ANALYSIS OF HOUSEHOLD DEMAND FOR LOCAL DAIRY PRODUCTS IN JIGAWA AND KADUNA STATES, NIGERIA

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A THESIS SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES AHMADU BELLO UNIVERSITY, ZARIA, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR AWARD OF THE DEGREE OF DOCTOR OF PHILOSOPHY IN AGRICULTURAL ECONOMICS

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SEPTEMBER, 2021

DECLARATION

I hereby declare that this thesis titled "**Analysis of Household Demand for Local Dairy Products in Jigawa and Kaduna States, Nigeria"** has been written by me and it is the record of my research work, except where references are made to published literatures and duly acknowledged. This work has not been presented before in any previous application for a degree or diploma at any institution.

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CERTIFICATION

This thesis titled **"Analysis of Household Demand for Local Dairy Products in Jigawa and Kaduna States, Nigeria"** by Ayoola Olugbenga OLADELE meets the regulations governing the award of the degree of Doctor of Philosophy in Agricultural Economics of Ahmadu Bello University, Zaria and is approved for its contribution to scientific knowledge and literary presentation.

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DEDICATION

This work is dedicated to THE ALMIGHTY GOD, the only wise God. To Him belong all the glory, honour and adorations. I am forever grateful for all HE is doing in my life. Halleluai.

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ABSTRACT

The population of Nigeria is increasing at an alarming rate in the cities as well as in the rural areas. Per capita income is expected to increase with the new minimum wage in the country. Hence, meeting the food demand of Nigerians is of profound implications in addressing food insecurity and malnutrition in the country. The study analyzed the household demand for local dairy products in Jigawa and Kaduna States of Nigeria. A multi-staged random sampling technique was used in selecting respondents for the study. Structured questionnaires were used to collect data from 480 households in the two states. Data were analyzed using descriptive statistics and inferential statistics including chi-square analysis, multinomial regression analysis and Linear Approximate Almost Ideal Demand System (LA-AIDS) model. The result show that majority (58%) of household heads were about 40 years old and majority were male (73%). An average household head purchased Kindirimo (₦918.00 per month) followed by Nono (₦ 861.00 per month) in the rural areas. In the urban areas, ₦ 1200.00 and ₦ 907.00 were the monthly expenditure of households on Kindirimo and Nono respectively. The multinomial regression analysis revealed that among other factors, region of residence of the household is a factor influencing the probability of consuming one local dairy products or the other. Households residing in the urban areas have higher probability of consuming Kindirimo (0.739), followed by fresh milk (0.632) and then yoghurt (0.616) than those living in rural areas (P < 0.05). However, the households in the urban areas are less likely to consume Nono (-0.918) than those in rural area. They were indifferent towards cheese (0.177) consumption (P < 0.05). The AIDS model expenditure elasticity analysis showed fresh milk (1.11), Kindirimo (1.09), butter (1.09) and yoghurt (1.08) were positive and greater than unity. As such, these products were viewed by the households as normal goods and luxury products. This implies that increase in income of the

households could lead to more consumption of these products. However, Nono (0.84) and cheese (0.42) were considered as normal goods and necessity products with expenditure elasticity that is positive but less than unity. This implies that an increase in household income would lead to less than a proportionate increase in consumption of these products. Also, the own price elasticities for Nono (-0.76) and Cheese (-0.057) were inelastic, implying that a 1% increase in the prices of each of these products will lead to less than 1% decrease in consumption of such products. Conversely, the own prices for fresh milk (-1.151), yoghurt (-1.103), kindirimo (-1.097) and butter (-1.095) were found to be elastic implying that, the percentage increase in quantity demanded is greater than the percentage fall in price and thus their total income increases in this scenario is the main stimulant for such product consumption. The result of cross-price elasticity show that consumption of fresh milk showed highest substitutability response with the price of powdered milk (0.512). The second most substitute response of the consumption of fresh milk is with the price of evaporated milk is 0.306. However, fresh milk showed complimentary response with the price of cereal drink (-0.518) and with the price of sugar and syrup (0.322). The main constraints influencing local dairy products consumption include poor storability and unhygienic product nature for kindirimo consumption, product adulteration for nono consumption, poor product processing for yoghurt consumption, implication of health talk, and unavailability of product for butter consumption. The study recommended that adequate training workshop and health talks be given to all actors in the local dairy products value chains; on milk quality control, better milk hygiene and use of improved milk handling and processing technologies. Regulatory and health official should enforce standards in milk processing, packaging and distribution. More cold storage facilities and local dairy collection centres

should be established across the study area by government and private milk processing companies in other to increase availability of quality products for the households.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

Nigeria is such a dynamic and rapidly changing country that is growing, with increasingly affluent and urbanized population, who will demand more of high quality and healthy animal source foods in the coming decades. The drivers of the demand for dairy products are anticipated to increasingly change in the coming decades in Nigeria. One such driver is the population growth which is projected to increase by nearly 230 million and reach 398 million people by 2050 (United Nation -UN, 2017). Another driver will be urbanization. Studies have revealed that from about 45.2 percent of the Nigerian population that lived in urban areas in 2012, projections indicate that, by 2050, 69.9 percent of the population will live in urban areas (UN, 2018). Also, increases in average income of heads of households as revealed by Growth Domestic Product (GDP) per capita, a proxy of consumer purchasing power, is estimated to increase from about United States Dollars (USD) 2,751 per capita per year to almost USD 7,132, representing a more than two-fold increase between 2012 and 2050 according to shared socio-economic pathways (SSP, 2016).

Undoubtedly, population growth, urbanization and gains in real per capita income in Nigeria will have profound implications on the overall food security and nutrition of her people. Akinyosoye (2014) reported that in the face of growing population, increase in the number of educated Nigerians receiving increase in average personal income and living a way of life influenced by western culture, dairy products demand in the country will continue to surge.Nigeria is a lower-middle income country with a population of 190 million and a GDP per capita of USD 1 968. In 2017, 49.5 percent of Nigeria’s population lived in urban areas,

growing substantially from 17.3 percent in 1968. The size of the middle class was estimated at around 20 percent of the population in 2013 (Corral et al., 2019).

Although, the dairy consumption level in the country is still low; and Nigerians only consume on the average under 2kg of dairy products in a year while Consumption levels of milk and meat are lower than the continental averages that are 44 litres and 19 kg respectively (Food and agricultural organization statistics - FAOSTAT, 2019). Such assertion portends for Nigeria the possibility of increase in local consumption demand for dairy products if there are adequate promotions and incentives to consume the products(Food and agricultural organization - FAO, 2019). In addition, over 140 million Nigerians were observed to be grossly under provided for with essential food components like proteins that are important for the realization and development of human potentials, both mentally and physically; but instead, Nigerians were viewed to consume more plant proteins, which are noted to be of lower nutritional quality compared to animal protein (Osotimehin, Tijani and Olukomogbon, 2006). This present state of the nation's nutrition is not comfortable for any serious country. It is needful to stir up and harness the nation's potentials for local dairy products development, utilization and for the provision of much-needed better nutrition for the average Nigerian. According to Yahuza (2001)**,** these nutritional improvement actions especially for women, children, and other vulnerable groups cannot be overstated. A forward – looking approach is necessary when considering the nutrition of the populace.

A robust analysis of local dairy products consumption among the households is in part necessary to support the demand side of policies of a sustainable growth of the livestock sub-sector, and the economy as a whole.However, the dairy development projects of the livestock sub-sector have been decried as a priority area needing considerable attention (Nigerian

institute of animal science - NIAS, 2010). It implied that massive technology driven and global best-practice production and investment in livestock sub-sector are urgently needed, especially in the development of the local dairy products production and marketing in Nigeria. Such development will safeguard the country from the unnecessary capital flight of her foreign exchange earnings on dairy products imports, and consequently increase national local dairy demand and supply.

The dairy industry in Nigeria, despite its unorganized nature is still believed as one that represent an important component of the agricultural sector with great economic, nutrition and social implications. Akinyosoye (2014) reported that most of the traditional milk products in northern Nigeria are processed from fresh milk mainly by wives of indigenous pastoralists. Also, that the local milk products are commonly produced from indigenous cattle breeds which are kept by about 6 million pastoralist most of whom are Fulanis. The average milk production per cow is just about 0.74 litres per day, ranging from 1.27 litres during wet season to 0.36 litres during the dry season, resulting in an estimated local milk production of roughly 450,000 tons per annum (Annatte, Fatima, Wambai, Ruma, Gideon, Lawal Lawrence, Aligana, Shofela, Mark, and Kasim; 2012); similar study on local dairy production among small-scale agro-pastoralists in Niger state of Nigeria by (International fertilizer development corporation - IFDC, 2012) showed slight improvement in the average dairy output per cow per day. The average milk productivity of indigenous milk per day at herd level and during a wet season is higher, about 2 liters than in dry season among the pastoral farmer. This means various selling prices of the commodity in both seasons; and consequential differences in demand for the products among Nigerians, all things being equal.

However, part of the overall efforts of the Nigerian government in local dairy products development is in improving the performance of the livestock sub-sector. Public private partnerships were set up that culminated into the establishment of some dairy farms with local and imported breeds of cattle across the country. The dairy cooperative federation were formed and especially in the rural areas; and the aim was to increase the efficiency of rural dairy marketing system in the country (Annatte *et al.,* 2012). Milk collection centers were established to interface in partnerships between these farms and the dairy federation. Such initiatives are meant to create awareness on local dairy products development in Nigeria. Consequent and examples of the direct results of such awareness has been the establishment of milk processing plants by both private and public sectors, as a means of increasing domestic production (Annatte*et. al.,*2012)**.** Notable examples are MILCOPAL (The Kaduna Federation of Milk Cooperative Associations Limited) dairy company in Kaduna state, Shonga farms in Kwara state, Maizube farms in Niger state, to mention but a few. Most of these organized local dairy farms produce yoghurts, fresh milk, and butter, which enjoy great patronage among most Nigerians in various regions.

Again, the Federal Government of Nigeria (FGN) ban on imported dairies, created a milestone of opportunities for local dairy producers to fill in the large supply–demand gap (Central bank of Nigeria – CBN, 2010)**.** Now opportunities abound for would be investors in dairy products enterprises for production, processing and marketing. The traditional dairy women marketers in particular have not been left out yet in the evolution of the new and expanded market for local dairy products; they have been involved in the local dairy products processing and sale of fresh milk (Madara), sour skimmed milk (*Nono*), sour creamed milk (*Kindirimo*), local butter (*Mai-shanu*), and local cheese (*Awara*). However, they often hawk these products around the local areas and make sales at specific locations and other special

markets, such as livestock markets in some towns (Global agriculture information network - GAIN, 2012). Also, most of the nomadic farming families are seen often pitching tents especially in the rural and peri-urban areas of the city metropolis basically to make sales of their local dairy products.

Therefore, due to increasing population, urbanization and changing tastes; consumption demand and utilization of dairy products is changing in Nigeria (Akinyosoye 2014)**.** This means that Nigerians in rural, peri-urban and urban areas are consuming dairy products in special ways. This study thus analyzed the economics of households' demand for local dairy products in Jigawa and Kaduna states of Nigeria.

1.2 Problem Statement

The importance of local dairy products consumption in Jigawa and Kaduna States of Nigeria cannot be overstated. However, only a handful of consumption studies on these products are carried out here, including Jabbar and Domenico (1990), Jansen (1992) and with the most recent being Akinyosoye (2006). As such, dearth of data on the household demand and consumption pattern of local dairy products among consumers in the study area exist. This is particularly important especially considering Kaduna State being the political capital of the northern states of Nigeria. Also as equally important is Jigawa State which has being an agrarian state with large expanse of lush savanna vegetation that support rearing of livestock including cattle, where greater volume of local dairy production and local dairy products consumptions coincides (Jigawa agricultural and rural development authority - JARDA, 2012).

Furthermore, evidences are there in literature concerning the dynamics of household food consumption patterns. Often, such analysis left serious gaps in the knowledge and understanding of which foods are consumed by which consumer groups, in which form, where and why. Also, Consumer demand for value-added dairy products such as butter, cheese, evaporated milk, yoghurt, and other milk beverages driven by their importation into the country is rising rapidly on the back of growing population, increasing urbanization, increasing per capital income and westernization of the populace (Akinyosoye 2014). These have implications on consumption of local dairy products. Local dairy products consumption preference structures among households in Jigawa and Kaduna States are diverse, especially as the consumer groups were having different cultural backgrounds, socio-economic status and lifestyles. Therefore, the documentation of such consumer behaviors and socio-economic factors which have effect on the way households acquire and consume local dairy products is necessary.

Again, the dairy products consumption demand in rural and urban areas by households' populations in these states, deserves more attention than have been given so far. These are important, and have implications for food and agricultural planning, and in bringing about better measure to motivate households propensity to consume local dairy products sufficiently and healthily.

Also, well packaged local dairy products from indigenous modern plants like MILCOPAL, National animal production research institute – NAPRI, *NAGARI*, West African milk company of Nigeria - WAMCO, *MAIZUBE* were expected to be popular in local markets for households consumptions, but this was not so. Instead, products from these plants were sold only in the niche markets confined to superstore and super markets in urban cities. Majority

of the consumers at the base of the pyramid of society, also prefer what the traditional local dairy producers and marketers brings to the market. They were reluctant to buy the modern dairy plants products for being expensive and out of reach of the majority of low income earners.

Furthermore, because most of the local modern dairy plants outsource for additional supplementary supplies from indigenous local dairy producers, who were being organized into cooperatives in other to supply raw milk at designated milk collection centres. In turn, these modern plants re-process the supplied raw milks into differentiated products such as, sweetened or flavored yoghurts, fresh milk, butter, and ice creams. These products were then repackaged using value added containers and then sold at the niche markets. Such products were sold in dairy shops, restaurants, hotels, super-markets and markets, far from the reach of the majority of the consumers at the base of the pyramid of the society. These groups who occupies the low income strata perceived the local dairy products from modern plants as expensive and unaffordable (Land O' lake 2007). However, in the view of the higher income households, such products are viewed as normal commodities and affordable.

