	Educational level	Literate	Illiterate
UBL	Level of urbanization	Urban	Rural
AGE	Age of consumer	< 30 yrs	If otherwise
RMC	Raw milk Consumption	No	Yes
YGUT	Yoghurt Consumption	No	Yes
EMC	Evaporated Milk Consumption	No	Yes
PMC	Powdered Milk Consumption	No	Yes
WAG	Wagashi Consumption	No	Yes
STORE	Storage of dairy products	No	Yes

The regression analysis was done in two stages. In the first stage the model was run with monthly aggregate expenditure on all dairy products as dependent variable. In the second stage, expenditures on individual dairy products were considered and the regression analysis was conducted for yoghurt, raw fresh milk and evaporated milk. In the aggregate model, however, such variables as price of product and prices of substitute products could not be captured because of aggregation problem.

3.4 *A priori* expectations

Consumption expenditure on dairy products is influenced by personal and household characteristics, product characteristics, economic, situational, and cultural factors (David Evans, 1992).

The personal characteristics of the consumer such as age, sex and educational level have considerable influence on not only the demand for but the expenditure on dairy products. The age of the consumer has a relationship with the type of dairy products consumed and hence the consumption expenditure on them. Aged consumers tend to show less interest in certain dairy products like ice cream and yoghurt whereas the youth tend to consume liberal amounts of such products. In view of this, consumer's age is expected to influence dairy consumption expenditure. The sex or gender of a consumer may also have a relationship with the level of expenditure on dairy products. Due to differences in purchasing and spending patterns of men and women, it is expected that males and females will spent different amounts on dairy products. However, it is not clear as to whether females spend more on dairy products than their male counterparts. Empirical research is thus needed to ascertain the exact effect of gender on dairy consumption expenditure.

The level of formal education achieved by the consumer can have an influence on dairy consumption expenditure. Educated consumers may buy a wide range of luxuries and basic necessities including dairy products to satisfy their psychological and physiological

needs without much concern for price. It is however common for many illiterates to treat certain products as luxuries particularly in developing countries. Lack of knowledge on the nutritional value of these dairy products will cause a reduction in consumer spending among illiterates, all other things being equal. Also, highly educated people may consider certain dairy products inferior and hence spend less on them. In the light of the foregoing, level of formal education may influence the level of expenditure on dairy products in either direction.

Household characteristics such as number of dairy consumers in the household and the level of urbanization of the household location also have influence on household dairy consumption expenditure. It is expected on *a priori* grounds that the higher the number of dairy product consumers in the household, the higher the level of household dairy demand. It is therefore hypothesized that households with high numbers of dairy product consumers will have high dairy consumption expenditure levels, *ceteris paribus*.

Dairy products supply and demand situations in urban and peri-urban communities may differ. Also, the purchasing power of consumers in urban centers is normally higher than that of consumers in peri-urban and rural communities. In the light of this, the levels of dairy consumption expenditure by households in urban communities are expected to be higher than that of consumers in peri-urban and rural communities.

There are many dairy products on Ghanaian markets ranging from unprocessed raw fresh milk to processed and industrially packaged products. Consumers have their tastes and preferences for different products and since the different products costs differently, the level of expenditure will depend on the type of product consumed.

The price of a commodity has a negative relationship with the demand for that commodity and a positive relationship with the demand for a substitute product. However, the expenditure made on the commodity will be high if the product is expensive and low if the product is relatively cheap, given that the quantity consumed

remains unchanged. It is therefore expected that dairy products with higher prices will have high levels of consumption expenditure.

Income level of the consumer is expected to have an influence on dairy consumption expenditure. Income level of the consumer determines his purchasing power or ability. According to Branson (1972), there is a positive relationship between the level of disposable or earned income and the level of expenditure on goods and services. It is therefore hypothesized that consumers with high income spend more on dairy products than those in the lower income brackets.

Situational factors such as the location of the consumer in terms of proximity to the point of purchase of dairy products are expected to influence dairy consumption expenditure. Close proximity to the point of sale of dairy product may encourage consumption of dairy products as access to products become easy. Consumption expenditure may increase when many consumers can easily access shops, kiosks, markets and other purchase points for the various dairy products. A negative relationship between dairy expenditure and distance from homestead to purchase point is therefore expected.

Various ethnic groups or tribes have their likes and dislikes for certain foods. As a result, some tribes either encourage or discourage the consumption of specific dairy products. Some dairy products are considered as foods for people from particular ethnic groups and thus receive low patronage from people of other ethnic background. It is hypothesized in this study that people of northern Ghana origin, who are traditional milk producers, consume more milk than people belonging to southern Ghana tribes. The religious belief of an individual may determine his/her attitude towards particular dairy products. According to Kinsey (1988), religion and for that matter culture may be used to explain differences in consumer buying behaviour.

Different religious groups have doctrinal differences regarding animal products that are recommended for consumption. Some religious groups do consider certain animal products as sacred and thus advise against their consumption. Unlike tribal affiliation,

however, it is not clear as to the direction of influence of religion on dairy consumption expenditure; but it is assumed that since most Muslims are of northern Ghana origin, Muslims should consume more milk than Christians.

In the light of the foregoing, it is expected on *a priori* grounds that income level, product price, price of substitute products, educational level, household size and the degree of urbanization of consumer location will have a positive relationship with dairy consumption expenditure level. On the other hand, age of consumer and distance from home to purchase point are expected to have a negative relationship with dairy consumption expenditure. Also, an increase in consumer income is expected to cause a decrease in consumption expenditure on raw fresh milk. It is also expected that Muslims will spend more on raw fresh milk than Christians. However, Christians are expected to spend more on tinned evaporated milk and yoghurt than Muslims.

3.5 Data

3.5.1 Type and Source of Data

Primary data was mainly used for the study. Household dairy consumption information was obtained from household heads. Past research works, books and journal articles were sources of valuable inputs in the preparation of the questionnaire to solicit data for the study and the review of literature.

3.5.2 Data collection

3.5.2.1 Sampling Procedure

The target population for the study was dairy consuming households in the Accra and Kumasi peri-urban areas of Ghana. Accra and Kumasi zones were purposively selected for the study in view of the high concentration of dairy products and dairy consumers in these areas. Again, these are the areas in Ghana where the prospects of dairy production and marketing look very bright. Further, due to their cosmopolitan nature, all tribes and people of different backgrounds needed for the study could be found in the Accra and Kumasi zones.

A multi-stage approach was used during sampling. A number of communities were purposively selected as clusters. The cluster sampling was followed by quota sampling. The quotas given to the selected communities were based on the concentration of dairy product consumers in these communities. Within the selected communities, systematic random sampling method was adopted in selecting the respondent households. Moving from one end of the community to the other, every 5th house was selected for interview.

Communities selected in the Kumasi zone included Ejura, Mampong, Kintampo, Buipe and Kumasi. For the Accra zone, Adenta, Kaneshie, Madina, Nima, Agbogboloshie and Cantonments communities as well as Accra Central were chosen for the conduct of the survey.

In all, one hundred and twenty-one and one hundred and eighty-two respondents were selected from the Accra and Kumasi zones respectively. Therefore, a total of three hundred and three dairy product consuming households were selected for the study.

3.5.2.2 Reconnaissance Survey, Questionnaire Design and Pre-test

Reconnaissance survey in the study areas was conducted in April 2001. This was done to enable the author gather information at first hand on dairying activities in the study area. A number of dairy purchase points were visited to ascertain issues relating to dairy product buying and selling activities in the communities selected. Also, focus group discussions were organized in two communities - Aboabo and Santasi in Kumasi. In each of these communities, ten dairy product consumers were involved in the discussions which focused on information on dairy products available in the community and factors which influence dairy purchasing and consumption decisions. The discussions were led with a check list by the author. The author also took the opportunity of the reconnaissance survey to have a look at unfamiliar dairy products like wagashi and fermented milk. Information obtained during the reconnaissance survey was used to prepare a standardized structured questionnaire, which was used for the main survey.

In the standardized structured questionnaire designed, household heads were asked to give the quantities of specific dairy products consumed by the household in the immediate past month preceding the day of interview and their respective unit prices. Again, such information as consumer's personal characteristics and household characteristics including age, sex, educational level, tribe, family size, etc. were collected. Also, information on the various dairy products consumed and the monthly expenditures on these products, among others, were also collected.

The questionnaire designed after the reconnaissance survey was initially pre-tested at Aboabo in Kumasi to detect lapses and make the necessary corrections, subtractions and additions before actual data collection commenced.

3.5.2.3 Conduct of the Survey

The survey was conducted from June to July 2001 by interviewing respondents in their homes. Enumerators were recruited and trained to help the author in the questionnaire administration. At all places, the author and the other enumerators read the questions and recorded the responses given by the respondents. The enumerators had to interpret the questions in the local languages since most of the respondents were illiterate and also due to the technical nature of some questions in the questionnaire. The author made periodic checks on the enumerators to ensure that they followed proper interview procedure.

3.5.3 Data Analysis

Both descriptive and inferential analyses of the data were undertaken. Descriptive tools such as frequency distribution tables, percentages and averages were employed to examine the characteristics of dairy product consumers and in the calculation of the average monthly dairy consumption expenditures made by different consuming groups. Frequency tables were used to illustrate the distribution of dairy consumers by age, sex, tribe, religion and income group. Average monthly dairy consumption expenditures made

by different consuming groups were illustrated with the use of pie and bar charts. To identify the determinants of dairy consumption expenditure, multiple regression analysis was conducted using an econometric model of the double logarithmic type.

3.6 Assumptions underlying the study

For the purpose of this study, it is assumed that:

a. Consumers have perfect knowledge of the utility derived from each dairy product consumed;

b. Consumers are perfectly rational in that given their subjective preferences; they always act in deliberate manner to maximize their satisfaction from dairy product consumption; and

c. Diminishing marginal utility sets in as increasing quantities of any dairy product are consumed.

3.7 Limitations of the study

Due to lack of record keeping on household dairy expenditures, some consumers had difficulties in recalling the exact prices and quantities of products consumed within the immediate past month preceding the interview date. Thus, the price and expenditure figures collected may not be very accurate.

Due to difficulty in aggregating own prices and prices of substitutes over products; these factors were not included in the aggregate dairy consumption expenditure model. They were however included in the individual product expenditure models to examine their effect on dairy consumption expenditure.