Also, most of the local dairy products offered for sale by the vast majority of local producers were unpackaged. These products included fresh milk, un-skimmed fermented dairy (*Kindirimo*), skimmed fermented dairy (*nono*), fermented and biological inoculants or artificial inoculants based dairy (yoghurt), scarified dairy fat (butter), and local wet/fried cheese/whey. Majority of the local dairy producers and marketers are unorganized and unlicensed to sell; yet, they are seen often hawking their products on the streets and corner shops in rural, peri-urban and urban areas and were not regulated. These sellers carry their products in plastic poly-bags, calabashes and gourds, and in plastic jerry cans over a longer distance to make sales. As such, their products lack guaranteed freshness. Some sellers even

adulterate it by adding additives such as processed powder of baobab fruits. Such additives are believed to contain lots of vitamin A and some pleasant tastes it adds to the local dairy products. Again, such additive do improve the texture and viscosity of the dairy products especially in occasion where suppliers of the dairy products found it needful to dilute the dairy product with more water in order to increase the volume of output for increased profit. Therefore, there exist standardization problem and disparity in valuation of local dairy products in consumers eyes for milk from indigenous and organized modern dairy plants (packed milk) compared with those dairy products (unpacked milk) supplied by the base of the pyramid of local dairy producers, who are the majority supplying local dairy products to households in the study area. Consequently, there exist variation in prices of local dairy products relative to their quality in the market place and thus, the analysis of household consumption demand for local dairy products is necessary and to show the contextual perspectives of the consuming households.

The health implication of nutrition and eating healthily are often some of the basis of consuming local dairy products by some consumers. Besides food prices, there are other variables of concerns among the demographic populations consuming local dairy products that need to be brought to light. For instance, this study firstly looked at actual expenditure among income strata in rural and urban areas of the study area; and set income elasticities as vital in determining income elasticities of the respondents. It became useful and needful to determine the factors especially, social and demographic influencing local dairy product consumption as well, in other to determine the better policy to meet this gap in the study area. Also, from the *a priori* knowledge, it is expected that some constraints might be the root causes militating against local dairy product consumption among households, but these might

be unusually different from the *a priori* expectation which this research study devotes itself to elicit.

Lastly,the early empirical studies of demand were characterized by the extensive use of single equation methods of measuring elasticities because they thought it as simple, easy to understand, convenient and dimensionless. However, the partial measures commonly employed using single-equation are not correct for obtaining elasticities among endogenous variables in a system framework because indirect effects are not accounted for by standard partial measures. This partial measure applies to elasticities with respect to exogenous variables but does not apply to structural elasticities. This study, therefore, examined the impact of price, expenditure and income on local dairy products demand in the study area. The study updates the earlier demand studies in Nigeria and beyond, as it presents estimates of price, expenditure and income elasticities for 16 different disaggregated local dairy products using cross-sectional household data over a considerable time.

Therefore, despite the significant progress in economic theory and estimation methods by researchers on household demand analysis, the system analysis of disaggregated local dairy products demand is needful but has received very limited attention owing to its condition of it to be use. It is important to determine the consumer demand elasticities for such disaggregated local dairy products using modern estimation approach such as Almost Ideal Demand System model (AIDS) used in this project. Again, in order to capture the marginal effect in demographic and socio-economic factors influencing households' consumption patterns; appropriate tools of analysis like Multinomial logistic model was employed. Household's consumption decisions on more than two categorical variables were explained

by a set of independent socio-economic and demographic variables, and Chi-square analysis was extensively used to test some stated hypotheses.

The following research questions are put forward in the study as follows:

i. What are the socio-economic characteristics of households consuming local dairy products in the study area?
ii. What are the households' consumption preference structures for local dairy products?
iii. What are the levels of household expenditures on local dairy products?
iv. What factors are influencing the household consumption of selected local dairy products?
v. What are the estimates of own-price, cross-price and expenditure elasticity of demand for local dairy products?
vi. What are the constraints to households' consumption of local dairy products?

1.3 Objectives of the Study

The broad objective of the study was to analyze the household's consumption demand for local dairy products in Jigawa and Kaduna States of Nigeria.

The specific objectives of the study were to:

i. describe the socio-economic characteristics of households consuming local dairy products in the study area.
ii. profile the households consumption preference structure for local dairy products.
iii. assess the level of expenditure on the household consumption of local dairy products.
iv. determine the factors that influence household demand for local dairy products.
v. estimate expenditure, own-price and cross-price elasticities of demand for local dairy products.

vi. describe the constraints to households' local dairy products consumption.

1.4 Justification of the Study

The rapid increase in population of the world has resulted in a huge increase in the demand for animal protein. The average animal protein intake in Nigeria which is about 19.38 g/caput/day is low and far below FAO requirement of 65 g/caput/day (FAOSTAT, 2016). Quality nutrition is particularly crucial in the developing countries like Nigeria where malnutrition and starvation are the major problems faced by millions households especially those in rural areas (Oni and Fashogbon, 2012); and where a large proportion of poor households still have inadequate access to sufficient food (Abdulai and Aubert, 2004).

Therefore, inadequate consumption of micro-nutrients which could contributes significantly to the burden of disease such as Iron deficiency which is associated with malaria, intestinal parasitic and chronic infections can be averted where there is adequate consumption of local dairy products. Again, in situations where iodine deficiency is chronic among individuals causing goiter in adults and affecting children's mental health, such can be checked when adequate dairy products are being consumed in the households. Moreover, where Vitamin A deficiency significantly increases the risk of severe illness and causes death from common childhood infections, particularly diarrhea diseases and measles; these can be prevented if most households have sufficient milk to consume. Furthermore, in areas where vitamin A deficiency exists, children are on average 50 percent more likely to suffer from acute measles and undernourishment has been described to have multiple negative consequences which sufficient consumption of local dairy by households can solve. Pinstrup-Andersen (2006) noted that nutritional problems result in low labor productivity, reduced economic growth, poverty, and large demands for public health funds. In same vein, Khaliukova, 2013 referred

to studies from Sierra Leone in which Strauss (1986) concluded that increased nutrient intake indeed raises farm labor productivity.

Therefore, like Omoyele (2011) reported that milk and milk products provide 15 essential nutrients for normal growth and for the maintenance of good health. The micronutrient help make up for the nutrients that many citizens miss in their diets that are composed largely of carbohydrates, and that increased milk consumption would be necessary as Nigeria strives to attain the Sustainable Development Goal. Although the danger of malnutrition and lack of balanced diets in foods were stressed together with the importance of dairy products in diet, few records and studies exist on the analysis of households demand for local dairy products in the study area, which makes this study timely.

Again, it was earlier expressed that estimates of food demand analysis are essentials for planned investments and future prosperity of business ventures in a country (Sadoulet and de Janvry, 1995). Thus, the livestock and dairy sub-sector of the Nigerian agriculture is a crucial sector of the economy and important in the calculation of the nation's GDP (Nigerian broadcasting corporation - NBC, 2012). This makes this study necessary in providing relevant estimates of demand for local dairy products which can be used as a part in the overall GDP computation for Jigawa and Kaduna states. Also, the estimated elasticities of demand will help in measuring the impacts of agricultural policies and predict future dairy consumption in the context of food security in terms of access, availability, stability, and food quality.

Nigeria is undoubtedly described as having great potentials for growing her local dairy sector (United nation development project - UNDP, 2011). The upsurge of potential and new investors now willing to process local dairy products for the local and international emerging markets is a key supply side factor.

This project set to provide applicable base-line information, relevant literature reviews, recommendations, policy insights and estimates on the local dairy products household demands, socio-demography and consumption patterns; for interested researchers, institutions, investors, marketers and value-chain actors is highly needful. In addition, a proper estimation of the elasticities and projected direction of change in consumption pattern is also an important instrument that guides the future policy decisions. Thus, the techniques used in estimating these elasticities have to be based on a functional form that is based on realistic assumptions such as provided in this work. Again, accurate income and price elasticity estimates are necessary for policy formulations, setting priorities, and engendering investments in the livestock sector in the study area and the country as a whole which this study provides.

Nevertheless, the priority for future research in food demand has been to generate sufficiently detailed demand estimates that have a high utility for disaggregated policy analysis, that which are based on a theoretically consistent and comparable methodology as showcased in this research. Again, it is evident today that paradigm shift exist in policy-makers need of disaggregated commodity-specific demand estimates differentiated by socio-economic groups to assess the likely impact of policy changes on food consumption and welfare outcome. Such information is particularly crucial for countries undergoing major reforms such as macroeconomic stabilization and structural adjustment policies as in the case of

Nigeria This research paved such pathway. These policies are likely to induce adjustments in household budgets and consumption patterns which have implications on nutritional well-being of the households in particular. The focus of this study was to understand factors underlying the consumption of disaggregated local dairy products in the study area, and the spatial significance of these factors as a basis to inform policy makers about the prospect to increase the portion of local dairy products in Nigerians' regular diets and to improve health and earnings of the overall local dairy value chain actors. Therefore the findings from this research should update policy makers and researchers on such current knowledge on demand and consumption patterns of disaggregated food demand parameters in Nigeria.

1.5 Hypotheses

The following hypotheses were put forward to achieve some of the stated objectives;

H_{o1}: The income classes of households consuming local dairy products in rural and urban areas are not significantly different.

H_{o2}: The own prices effects on local dairy products consumptions by household heads are not significantly different.

H_{o3}: The cross prices effects on local dairy products consumptions by household heads are not significantly different.

H_{a4}: The constraints affecting households consuming local dairy products in rural and urban regions are not significantly different.

1.6 Scope of the Study

This researched focused on the household demand for local dairy products in Jigawa and Kaduna of Nigeria. The local dairy products hereby referred to as food items are produced and processed from milk of mammals mainly cows, raised locally by households, pastoralists or entrepreneurs. These products are energy-dense, of high quality protein and with micro-

nutrients in an easily absorbable form. It benefits both nutritionally vulnerable and healthy people alike when consumed healthily and in appropriate amounts. Fresh milk (madara), fermented un-skimmed milk (*kindirimo*), fermented skimmed milk (*nono*), yoghurt (natural or artificially inoculants cultured milk), butter (*Mai-shanu*), and cheese (*Awara*) are the main local dairy products considered in this study. These products are predominantly marketed by traditional women and by few retail shop owners who are mostly directly involved in collection, processing and sale. Most of the milk produced are sometimes partly consumed at home and what remains are carried in calabashes, gourds or plastic containers for direct sales to local consumers at sale points such as rural markets, roadsides settlements and peri-urban areas. Door to door sales of these local dairy products to households are often carried out in peri urban and urban areas; and sometimes sales at construction sites, street corners, restaurants places of worships, institutions and at some retail shops are evident.

However, in the overall model, inclusions were made of associated products commonly consumed as complements or as substitutes with these main local dairy products: these were reconstituted dairy products such as evaporated milk, powdered milk, flavored milk, ice cream and instant formula (baby) milk; cereal drinks, soya cheese, soya drinks, sugar and syrups are considered. Nonetheless, all other drinks at home were considered as well (alcohols, carbonated drinks, tea or coffee, loaves and bread, fruit and vegetable drinks) as an aggregate of all residual drink types; each of which are most of less than 1% consumption share influence relative to the main local dairy product in the budget share. Thus, aggregating them into a single class had little effect in this study. Lastly and importantly too is that these main local dairy products are representative of the local dairy product types commonly consumed among households in the north-western states of Nigeria.

1.7 Limitation of the Study

Owing to the effects of levies, subsidies and government interventions to help the local dairy producers at the supply side is likely to harm consumers as they face higher prices. A detailed knowledge of demand price elasticities capturing these conditions is not available and an arduous task.

The chi square test of hypothesis of preference structures for local dairy products consumption stated reasons and consumption home away and constraints to consumptions of local dairies by household heads was subjective in that respondents data used were based on those who consumed local dairy products on aggregate basis and not responses on specific local dairy product. Therefore further study can disaggregate responses based on individual local dairy products is important in order to well capture specific effect of reason for consumption per specific local dairy products. This notation is also applicable to analysis of demand of local dairy as influenced by specific locations away from home. Also, regional implications of these analysis is vital and thus consideration of urban and rural respondents data is needful for future projects completeness.

This study estimated own prices for local dairy products; it estimated price effects substitution from one local dairy products and associated products with the other; and the price responsiveness among household heads considering the pooled data of the whole study area. Further study can be carried out to estimate the own prices, cross prices and expenditure elasticities of local dairy product demand among household living in rural area. Again, this can be done for households living in urban areas. Such resulting estimates across the regions can also be compared.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Conceptual Framework

2.1.1 Dairy products consumption and nutrition.

Milk is a complex mixture of proteins, carbohydrates, vitamins, minerals and other constituents dispersed in water (Harding, 1999). It is one of the oldest foods known to man (Nickerson, 1999). On the basis of the protein content of milk, it is generally regarded as "nature's most nearly perfect food" owing to its rich protein profile containing more essential amino acids than any other natural food (Dairy Council, 2013). In addition, milk is an important source of mineral substances, especially calcium, phosphorus, sodium, potassium, chloride, iodine, magnesium, and small amounts of iron. Of these mineral constituents, calcium and phosphorus constitute a larger fraction in milk which is needed for bone growth and the proper development of newborns (Al-Wabel, 2008)**.**

In humans, breast milk provides all the energy and nearly all nutrients required for infant growth and development during the first 4 to 6 months of life, as well as various immunological factors and bioactive components (Titi, *et al.,* 2014). However, in the absence of breast-feeding, cow milk is commonly used as a weaning substitute for infants (El-Agamy, 2007) often processed into various dairy formulas. Due to its high nutritive value, cow milk is widely consumed by infants and adults alike to meet their basic nutritional needs.However, Milk simply refers to dairy products. It contains many nutrients and provide a quick and easy way of supplying nutrients in diet, within relatively few calories which our human bodies need (Dairy Council, 2013). Fluid milk, cheese and yogurt are types of dairy products that provides human with beneficial nutrients in varying quantities; Calcium - for healthy bones

and teeth, Phosphorous - for energy release, Magnesium - for muscle function, Protein - for growth and repair, Vitamin B12 - for production of healthy cells, Vitamin A - for good eyesight and immune function, Zinc - for immune function, Riboflavin - for healthy skin, Folate - for production of healthy cells, Vitamin C - for formation of healthy connective tissues, Iodine - for regulation of the body's rate of metabolism. It was stressed by Cash *et al.*, (2005) that one glass of milk alone can make a contribution to the daily recommended intake of many important nutrients for all age groups.

Cow milk is the most universal raw material for processing dairy products resulting in the broadest spectrum of manufactured dairy products. At present, the number of animals bred for dairy purposes abound which include Cattle, Goat, Sheep, Horse, Donkey and Camel (Barłowska, Szwajkowska, Litwi´nczuk and Krol, 2011). In Nigeria, cattle (cow) provide more than 90% of the total animal milk output while goats and sheep provides less than 10% and are kept for production of meat, hides and skin (Walshe, Grinddle, Neji and Benchman, 1999). The white Fulani popularly called 'Bunaji' is the most numerous and wide spread of all the Nigerian cattle breeds accounting for about 37% of the national cattle population (Oni *et al.*,2001). Subsequently, the Friesian breed was introduced in Nigeria and has been used to produce a stabilized crossbred Friesian plus white Fulani cows whose dairy performance has been adjudged to be higher than the pure white Fulani cows (Alphonsus, Essien, Akpa and Barje, 2011).

The role of milk as a source of macronutrients for human nutrition and health cannot be over emphasized. Milk is a major source of dietary energy, protein and fat, contributing on average 134 kcal of energy/capita per day, 8 g of protein /capita per day and 7.3 g of fat /capita per day in 2009/11 (FAOSTAT, 2012). It was further stressed that the consumption of

milk and dairy products has been associated with numerous health benefits. In bone health,dairy products provide calcium, which is essential for healthy bone growth and development. Dairy products contains calcium and other tooth friendly nutrients, which help tooth grow and keep them healthy. Further,contrary to popular belief that associated obesity with milk consumption, research has shown that people who consume milk and dairy foods are likely to be slimmer than those who do not. Local dairies consumptions helps to reduce blood pressure, and the potassium, magnesium and calcium found in dairy products are all linked to healthy blood pressure.

Consumption of milk and dairy has also been associated with a reduced risk of suffering a heart attack due to cardio vascular diseases. Consumption of low fat dairy products has been linked to a reduced risk of developing type-2 diabetes, and that each extra portion of low fat dairy consumed each day is associated with increasingly lower risk. Regular fluid (dairy products) in- take throughout the day is essential to be well hydrated, dietetic experts recommend drinking 6-8 glasses of fluid per day, therefore, as milk contains a high percentage of water, it is a useful vehicle for rehydration. Eating habits**;** for people who consume milk and dairy products have better intake of nutrients than people who do not, therefore, introducing dairy products at an early age helps establish good eating habits for later in life.

Yoghurt has gained widespread consumer acceptance as a healthy food (Mckinley, 2005). Therefore, yogurt is nutritionally rich in protein, calcium, vitamin D, riboflavin, vitamin B6 and vitamin B12. It has nutritional benefits beyond those of milk. Gezginc and Akbay (2015) said yogurt is "probiotics" which literally refers to living organisms that can result in a health benefit when eaten in adequate amounts (Cheng, 2010). Numerous health benefits beyond its

nutritional value have been associated with consuming yogurt. Scientists have found that the intake of yogurt with active cultures may aid digestion, ease diarrhea, boost immunity, fight infection and protect against cancer, (Chandra, 2002); (Adam, Rubio-Texeira and Polaina, 2004); and (Adolfsson, Meydani and Russell; 2004). These specific health benefits depend on the strain and viability of the culture in yogurt (Meydani and Ha, 2000).

In addition, yogurt has more amount of calcium, which helps the body to improve the, strength of muscles and bones. Calcium is needed throughout life but are normally insufficient imost diets but milk. However, across the board, the consumption ofcalcium-rich dairy products tends to decrease as people age increases (Isolauri, Kirjavainen and Salminen, 2002). They recommended daily milk or yogurt consumption of about 200-400 ml for adults and 600-800 ml for children and pregnant women. Besides the obvious nutritional benefits, consumption of yogurt also shows promising health benefits for certain gastrointestinal conditions, such as lactose intolerance and diarrheal diseases. Thus, Gezginc and Akbay, (2015) agreed with the fact that the popularity of yogurt has increased due to its perceived health benefits. Also the health promoting attributes of consuming yogurt containing live and active cultures are well-documented (Meydani and Ha, 2000).

2.1.2 Global dairy products demand and development

Milk, meat, and eggs currently provide around 13% of the energy and 28% of the protein consumed globally; in developed countries, this rises to 20 and 48% for energy and protein, respectively (FAO, 2019). In the majority of developed countries, per capita consumption of dairy products is generally high and therefore, food availability and affordability concerns have largely been superseded by consumers' concerns about food quality and other food attributes. The per capita consumption of dairy products in less developed countries is generally lower. However, increasing demand is currently being fuelled by high population

and income growth, also the impact of urbanization and the development of fast food, changes in lifestyles, expansion of cold storage facilities and improved product shelf life.

In Europe, about 5% of the overall population is at risk of malnutrition, and among vulnerable groups—the poor, the elderly, and the sick—this percentage is even higher (Reisch, Eberle, and Lorek, 2013). In the NMS malnutrition and general poverty is the highest; for instance, in 2011, poverty rate ranged between 20% in Slovakia and 40% in Romania as poverty rates considerably differ between urban and rural areas and across income groups. Food preferences and consumer attitudes are progressively gaining in importance asinsignificant determinant of demand for milk and dairy products, particularly in high income countries as consumers become more affluent and more educated.

Health and nutritional issues have become important factors in determining the overall demand as well as the compositional of demand for milk and dairy products. Demand is progressively becoming orientated towards more natural products; with a reduction in the demand for products which are perceived to be 'unhealthy' (e.g. fats). In the UK, for example, health consciousness increases with income and age and women tend to be more health conscious than men (Mintel, 2003). Also, food safety has emerged as an important global issue with international trade and public health implications. In recent years, food safety incidents have seriously affected consumer attitudes towards food, which in turn has led to significant changes in food consumption and purchasing patterns. For example, following the European Union BSE (Bovine Swine Enteritis) outbreak in 2000, consumption of cheese as a protein substitute to beef and veal increased in many Member States.

Again, quality (including factors such as taste, freshness, branding and packaging) is an important factor driving purchasing decisions for milk and dairy products, particularly as

consumers become more affluent and educated. This drive towards quality products has tended to result in a shift in demand from commodity type products to value added products.Marian, Anrej, and Jan (2014), in a household demand consumption pattern study of Slovakiafound that food security situation has improved in that country since Slovakia's EU accession; and that food commodities that are important for health are expenditure and own-price elastic. They suggested therefore that where majority of a population food demand is price and income in-elastic, implies that food is perceived as necessity rather than luxury. And that their average expenditure elasticity for food is greater than their own-price elasticity for food; implies that the government should support policy that generates more income better than policy to reduce price to such a population.

Consumers' perceptions of dairy product quality are complex and differ across countries (Francesconi, Heerink, and D'Haese (2010); and (Boniface and wendy, 2012). Also, Agza, Melesse, Funga and Melesse (2013), described some literatures on consumption perceptions of dairy in some countries. In Australia, consumers perceive whole milk to be of lower quality than other types of milk (Bus and Worsley, 2003). Hatirli, Ozkan and Aktas (2004), reported that in Turkey, households' choice of fluid milk sources is influenced by the number of children living in the household and education levels of the respondent. A similar study of Taiwanese consumers who purchased greater amounts of fluid milk had higher levels of household incomes than consumers who purchased mostly yoghurt drinks (Hsu and Lin, 2006). A study in U.S showed that low fat milk consumption is positively related to age, education level and income (Robb and Abdel-Ghany, 2007). The current assessment study of consumers indicated that price was the most important influencing factor to consume dairy products than quality and safety parameters.

2.1.3Demand for dairy products in African countries

Over the coming decades, population growth, urbanization, and income growth, especially in developing countries, have resulted in huge increases in demand for milk, meat, and eggs. Meeting that demand will place enormous pressure on the global food system. This has led some authorities to call for a global rebalancing: those who eat too little animal-source foodsshould eat more; those who eat too much should eat less (McMichael, Powles, Butler and Uauy, 2007). Agreeing on the "right" amount, as well as the practicalities and fine tuning of implementing such recommendations, is a significant challenge for the future (Westhoek *et al.*, 2011). While the idea may gain some traction among the "worried well" in the West as a healthy lifestyle choice, it is likely to be a hard sell in the developing world; as people emerge from absolute poverty, dietary diversification, including increased consumption of milk, meat, and eggs, tends to be one of the first manifestations of their increased spending power. Meeting the proposed target would require some big changes to be made; According to FAO data for 2009 on average, Africans would need to double their consumption while North Americans would need to reduce their consumption to almost a quarter of the 117.6 kg per year consumed in 2020 (see http:// faostat.fao.org/).

However, dairy demand in some African countries reported by Akaichi and Revoredo-Giha (2012) cited Mdoe and Wiggins (1996) in an estimated demand for dairy products inTanzania and found that among dairy products, the consumption of fresh and sour milk was the highest across the income groups. Also, that the average consumption of all dairy products was 142 kg/person/year in urban areas, relative to 45 kg/person/year in rural areas. Also, Ecker and Qaim (2011) posited that the price elasticities of demand for milk have been more inelastic in rural areas, (-0.19) compared to -0.32 in urban areas. The income elasticity of demand for milk was found to be greater than unity (1.14) in the rural areas, but lower than

nity (0.91) in the urban areas, indicating that milk was a necessity good in urban areas of Tanzania, whilst it was a luxury good in rural areas. It was also reported that fresh and sour milk were the main dairy products being consumed. The consumption of milk in rural areas more than 50% of the total consumption in the country. Also, Agbola (2003) estimated the linear version of the almost ideal demand system (AIDS) on food demand patterns in South Africa, using a dataset from the 1993 Integrated National Household Survey and found that the demand for grains, meat, dairy products and vegetables were price elastic (i.e. the own-price elasticities were -1.73, -1.27, -1.24 and -1.31 respectively). Furthermore, the income elasticities of meat (1.03) and grains (1.25) were greater than 1, implying that these foods were luxury products. Nonetheless, the income elasticities for dairy products (0.90), fruit (0.72) and vegetables (0.91) were lower than 1, implying that these food products were necessity products.

Moreover, Balagtas, Coulibaly, Eales and Diarra (2006), estimated an AIDS model to assess the demand for imported dairy products in Cote d'Ivoire and reported that the demand for imported powdered milk was inelastic (i.e. the own- price elasticity was equal to -0.54), whilst it was elastic for imported fluid milk, yogurt and ice cream (i.e. the own-price elasticities were equal to -1.39, -1.22 and -1.16 respectively). Also, they found that dairy products domestically produced from imported powdered milk could substitute the imported dairy products. These studies above showed discrepancies between African countries in terms of the effect of prices and income changes on the demand for dairy products.

2.1.4 Consumption patterns of local dairy products in Nigeria

The consumption pattern of a household is the combination of qualities, quantities, acts and tendencies characterizing a community or a human group's use of resources for survival, comfort and enjoyment (NBS, 2012). Of course the type of food and non-food items

consumed, vary from region to region. Consumption patterns normally contribute greatly to the social and economic policy of the country. In a developing country like Nigeria, the consumption pattern is skewed towards food i.e. food accounts for a higher proportion of the total expenditure, while in developed countries the opposite is the case.However, household's income and consumption are the most popular approaches in determining the living standards of people in a nation, state or region (NBS, 2012). Income refers to earnings from productive activities and current transfers; and measuring consumption over a week or month provides an indication of a household's consumption habits over a year because it has a smooth flow to it in order words it is steady.

The concept ofhousehold incomeconsists of all receipts whether monetary or in kind (goods and services) that are received by the household or by individual members of the household at annual or more frequent intervals, but excludes windfall gains and other such irregular and typically onetime receipts. Household income receipts are available for current consumption and do not reduce the net worth of the household through a reduction of its cash, the disposal of its other financial or non-financial assets or an increase in its liabilities.Household income may be defined to cover: (i) income from employment (both paid andself-employment); (ii) property income; (iii) income from the production of household services forown consumption; and (iv) current transfers received. Income however, tends to vary widely from week to week or month to month. It was stressed that Consumption data is much easier to collect than income data, particularly in agricultural communities or with self-employed persons. Consumption is therefore a better indicator of living standards. The consumption pattern of a country depicts the aggregate demand of goods and services in the country, and in most cases it constitutes about 60% of the total GDP of the country. Consumption pattern also depicts the level of welfare and poverty that a nation is experiencing. Marian, Anrej and

Jan (2014), stressed that managing food security requires not only understanding how policies influence the availability of food and income at national level but also how individual households can cope with income and price shocks.

Sidiqat *et al.* (2015), in a study on the "Influence and Consumption Pattern of Dairy Products on nutritional and health development of school-aged children in Ekiti local government area of Kwara State, Nigeria" revealed that respondents' preference for dairy consumption was more of milk alone and at other times combined with pap or beverages. Cheese, yoghurt and powdered milk were the most available dairy products. Also affordability was identified as the major constraint influencing the consumption of dairy products.Also, Consumers prefer packed milk because of its guarantee of quality, long shelf life, and packaging to carry and store. The desire to purchase a safe food product is also a reason to prefer packed fluid milk. In fact, not only education, age, income, and other demographic characteristics of consumers influence pasteurized and sterilized milk consumption choices but also factors such as increasing consumer awareness and concerns about health and food safety, and advertising play important roles (Akbay, Yildiz and Tiryaki, 2008).

Today, in developed countries, fluid milk consumption pattern has changed. Due to health, concerns, aging of the population, increased education and income level factors in developed countries, low-fat milk consumption has shown an increase but per-capita consumption of whole-fat milk has decreased (Jensen, 1995). In contrast, consumption of fluid milk in developing countries.In addition to income being a significant driver of dairy consumption, western culture is now being observed as influencing the consumption of dairy products in view of the substantial expenditures on ice-cream, butter, cheese and yogurt (Akinyosoye, 2014). And this trend may continue with increasing number of fast-food outlets opening in

most Nigerian urban centres. In Nigeria for instance, consumption patterns differ from one zone to another. NBS (2012) described that zonal variation exists at a close examination of a representative state within one zone when compared with another state within another zone.