In Ghana, records on consumers of various consumer goods are nonexistent. Thus, sampling frame for dairy consumers in the selected communities was not obtained. As a result, the quotas given to the communities were quite subjective.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

This chapter discusses the results of the study in the context of the objectives. It covers the characteristics of dairy product consumers covered in the study, consumption expenditure on dairy products by different categories of consumers and examination of the regression estimates.

4.1 Dairy product consumption

4.1.1 Dairy product types consumed

Various dairy products are found on Ghanaian milk markets. These include raw fresh milk, boiled fresh milk, fermented milk, condensed milk (tinned), evaporated milk (tinned), powdered milk, local cheese (wagashi), imported cheese, ultra-heated milk (packed or UHT milk), butter/ghee, yoghurt and ice cream. Respondents consume different types of dairy products based on their preferences, tastes and purchasing abilities. Table 4.1 below provides the distribution of respondents by type of product consumed.

It is evident from the table that majority (89%) of the respondents indicated that they consume tinned evaporated milk. Of the 303 respondents 258, representing 85% consume yoghurt whiles 45% consume raw fresh milk. Only 10% and 7% of the respondents consume UHT milk and boiled fresh milk respectively. It can be concluded from the ranking in the table that the most patronized dairy products are tinned evaporated milk, yoghurt, powdered milk and raw fresh milk. This observation is not surprising because evaporated milk and powdered milk are very common on the market and can be found in almost every provision or corner shop in the country. Yoghurt is also very common as the mobile vendors bring them to the doorsteps of consumers.

The observation that 45% of the respondents patronize raw fresh milk is however very significant. This is because raw fresh milk is available only at very far locations and indeed not accessible to many consumers.

Table 4.1: Distribution of Respondents by dairy product Type consumed

Dairy product Type	No. Of Respondents consuming product	Proportion of total Respondents (%)	Rank*
Raw fresh milk	135	44.55	4
Boiled milk	23	7.59	11
Fermented milk	70	23.10	8
Condensed milk	60	19.80	9
Evaporated milk	270	89.12	1
Powdered milk	209	68.98	3
Imported cheese	13	4.29	12
UHT milk	30	9.90	10
Yoghurt	258	85.15	2
Ice cream	130	42.90	5
Butter	111	36.63	6
Wagashi	85	28.05	7

Source: Field survey, 2001.

** In the ranking, 1 represents the most patronized dairy product whilst 12 represents the least patronized product.*

4.1.2 Available Dairy Products

Of the various dairy products identified on the Ghanaian market, some are widely and readily available whiles others are available only in few areas and thus highly inaccessible to many consumers.

Dairy products like raw fresh milk, boiled fresh milk, fermented milk and wagashi are scarce in many urban towns and rural communities in Ghana. They are available only in few cattle-rearing rural communities and few suburbs of big cities like Accra and

Kumasi. These unprocessed dairy products are mainly found in communities dominated by Muslims and people of Northern Ghana origin such as Aboabo in Kumasi and Nima in Accra. On the contrary, products like imported cheese; Ultra Heated Milk, condensed milk and butter are very common in urban centers than in rural communities. However, products like evaporated milk, yoghurt, powdered milk and ice cream are widely and readily available throughout the study area and even throughout Ghana.

Table 4.2, which depicts the distribution of the consumer type according to product type consumed, shows that majority of rural respondents consume unprocessed dairy products whiles majority of metropolitan and urban consumers patronize the processed dairy products. Out of the 54 rural respondents, 83% indicated that they consume raw fresh milk whiles 78% also said they consume fermented milk. For the urban and metropolitan consumers, only 37% and 11% indicated that they consume raw fresh milk and fermented milk respectively. It can therefore be concluded that rural dairy consumers dominate in the consumption of unprocessed dairy products whereas metropolitan and urban dwellers patronize processed dairy products most.

Table 4.2: Distribution of consumer type by product type consumed and location

Dairy product Type	Type of Consumer			TOTAL
	Metropolitan Consumer	Urban Consumer	Rural Consumer	
Raw fresh milk	75	15	45	135
Boiled milk	8	4	11	23
Fermented milk	25	3	42	70
Condensed milk	30	12	18	60
Evaporated milk	198	31	41	270
Powdered milk	161	28	20	209
Imported cheese	10	3	-	13
UHT milk	24	6	-	30
Yoghurt	200	30	28	258
Ice cream	89	27	14	130
Butter	74	25	12	111
Wagashi	35	9	41	85

Source: Field survey, 2001.

4.2 Characteristics of respondents

4.2.1 Income Level of Respondents and dairy product type consumed

Respondents sampled for the study fall within different income categories. The distribution of the respondents according to income group is provided in table 4.3.

From the table the highest number of respondents (115), representing 37.95% of the total number of 303 respondents had monthly incomes between ¢100,000 and ¢200,000. Only ten (10) respondents, representing 3.30% fall in the ¢501,000 - ¢600,000 income bracket whereas nine (9) respondents, constituting 2.98% had monthly incomes above ¢600,000.

It can be deduced from the table that as high as 79% of the respondents have monthly incomes below ¢301,000. This implies that majority of dairy product consumers are in the very low income brackets.

Table 4.4 shows the distribution of consumers in the various income brackets according to product type consumed. It can be seen from the table that evaporated milk, yoghurt and powdered milk are patronized equally by consumers in both the lower and higher income brackets. It is however evident that raw fresh milk and wagashi are patronized more by low income earners. Only 31% and 16% of consumers with incomes greater than ¢300,000 patronize raw fresh milk and wagashi respectively as against 48% and 31% of consumers in the lower income bracket (i.e. incomes below ¢301,000).

Table 4.3: Distribution of respondents by income group

Monthly income Range (¢'000)	No. of Respondents in income range	Proportion of Respondents (%)	Cumulative Percent
≤ 100	54	17.82	17.82
101 – 200	115	37.95	55.77
201 – 300	70	23.10	78.87
301 – 400	34	11.22	90.09
401 – 500	11	3.63	93.72
501 – 600	10	3.30	97.02
> 600	9	2.98	100.00
Total	303	100.00	-

Source: Field Survey, 2001.

Table 4.4: Income Group distribution of Consumers by specific dairy products

Dairy Product	< ¢301,000 *n = 239*		> ¢300,000 *n = 64*		TOTAL *N = 303*	
	Freq.	Percent	Freq.	Percent	Freq.	Percent
Raw fresh milk	115	48.12	20	31.25	135	44.55
Fermented milk	53	22.18	17	26.56	70	23.10
Boiled fresh milk*	14	5.86	9	14.06	23	7.59
Yoghurt	197	82.43	61	95.31	258	85.15
Ice Cream	71	29.71	59	92.19	130	42.90
Wagashi	75	31.38	10	15.63	85	28.05
UHT milk	8	3.35	22	34.38	30	9.90
Butter/ghee	57	23.85	54	84.38	111	36.63
Condensed milk	19	7.95	41	64.06	60	19.80
Powder milk	157	65.69	52	81.25	209	68.98
Evaporated milk	210	87.87	60	93.75	270	89.12
Imported cheese	3	1.26	10	15.63	13	4.29

Source: Field survey, 2001.

** Boiled fresh milk refers to fresh milk that is pre-boiled before sale.*

4.2.2 Religious Affiliation of Respondents and dairy product type consumed

The distribution of respondents according to religion is given in table 4.5. About 70% of the sample indicated that they are Christians. Respondents belonging to the traditional religion were two in number and constituted less than 1% of the sample taken for the study. Muslims formed nearly 30% of the respondents considered in this study.

It must be noted that Christians dominate the population from which the sample was drawn. The figures in table 4.5 are therefore a fair reflection of the predominance of the various religious groups in the study area and one cannot conclude based on these figures, that Christians patronize dairy products more than Muslims.

Table 4.5: Distribution of respondents by religion

Religion	Frequency	Percent
Christianity	211	69.64
Islam	90	29.70
Traditional	2	0.66
TOTAL	303	100.00

Source: Field survey, 2001.

Table 4.6 gives the distribution of the consumers in the Christian and Islamic religions according to specific dairy products consumed. It can be seen that majority of Muslim consumers patronize raw fresh milk and wagashi (96% and 83% respectively) than their Christian counterparts. The table reveals again that apart from ice cream and yoghurt, a higher proportion of Muslims patronizes each of the dairy products captured in the study than Christians.

Table 4.6: Religious distribution of Consumers by specific dairy products

Dairy Product	Islam *n = 90*		Christianity *n = 211*		TOTAL *N = 303*	
	Freq.	Percent	Freq.	Percent	Freq.	Percent
Raw fresh milk	86	95.55	49	23.22	135	44.55
Fermented milk	61	67.77	9	4.27	70	23.10
Boiled fresh milk*	18	20.00	5	2.37	23	7.59
Yoghurt	71	78.89	187	88.63	258	85.15
Ice Cream	33	36.67	97	45.97	130	42.90
Wagashi	75	83.33	15	7.11	85	28.05
UHT milk	9	10.00	21	9.95	30	9.90
Butter/ghee	48	53.33	63	29.86	111	36.63
Condensed milk	42	46.67	18	8.53	60	19.80
Powder milk	83	92.22	126	59.72	209	68.98
Evaporated milk	87	96.67	183	86.73	270	89.12
Imported cheese	5	5.56	8	3.79	13	4.29

Source: Field survey, 2001.

** Boiled fresh milk refers to fresh milk that is pre-boiled before sale.*

4.2.3 Ethnic affiliation of Respondents and dairy product type consumed

Tables 4.7 and 4.8 provide the distribution of the respondents according to ethnic group affiliation and the type of dairy products consumed respectively.

It can be seen from table 4.7 that nearly 60% of the consumers interviewed were from Southern Ghana tribes (Akans, Gas and Ewes) with the remaining 40% belonging to northern Ghana tribes. This disparity is not surprising as the survey was carried out mainly in the southern communities in Ghana (Accra and Kumasi). Whereas the Akans formed majority of the respondents belonging to the Southern Ghana tribes, the remaining respondents are relatively evenly distributed among the Northern Ghana tribes.

Table 4.7: Distribution of respondents by ethnic affiliation

Tribe/Ethnic Affiliation	Frequency	Percent
Northern Tribes:		
Frafra	15	4.95
Dagati	21	6.93
Fulani	25	8.25
Hausa	22	7.26
Moshi	10	3.30
Others	28	9.24
Sub total	*121*	*39.94*
Southern Tribes:		
Akan	131	43.23
Ga	28	9.24
Ewe	23	7.59
Sub total	*182*	*60.06*
TOTAL	303	100.00

Source: Field survey, 2001.