Consumption prevalence was defined as the proportion of households consuming a specific dairy product; and this was determined by asking the respondents if they consumed various dairy products (Mohammed *et al*., (2014). In: Jabbar and Domenico 1990 (Ed.). Also, Mohammed *et al*., (2014) reported that there was high prevalence of dairy product consumption among the northern populace; supporting Jansen (1992) who reported 100 percent consumption prevalence for dairy products in northern Nigeria especially of the traditional types. Also, Akinyosoye (2014), reported that all the dairy products (fresh milk, powdered milk, tinned milk and others like ice cream, butter, cheese and yogurt) are consumed across Nigeria. Further, that an average household in northern Nigeria consistently out-spend their southern counterparts on the locally processed dairy products such as fresh milk, sour milk, with the reverse being the case for processed dairy products such as powdered milk, tinned milk, ice cream, butter, cheese and yoghurt.

Consumption preference studies can be classified into two; namely Revealed preference methods (RPM) and Stated preference methods (SPM). The former is being based on data obtained by direct observation or obtained in surveys asking for actual behavior, while the latter use individual respondents' statements about their preferences in a set of options to estimate utility functions (Mohammed *et al*., (2014); Kroes and Sheldon, (1988). Office of Management and Budget OMB (2003) observed that stated preference methods have been developed and used in the peer-reviewed literature to estimate both "use" and "non-use"

values of goods and services especially those that are not easy to study through revealed preference methods. However, OMB (2003) noted that the main weakness of stated preference methods is that people may not necessarily do what they say. Similarly, Kroes, Sheldon and Beswick, (1986) noted that estimates of absolute demand levels derived using stated preference methods do require careful interpretation, since it is known that people generally do tend to overstate their responses under experimental conditions.

Further, in a study on consumption preference in Sokoto State, Mohammed *et al*., (2014), obtained the stated consumption preference structures for each dairy products using the local method. They made a list of commonly consumed dairy products, and the respondents were asked to rank in descending order of their preference for the dairy products. They asked the respondents to indicate the one strongest basis of preferring a particular dairy product. Some of the consumption preference structure basis provided includes, convenience, habit, health benefits, reduced cost, taste, and thirst.

2.1.5 Socio-economic determinants of household food expenditure

Most studies on food expenditure use a demand system approach in the understanding of the major determinants of food expenditure. Food consumption is an important issue in Nigeria, given its relation to poverty and deprivation. With the pressing need to increase food security, understanding the determinants of demand for food has become a vital task.

Household income is important as it determines how much a household can spend on various needs of the household. The quantity and quality of a household's food consumption pattern are highly correlated with the purchasing power of the household. Income is an important means of widening the range of consumption options, especially as economies around the world become increasingly monetized. Income gives people the ability to buy diverse, nutritious foods instead of eating only their own crops, to pay for motorized transport instead

of walking, to pay for health care and education for their families, to pay for water from a tap instead of walking for many hours to collect it from a well (Mor and Sethia, 2012). They further expressed that the increasing dependence of much consumption on private income means that changes in income have a dominant influence on changes in consumption. When incomes rise steadily consumption rises for most of the population. But for the same reason, when incomes decline, consumption also falls sharply, with devastating consequences for human well-being.

Changes in consumer demand for food per se at the global level are largely income driven. Food in general is considered in economic terms as a 'normal' good, meaning that an increase in income brings about an increase in food expenditures. Studies indicate that with an expected large growth in population and income levels, developing countries are likely to account for the majority of future increases in global food demand (Andersen, Pandya-Lorch and Rosegrant (1999). Global food demand, especially in developing countries, is expected to increase with income, the total share of a household's budget spent on food generally falls as incomes rise, while the budget share spent on services rises (known as the Engel effect). Again, the proportion of a household's budget in low, middle and high- income countries, which was spent on dairy products have been quantified (Regmi, Deepak, Seale Jr., and Bernstein, 2001). This ranged from less than 1% of total household expenditure being spent on dairy products in low income countries to around 13-14% in middle and high-income countries. Although the proportion of a household's budget that was spent on food (including milk and dairy products) tends to decrease with income, an analysis of USDA (2004), data for aggregated dairy product elasticity in selected countries demonstrated that low-income countries exhibit a greater responsiveness (i.e. they have higher income elasticity) to changes in income levels, compared with higher income countries (i.e. they have lower income

elasticity). In other words, as income changes, poorer countries make larger changes in the consumption of food (including milk and dairy products) than wealthier countries; however, income elasticity's are defined as the percentage change in quantity demanded with respect to a one percent change in income.

Household head (in years) is selected as an explanatory variable in the study as both younger and older people are assumed to have differences in tastes and preferences for food, eating habits, lifestyles and opportunities to socialize.One of the main factors affecting demand over time has been the change in demographic structure brought about by an ageing of the population in most regions of the world (which has resulted from a fall in both birth and death rates), particularly in the higher income countries. As consumers of different ages differ in their demands for dairy products, any change in the age distribution of consumers will have large implications for overall demand and consumption patterns for individual dairy products. In the UK, for example, consumption of butter and fresh and ripened cheese is higher in older age groups whereas consumption of block cheese is higher in lower age groups (Mintel, 2003).

Household head are important to consider as an explanatory variables as the head plays a primary role in food purchasing and can influence the consumption patterns of a household. Research has found that gender, age, educational level and socio-economic status (Harper and Henson, 2001) of household head are important factors determining the purchasing decisions for such dairy products. For example, young, educated women of a higher socio-economic status tend to be more concerned about production ethics. Production ethics are receiving more attention from consumers when making their purchasing decisions, particularly in higher income countries. Concern about the environment and animal welfare has also grown

considerably, resulting in an increasing demand for milk and dairy products that are perceived by consumers to be more 'environmentally' and 'animal-friendly'. These include organic, welfare friendly and locally produced dairy products. Household size meant to account for the effects of household composition on expenditure. It was expected that household size would significantly impact food expenditure. Household headhasits effect on lifestyles and health-related behavior of the consumers. Individuals with different levels of education may have different knowledge and perception about diet and health, and consequently may have a different consumption basket.

2.1.6 Factors affecting dairy products demand

Krešić, Herceg, Lelas and Jambrak (2010); worked on consumer behavior and motives for selection of dairy beverages in Croatia and described consumers of today as being more informed and more demanding, so consequently the food producers who want to survive on the market, should take special care about the consumption and purchasing behavior of their consumers and their motives in food selection. Further, they referenced several authors who said that food selection is a complex phenomenon, depending on a lot of factors, which affect human behaviour in different ways, resulting in the selection of some, and rejection of other products (Wadolowska, Babicz-Zielinska, and Czarnocinska, 2008).

Factors that affect food choices may be divided into three main groups; product-related factors; which rely on chemical and physical properties, sensory attributes (taste, aroma, texture, visual appearance), functional factors (packaging, accessibility, convenience), nutrient content, consumer-related factors; including personality (age, gender, education level); psychological factors (personality, experience, mood); physiological effects (satiety, hunger, appetite); environmental-related; which include economic (price, incomes), cultural (beliefs); and social factors (fashion, society); (Sheppard, 1989). Underlying food choice is

important not just for the improvement and re-designing of food products that actually exist on the market but it is also valuable in the process of new product development Furst *et al.,* (1996).

Moreover, they cited literatures that opined that modern studies that has examined consumer behavior often measure the range of food selection motives using a food choice questionnaire Prescott *et al.,* (2002) and Sun, 2008; Sandell and Pohjanheimo (2009). Also that in a multi-dimensional scale constructed by Steptoe and Co-workers (1995), nine factors were identified which potentially influenced food choice. These include health, mood (positive or negative emotions), convenience (easiness to prepare or availability), sensory appeal (appearance, taste and smell), natural content (no additives), price, weight control (low in calorie and fat), familiarity and ethical concern (politically approved country of origin, environmentally friendly packaging). Again, the importance of market research and the role of the consumers in strategic planning within the dairy market sector are well recognized world-wide. And it was stressed that trends in this sector suggest shifting the focus of interest from consumer requirements (i.e. supermarket) toward consumer preferences and motives for selection (Fearne and Bates, (2003); Kapsdorferova and Nagyova, (2005).

Further, Agza *et al*., (2013) in their current assessment study of consumers indicated that price was the most important influencing factor to consume dairy products than quality and safety parameters. They expressed that though most consumers are not sure for the safety of the products, nearly half of the respondents were believed that raw milk (52%) and traditionally processed milk products, cheese (53%), butter (52%) and fermented milk (47%) available in local markets were of good quality. However, Consumers' perceptions of dairy product quality are complex and differ across countries (Francesconi *et al.,* 2010 and

Boniface and Wendy 2012). In Australia, consumers perceive whole milk to be of lower quality than other types of milk (Bus and Worsley, 2003). Hatirli *et al*., (2004) reported that in Turkey, households' choice of fluid milk sources is influenced by the number of children living in the household and education levels of the respondent. A similar study of Taiwanese consumers who purchased greater amounts of fluid milk had higherlevels of household incomes than consumers who purchased mostly yoghurt drinks (Hsu and Lin, 2006). Further, it was shown from a study in U.S. that low fat milk consumption is positively related to age, education level and income(Robb and Abdel-Ghany, 2007).

In another development, consumption of dairy products has been described as increasing on a global level as a result of both a growing population and increases in per capita consumption. It is generally observed that economic factors such as higher consumer income and declining retail prices for dairy products over recent decades, relative to other foods, have caused most of this increase in per capita consumption (Jacobson and Outlaw, 1995). Secondary factors other than population growth, income and price have also affected per capita consumption, particularly in higher income countries. These include demographic and socio-economic factors and food preferences and consumer attitudes. Consumers prefer packed milk because of its guarantee of quality, long shelf life, and packaging to carry and store. The desire to purchase a safe food product is also a reason to prefer packed fluid milk. In fact, not only education, age, income, and other demographic characteristics of consumers influence pasteurized and sterilized milk consumption choices but also factors such as increasing consumer awareness and concerns about health and food safety, and advertising play important roles (Akbay, Yildiz Tiryaki, 2008).

Today, in developed countries, fluid milk consumption pattern has changed. Due to health concerns, aging of the population, increased education and income level factors in developed countries, low-fat milk consumption has shown an increase but per-capita consumption of whole-fat milk has decreased (Jensen, 1995). In contrast, consumption of fluid milk in developing countriesThe price for dairy products, relative to other foods, is a significant factor determining demand (Jacobson and Outlaw, 1995).The impact of price on demand for dairy products can be demonstrated quantitatively using own- price elasticity and cross-price elasticity.

Own price elasticity represent the impact on sales volume as a result of a 1% change in price. Own price elasticity measures the degree of responsiveness of the budget share allocated to various food sub-groups as their respective prices change. An analysis of own-price elasticity produced (FAPRI, 2004) by product type (namely milk, butter, cheese, non-fat dry milk and whole milk powder) demonstrates varying responsiveness to changes in retail price levels. Further, based on the European Union level of standard, demand is expected to fall by a greater amount as a result of a 1% increase in the retail price for butter (-0.3%) and whole milk powder (-0.27%). Non-fat dry milk and cheese is less responsive with reductions of -0.24% and -0.18% as a result of a 1% increase in the retail price. In contrast, demand for liquid milk is relatively unresponsive to changes in retail prices, with the data indicating a –0.07 reduction in demand as a result of a 1% increase in retail prices.

The relative price of dairy products to other competing (i.e. substitute) or complementary products is an important factor affecting demand. For example, other drinks provide substitute for liquid milk, margarine provides a substitute for butter and meat provides protein substitute for cheese. Thus the relative price of substitute products greatly affects the

purchasing behavior of consumers. There are also a number of complementary food products, where a change in price will have a direct impact on the demand for certain dairy products. For example, bread and butter, breakfast cereals and milk, and pizzas and cheese are all complementary products. Frank (2008),described that two goods that complement each other show a negative cross elasticity of demand: as the price of good Y rises, the demand for good X falls. Two goods that are substitutes have a positive cross elasticity of demand: as the price of good Y rises, the demand for good X rises. Two goods that are independent have a zero cross elasticity of demand: as the price of good Y rises, the demand for good X stays constant.

Several researchers have made important contributions to the understanding of factors associated with consumer choice (Engel, 1895; Barton, 1955; Becker, 1976). Engel focused on the relationship between expenditure on food and income. According to Engel's Law, the household budget spent on food decreases as income increases. He suggested that a higher propensity of households experiencing increasing income spend a bigger proportion of the food budget on a diversified diet thus improving the nutritional status of the household members. In reality consumers taste differences between milk, as they use fat content as a proxy for milk quality, yet it is also known that tasting milk is not a dependable criterion for appraising other, more health related, aspects of milk. Moreover, more researchers (Bansback, 1995; Dickinson *et. al*.,2003) indicated that non-economic factors (i.e. non price/income factors) are becoming more important in determining consumers' purchasing decisions. Although, Andersen and Smed, (2012), for instance, found that Danish consumers who prefer high-fat milk are more responsive to price than nutrition information, whereas Cash *et al.*, (2005) studied health concerns and demand for dairy products in Canada and found that nutrition information has both positive and negative effect on dairy product choice.

Most studies looked at the effect of taste on consumption behaviour. Research awareness has been created describing consumers as deriving utility from consuming a product basically from quality attributes of the product such as safety, nutrition and taste (Unnevehr *et al.*, 2010; Lusk, Roosen and Shogren, (2011); Ortega, Wang, Wu and Olynk, (2011). Wayua, Shibia and Mamo, (2009) studied sensorial characteristics of fluid milk in northern Kenya and found that consumers are willing to pay more for improved quality, especially when they felt that this was guaranteed. Other work conversely suggests that nutrition information may have a negative effect on consumer taste perception, which further adds a challenge on the way nutrition information is framed and delivered (Berning, Chouinard and Mc Cluskey (2010).

The nature and patterns of food expenditure continue to reflect the socio-economic and demographic characteristics of households under consideration. Engel's (1895) work was predicated on the relationship between expenditure on food and income. And that the household budget spent on food decreases as income increases. Further, he suggested that a higher propensity of households experiencing increasing income spend a bigger proportion of the food budget on a diversified diet thus improving the nutritional status of the household members. Nevertheless, the relevance of income and family size was linked and described as influencing household expenditure. However, later studies show that larger families typically have larger budget shares of necessities than smaller families at the same income level. However, Gheblawi and Sherif, (2007) examined the factors affecting expenditure on rice, fish, and meat in the United Arab Emirate (U. A. E.); and found that income and household size are important factors affecting the amount of money spent on the three examined food

groups, and that the expenditure on the three examined food items was not highly responsive to changes in households' incomes.

At the global level, there has been a marked shift in the urban–rural population balance, which is likely to continue and further have a significant impact on the demand for milk and dairy products. Urbanization has a number of implications for the overall demand for milk and dairy products; Given different lifestyles, calorie requirements of urban and rural residents differ (Clark, Huberman and Lindert, 1995), with sedentary urban lifestyles requiring fewer calories to maintain a given body weight. Again, food availability and an individual's ability to purchase food differs in urban and rural areas (Wu, 1999).

Given the subsistence nature of agriculture in many developing countries, the composition of food consumption in rural areas is generally constrained by an individual's ability to sell their produce as well as purchase other food (Regmi and Dyck 2001). For example, in China rural households still produce up to 50% of their own food on average. In contrast, urban households do not tend to produce any of their food requirements and as such urbanization has the effect of increasing the availability and the selection of food in the market. Urbanization also means a higher female participation in the work force (Kennedy and Reardon, 1994), with a resulting shift in consumer purchasing behavior away from traditional time-intensive food preparations towards pre-cooked convenience food at home, or fast food and snacks eaten away from home. Studies have indicated that increased opportunity cost of women's time increases the demand for non-traditional 'fast food' in many countries food (Regmi and Dyck 2001).

2.1.6.1 Difference between mashallian (uncompensated) and hicksian (compensated) demand curve

An individual's demand curve shows the relationship between how much an item costs and how much of it they will demand. The higher the price, the less you will buy, which is why the demand curve slopes down. This simple, observable relationship is the marshallian demand curve - if one want to predict how much people will buy at a given price, this is the curve that is needed. For some purposes, though, it's important to recognise that two different things happen when the price of something changes. The first is the substitution effect - if something gets more expensive one will be less likely to buy it and more likely to buy something else. So if milk goes up in price one will buy more of other products and less of milk.

The second is the income effect. If something one has already buy gets more expensive then, one will have less money to spend on other things. So a price rise for something one already buys is the same as a reduction in one's income. And when one's income falls, one will spend less money on some goods, possibly including the thing that just changed in price. So the income effect asks what would happen to one's demand for a good when it increases in price, not because it now costs more than other goods, but because the price rise has effectively made one poorer.

The effect of one being poorer on one's demand for a good will usually be negative - one have less money to spend overall so one will probably buy a bit less of everything - but not necessarily everything. Some goods, which economists call "inferior goods" are the kinds of things one buys more of when one is poor than when one is rich. For these goods the income effect of a price rise makes one want more of them. So the marshallian demand curve

illustration shows one the combined effect of both of these things. The Hicksian demand curve is the demand curve which shows how much of a product one would buy at any given price taking out the income effect. So it is the answer to the question "how much of this would one buy if the price went from say ₦ 8 to ₦ 10 and one gave enough extra income to compensate for the price change?" Economists use the Hicksian demand curve for what's called "welfare analysis" - to figure out how much better or worse off people are as a result of a price change.

The effects of a price change depend on how many good alternatives are available, so they need to be measured just looking at the pure substitution effect, without having to look at the income effect at the same time. The Hicksian demand curve doesn't show anything one observe in the real world, but it is the right way to determine how good or bad price changes are for the people they effect.

2.2 Theoretical Framework

The foundations of the theory of consumer behavior are well documented in economic literatures. This research outlines the relevant aspects of the economic theory in order to develop a method of analysis to examine the households' demand for local dairy products in study area.

2.2.1 Theory of demand

The objective of each consuming households is to attain the highest level of utility or satisfaction possible via the consumption of goods and services available to him. However, no individual has unlimited income. Thus, it is assumed the desire of the rational consumer is to maximize utility subject to the limitations of income. However, there is an infinite number

of commodity combinations available to the consumer; and it was assumed that the individual is aware of all the possibilities he faces (he possesses perfect information); and is able to make an ordinal ranking of each of the possibilities.

Implicitly, the ability of households to rank various commodity bundles the ordinal way is represented by the individual's utility function;

$$U\ (q_1 \ldots \ldots \ldots \ldots \ldots \ldots . . q_n) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (1)$$

Where q_1 is the level of consumption of the i^{th}commodity. The utility function enables the individual to rank commodity bundles such that he either prefers one bundle to another or is indifferent between bundles. Also, assuming that the utility function is a continuous, single valued function of all commodities that is available. No meaningful numeric (cardinal) value of utility is attached to any commodity bundle. The only valid economic interpretation of utility is in the preference relationship of the possible combinations.

The form of the utility function is influenced by the tastes and preferences of the individual and by various socioeconomic factors such as age, sex and race. The structure of the utility function is assumed constant over the period of statistical analysis even though changes probably occur over time. In general, no two individuals would have the same utility function since each would place different values on the possible consumption opportunities.

Since the consumer attempts to attain the highest level of utility subject to the income constraint, his actions may be represented by maximizing a Lagrangian function;

$$L = U(q_1, \ldots, q_n) - \lambda(\bar{Y} - \textstyle\sum_{i=1}^{n} p_1 q_1) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (2)$$

where, $\bar{Y} - \sum_{i=1}^{n} p_1 q_1$ is the budget constraint of the individual, p_1, is the price of the ith commodity, and λ is the Lagrangian multiplier representing the marginal utility of income.

The demand function for each good is derived from the 1st order conditions for a maximum. This is accomplished by setting the partial derivatives of L with respect to each good and λ equal to 0. This yields (n+1) independent equations;

$$\frac{\delta L}{\delta q_1} = \frac{\delta U}{\delta q_1} - \lambda P_1 = 0 \quad \text{.....(3)}$$

$$\frac{\delta L}{\delta q_n} = \frac{\delta U}{\delta q_n} - \lambda P_n = 0 \quad \text{.....(4)}$$

$$\frac{\delta L}{\delta \lambda} = \bar{Y} - \sum_{i=1}^{n} p_1 q_1 = 0 \quad \text{.....(5)}$$

The first n elements of the $(n+1) \times 1$vector represent the necessary conditions for constrained utility maximization. The (n+1) element insures all income earned by the household is spent (saving is also considered a good which yields utility). This system of (n+1) equations in (n+1) unknowns may be solved for each of q_1.

Generally, this would yield: $q_1 = f(p_1, , \ldots\ldots\ldots\ldots p_n|\bar{Y})$ .....(6)

This represents the demand for the ith good as a function of the prices of all goods consumed by the household and the fixed level of income. The demand relationships derived in this manner have the following properties;

Firstly, they are single valued functions of prices and incomes. The socioeconomic factors and tastes do not appear explicitly in the demand function. Yet, the shape of the utility function and, hence, the demand relationship is closely related to these factors.

Secondly, the demand relationships are homogeneous of degree 0. Therefore, if all prices and income are doubled there will be no change in the quantity demanded of the ith good. This assumes no money illusion exists.

The preceding demand relationship has several implications for practical econometric estimation. The demand function relates quantity consumed to all prices appearing in the individual's utility function. From a statistical point of view, it is impossible to estimate a demand function which includes all prices. It does seem reasonable to include only those prices closely related to the commodity under investigation. This presents a theoretical justification for including the prices of substitutes and complements and excluding prices of goods that are "want independent". Furthermore, since the demand relationships derived above displays the absence of money illusion, relative prices and real income are the relevant variables. This justifies deflating monetary variables by a measure such as the consumer price index to differentiate between a change in price due to inflation versus a change in the relative price which is economically relevant.

2.2.2 Consumer response to changing relative price

Consumer response to changes' in relative prices of commodities is composed of two effects. First, consumers respond to "pure" changes in relative prices while holding purchasing power constant. As relative prices rise less of the good is purchased. This is the “first fundamental law of demand" and represents the substitution effect. Higher relative prices induce the consumer to search for substitute commodity bundles composed of less of the higher priced good. Second, a change in the price of a good, holding all other prices and nominal income constant, causes the purchasing power of the individual to change. Higher relative prices reduce the opportunity set or real income facing each consumer. Again, the consumer is forced to seek an alternative commodity bundle.

If the typical consumer responds to higher (lower) income levels by purchasing more (less) of the good, the income effect reinforces the substitution effect and an inverse relationship between quantity consumed and price must exist. On the other hand, if a consumer purchases more of a good as income falls, the income effect counters the negative substitution effect. Only if this opposite income effect is of sufficient magnitude to offset the negative substitution effect could we observe a direct relationship between prices and quantity consumed. This would be a rare occurrence.

2.2.3 Price elasticity of demand

Consumer response to changing prices is measured by the price elasticity of demand. Price elasticity is defined as the ratio of the percentage change in quantity consumed to the percentage change in relative price.

$$\varepsilon = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}} = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q} \quad \text{.....(7)}$$

The elasticity coefficient is a number independent of the unit of measurement of either price or quantity. Generally, the value of the elasticity changes along each point on the demand curve. Most empirical studies measure elasticity at the mean value of each variable. The value of the price elasticity coefficient for a normal good ranges from – infinity > to 0. Three ranges here have particular economic relevance- Values of e between 0 and -1 are termed "inelastic". When elasticity falls in this range a change in price elicits a less than proportional change in quantity consumed. Also; A value of $\varepsilon = -1$is called "unitary" elasticity and indicates proportional changes in both price and quantity. Again; a value of $\varepsilon < -1$ is is called "elastic" demand and implies a greater than proportional change in quantity consumed for a given price change.

In general, the availability of close substitutes and the proportion of the budget spent, on the particular commodity determines the magnitude of the price elasticity of demand. Usually, a good with a greater number of acceptable substitutes will have a relatively higher elasticity since it is less costly for a consumer to search for substitutes when a great number exist. The greater the proportion of the budget spent on a good, the greater the price elasticity of demand. Generally, the greater the amount spent on a commodity the greater the potential net gains from searching for substitutes as price rises. For those goods comprising a small part of the budget, the cost of searching for a substitute may outweigh the potential benefits and consumers are likely to respond less to a given price change. Also, income effects are greater when the commodity comprises a large part of the total budget.

A second fundamental law of consumer behavior theory is: "The price elasticity of demand for a good is more elastic in the long run than in the short run". Consumers are generally unable or unwilling to respond immediately or fully to changing market conditions. This is the result of habit formation by consumers and a lack of immediate market information. This implies ultimate consumer response is distributed over several time periods after the initial price disturbance.

2.2.4 Price elasticity and producer revenue

The total revenue earned by a producer or processor is closely related to the manner in which consumers react to changing market conditions. When price changes, there are two counteracting forces affecting processor revenue. As price rises, consumers respond by purchasing less of the good. This represents a reduction in total revenue to the processor. Also, as price rises, each unit of commodity sold by the processor becomes more valuable or increases total revenue. Therefore, which of these forces dominates determines whether total

revenue increases, decreases or remains the same when price changes. Mathematically, the change in total revenue to given price changes may be related in the following manner:

$$\frac{\delta(Total\ revenue\ )}{\delta(price\ )} = Q(1+\varepsilon) \ldots\ldots(8)$$

Where Q is the quantity consumed and ε is the price elasticity of demand. Thus, if the price elasticity is unitary, total revenues remain unchanged since a price rise leads consumers to reduce consumption proportionately. When demand is elastic (i.e ε, less than -1). The loss from reduced consumption is greater than the increase from the per unit price rise and total revenue falls as price per unit rises. For inelastic demand, consumers respond less than proportionately to changing price, therefore, total revenue increases with per unit price increases.

2.2.5 Response to changing income levels

Consumers may respond in one of three ways to changing income levels. For "normal" goods, consumption increases as income rises. If consumption remains unchanged after income rises the good is "income neutral." If consumption decreases as income rises the good is termed "inferior." The magnitude of response is measured by the income elasticity coefficient. Normal goods have an income, elasticity greater than 0 while inferior goods have negative income elasticity. All goods can be normal but it is not possible for all goods to be inferior. This is readily observed from the following relationship derived from the definition of, income elasticity:

$$\sum_{i=1}^{n} \alpha_i \,.\, n_i = 1 \ldots\ldots(9)$$

Where α_i is the proportion of the budget spent on each good and n_i is the income elasticity of each commodity purchased. We therefore in general noted from this relationship that goods comprising a large portion of the household's budget such as on local dairy products are

likely to possess income elasticities which are small. ‘It is also possible for a good to be normal for a relatively low income level and inferior at some higher level.

2.2.6 Modelling local dairy products statistical demand relationship

There are several difficulties encountered in applying the theory of consumer demand to empirical studies. Since it is impossible to statistically estimate demand functions containing all prices found in the budget of an individual it is necessary to abstract from reality. The model which is developed is not able, nor is it intended, to predict consumer response, exactly. It is merely an approximation of what we believe to be economic reality. The theoretical framework which has been developed is for an individual or "typical" consumer.

More generally, however, we are interested in the market or the aggregate demand of all consumers for a particular commodity. In theory, we are able to combine the demand schedule of every, individual by- adding the total quantity demanded at each price and obtaining the market demand schedule. However," it is impossible to estimate the demand for each individual in the market. We must rely on aggregate data for those variables such as quantity consumed and income which are different for each consumer. Since each individual possesses- a different utility function which cannot be aggregated into a "market utility function", the statistical model is not strictly based on economic theory. For example, the market demand for goods may depend not only on income level but also on the manner in which income is distributed. While a change in the distribution of income may shift the market demand curve, the use of aggregate data does not permit the detection of the shift. The results obtained from the use of aggregate data may be biased, and this possibility should be recognized.

Therefore, the theory of demand developed in this context, along with the knowledge of the local dairy industry; presents a theoretical justification for those variables expected to be important determinants of the level of local dairy consumption in Nigeria. Based upon economic theory, an inverse relationship between the relative price of milk and total consumption is expected. Since few close substitutes for local dairy products exist, it is likely the price elasticity is small in the short run and greater in the long run.Prior studies suggest that income would be expected to have a positive effect on consumption. The income elasticity may be of small magnitude since milk products do comprise a relatively large share of consumer expenditure.