From table 4.8, it can be seen that consumption of products like yoghurt, condensed milk, evaporated milk, butter, imported cheese and UHT milk is dominated by consumers belonging to southern Ghana tribes. A critical deduction from the table also indicates that raw fresh milk, fermented milk, boiled milk and wagashi, are predominantly consumed by persons of northern Ghana origin and very few southerners consume these products. Only 8% and 27% of southern Ghana respondents consume wagashi and raw fresh milk respectively. It can therefore be concluded that raw fresh milk and wagashi are notably northern Ghana foods and only patronized by few people of southern Ghana origin.

Table 4.8: Tribal distribution of Consumers by specific dairy products

Dairy Product	Northerners *n = 121*		Southerners *n = 182*		TOTAL *N = 303*	
	Freq.	Percent	Freq.	Percent	Freq.	Percent.
Raw fresh milk	85	70.25	50	27.47	135	44.55
Fermented milk	41	33.88	29	15.93	70	23.10
Boiled fresh milk*	20	16.53	3	1.65	23	7.59
Yoghurt	101	83.47	157	86.26	258	85.15
Ice Cream	58	47.93	72	39.56	130	42.90
Wagashi	60	49.59	15	8.24	85	28.05
UHT milk	9	7.44	21	11.54	30	9.90
Butter/ghee	29	23.97	82	45.05	111	36.63
Condensed milk	68	56.20	141	77.47	60	19.80
Powder milk	33	27.27	27	14.84	209	68.98
Evaporated milk	106	87.60	164	90.11	270	89.12
Imported cheese	4	3.31	9	4.95	13	4.29

Source: Field survey, 2001.

** Boiled fresh milk refers to fresh milk that is pre-boiled before sale.*

4.2.4 Distribution of Respondents by Distance to Dairy product Purchase point

Table 4.9 gives the distribution of consumers of the various dairy products by distance from home to the respective dairy product purchase points.

Between 53% and 80% of dairy product consumers purchase their products from about 1Km (or less) away from their homes whiles 14-33% of consumers travel up to 3Km to buy dairy products for their consumption. Very few persons (maximum 15% of the consumers) will travel beyond 3Km to procure dairy products for consumption.

Table 4.9: Distribution of consumers of specific dairy products by distance from homestead to the point of purchase

DAIRY PRODUCT	DISTANCE (D) FROM HOME TO PURCHASE POINT							
	D ≤ 1 Km		1 < D ≤ 3Km		D > 3 Km		TOTAL	
	Freq	% Of total consumers of product	Freq	% Of total consumers of product	Freq	% Of total consumers of product	Freq	% Of total No. Of respondents (303)
Raw Fresh Milk	85	62.96	34	25.19	16	11.85	135	44.55
Fermented Milk	37	52.86	23	32.86	10	14.29	70	23.10
Boiled Fresh Milk	13	56.52	7	30.43	3	13.04	23	7.59
Yoghurt	159	61.63	71	27.52	28	10.85	258	85.15
Ice Cream	89	68.46	29	22.31	12	9.23	130	42.90
Wagashi	47	55.29	25	29.94	13	15.29	85	28.05
UHT Milk	24	80.00	5	16.67	1	3.33	30	9.90
Butter/Cheese	74	66.67	27	24.32	10	9.01	111	36.63
Condensed Milk	38	63.33	17	28.33	5	8.33	60	19.80
Powder Milk	167	79.90	30	14.35	12	5.74	209	68.98
Evaporated Milk	174	64.44	77	28.52	19	7.04	270	89.12
Imported Cheese	8	61.54	4	30.77	1	7.70	13	4.29

Source: Field survey, 2001.

4.2.5 Gender of Respondents and dairy product type consumed

Table 4.10 provides the gender distribution of respondents in the study. It can be seen from the table that out of the 303 respondents interviewed, 208 representing 69% are males with the remaining 31% being females.

Table 4.10: Gender distribution of dairy product consumers

GENDER	FREQUENCY	PERCENT
MALE	208	68.65
FEMALE	95	31.35
TOTAL	303	100.00

Source: Field Survey, 2001.

Gender distribution of respondents according to product type consumed is provided in table 4.11. It is seen that women patronize yoghurt, ice cream, butter, powdered milk, imported cheese and evaporated milk more than males.

Table 4.11: Gender distribution of Consumers by specific dairy products

Dairy Product	Male		Female		TOTAL	
	Freq.	Percent	Freq.	Percent	Freq.	Percent
Raw fresh milk	105	50.48	30	31.58	135	44.55
Fermented milk	47	22.60	23	24.21	70	23.10
Boiled fresh milk*	17	8.17	6	6.32	23	7.59
Yoghurt	169	81.25	89	93.68	258	85.15
Ice Cream	59	28.37	71	74.74	130	42.90
Wagashi	64	30.77	21	22.12	85	28.05
UHT milk	28	13.46	2	2.12	30	9.90
Butter/ghee	62	29.81	49	51.58	111	36.63
Condensed milk	44	21.15	16	16.84	60	19.80
Powder milk	126	60.58	83	87.37	209	68.98
Evaporated milk	179	86.06	91	95.79	270	89.12
Imported cheese	7	3.37	6	6.32	13	4.29

Source: Field survey, 2001.

** Boiled fresh milk refers to fresh milk that is pre-boiled before sale.*

4.2.6 Age of Respondents and dairy product type consumed

Consumers of different age groups may tend to consume different bundles of dairy products due to differences in preferences and purchasing power. Table 4.12 provides the distribution of respondents according to age group. From the table, 196 out of the 303 respondents, representing 65% were found to be within the age range of 30 – 50years. However, consumers above 50years formed less than 10% of the total number of respondents considered in the study.

Table 4.12: Distribution of consumers by age

Age group (Yrs)	Frequency	Percent
<30	77	25.41
30-50	196	64.69
>50	30	9.90
Total	303	100.00

Source: Field survey, 2001.

Table 4.13 shows the specific dairy products patronized by consumers in the different age brackets. The table shows that consumers below 30years patronize yoghurt, ice cream, butter, powdered milk, evaporated milk, imported cheese and condensed milk more than consumers who are above 29 years.

Table 4.13: Age distribution of Consumers by specific dairy products

Dairy Product	< 30 years *n = 77*		> 29 years *n = 266*		TOTAL *N = 303*	
	Freq.	Percent	Freq.	Percent	Freq.	Percent
Raw fresh milk	20	25.97	105	46.46	135	44.55
Fermented milk	15	19.48	55	24.34	70	23.10
Boiled fresh milk*	7	9.09	16	7.08	23	7.59
Yoghurt	73	94.81	185	81.86	258	85.15
Ice Cream	69	89.61	61	26.99	130	42.90
Wagashi	10	12.99	75	33.19	85	28.05
UHT milk	2	2.60	28	12.39	30	9.90
Butter/ghee	40	51.95	71	31.42	111	36.63
Condensed milk	17	22.08	43	19.03	60	19.80
Powder milk	61	79.22	148	65.49	209	68.98
Evaporated milk	74	96.10	196	86.73	270	89.12
Imported cheese	5	6.49	8	3.54	13	4.29

Source: Field survey, 2001.

** Boiled fresh milk refers to fresh milk that is pre-boiled before sale.*

4.2.7 Educational level of Respondents

Consumers sampled for the study have different educational backgrounds. Table 4.14 gives the distribution of respondents according to educational level.

It can be seen from the table that majority (82%) of the respondents interviewed were literate. One hundred and seventy-nine (179) out of the 247 literate respondents have not been to the tertiary level of education. Respondents belonging to this group have at least secondary school level education but not up to the polytechnic and the university levels. Tertiary literate consumers formed only 17% of the sample taken for the study. On the other hand, 19% of the respondents are consumers who have either had basic level education or no formal education at all. It is not surprising that the percentage of highly

educated people (consumers with at least Higher National Diploma - HND) in the sample is low. This is because many illiterate and secondary level consumers dominate in the consumption of raw fresh milk, wagashi and also patronize roadside beverages/tea with milk.

Table 4.14: Distribution of consumers by educational level

Educational level	Frequency	Percent
Illiterate/Basic	56	18.50
Secondary	197	65.00
Tertiary	50	16.50
Total	303	100.00

Source: Field survey, 2001.

Table 4.15 shows that raw fresh milk is least patronized by consumers who have had tertiary level education. Only two consumers in this category, representing 4% of the 50 respondents consume raw fresh milk. Apart from raw fresh milk, illiterate consumers also patronize fermented milk, boiled milk, powdered milk, wagashi and condensed milk more than the tertiary and secondary level consumers.

Table 4.15: Educational level distribution of Consumers by specific dairy products

Dairy product	Illiterates/Basic Level *n = 56*		Secondary Level *n = 179*		Tertiary Level *n = 50*		TOTAL *N = 303*	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Raw Fresh Milk	20	35.71	113	57.36	2	4.00	135	44.55
Fermented Milk	17	30.36	53	26.90	-	-	70	23.10
Boiled Fresh Milk*	13	23.21	9	4.57	1	2.00	23	7.59
Yoghurt	36	64.29	181	91.88	41	82.00	258	85.15
Ice Cream	10	17.86	100	50.76	20	40.00	130	42.90
Wagashi	37	66.07	48	24.37	-	-	85	28.05
UHT Milk	2	3.57	20	10.15	8	16.00	30	9.90
Butter/Ghee	39	69.64	48	24.37	24	48.00	111	36.63
Condensed milk	17	30.36	41	20.81	2	4.00	60	19.80
Powder milk	45	80.36	130	65.99	32	64.00	209	68.98
Evaporated milk	48	85.71	174	88.32	48	96.00	270	89.12
Imported cheese	1	1.79	11	5.58	1	2.00	13	4.29

Source: Field survey, 2001.

** Boiled fresh milk refers to fresh milk that is pre-boiled before sale.*

4.2.8 Urbanization and dairy product consumption

The distribution of respondents according to level of urbanization of their location is provided in table 4.16.

In terms of urbanization level of their residential locations, the respondents were categorized into metropolitan, urban and rural consumers. Here, classification of towns and cities into metropolitan, municipal, urban and rural by the 1993 Local government

Act - Act 462, was adopted. All respondents located in the Accra and Kumasi Metropolitan Areas were categorized as metropolitan consumers and those in Asanti Mampong were classified as urban consumers. All respondents sampled from towns located in rural districts like Ejura, Kintampo and West Gonja were considered as rural consumers.