Several socioeconomic factors may also be important such as season of the year, rural-urban composition, population, family composition and age distribution.The outline of statistical and econometric procedures which appear to be appropriate for obtaining empirical estimates of consumer response in the local dairy product market are thus described. A given data base may have, a multitude of statistical explanations; yet, only the statistical results based on sound economic principles are relevant.

The statistical model representing the local dairy products demand structure is assumed to be:

$$q_t^* = \beta_0 + \sum_{i=1}^{K} \beta_i X_{it} + e_t \quad \text{.....(10)}$$

Where q_t^* the long run equilibrium level of fluid milk is consumed and X_{it} represents the value of the i[th]. explanatory in time period "t". The set of explanatory variables $(X_1 \dots\dots\dots X_k)$are the economic and socioeconomic factors' believed to determine the quantity of fluid milk consumed in any time period. The vector of $\beta_1's$ represents the

parameters underlying the statistical relationship. Eachβ_1 describes the marginal effect of a, small change in the i*”^1 explanatory variable on $q_t^*$the error term, e_t accounts for the stochastic nature of the empirical demand relationship.

The disturbance term e is assumed to possess the following- properties;

$$E(e_1) = 0 \quad (all\, i) \quad (11)$$

$$E(e_1 e_j) = 0 \quad (i \neq j) \quad (12)$$

$$E(e_1^2) = \sigma^2 (all\, i) \quad (13)$$

The nature of the stochastic error term implies the long run demand function does not hold exactly each period. The disturbance term accounts for such factors as errors in measurement of the quantity of local dairy products consumed and unobservable factors which may be affecting consumption.The variable q_t^* may be interpreted as the quantity of fluid milk that would be consumed if all factors were to remain unchanged for a sufficient time period. However, most market factors do not remain constant over time. ‘Consumers develop habit patterns that change slowly. As a result, consumers are unable or unwilling to adjust immediately as market factors change. Consequently, q_t^*, the long run equilibrium, is not readily observable.

It is assumed that consumers adjust to changing conditions in a systematic manner. The actual change in consumption between periods is assumed to be a proportion of the difference between the long run desired level and the quantity consumed last period. This adjustment mechanism is. a behavioral relationship described by the following difference equation:

$$q_t - q_{t-1} = \alpha[q_t^* - q_{t-1}] + U_t \quad (14)$$

The quantity $(q_t - q_{t-1})$ is the observed change in the quantity consumed between time period t and t-1. The adjustment parameter a is assumed to possess a positive value less than

unity. This adjustment mechanism implies consumers adjust rapidly when, a is near I and slowly for values of a near 0. The adjustment mechanism is stochastic. The error term U_t tis assumed to possess the classical properties of zero mean and constant variance. Thus, the process of adjustment outlined above may not hold exactly, each period, but deviations from the theoretical adjustment pattern are assumed to average to 0 over time.

Solving the difference equation (2) for q_t^* yields

$$q_t^* = q_t/\alpha - [(1-\alpha)/\alpha]q_{t-1} - U_t/a \text{.....(15)}$$

The unobservable quantity q_t^* is eliminated upon substitution of equation (3) into the long run demand function (I). The demand function, is transformed into:

$$q_t = \alpha\beta_0 + \alpha\sum_{i=1}^{K}\beta_1 X_{it} + (1-\alpha)q_{t-1} + (U_t + ae_t), \text{.....(16)}$$

which can be directly estimated. This procedure provides a theoretical justification for including the lagged value of the dependent variable as an additional, explanatory variable in order to eliminate the unobservable long run equilibrium quantity and to capture the habit persistence or inertia effects of consumer behavior. The demand relationship is now dynamic- as represented by the 1st order difference equation.

2.2.7 Statistical consideration in demand model

A classical assumption of the standard regression model is that all explanatory variables are no stochastic. Inclusion of lagged values of the dependent variable introduces random elements into the data matrix in violation of the classical assumptions.

The parameter estimate of *a* must be positive and less than one. Violation of this assumption implies the difference equation is unstable since the variance of q_t increases with the sample size. The disturbance term of equation is uncorrelated with the lagged dependent variable since q_{t-1}depends on $e_{t-1}, \ldots\ldots\ldots\ldots\ldots\ldots\ldots e_1$ but not one e_t. In the absence of

autocorrelation, ordinary least squares estimation provides consistent parameter estimates and we could proceed as usual provided the sample size is large.

However, the Durban-Watson statistic is asymptotically biased when the lagged dependent variable is treated as an ordinary explanatory variable. Hence, this statistic may not have the "power" to detect autocorrelation among the successive error terms. Inclusion of the lagged dependent variable with autocorrelation among the disturbances results in inconsistent estimates since $q_{t-1}$and e_t are the correlated.

If $E(q_t^*)$and(q_{t-1}) redefined and replacing q_t^* and q_{t-1}then the final equation is

$$E(q_t) = \alpha\beta_0 + \alpha \sum_{i=1}^{K} \beta_i X_{it} + (1-\alpha)E(q_{t-1}) \ldots\ldots(17)$$

This approach implies that the mathematical relationships above are more nearly valid when q_t^* and q_1 are defined with the "statistical errors" removed from them. The ultimate consideration is what constitutes these "statistical errors" $e_t$and U_t which are primarily "ignorance terms" in our empirical model with aggregate data. The operational model is obtained by adding an "ignorance term" to above where:

$$q_t = E(q_t) + v_t \ldots\ldots(18)$$

Then one can also directly interpret *(A)'* without any motivation' for its existence except a distributed lagged response with respect to the variable. Substitution of the expectation of the lagged dependent variable for the actual lagged value introduced nonlinearity among the parameters of the statistical model. Using only one • independent variable for simplification, the statistical model now becomes

$$q_t = \beta_0 + \beta X_t + \lambda[E(q_{t-1})] + v_t \ldots\ldots(19)$$

Replacing the expectation by;

$$[E(q_{t-1})] = \beta_0 + \beta X_{t-1} + \lambda E(q_{t-2})v_t \ldots\ldots(20)$$

makes apparent the intrinsically nonlinear relationship among the parameters.

Estimation using ordinary least squares is no longer possible. It is therefore necessary to employ a nonlinear estimation procedure. For this purpose, maximum likelihood estimates may be obtained using nonlinear ' least squares estimation. It may be shown that under general conditions the maximum likelihood estimator is consistent, asymptotically efficient and asymptotically normal,

The formulation implies a geometric distributed lag has been imposed upon all explanatory variables. Successive substitution of $E(q_{t-1})$ for each prior period results in:

$$q_t = \alpha(1 + \lambda + \lambda^2 + \cdots) + \beta(X_{t-1} + \lambda^2 X_{t-2} + \cdots) + v_t \text{.....(21)}$$

which implies observed consumption this period is a weighted linear combination of all explanatory variables over all prior periods. If a permanent (one time) change in a variable such as price occurred while all other variables remained constant, equation (ii) Suggests quantity consumed in the first time period would change by: $\beta(\Delta P)$, in period (t + I) quantity consumed would change by $\beta(\Delta P)(1 + \lambda)$.

The total or "long run" consumer response would be $\beta(\Delta P)(1 + \lambda + \lambda^2 + \cdots)$.

The long run price elasticity suggested by this formulation of the statistical model is:

$$E_{LR} = \frac{\beta}{1-\lambda}(p/\bar{q}) \text{.....(22)}$$

The long run elasticity, evaluated at the sample means, is found by dividing the parameter estimate of price by one minus the parameter estimate of the expectation of the lagged dependent variable and multiplying this quantity by the ratio of the mean values of price and quantity consumed.

2.2.8 Hypothesis tests for the demand model

Tests of significance on the estimated parameters may be performed provided the sample is of sufficient size. Asymptotic variances of the estimators may be obtained from the diagonal elements of the inverse of the information matrix. Standard, single parameter hypotheses tests may be performed using a "t" statistic since the parameter estimates are distributed asymptotically normal. It should be noted that the test statistic is only approximately distributed as a "t" distribution since the linear approximations do not estimate the nonlinear relationships among the parameters exactly and because sample size is not infinite.

2.2.9 Properties of the estimators with serially correlated disturbances

It may be shown that when the disturbances are serially correlated the estimators are consistent but no longer asymptotically efficient. Confidence intervals and hypothesis tests conducted with inefficient estimators yield biased results when the usual parameter covariance matrix is assumed.Some desirable large sample properties may be regained by estimating the autocorrelation parameters and transforming the model. It is assumed the disturbances are generated in the following manner:

$$u_t = \rho_1 u_{t-1} + \rho_2 u_{t-2} + \cdots + \rho_s u_{t-s} + e_t \text{.....(23)}$$

where$p_1, \ldots . p_s$are the coefficients of autocorrelation and e^ possesses the classical properties. The general procedure is outlined below with only one independent variable and first order autocorrelation:

$$q_t = \alpha + \beta X_t + U_t \text{.....(24)}$$

$$q_{t-1} = \alpha + \beta X_t + U_{t-1} \text{.....(25)}$$

Equation (24) represents the model the current period and equation (25) represents the model the prior period. Multiplying (25) by p and subtracting from (24) yields:

$$q_t - \rho q_{t-1} = \alpha(1-\rho) + \beta(X_t - \rho X_{t-1}) + (u_t - \rho u_{t-1}) \text{.....26)}$$

which reduces to:

$$q_t = \alpha(1-\rho) + \beta(X_t - \rho X_{t-1}) + \rho q_{t-1} + e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.(27)$$

In the more general case of an nth order autocorrelation, the transformation becomes

$$q_t - \sum_{i=1}^{n}(\rho_i q_{t-1}) = \alpha(1 - \sum_{i=1}^{n}\rho_1) + [X_t - \sum_{i=1}^{n}(\rho_i X_{t-i})] + e_t \ldots\ldots\ldots\ldots..(28)$$

The disturbance term of the transformed model (28) possesses the classical properties. Thus, the estimates of the parameters will be consistent and "asymptotically equivalent to the best-linear-unbiased estimators". Autocorrelation also introduces non-linearity into the regression model. Maximum likelihood estimates of the autocorrelation parameters may be obtained using an iterative technique. This procedure introduces several statistical complications:

Two degrees of freedom are lost for each autocorrelation parameter estimated. One degree of freedom is lost in the actual estimation of p. and another due to a lost observation in the transformation process. This presents difficulties if the sample size is small and if a high degree of autocorrelation is encountered.

The small sample properties of maximum likelihood estimators are not .generally known. Equation (28) becomes an n order difference equation with the order determined by the degree of autocorrelation. For the solution of the difference equation to be stable it is necessary for the n roots of the characteristic equation to be less than one in absolute value. Testing the Stability of High, Order Difference Equations It is often difficult to determine the roots of the characteristic equation when the difference equation exceeds third order. This is sometimes the case when a high order of autocorrelation necessitates transforming the original statistical model such as in equation (28). However, it is still quite easy to test for stability (even if the roots are unknown), using the "Schur theorem”. This procedure is outlined below. "The roots of the nth degree polynomial equation:

$$a_0 b^n + \alpha_1 b^{n-1} + \cdots + a_{n-1} b + a_n = 0 \text{ ……..……(29)}$$

will all be less than unity if' and only if the following n determinants are all positive."

$$A_0 = \begin{vmatrix} a_0 & a_n \\ a_n & a_0 \end{vmatrix} > 0 \text{…….....(30)}$$

$$A_1 = \begin{vmatrix} a_0 & 0 & a_n & a_{n-1} \\ a_1 & a_0 & 0 & a_n \\ a_n & 0 & a_0 & a_1 \\ a_{n-1} & a_n & 0 & a_0 \end{vmatrix} > 0 \text{…….……(31)}$$

$$A_n = \begin{vmatrix} a_0 & 0 & 0 & a_n & a_{n-1} & a_1 \\ a_1 & a_0 & 0 & 0 & a_n & a_2 \\ a_{n-1} & a_{n-2} & a_0 & 0 & 0 & a_n \\ a_n & 0 & 0 & a_0 & a_1 & a_{n-1} \\ a_{n-1} & a_n & 0 & 0 & a_0 & a_{n-2} \\ a_1 & a_2 & a_n & 0 & 0 & a_0 \end{vmatrix} > 0 \text{……..(32)}$$

If each determinant possesses a value greater than 0, both the necessary and sufficient conditions for convergence will be satisfied.

Finally, using the expectation of the lagged dependent variable in dynamic regressions eliminates the random element from the systematic part of the regression equation. The assumed form of the adjustment mechanism using the expectation is no more arbitrary than using the actual lagged value and has consistently displayed better explanatory power in the empirical results.

However, nonlinearity is introduced into the model but presents no major obstacle to estimating the parameters. Maximum likelihood estimation using nonlinear least squares provides desirable asymptotic properties of the estimators when the stochastic disturbance term meets the classical assumptions.

Autocorrelation parameters may be estimated and tested for significance. When significant autocorrelation exists, the regression equation may be transformed and the classical properties of the disturbance terms regained.

2.3Analytical Framework

2.3.1 Linear demand functions for commodities

The specification of linear demand function for a commodity was as follows:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + \text{error}; \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..(33)$$

Where: Y = Quantity purchased, X_1 = Prices of commodity, X_2 = Prices of other commodity (complementary/ substitutes), X_3 = Income.

The values of b_0,b_1, $b_2$and b_3 can be estimated by OLS method with specific assumptions relating to the distribution of random variable, independent variables and dependent variable. The reliability of the above estimates of b_0,b_1, $b_2$and $b_3$can as usual be assessed by taking the values of standard errors or 't' values. If the standard errors are smaller than half of the regression coefficients of X_1, X_2, X_3 then the estimates are deemed to be reliable estimates i.e., X_1, X_2, X_3 variables do have significant impact on the demand for the commodity. If it is more than half of the regression coefficients, then the estimates of parameters are deemed to be unreliable estimates i.e., X_1, X_2, andX_3 do not have significant impact on the demand for the commodity.

Similarly, the value of '*t*' test can be considered to assess the reliability of estimates of the parameters. If the values of '*t*' are very high, then the estimates are considered to be statistically significant. If they are smaller, then the estimates are considered to be statistically insignificant. Thus, on the basis of either standard errors or '*t*' values, the reliability of estimates can be assessed. Similarly, the overall goodness of the linear equation fitted to time series data can be assessed by taking the values of both R^2 and Adjusted R^2. If the value of these statistics are close to one, then the linear regression model (equation) fitted to the observations (data points) will be considered good. If the values of these statistics are close to zero, then the linear regression model fitted to the observations will be considered not good.