Table 4.16 shows that 18% of the respondents are rural dwellers and the remaining 82% are urban and metropolitan dwellers. The metropolitan consumers, who are the majority, constitute 71% of the sample size used for this study.

Table 4.16: Distribution of consumers by location

Consumer classification	Frequency	Percent
Metropolitan consumers	215	70.96
Urban consumers	34	11.22
Rural consumers	54	17.82
Total	303	100.00

Source: Field survey, 2001.

4.3 Dairy consumption expenditure and consumer characteristics

4.3.1 Dairy consumption expenditure and Income level of Respondents

Table 4.17 provides the monthly expenditures made on dairy products by consumers of different income groups.

It is seen that whiles some individual households spend less than ¢2,000 a month on dairy products, others spend more than ¢400,000 monthly on these dietary essentials. It can again be observed from the table and figure 4.1 that the mean monthly dairy consumption expenditure increases with income. The mean monthly expenditure on dairy products by

consumers earning below ¢201,000 is ¢24,032.90 and that for consumers with monthly incomes above ¢600,000 is ¢120,433.30.

Table 4.17: Dairy consumption expenditure by income level

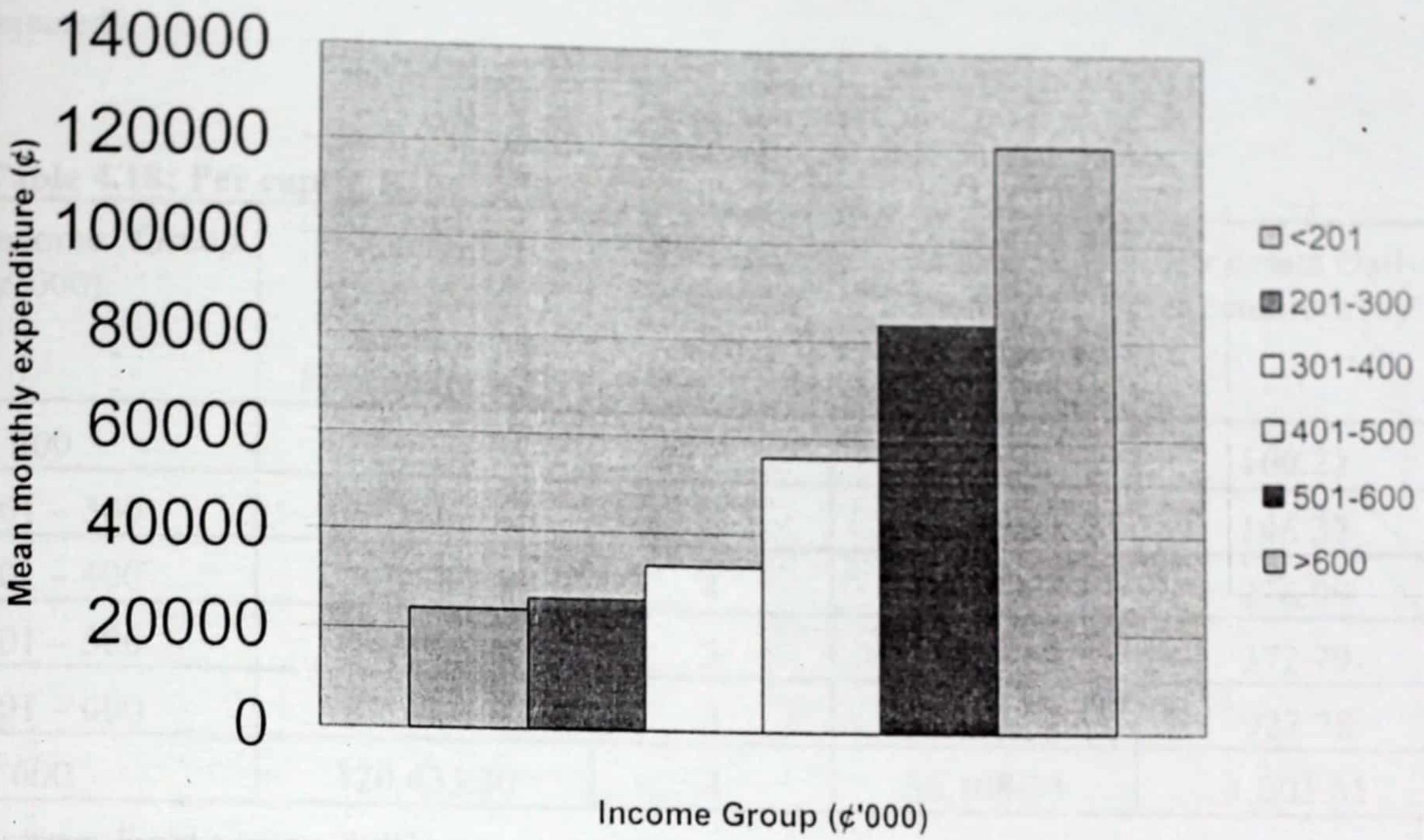
Monthly income (¢'000)	Minimum Monthly Expenditure (¢)	Mean Monthly Expenditure (¢)	Maximum Monthly Expenditure (¢)
≤ 200	1,200	24, 032.90	98,000
201 – 300	2,300	26,346.97	178,700
301 – 400	9,500	33,238.24	134,600
401 – 500	4,500	55,918.18	217,000
501 – 600	15,500	83,500.00	186,500
> 600	23,450	120,433.30	424,700

Source: Field Survey, 2001.

The result in figure 4.1 is in consonance with economic theory as consumers in the higher income groups spend more on consumables due to high disposable income and hence high purchasing power.

Given that a total of 278 households made a total expenditure of ¢8,284,400 per month on dairy products, the average household expenditure on dairy products is estimated at ¢29,800 per month. This figure represents an average of nearly ¢1,000 per day as the household consumption expenditure on dairy products in the study area. Given an average household size of 4 people, the per capita daily expenditure on dairy products is estimated at ¢250.00 which is equivalent to a quarter of a Fanta bottle full of fresh milk.

Figure 4.1: Average monthly dairy consumption expenditure by income group



Source: Field survey, 2001.

Table 4.18 gives the average household sizes of consumers in the various income groups and their per capita dairy consumption expenditure.

It is evident from table 4.18 that members of households with monthly income levels below ¢300,000 spend less than ¢200 (this is equivalent to 50 ml of fresh milk) daily on dairy products per head. Apart from the fact that these consumers have low incomes, their family sizes are relatively high and thus dairy products purchased are shared among a lot of people. On the contrary, however, consumers with monthly incomes above ¢500,000 have per capita dairy consumption expenditure of about ¢1,000 (equivalent to about 300ml or a Fanta bottle full of fresh milk) daily. This group of consumers buys relatively large quantity of dairy products and shares them among few household members.

In the light of the above findings, the hypothesis that households with large numbers of dairy consumers spend more on dairy products than those with smaller numbers is rejected.

Table 4.18: Per capita Expenditure on dairy products by Income level

Income Group (¢'000)	Average Household Monthly Expenditure (¢)	Average Household size	Per capita monthly expenditure (¢)	Per capita Daily expenditure (¢)*
≤ 200	24,032.90	5	4,806.58	160.22
201 – 300	26,346.97	6	4,391.16	146.37
301 – 400	33,238.24	4	8,309.56	276.99
401 – 500	55,918.18	5	11,183.64	372.79
501 – 600	83,500.00	3	27,833.33	927.78
> 600	120,433.30	4	30,108.33	1,003.61

Source: Field survey, 2003.

** Per capita daily expenditure was calculated by dividing per capita monthly dairy expenditure by the number of days in a month which was taken as 30.*

4.3.2 Income level of respondents and expenditure on selected dairy products

Table 4.19 and figure 4.2 depict the effect of income level on expenditure levels on evaporated milk, yoghurt and raw fresh milk.

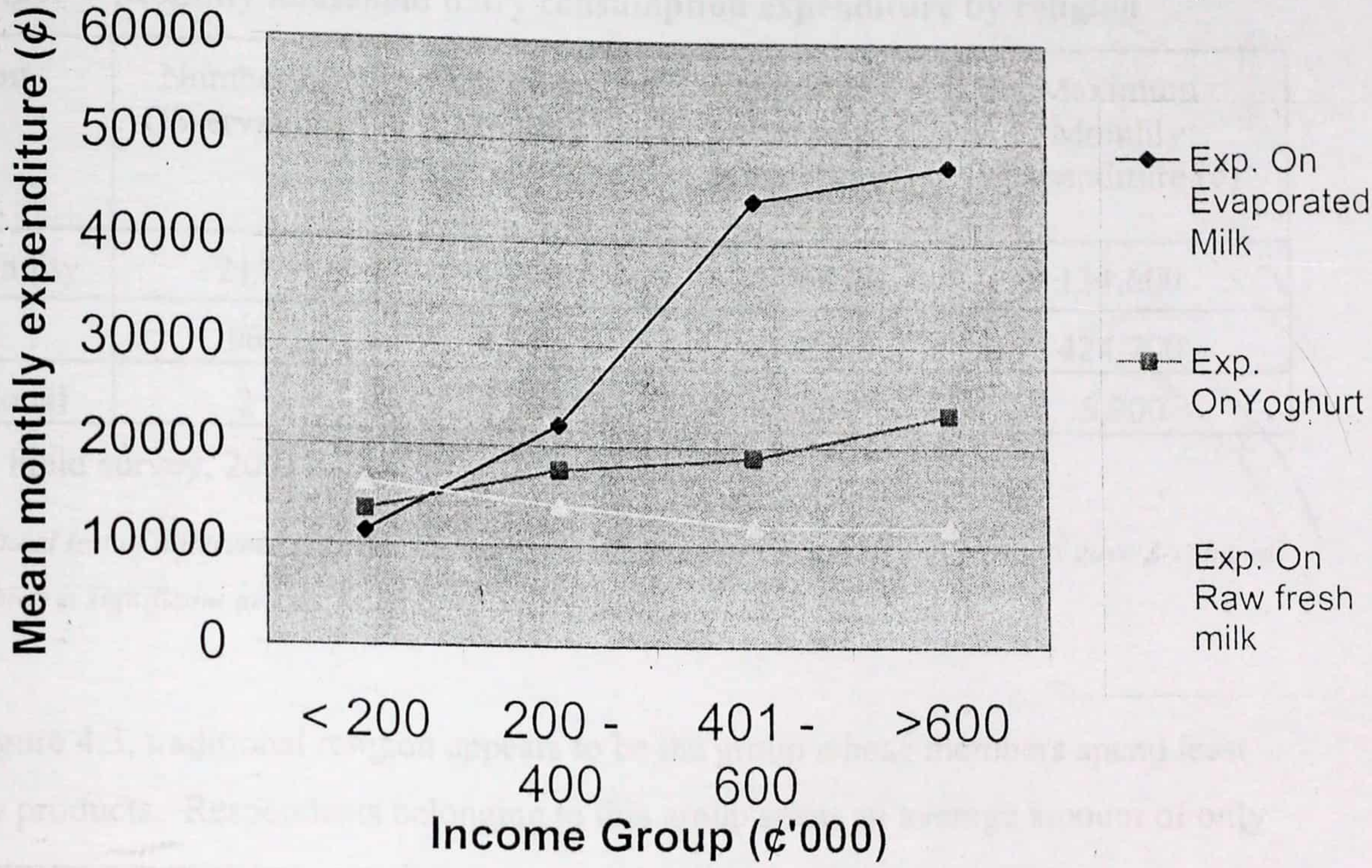
Table 4.19: Average monthly expenditure on Evaporated milk, Yoghurt & Raw fresh milk