Thus, the values of R^2 and Adjusted R^2 provide us an idea about the extent of variation explained by the independent variables included in the model in total variation.

2.3.2 Linear approximation almost ideal demand system (LA/AIDS) model

The advantages of the LA/AIDS model include its ease of estimation and the ability to conserve degrees of freedom by imposing homogeneity, symmetry, and Engle aggregation restrictions. Disadvantages include inconsistency of estimators when using the Stone price index (Buse, 1994; Alston, Foster and Green, 1994). The Linear Approximation Almost Ideal Demand System (LA/AIDS) model has also been used by Ezedinma, Asumugha and Nweke, (2006), in Nigeria to estimate the elasticity's of demand for meat and meat products: beef, mutton and goat meat, chicken, eggs, fish and milk. Because of its flexibility as a complete system; this model has been used for similar studies in West Africa (Savadogo and Brandt, 1988); in India (Abdulai and Jain, 1999); in Greece, In Morocco (Mdafri and Brorsen, 1993); in Myanmar (Soe, Batterham and Drynan (1994) and in the United States of America (Heien and Pompelli, 1988). This means that it can be restricted to satisfy the conditions of adding-up, homogeneity, and symmetry.

Where household expenditure data are used to estimate demand parameters, the LA/AIDS model has been found to satisfactorily explain demand responses (Lee, Brown and Seale, 1994). In formulating the meat demand model, household data were used as these avoid the problem of desegregating over consumers. Weekly data from each panel household were collected six times during the period, thus the problem of non-consumption as suggested by Heine and Wessells, (1990), was avoided. Censoring is required only when one data point is used, increasing the probability of non-consumption, as in the case referred to by Hein and Wessells (1990). Murshid*etal.*,(2008) studiedthefood availability,consumptionpatternandnutritionalstandardinBangladesh.They estimatedthe

income(expenditure)elasticity,ownpriceelasticity ofmajorfooditemsbyusingtheLinear ApproximationoftheAlmostIdealDemandSystem(LA/AIDS)andcomparedwithprevious studies. However, conventional milk consumption studies tend to approach milk as a homogenousproduct in which different types of milk products are lumped together (Deaton andMuellbauer, 1980).

2.4 Review of Empirical Studies

2.4.1 Demand system model of analysis

According to utility theory, the consumption pattern of any household will depend on the household's preferences, income, prices, as well as particular biogenetic and other needs. Also, it will depend on the household's composition (age, sex, gender, etc.) as well as social class. However, the demand for dairy products often depends on consumer preference, consumer's income, population size, price of the product, price of substitutes and other factors. Increasing population growth, rising real income and decreasing consumer prices are the major factors that are expected to increase the demand for dairy products (Ahmed, Ehui and Yemesrach, 2004).

In estimating the demand relationships, the formulation of a model expressing these relationships between consumption and the relevant explanatory variables is paramount. Various estimation functions have been developed and applied over the years. In their review of such models, Sadoulet and de Janvry, (1995) indicated that three demand systems have received considerable attention because of their relative empirical expediency. These are the Linear Expenditure Systems (LES) developed by Stone (1954), the Almost Ideal Demand Systems (AIDS) developed by Deaton and Muellbauer (1980) and the combination of these two systems into a Generalized Almost Ideal Demand Systems (GAIDS) proposed by Billino,

(1990). Another variant of the AIDS model is the Quadratic Almost Ideal Demand System (QUAIDS) derived by Banks Blundell and Lewbel (1997) and recently applied in Nigeria by Abdulai, (2001)and Obayelu, Okoruwa, and Ajani, (2009). Ogunniyi *et al*.,(2012), in Nigeria also reviewed some work that uses AIDS models and stated below that Deaton and Muellbauer, (1980a) introduced the Almost Ideal Demand System (AIDS) as that which satisfies a number of durable theoretical properties, and is very convenient to estimate. Estimation of the demand functions is very useful as they provide us with income (expenditure) and price elasticities. They stated that AIDS model has been used extensively in different areas including Gallet, (2007), who used AIDS model to study demand for higher education in the United States. He found out that demand is least responsive to tuition and income in the United States.

Furthermore, Hannan *et al*.,(2010), used a variation of the AIDS model of Deaton and Muellbauer, (1980a) to determine the impacts of per capita total expenditure, food prices and demographic variables on household demand for dairy products in Bangladesh. They showed that the budget shares are generally more responsive to per capita total expenditure than to prices; and that the family size and occupation of the household head have a significant impact on the household demand behaviour. Huq and Arshad, (2010), estimated demand elasticities for different food item in the context of Bagladesh using AIDS model with corrected Stone price index. The income elasticity of demand for cereal, meat and fruit were 0.51, 2.46 and 1.96 respectively. However, Han and Wahl (1998) used a two-stage budgeting LES- LA/AIDS system to estimate rural household demand in China with special emphasis on changes in demand for fruit and vegetable commodities across different income groups. The own-price elasticity for food was found to be more elastic than that for clothing, housing,

durable goods, and other items. Within the food group, price elasticities range from -1.042 to -0.019.

Mullah,(2005),studiedconsumerdemandbehaviorinBangladeshby usingEngelandAIDS modelfortheHIES-2000data. Heestimatedtheexpenditureelasticity usingAIDSmodelfor differentfoodandnon-fooditems.Murty, (1980)analyzedconsumerdemandbehavior using timeseriesdata,Ray, (1982)household AIDSontimeseriesandpooledcrosssection dataandtesttherestrictionofhomogeneityandsymmetry,Blanciforti,GreenandKing, (1986)estimated AIDSforfourfoodgroupsandcomparedwithLESusing timeseriesdata werereviewed. Chowdhury, (1982),completeconsumermodel,AhmedandShams,(1994) complete demand system for rural Bangladesh, Ferdous, (1997) for consumer demand behaviorandKhanamandFerdous,(2000)foodpreferenceandconsumerdemandbehaviour inBangladesh healsoreviewed.Mostofthestudy herereviewedusedAIDSmodeltoestimate expenditure(income)andpriceelasticity.Hefoundtheexpenditureelasticity forriceand wheat was 0.31and 0.84respectively. Inthe areaof meatdemandanalysisinBangladesh,Wadud,(2006)estimatesMarshallianand Hicksian price and expenditure elasticities for the period 1980 to 2000 and found that differenttypesofmeathaveinelasticdemand.

HuqandArshad,(2010),estimateddemandelasticitiesfordifferentfooditemsinthecontext ofBangladeshbyusingAIDSmodelwithcorrectedStonePriceIndexfromHIESdatain 2000.They werefoundthattheuncompensatedownpriceelasticity forallfooditemsexcept edibleoilandspiceswerepriceinelastic.Likewise, some of therecentstudiesaboutAIDSmodel carried outindifferentcountries are reviewed. Wu(1995)studiedconsumptionpatternsofurban householdsinChinausing

aggregatedhouseholdconsumptiondataandestimatedthedemandsystemof different commodities(rice,pork,vegetable,fish, eggandfruits).Karagiannis, Katrandis and Velentzas, (2000), explore the methodology of an error correction form (ECM-AIDSmodel) of almostideal demand system for meat. They estimated the short-run and long-run elasticityfor meatdemand using annualtimeseriesdata for the period 1958-1993. The proposed formulation of methodology performswellandallthe propertiesweresupported by thedata. All meat items were found to substitutes eachotherexceptchicken and mutton-lamb, and pork and chicken.

LindandFrandsen,(2000), studied food demandbehaviourinIndia usingannualtimeseriesdatafor theperiod1967-1997.They used AIDSmodelandvectorerrorcorrectionapproachfor estimationof adynamicconsumer fooddemandsystem.The estimatedeconometricresultshowedthatthesystemfulfilledthe theoretical properties ofademand system.Mostrecently,Nzumaand Sarker, (2010), estimatederrorcorrectedalmostidealdemand systemformajorcerealsinKenya.Theyusedannualtimeseriesdatafortheperiod1963to 2005andAIDSmodelwithcorrected Stonepriceindexfor itswelltheoreticalandempirical grounds. They found all own-price elasticities were negative and significant while expenditureelasticitiesofallcereals(rice,wheat,maizeandsorghum)were positiveand inelasticinbothshort-runandlong-run.Anotherstudy byZhengandHenneberry,(2010), analyzedthefoodgrainconsumptioninurbanJiangsuprovinceofChinaby usingboththe QUAIDSandAIDSmodel.Theyfoundthatthedemandsforwheatflourandcoarsegrains are priceelasticandthedemandsforriceandfoodgrainproductsarepriceinelasticand certaindemographic variable indicatedtheimpactof food graindemandandchange the consumption of rice.

Zahedi, (2006),estimate an ECM-AIDS model for urban- area‘shousehold expenditure: The caseof Iran -estimatetheshort-runand long-run elasticityfor householdexpendituredemand Annual timeseriesdata over theperiod 1984-2004. The ECM-AIDSmodel showed that the proposedformulationofdynamic specificationperforms wellonboth theoretical andstatistical grounds as the theoreticalrestrictionof homogeneityand symmetry.Pomboza and Mbaga,(2007), estimate food demand elasticities ofmajor food groups in Canada. They identified thefactorsthat influence the changein food expenditure pattern using the food expenditure survey of 2001. The results of the estimation were consistentwith economictheory.Own price elasticitieswere negative,while expenditureelasticities werepositive and lessthan one.Hannan *et al.,* (2010), analyzed household demand for dairyproducts in Bangladesh using household expenditure surveydata2000 and obtained estimates of different elasticities. Also, they identified the factors affecting the household demand for dairyproducts. Theempiricalresultsshowedthatthe AIDSmodelwasausefulinstrument forthis analysis.Budgetshares were moreresponsivetoper capita total expenditurethan price.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Area

This study was carried out in Jigawa and Kaduna states, located within the North-West geo-political zone of Nigeria.

3.1.1 Jigawa state

Jigawa State is a state situated in the north-western part of the country between latitudes1.00°N to 13.00°N and longitudes 8.00°E to 10.15°E (JARDA, 2000). Kano State and Katsina State border Jigawa to the west, Bauchi State to the east and Yobe State to the northeast. To the north, Jigawa shares an international border with Zinder Region in The Republic of Niger, which is a unique opportunity for cross-border trading activities. Government readily took advantage of this by initiating and establishing a Free-Trade Zone at the Border town of Maigatari with Niger.

The state has a total land area of approximately 22,410 square kilometres. Its topography is characterized by undulating land, with sand dunes of various sizes spanning several kilometres in parts of the State. The main rivers are Hadejia, Kafin Hausa and Iggi Rivers with a number of tributaries feeding extensive marshlands in north-eastern part of the State. Hadejia – Kafin Hausa River traverses the State from west to east through the Hadejia-Nguru wetlands and empties into the Lake Chad Basin. Most parts of Jigawa lie within the Sudan Savannah with elements of Guinea Savannah in the southern part.

The human population of this state was estimated at 4.3 million (NPC, 2006). The cattle population in the state comprises mainly of white Fulani (Bunaji) and the Rahaji breeds also known as the Red Bororo. The common husbandry system practice in the state is the extensive management system, although, nowadays the herd owners are becoming settled

pastoralists. The state is socio-culturally homogeneous and mostly populated by Hausa/Fulani, who can be found in all parts of the State; Kanuri are largely found in Hadejia Emirate, with some traces of Badawa mainly in its Northeastern parts (JARDA, 2000). Islam and a long history of inter-marriages have continued to bind the people together. About 3.6 million people inhabit Jigawa State. Life expectancy as at 2001 was about 52 years with a total fertility rate of about 6.2 children per woman of childbearing age (a little above the national average).

The Economy of Jigawa State is largely characterized by informal sector activities with agriculture as the major economic activity. Over 80% of the population is engaged in subsistence farming and animal husbandry. Trade and commerce are undertaken on small and medium scale, especially in agricultural goods, livestock, dairy products and other consumer goods. Other informal sector activities include blacksmithing, leather-works, tailoring services, auto repairs, metal works, carpentry, tanning, dyeing, food processing, masonry etc. (JARDA, 2000).In the same vein, Jigawa state was selected for this project being an agrarian state with vast luxuriant grassland that greatly support animal husbandry and small to medium scale agro-processing industries. Most of the livestock farmers in the state are engaged in medium to small holder livestock farming including cattle, sheep, goat etc. Though the small holder farmers are more, they keep their livestock mostly under traditional management system. This implied that they depend on the natural free range of forage with little or no supplementation. Owing to the state's large expanse of natural free range grazing land reserve up to 450 - 452 square kilometer that potentially provide the needed support to these small to medium scale animal husbandry and greater opportunities for large scale and sustainable livestock development in the state (JSMA, 2013). Further, Jigawa state through its inclusive and equitable management of natural resources and the establishment of the

farmers and herdsmen board; was able to achieve a revised development of farm settlement, cattle routes and grazing reserves in the state. Such initiative portends a promising livestock and dairy development in the state.

3.1.2 Kaduna state

Kaduna state is situated in the central position of the Northern Nigeria and located between longitude 30^0East of the greenish meridian and latitude 09^0-$11^0$30" North of the equator. The state occupies an area of approximately 48,473.2 square kilometers and has a population of about 6,006,562 (NPC, 2006). The state shares common borders with Zamfara, Katsina, Niger, Kano, Bauchi and Plateau states; and to the south west with the Federal Capital Territory, Abuja.Kaduna is a metropolitan as well as a cosmopolitan industrialized state with over 80 commercial and manufacturing industries. The manufactured goods produced here ranges from carpets, textiles, reinforced concrete materials, bicycle assembly, toiletries, bakeries, confectioneries and cigarettes. Other consumer goods commonly produced include dairy products, soft drinks, and groundnut oil. Nevertheless, many farmers are also involved in animal husbandry including rearing of cattle, sheep, goats, pigs and poultry. They are also involved in dairy product production, processing and sale.