Income Group (¢'000)	Average Expenditure		
	Evaporated milk (¢)	Yoghurt (¢)	Raw fresh milk (¢)
< 200	11,330.32	13,500	16,201.33
200 - 400	22,125.71	17,600.35	13,925.77
401 - 600	44,200.44	18,964.58	12,000.61
> 600	47,650.63	23,371.74	11,891.89

Source: Calculations from Field Survey, 2001.

It is evident from table 4.19 and figure 4.2 that expenditure on tinned evaporated milk increases with increasing level of income. Expenditure on yoghurt also increases with increase in income but at a slower rate. However, expenditure on raw fresh milk decreases with increasing level of income. The implication is that as income increases, consumers switch from raw fresh milk consumption to the consumption of processed dairy products like yoghurt, evaporated milk, etc. This observation is not strange as many Ghanaians consider raw fresh milk as an inferior product. It must be pointed out here that the above observation is the direct opposite of the situation in Kenya and the developed world where dairy consumers switch from processed dairy products to unprocessed or raw products when income rises (Seyoum, 1988).

Figure 4.2: Expenditure on selected dairy products by Income level



Source: Calculations from Field Survey, 2001.

4.3.3 Religious Affiliation of Respondents and Dairy consumption expenditure

Expenditure on dairy products according to religious affiliation is provided in table 4.20 and figure 4.3.

It is evident from table 4.20 that on the average Muslims spend more on dairy products than consumers who belong to the other religions. The mean monthly dairy consumption expenditures by Muslims and Christian households are ¢42,768 and ¢22,768 respectively. This observed difference was found to be statistically significant at the 1% level. It implies that Muslims spend twice as much more money on dairy products than Christians. Many Muslims are of northern Ghana origin where dairy products are

considered as traditional foods. It is therefore not surprising that Muslims spend more on dairy products than Christians.

Table 4.20: Monthly household dairy consumption expenditure by religion

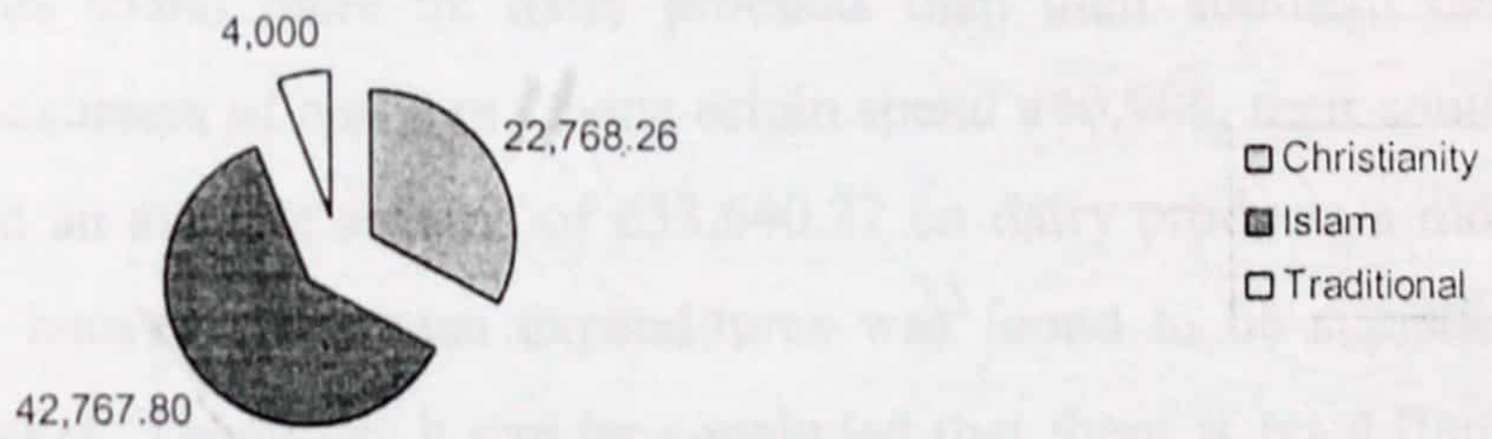
Religion	Number of Observations	Minimum Monthly Expenditure (¢)	Average monthly expenditure* (¢)	Maximum Monthly Expenditure (¢)
Christianity	211	1,200	22,768.26	134,600
Islam	90	4,500	42,767.8	424,700
Traditional	2	2,300	4,000.0	5,700

Source: Field survey, 2001.

** A statistical test of difference between mean dairy expenditure by Christians and Muslims gave Z-value of -3.672 which is significant at 1%.*

From figure 4.3, traditional religion appears to be the group whose members spend least on dairy products. Respondents belonging to this group spent an average amount of only ¢4,000 per month on dairy products.

Figure 4.3: Average monthly Dairy Consumption expenditure by Religion



Source: Field survey, 2001.

Table 4.21 gives the per capita dairy consumption expenditure by religion. It is evident from the table that Muslims spend more on dairy products than Christians on per capita

basis. Whereas Muslims spend about ¢238 (equivalent to about a quarter of fanta bottle full of fresh milk) daily, the daily per capita expenditure for Christians is ¢190.

Table 4.21: Per capita dairy consumption expenditure by Religious affiliation

Religion	Average Household Monthly Expenditure (¢)	Average Household size	Per capita monthly expenditure (¢)	Per capita Daily expenditure (¢)*
Christianity	22,768.26	4	5,692.07	189.74
Islam	42,767.80	6	7,127.97	237.60
Traditional	4,000	3	1,333.33	44.44

Source: Field Data, 2001.

* *Per capita daily expenditure was calculated by dividing per capita monthly dairy expenditure by the number of days in a month which was taken as 30.*

4.3.4 Tribal affiliation and Dairy consumption expenditure

Table 4.22 and figure 4.4 show the monthly expenditures made on dairy products by consumers of northern and southern Ghana origins.

The results in table 4.22 and figure 4.4 show that on the average consumers belonging to the northern Ghana tribes spend more on dairy products than their southern Ghana counterparts. Whereas consumers of northern Ghana origin spend ¢40,986, their southern Ghana counterparts spend an average amount of ¢33,640.27 on dairy products a month. However, the difference between the mean expenditures was found to be statistically insignificant at the 5% level. Therefore, it can be concluded that there is no difference between dairy expenditure levels of people of northern and southern Ghana origins. On this basis, the hypothesis that people of northern Ghana origin spend more on dairy products than their southern Ghana counterparts is rejected.

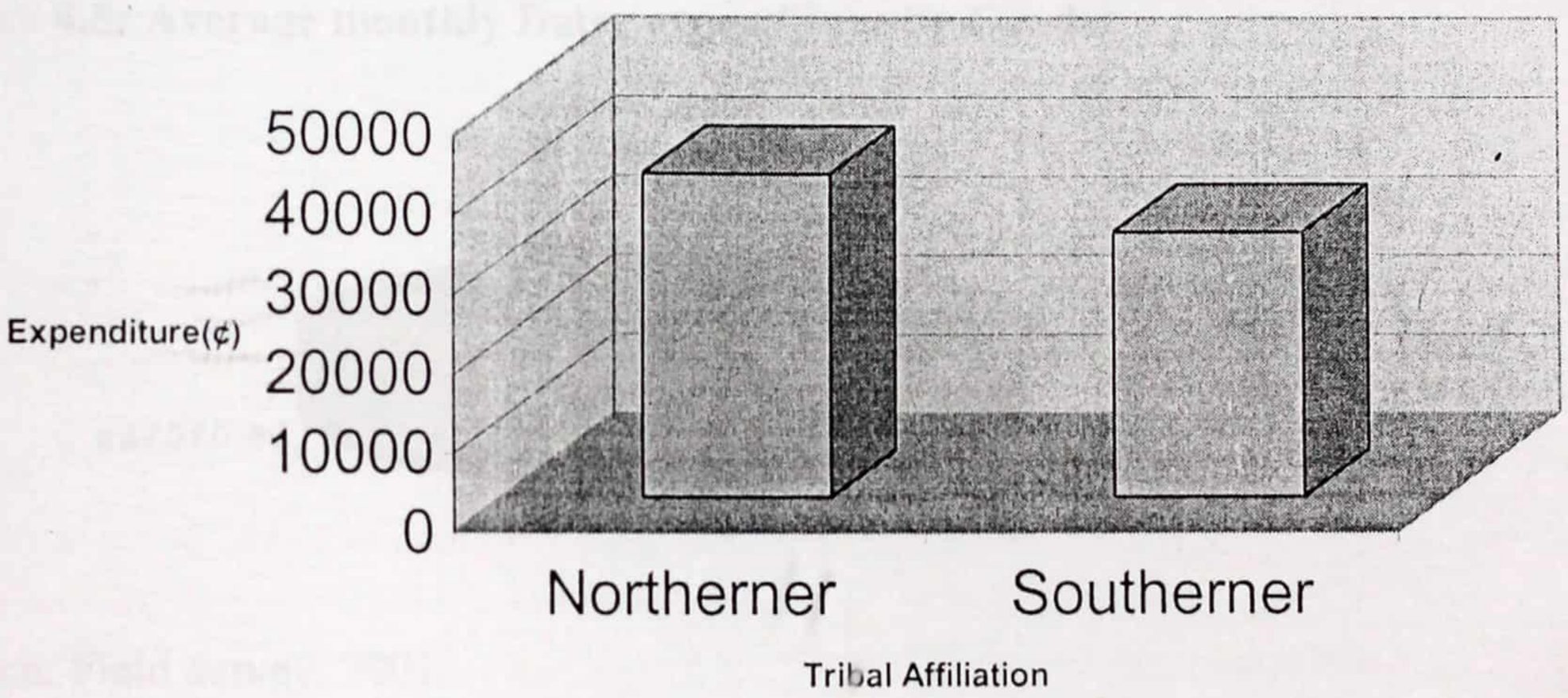
Table 4.22: Monthly dairy consumption expenditure by ethnic Affiliation

Tribal/ Ethnic Affiliation	Minimum Monthly Expenditure (¢)	Average monthly expenditure* (¢)	Maximum Monthly Expenditure (¢)
Northern tribes	1,200	40,986.00	424,700
Southern tribes	4,500	33,640.27	178,700

Source: Field survey (2001).

** A statistical test of difference between mean dairy expenditure by northerners and southerners gave Z-value of -1.308 which is not significant at 5%.*

Figure 4.4: Mean monthly Dairy Expenditure by Tribe



Source: Field survey, 2001.

4.3.5 Gender of Respondents and Dairy consumption expenditure

Table 4.23 and figure 4.5 provide the monthly dairy consumption expenditures made by females and males. It can be seen from the table that average monthly dairy consumption expenditure for males is ¢26,479 and that for females is ¢ 37,070. The difference between the mean monthly dairy consumption expenditure by males and females was found to be

statistically insignificant at the 5% level. The observed difference in expenditure levels can thus be attributed to chance occurrence.

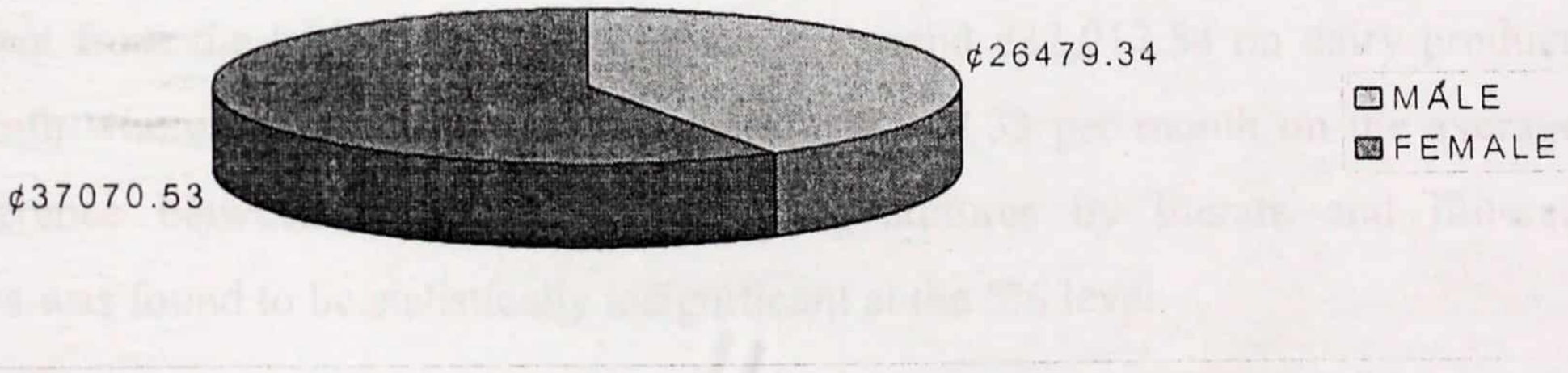
Table 4.23: Monthly expenditure on dairy products by Gender

GENDER	Frequency	Minimum monthly Expenditure (¢)	Mean monthly expenditure* (¢)	Maximum monthly Expenditure (¢)
MALE	208	1,200	26,479.34	424,700
FEMALE	95	2,300	37,070.53	186,500

Source: Field Survey, 2001.

** A statistical test of difference between mean dairy expenditure by Males and Females gave Z-value of 1.183 which is not significant at 5%.*

Figure 4.5: Average monthly Dairy expenditure by Gender



Source: Field survey, 2001.

4.3.6 Age and Dairy consumption Expenditure

Table 4.24 shows that the average monthly dairy consumption expenditure for respondents who are 30years or younger is about ¢40,000. For respondents between 31 and 50 years, mean monthly dairy consumption expenditure was estimated at ¢30,712. Older people (persons above 50 years) spend about ¢24,000 monthly on dairy products. It is evident from the figures in table 4.24 that average monthly expenditure on dairy products decreases with increasing age of respondents.

Table 4.24: Monthly dairy consumption expenditure by age of respondent

Age group (Yrs)	Minimum monthly expenditure (¢)	Average monthly expenditure (¢)	Maximum monthly expenditure (¢)
≤30	15,500	39,569.44	162,000
31-50	9,500	30,717.61	424,700
>50	1,200	23,896.30	98,000

Source: Field survey, 2001.

4.3.7 Educational level and Consumption Expenditure

One's educational level, to a large extent, determines his income and choices. The level of education will influence the type or bundle of dairy products purchased and consumed by an individual. Table 4.25 gives the monthly dairy consumption expenditure according to educational level of respondents.

It is evident from the table that literate consumers spend ¢32,917.54 on dairy products every month whereas illiterate consumers spend ¢28,908.33 per month on the average. The difference between the mean monthly expenditures by literate and illiterate consumers was found to be statistically insignificant at the 5% level.

Table 4.25: Monthly dairy consumption expenditure by educational level

Educational level	Minimum Monthly Expenditure (¢)	Average monthly dairy expenditure* (¢)	Maximum Monthly Expenditure (¢)
Illiterate/Basic	1,200	28,908.33	152,200
Literate	6,500	32,917.54	424,700

Source: Field survey, 2001.

** A statistical test of difference between mean dairy expenditure by literate and illiterate consumers gave Z-value of 0.892 which is not significant at 5%.*

4.3.8 Urbanization and Dairy consumption expenditure

The expenditure made by consumers in urban and rural areas are expected to be different. Table 4.26 gives the monthly dairy consumption expenditure according to the level of urbanization of consumer location.

Table 4.26: Mean monthly dairy consumption expenditure by Level of urbanization

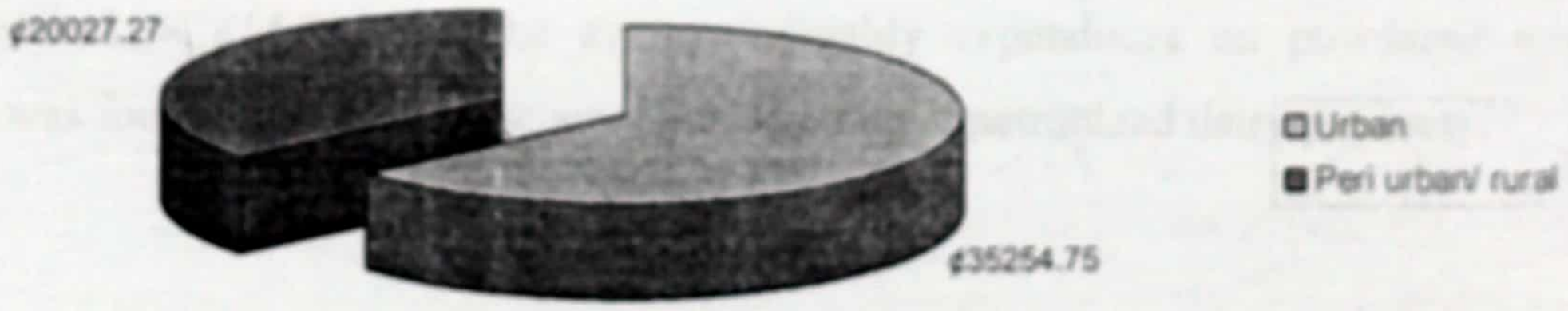
Location classification	Minimum monthly expenditure (¢)	Mean monthly dairy expenditure* (¢)	Maximum monthly expenditure (¢)
Metropolitan/Urban	2,300	35,254.75	424,700
Rural	1,200	20,027.27	74,600

Source: Field survey, 2001.

** A statistical test of difference between mean dairy expenditure by Urban and Rural consumers gave Z-value of 13.734 which is significant at 1%.*

From table 4.26 and figure 4.6, it can be seen that households in metropolitan and urban areas spend an average amount of ¢35,254.75 a month on dairy products and households in rural areas spend ¢20,027.27 per month on the average. The mean dairy consumption expenditure by urban dwellers is thus 76% higher than that for rural consumers.

Figure 4.6: Mean monthly dairy expenditure by level of urbanization



Source: Field survey, 2001.

The above result does not only meet *a priori* expectation but it is also consistent with the findings of Jaffee and Motton (1995) in a similar study conducted in Kenya. In their study the higher dairy consumption expenditure in urban centers was attributed to higher disposable incomes in urban areas. The Ghanaian situation could also be attributed to the same factor. In addition to the above reason, the high level of dairy product consumption in urban areas can be attributed to the fact that majority of Ghanaian urban dwellers take in beverages every morning due to lack of enough time to prepare other meals before leaving for the work place.

4.4 Dairy consumption expenditure by product type

Different dairy products have different prices on the market. The level of expenditure on these products by respondents is expected to vary with the variation in prices and consumers will have to pay more for expensive products. The monthly expenditure figures for selected dairy products are provided in table 4.27.

It is evident from table 4.27 that expenditure level on tinned evaporated milk is higher than the other products. The average expenditure on tinned evaporated milk was found to be ¢45,600 per month. Evaporated milk which is the most commonly used dairy product in the preparation of beverages in Ghana is quite expensive than the other dairy products. Thus, it is not strange to discover that the average monthly expenditure by households is highest for evaporated milk than the other milk products. The average expenditure on yoghurt was found to be ¢18,246.54. For raw fresh milk, average monthly expenditure was estimated at ¢14,215.62. The average monthly expenditure on powdered milk (¢6,500) was found to be the lowest among the four most patronized dairy products.

Table 4.27: Monthly Expenditure on the most patronized dairy products

Product Type	Monthly Expenditure (¢)		
	Minimum	Mean	Maximum
Evaporated Milk	1,800	45,600.00	120,400
Yoghurt	900	18,246.54	35,000
Powdered Milk	1,000	6,500.00	13,200
Raw fresh Milk	1,200	14,215.62	32,000

Source: Field Survey, 2001.

4.5 Determinants of dairy consumption expenditure

In this section, the effects of personal, household and product characteristics as well as cultural and economic factors on household dairy consumption expenditure are examined using econometric models. An aggregate/composite dairy consumption expenditure model is first estimated after which dairy consumption expenditure is modeled along particular product lines.

4.5.1 Aggregate Dairy Consumption Expenditure Model

A double logarithmic function was fitted to the data obtained from the field, with total monthly dairy consumption expenditure by households as the regressand or dependent variable.

Due to the problem of aggregation, it was not possible to measure and incorporate variables like product price and the price of substitute products in the composite model. The estimated coefficients obtained after running the log-linear model are provided in table 4.28.

The multiple coefficient of determination (R^2) of the model was estimated at 0.596. This implies that 60% of the variation in total expenditure on diary products is explained by the regression model. The product price and price of substitutes, which were not included in the model due to aggregation problem, could have improved the explanatory power of the general consumption expenditure model. The F-value of 36.70 for the overall model is statistically significant at 1%. The implication is that the data provides sufficient evidence to indicate that the monthly expenditure on dairy products varies with different levels of the regressors.

It was found out that the income level of consumer, distance to dairy product purchase point and the level of urbanization of consumer location are the factors that significantly influence the level of dairy consumption expenditure.

The positive sign of the coefficients of income level and distance from home to dairy product purchase point is consistent with *a priori* expectation and economic theory. This is an indication of a direct (positive) relationship between these variables and household dairy consumption expenditure level.

The magnitudes of the exponents of income level (0.42) and distance from home to dairy product purchase point (0.10) are also in consonance with economic theory. Because these exponents or elasticities are fractions (i.e. $0 < bi < 1$), consumption expenditure on dairy products increases at a decreasing rate for increasing levels of income and distance from home to purchase point. This depicts the Engel's Curve, which is suggestive of diminishing marginal expenditure on dairy products for each unit increase in income level.

Table 4.28: Aggregate Dairy Consumption expenditure model estimates

Variable	*Dependent Variable: Monthly household dairy consumption expenditure;* $R = 0.784$, $R^2 = 0.615$, *Adj.* $R^2 = 0.596$, *Std. Error = 0.398;* *F = 36.70, DF= 242 (Significant at 1%)*		
	Coefficients	t	Probability
Constant	3.152**	2.819	0.000
LOG INCM (Y)	0.422**	4.134	0.000
LOG DIST	0.103*	2.081	0.031
RESP AGE	-0.016	-0.270	0.352
SEX	-0.036	-0.639	0.529
EDU	0.035	0.526	0.956
RLGN	-0.041	-0.611	0.102
TRIBE	-0.043	-0.698	0.376
UBL	-0.477**	-6.184	0.000
YGUT	0.098	1.741	0.518
RAWMILK	-0.014	-0.215	0.347
EVAPMILK	0.053	0.885	0.491
POWDMILK	0.023	0.420	0.884
WAGASHI	-0.080	-1.530	0.543
STOREMILK	-0.0087	-0.159	0.628

** = Significant at 5%; ** = Significant at 1%*

The coefficient of -0.477 for the level of urbanization of consumer location gives a figure of - 4255.99 when the antilog is multiplied by the antilog of the constant intercept. This shows a positive relationship between dairy consumption expenditure and level of urbanization. It implies that consumers in urban centers (metropolitan and urban consumers) spend ¢4,255.99 more on dairy products than their counterparts in rural districts. This result is in conformity with the revelation by Jaffee and Motton (1995) that consumers in urban centres of Kenya spend more on dairy products than rural and semi-

urban consumers. This state of affairs is due to high disposable incomes and for that matter, high purchasing power in urban centres than in rural areas.

4.5.2 Consumption Expenditure Model for Yoghurt

The effects of personal, cultural, economic and product characteristics on monthly expenditure on yoghurt were also examined. The estimated log-linear model is presented in table 4.29.

The multiple coefficient of determination of 0.79 implies that 79% of the variation in household monthly expenditure on yoghurt is explained by the variation in the various levels of the regressors. The model is significant at 1% level. This means that the data provides sufficient evidence to suggest that the monthly expenditure on yoghurt varies with different levels of the explanatory variables.

Yoghurt price, income level of consumer and the level of urbanization of consumer location were found to influence expenditure on yoghurt significantly at the 5% level. It is evident from table 4.29, however, that all the variables in the model have the expected signs.

As expected, the magnitude of the exponent of consumer income is not only a fraction but it also has a positive sign which is a demonstration of the positive relationship between income level and yoghurt consumption expenditure. The income exponent of 0.31 indicates that for a 10% increase in consumer income, expenditure on yoghurt increases but at a declining rate of 3%. In other words, ten Cedis increase in consumer income will result in ¢ 3 increase in consumer expenditure on yoghurt, all other things being constant. It implies that as people's living standards (at least as measured by income level) increase, they tend to demand more yoghurt. This amply demonstrates the fact that yoghurt is not just a normal commodity but also a basic necessity.

Table 4.29: Yoghurt Consumption expenditure model estimates

Variable	*Dependent variable: Monthly household expenditure on yoghurt; $R = 0.890$, $R^2 = 0.792$, Adjusted $R^2 = 0.790$, $F = 106.346$ (DF = 193); significant at 1%.*		
	Coefficient	t	Probability
Constant	3.421**	9.637	0.000
LOG Y	0.313**	28.545	0.000
LOG YP	1.061**	9.450	0.001
LOG RMP	0.271	1.642	0.592
LOG EvPmP	0.197	1.512	0.728
Log FS	0.169	1.441	0.663
UBL	-0.252*	-2.187	0.048
TRIBE	0.007	0.087	0.294
EDUC	0.075	1.891	0.227
DIST	-0.068	-1.822	0.925

**Significant at 5%, ** Significant at 1%,*

With respect to unit price of yoghurt, the exponent is unity, suggesting a constant rate of increase in yoghurt expenditure for each unit increase in the price of yoghurt. The positive relationship between price and expenditure is well documented and emphasized in economic theory. The result means that a 1% change in the price of yoghurt will cause expenditure on yoghurt to change by 1%. This is to say that a Cedi increase in the unit price of yoghurt will cause expenditure on yoghurt to also increase by one Cedi. This demonstration of unit elasticity of expenditure on yoghurt with respect to yoghurt price is not surprising as quantity of yoghurt bought is paid on per unit basis. In view of this, household yoghurt expenditure increases by just the unit price paid for an extra sachet of yoghurt when consumption increases by one unit.

The results of the regression analysis also indicate that urban consumers spend about ¢ 4,700 more on yoghurt than their rural counterparts. This is not surprising as yoghurt is

more common in urban centres than in the rural areas. Also, disposable incomes are high in urban centers than in rural areas.

4.5.3 Consumption Expenditure Model for Raw Fresh Milk

A model similar to that fitted for expenditure on yoghurt was built for expenditure on raw fresh milk. The coefficients obtained after the regression analysis are provided in table 4.30.

The multiple coefficient of determination of 0.80 implies that 80% of the variation in the expenditure on raw fresh milk is explained by the estimated model. The F-ratio of 33.072, which is significant at the 1% level, means that the data provides sufficient evidence to suggest that household monthly expenditure on raw fresh milk varies with different levels of the regressors.

The regression results show that price of raw fresh milk, price of evaporated milk, income level, distance from consumer's homestead to purchase point and religion are the factors which significantly influence raw fresh milk expenditure at the 5% level.

The elasticity of raw fresh milk expenditure with respect to own price was found to be unity as in the case of yoghurt. This means that expenditure on raw fresh milk increases at a constant rate for successive increases in the level of raw fresh milk price.

Table 4.30: Raw Fresh Milk Consumption expenditure estimates

Variable	*Dependent variable: Monthly household expenditure on raw fresh milk;* $R = 0.901$, $R^2 = 0.812$, *Adjusted* $R^2 = 0.800$, *Standard Error = 0.146. F-Ratio = 33.072 (DF = 26); significant at 1%*		
	Coefficient	t	Probability
Constant	2.838**	5.712	0.013
LOG Y	-0.100**	-4.271	0.001
Log FS	-0.259	-1.006	0.391
Log RMP	1.001**	7.184	0.000
Log YP	0.351	1.963	0.428
LOG EvPmP	0.442**	2.131	0.014
UBL	0.102	0.836	0.096
TRB	0.116	0.977	0.127
RGN	-0.285*	-2.065	0.036
EDUC	-0.102	-0.739	0.225
DIST	-0.050**	-0.607	0.013

**Significant at 5%, **Significant at 1%*

Income level was found to be negatively related to the consumption expenditure on raw fresh milk. The negative exponent (- 0.100) implies that for a 10% increase in income level, consumption expenditure on raw fresh milk decreases but at a declining rate of 1%. In other words, ¢ 10 increase in consumer income will warrant a Cedi reduction in the expenditure on raw fresh milk, *ceteris paribus*. This means that consumers shift from raw fresh milk to the consumption of processed dairy products when income increases. The negative sign of the income elasticity of raw fresh milk consumption expenditure is ample demonstration of the fact that raw fresh milk is an inferior commodity in Ghana. The inferiority of raw fresh milk may be attributed to the negative consumer perception about the product, which stems from what some consumers consider as unhygienic methods of preparation and bad odour of the product. It is significant to note that this observation is in sharp contrast with the situation in some East African countries and the developed world. Jaffee and Morton (1995) reported that dry milk is rather inferior in

Kenya and the developed world. According to them, consumers in these countries switch from dry milk to raw milk consumption when income rises. The implication of the inferiority of raw fresh milk for the local dairy industry is that if raw fresh milk is not processed under hygienic conditions, alongside vigorous consumer education to erase negative consumer perception about the product, its demand will fall as the living standards of Ghanaians improve. It is equally important to emphasize the point that one is likely to see high concentration of low income people at fresh milk production centers. As a result, the negative relationship between income and raw fresh milk consumption could partly be due to lack of access to the product by high income earners.

The price of tinned evaporated milk, a close substitute of raw fresh milk, was found to have a significant positive influence on raw fresh milk expenditure level. The elasticity of raw fresh milk expenditure with respect to the price of tinned evaporated milk was found to be less than unity (0.44). The implication is that a 100% change in the unit price of evaporated milk would engender a 44% change in the level of raw fresh milk consumption expenditure. This is to say that the rate of increase in raw fresh milk consumption expenditure lags behind the rate of increase in the price of tinned evaporated milk. This observation could have serious implication for the local dairy industry. If the government implements policies that are very favourable for industrial production of dairy products such as tinned evaporated milk at very low costs, there will be a dramatic reduction in the demand for raw fresh milk in Ghana. When such policies are sustained, local dairy production will be stifled and the effort of producers will not be rewarding enough to attract the unemployed youth into the industry. To forestall this possibility, government must equally support producers to step up the production of raw milk to feed the industries that process dairy products for sale; whilst discouraging them from importing raw materials that are available locally from abroad.

Distance from home to point of purchase was found to be negatively related to the expenditure on fresh milk at the 1% level. The coefficient of –0.05 implies that a 100% increase in the distance from home to purchase point will warrant a 5% reduction in the

expenditure on raw fresh milk. This result is consistent with *a priori* expectation that close proximity to raw fresh milk purchase point will influence expenditure on the product positively.

The religion of consumer was found to influence expenditure on raw fresh milk significantly at the 5% level. The coefficient of the religion variable indicates that consumers who belong to the Islamic religion spend ¢1,333.52 more on raw fresh milk than consumers belonging to the other forms of religion. This observation is not surprising as raw fresh milk production centers and purchase points are mostly located in Islamic communities like Aboabo in Kumasi and Nima in Accra.

The other explanatory variables considered in the model such as family size, tribe and educational level of consumer were found to be insignificant at the 5% level.

4.5.4 Consumption Expenditure Model for Tinned Evaporated Milk

A double logarithmic function was fitted to explain expenditure on evaporated milk. Table 4.31 gives the coefficients of the regressors and their respective t-values.

The multiple coefficient of determination was found to be 0.78 with a standard error of 0.204. The implication is that the independent variables in the model explain 78% of the differences in the level of household expenditure on tinned evaporated milk. The analysis of variance (ANOVA) gave an F-ratio of 42.930 at the 1% level. This indicates that the data provides sufficient evidence to conclude that monthly expenditure on tinned evaporated milk by households varies with different levels of the explanatory variables.

The regression results show that price of evaporated milk, income level, urbanization level of consumer location; raw fresh milk consumption and religion significantly influence consumption expenditure on tinned evaporated milk at the 5% level.

Table 4.31: Evaporated Milk Consumption Expenditure estimates

Variable	*Dependent variable: Monthly household expenditure on evaporated milk;* $R = 0.883$, $R^2 = 0.779$, *Adjusted* $R^2 = 0.780$, *Standard Error = 0.204, F-ratio = 42.930 (df = 114); significant at 1%.*		
	Coefficients	t	Probability
Constant	3.400**	16.244	0.000
LOG Y	0.541**	14.112	0.000
LOG EvPmP	1.021**	20.178	0.000
LOG YP	0.101	1.715	0.413
LOG FS	-0.257	-1.643	0.522
UBL	-0.442**	-8.418	0.000
RMC	-0.154**	-2.504	0.011
RGN	0.111*	2.025	0.034
TRB	-0.072	-1.282	0.205
EDUC	0.012	0.207	0.512

**Significant at 5%, **Significant at 1%,*

The elasticity of evaporated milk expenditure with respect to own price was found to be close to unity, suggesting a constant marginal expenditure on the product for each percentage increase in the price of tinned evaporated milk. Consumer income was also found to be positively related to consumption expenditure on tinned evaporated milk. The income elasticity of evaporated milk consumption expenditure of 0.54 implies that a 10% change in income level will result in 5% change in the expenditure on tinned evaporated milk. This is to say that a ten Cedi increase in consumer income will cause expenditure on tinned evaporated milk to increase by ¢5.

Raw fresh milk consumption was found to influence expenditure on evaporated milk significantly at the 5% level. Consumers of raw fresh milk spend about ¢3,580.00 less on evaporated milk than non-consumers of raw fresh milk. Consumers of raw fresh milk

might use evaporated milk as a substitute in the absence of raw fresh milk. It is therefore not surprising that they spend less on tinned evaporated milk.

The model depicts a significant positive relationship between the level of urbanization and consumption expenditure on evaporated milk. On the average, urban consumers spend ¢6,950.24 more on evaporated milk than consumers in the peri-urban and rural areas. This observation, which is consistent with *a priori* expectation, can be attributed to the high disposable incomes in the urban areas as well as easy access to evaporated milk in urban centres.

Religious affiliation was found to influence expenditure on evaporated milk significantly at the 5% level. Muslims were found to spend ¢3,243.40 less on evaporated milk than their Christian counterparts. Since Muslims were found to spend more on raw fresh milk, it will not be wrong to speculate that they supplement evaporated milk consumption with that of raw fresh milk. As a result, their expenditure on evaporated milk must be less than that of Christians.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This section summarizes the main findings of the study and presents concise statements of the inferences that were made as a result of the study. Finally, recommendations consistent with the purpose of the study, the objectives and the evidence presented by the data and the interpretation given are also in this section.

5.1 Summary and conclusions

The evidence presented suggests that the main dairy products found on Ghanaian markets are raw fresh milk, boiled and fermented milk, yoghurt, ice cream, tinned condensed milk and tinned evaporated milk. Others include powdered milk, wagashi (local cheese), imported cheese, butter/ghee and ultra-heated milk (UHT milk). The study revealed that the four most consumed dairy products in the Accra and Kumasi peri-urban areas are tinned evaporated milk, yoghurt, raw fresh milk and powdered milk.

About 79% of the study sample had monthly incomes below ¢301,000. Whereas Christians formed 69.64% of the respondents, consumers belonging to the Islamic religion constituted almost 30% of the sample. Also, majority (nearly 60%) of the sample in the study were affiliated to southern Ghana tribes. The study revealed that at least, 53% of the consumers of each of the dairy products considered in this study purchased from selling points located less than 1Km away from their homes. Males constituted majority (69%) of the sample selected for the study and in terms of age, 65% of the consumers interviewed were between the ages of 30 and 50 years. Only 56 consumers, representing 19% of the respondents were illiterate. Further, 82 % of the consumers sampled for the study were located in urban centers (mainly Kumasi, Accra and Asante Mampong) with only 18% located in rural districts.

The regression analysis conducted revealed that the principal determinants of the aggregate consumption expenditure on dairy products are income level of consumer, distance from home to product purchase point and the level of urbanization of the consumer's location. The study revealed a direct or positive relationship between aggregate dairy consumption expenditure on one hand and income level, distance to purchase point and the level of urbanization of consumer's location on the other hand. The magnitudes of these variables, as expected on *a priori* grounds, were fractions (*i.e. 0 < bi < 1*) depicting the Engel's curve, which is suggestive of diminishing marginal expenditure on dairy products for each percentage increase in income level and distance to purchase point.

The major determinants of expenditure on yoghurt at the 5% significance level were found to be income level, price of yoghurt and level of urbanization of consumer's location. There was a significant positive relationship between expenditure on yoghurt on one hand and income level, own price and level of urbanization of consumer location on the other hand. The level of expenditure on yoghurt was found to be unitary elastic with respect to the price of yoghurt. This is indicative of a linear relationship or constant marginal expenditure on yoghurt with respect to own price. However, the elasticity of yoghurt consumption expenditure with respect to consumer income was less than unity. Urban consumers were found to spend more on yoghurt than rural consumers.

The principal determinants of expenditure on raw fresh milk were identified as income level, price of raw fresh milk, price of evaporated milk, distance from home to purchase point and religious affiliation of consumer. Price of raw fresh milk was found to have a positive relationship with the expenditure on raw fresh milk. There was a perfect linear relationship between expenditure on raw fresh milk and the price of raw fresh milk. Income level and distance from home to purchase point were however found to be negatively related to expenditure on raw fresh milk. Expenditure on raw fresh milk decreases at a decreasing rate of 1% for every 10% increase in consumer income. Thus, the study concluded that raw fresh milk is an inferior commodity in Ghana. The results also show that the price of evaporated milk has a significant positive relationship with

expenditure on raw fresh milk. The study concluded that whenever the price of evaporated milk is reduced drastically, the demand for fresh milk would be reduced significantly, leading to a stifling of the local fresh milk industry. The study also revealed that Muslims spend more on raw fresh milk than Christians, all other factors remaining unchanged.

The principal determinants of expenditure on tinned evaporated milk were identified as income level, own price, urbanization level of the consumer's location, raw fresh milk consumption and religious affiliation of the consumer. The elasticity of evaporated milk consumption expenditure with respect to income level was found to be less than unity. However, the elasticity with respect to own price was found to be unity. The level of urbanization was found to be positively related to the expenditure on evaporated milk. All other factors remaining constant, urban consumers spend ¢6,950.24 more on evaporated milk than consumers in rural communities. On the basis of religion, Muslims were found to spend ¢3,243.40 less on evaporated milk than their Christian counterparts. Raw fresh milk consumption has a significant negative relationship with expenditure on evaporated milk. Raw fresh milk consumers spend ¢3,580.96 less on evaporated milk than non-consumers of raw fresh milk, *ceteris paribus*.

5.2 Recommendations

The following recommendations are made based on the findings of the study.

a. Since the results show that urban consumers spend more on dairy products but income level and distance to purchase point rather have negative relationship with the expenditure level on fresh milk, it would be expedient for producers and marketing agents to critically examine the distribution of fresh milk if the demand of the product is to be improved upon. It is therefore recommended that marketing agents and producer sellers should explore the possibility of locating a lot more fresh milk selling points in urban communities dominated by low income people to boost the consumer demand for the product.

b. The significant positive relationship found between expenditure on fresh milk and the price of evaporated milk, which is reinforced by the significant negative relationship between raw fresh milk consumption and expenditure on evaporated milk, should be explored further for the examination of the possible policy implications. This study recommends that a deliberate government intervention or policy should be made to promote the use of locally produced raw fresh milk in the industrial production of tinned evaporated milk to boost the local dairy industry. This industrial synergy would engender dramatic increase in the demand for fresh milk and make fresh milk production and marketing rewarding and attractive to the youth.

c. In line with the finding that fresh milk is an inferior commodity in Ghana, it is recommended that vigorous consumer education should be embarked upon to diffuse the negative perceptions of people about the product. This education, which would boost the demand for the product, should be done by the livestock subsector of the Ministry of Food and Agriculture in conjunction with the association of producers and marketers of fresh milk if such an association is in existence or when one is formed.

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