The state extends from the tropical grassland guinea savannah in the south to the sudan savannah in the north. The prevailing vegetation of tall grasses and bigger trees are resources of economic importance during both the wet and dry season. The wet season is usually from April through October and with great variations as you move northwards. On the average, the state enjoys a rainy season of about five (5) months; with an average rainfall of about 1016mm. The entire land structure consists of an undulating plateau with major rivers in the state including River Kaduna, River Wonderful in Kafanchan, River Kagom, River Gurara

and River Galma.There is a clear distinction between the modern and the traditional livestock production in Kaduna State. The operators in the traditional production systems predominate and their production systems are essentially low input and low output systems. The modern livestock production systems are relatively small. They employ more capital and utilize mostly purchased variable inputs such as feeds, drugs, vaccines etc. The productivity of these systems is hence significantly higher than that of the traditional production systems. The policy challenge embarked upon by the state therefore include the movement of the operators in the traditional production systems gradually into the modern livestock production sector.

Unavailability of good quality pasture all-the-year is a major constraint to ruminant production systems in the state since the quality of the pasture declines with the coming of the dry season. The available grazing land becomes inadequate and pastoralist start moving their herds in search of better grazing lands. Under this condition, the modern ruminant producer in the state, especially dairy, starts to feed agro-industrial by-products to their animals. These include wet brewer's grain, cotton seed cake and molasses whenever available. Some also resort to the use of maize silage. Therefore the policy challenge of the government is geared at ensuring that agro-industrial by-products are available and promote the production of silage for use during the dry season (JSMA, 2013).

Available estimates on the traditional livestock sector, based on a field survey conducted by NPC (2006), indicate a cattle population of about 1.9 million, goats 1.6 million, sheep 1.3 million and chicken 5.1 million. However, the modern dairy sector is also significantly small with estimated potential annual turnover is a hundred and eleven million naira (₦111m). The common diseases of livestock in Kaduna State include: CBPP; Foot and mouth diseases; Helminthelosis; PPR (Sheep and goats); New castle disease (poultry); Gomboro (poultry);

African swine fever (pigs).The structures for supporting the livestock sector consist of a number of key federal and state owned institutions with several projects and programmes. These include; Extension Services; Veterinary Services; Livestock Breeding (Cattle Breeding, Dairy Cattle Multiplication, Goat Improvement and Rabbit Breeding); Poultry Production; Grazing Reserves; Abattoir Services. Most of the infrastructure for supporting the livestock sector that were established several years ago are in ailing conditions and need renewal.

Relative to other northern states, Kaduna state has people with varying levels of living including the poor, the middle class and the very rich. Further, the state was a custodian of a well-established and successful tri-partite partnership dairy initiative project of the World Bank, the National Livestock Project Division (NLPD) of the Federal Ministry of Agriculture and Rural Development (FMARD), and the Kaduna state government (Annatte and Ogundipe, 2006.). This project, Kaduna federation of milk producer cooperative association company limited, tagged MILCOPAL has been instrumental to the establishment of local dairy cooperatives and has aided in the overall marketing of local dairy products including Milcopal yoghurt in the State. Also, the National Animal Production Research Institute (NAPRI), produce NAPRI yoghurt and has been instrumental to local dairy products development in the State in particular. There were the presence of National Institute of Tripanosomiasis Research (NITR), National Agricultural Extension Research and Liaison Services (NAERLS) among other national research institutes situated in Kaduna state that commands the attention of this project's selection. Again, Kaduna state was selected among the pivot and pilot states for the national dairy production initiative of the Federal government of Nigeria currently under the national commercial agriculture development plan.

3.2 Sampling Procedure

The study was carried out in Jigawa and Kaduna States of the northwest geopolitical zone of Nigeria. The selection of Kaduna State owed it to its very high population relative to most other states in the region, with projected population of 9.4 million (Kaduna State bureau of statistics - KDBS, 2021). A multistage sampling procedure was used in this study to select households in the two states. Four stages were involve: including selection of agricultural zones, selection of Local Government Areas, selection of district/wards, and the selection of households. The first stage involved a random selection of two (2) agricultural zones from each of the selected states using the lucky-dip approach; a total of four (4) agricultural zones were thus selected in the two States. The second stage involved the random selection of two (2) local government areas from each of the agricultural zones using a table of random number approach. A total of eight (8) local government areas were selected in all. The third stage involved a random selection of two (2) districts/wards/villages from each of the selected local government areas using atable of random numbers approach, and sixteen (16) District/wards/villages were selected in all.

The penultimate stage, involved making a list of all households in the selected district/wards/villages. The list was obtained from National Population Commission; based on Enumeration Area (EAs) of 2006 census purposes by the National Population Commission. Using the random number table, a random sample of thirty two (32) local dairy products consuming households were chosen for the study. This was based on the disaggregated list of the Enumeration Areas (EAs) developed from the 2006 population census by the National Population Commission. A total of 256 households was eventually selected from each state to make 512 households' in all for the two states.

However, based on earlier concept and definition of household income, the households were categorized into low, middle and high income classes' base on the monthly income amount they get on a steady basis in both urban and rural regions as wages or salary, or from their production activities.The households wereclassified according to their income grouping having been asked to respond to pilot questionnaire during a reconnaissance survey. An household is categorized as low income class if he earns ₦50,000 monthly on a steady basis. A middle income household is one that earn on a steady monthly basis income of between ₦51,000 and ₦100,000 while an household is classified as a high income earner if he earns a steady monthly income of above ₦100,000.

Finally, the lists of names of household heads or persons responsible for all the food purchases and planning in the selected homes were collected from these five hundred and twelve (512) residential homes. However, a total of four hundred and eighty (480) households were analyzed in this study owing to some household's non-consumptions of the local dairy products amidst other complaints and problems. Such households are therefore discontinued from the study.

Table.1 Sample Selection Procedure

S/n	Agro-ecological zones	LGA	Districts	Wards/villages	Sample unit
1.	Birni-kudu	Birni-kudu	Wurno	Lafiya	32
		Birni-kudu	Kwangara	Sundimina	32
		Dutse	Kudai	Madobi	32
		Dutse	Jigawa Tsada	Duru	32
2	Kazaure	Kazaure	Kanti	Sabaru	32
		Kazaure	Ungwa Gabas	Ungwa Gabas	32
		Ringim	Ringim	Ringim	32
		Ringim	Y/Dutse	Tofa	32
3	Samaru	Sabon-gari	Hanwa	Palladan	32
		Sabon-gari	Sabo	Ungwa-godo	32
		Soba	Soba	Takalafia	32
		Soba	Maigana	Kinkiba	32
4	Birni-gwari	Kajuru	Kufana	Kufana	32
		Kajuru	Kajuru	Gefe	32
		Kaduna-north	Kawo	Rafin guza	32
		Kaduna-north	Doka	Gamji	32
	Total				**512**

Source: Field survey, 2018

3.3 Data Collection

Primary data were used for the study. The primary data were collected with the aid of a set of structured questionnaire on quantity consumed of each food item, income and income class of households. Data were also collected on the socio-economic and demographic variables of the household heads such as age, sex, marital status, family size, educational status and income status. Data on households' local dairy product's consumption preference and prevalence were also collected. The stated preference method was used to determine the preferred local dairy products among respondents.

A survey of each household was carried out every 2 weeks for seven months making a total of 14 weeks of data collections was done by male and female enumerators drawn mainly from the NPC and the Agricultural Development Projects in Jigawa and Kaduna States. This was to ensure data robustness and better handling by experienced personnel. Each of the household head in the study areas was identified as the person responsible for food planning, purchasing and preparation in a household and was always interviewed. However, other household members are encouraged to actively participate to ensure completeness of data. For each survey period, each of the household heads were contacted by enumerators at least a week before the reference week. They were reminded to note down their food and non-food expenditure patterns. Access to all members of each survey household was guaranteed by the use of two enumerators (a man and a woman) who visited the households in other to administer the questionnaire.

During the interview week, the enumerators recorded food and non-food consumption and expenditure patterns of households. Data on infrequently purchased items were also collected at month ends.Questions were grouped into data sets such as household's socioeconomic and

demographic characteristics; household's purchases and non-purchases of the various groups of 16 budget shares of food commodities with emphasis on local dairy and associated products, including: w_1Fresh milk (Madara), w_2 Fermented un-skimmed milk (*Kindirimo*), w_3Fermented skimmed milk (*nono*),w_4Local pasteurized yoghurt, w_5Butter/ghee (*Mai-shanu*), w_6Cheese (*Awara*), w_7Baby milk formula, w_8Evaporated milk, w_9Powdered milk w_{10} Flavored milk, , w_{11}Ice cream ,w_{12}Soya drink, w_{13}Soya cheese, w_{14}Cereals and product, w_{15}Sugar and syrups products, w_{16}Other food at home. In particular, local dairy products consumption data were considered and analyzed for this project. These local dairy product types are representative of the various dairy products types commonly consumed in north western states of Nigeria.

Furthermore, the respondents were asked if he or she consumes local dairy products including: fresh milk or any of *kindirimo*, *nono*, yoghurt, butter and cheese in both rural and urban regions of the study area. Alsocollected data were the respondents' socio-economic and demographic characteristics (Region of abode based on urban or rural, western education, marital status, sex, age, family size, and household income status). Local dairy product consumption was also related to consumers consumption prevalence of these local dairy products; to preference structure based on reasons why they consume a local dairy product over and above others viz, convenience, habit or addiction to such dairy product, health concerns , reduce cost and relative price of the product, taste attribute of the product, and simply use product as thirst quencher.

To find out how sensitive consumers were about price and health, they were asked to rank importance of the following attributes for their local dairy product consumption decision. The attribute are "local dairy product is the most important part of human diet", "local dairy

product is fattening", "local dairy product advertising influences people so they buy more of it", "Price of a particular local dairy product is expensive compared to its complements or substitutes". Consumers were asked to record their responses on a scale as follows: strongly disagree (1), somewhat disagree (2), neutral (3), somewhat agree (4), and strongly agree (5). Also, the preference structure as it concerns away from home consumption and place of purchase of the products including institution outlets, eating establishments, supermarkets, dairy shops, and open market. It is hypothesized that the households' socio-economic characteristics, beliefs, knowledge and the attitudes about price and health affected consumers' local dairy product consumption decisions.

3.4 Analytical Technique

Data collected were subjected to both descriptive and inferential statistics. The descriptive statistics used were frequency counts, percentages, mean scores and standard deviations. The inferential statistics employed include; Chi-square, Multinomial logit model, Correlation analysis, and Almost Ideal Demand System model of analysis.

3.4.1 Descriptive statistics

3.4.1.1 Household income (HI)

Household income refers to the actual income amount available to household for spending; less savings, and after taxes have been paid; otherwise referred to as Personal outlay. Where; Personal outlay implies personal disposable income less personal savings.

3.4.1.2 Determination of mean regional household income class was modeled as:

i. Rural Household Income Class;

$\left(\sum_i^n \frac{R_{i1}}{N_1} + \sum_i^n \frac{R_{i2}}{N_2} + \sum_i^n \frac{R_{i3}}{N_3}\right) whereRi1, Ri2, andRi3 \ldots\ldots Rural : Low,$

$Medium, andHighincome$Household$respectively.$

ii. Urban Household Income Class;

$\left(\sum_i^n \frac{U_{i1}}{N_1} + \sum_i^n \frac{U_{i2}}{N_2} + \sum_i^n \frac{U_{i3}}{N_3}\right) whereUi1, Ui2, andUi3 \ \ldots\ldots Urban: Low,$

$Medium, andHighincome$Household$respectively.$

iii. Pooled Household Income Class;

$\left(\sum_i^n \frac{RU_{i1}}{2N_1} + \sum_i^n \frac{RU_{i2}}{2N_2} + \sum_i^n \frac{RU_{i3}}{2N_3}\right) whereRUij1, RUij2\ andRUij3 \ \ldots\ldots Rural -$

$Urban: Low,\ \ Medium, andHighincome$Household $respectively.$

Note; i and j refers to values relating to Jigawa and Kaduna states respectively; and N is the total number of respondents in the stated category/ region. However, the method of classification of household income was described in the sampling procedure of the study.

3.4.2 Inferential statistics

3.4.2.1 Chi-square analysis

This type of analysis was used extensively in this project to test for the relationships between one variable and the other. One of such use of Chi-square tests was on statement of hypothesis of no significant relationship between the income classes of households consuming local dairy products in rural and urban areas are not significantly different in Jigawa and Kaduna States. This test is performed by using a Chi-square test of independence of two categorical variables. It involved the summarization of two categorical variables within a two-way table, also called a r × c contingency table, where r = number of rows, c = number of columns. Also, question of interest such as "Are the two variables independent?" This question was set up using the following hypothesis statements; the null hypothesis that is the two categorical variables are independent and the alternative hypothesis that is the two categorical variables are dependent.

The $\chi^2 = \sum_j \frac{(O_j - E_j)^2}{E_j}$; $where \chi^2 = chi - square; O_j = observedvalue; and E_j$

$= expectedvalue.\ And\ where\ E$

$= \frac{row\ total * column\ total *}{sample\ size}$ ……(34)

The value of the chi-square test statistic χ^2 to the critical chi-square value of χ^2_α will be compared, with degree of freedom equal to product of (r-1) and (c-1), at 0.5 level of significance; and reject the null hypothesis if calculated test statistic chi-square is greater than the critical tabulated statistic chi-square that is $\chi^2 > \chi^2_\alpha$.

3.4.3 Multinomial Logit model

Multinomial logit model was used for analysis of households' local dairy products choices as a function of socioeconomic and demographic factors. Multinomial logit model describes the behavior of consumers when they are faced with a variety of goods with a common consumption objective. However, the goods and choices must be highly differentiated by their individual attributes.The multinomial logit model is a simple extension of the binary logit model. The multinomial logit model is the most frequently used model for nominal outcomes which are often used when the dependent variable is ordinal. In the survey, the questionnaires asked the respondents to indicate their choice of local dairy product consumption in the study area.

The responses, dependent variables were created from the data, which indicated the consumption of fresh milk (1), *kindirimo* (2), *Nono* (3), Yoghurt (4), Butter (5), and Cheese (6). Since the dependent variable has more than two choices, the multinomial logit regression model is most suitable to estimate the relationship such dependent and independent variables.

Multinomial logit model was used for analysis of households' local dairy products choices. According to the objectives of this research, multinomial logit model was used to analyze households' local dairies consumption decisions as a function of socioeconomic and demographic factors. Multinomial logit model describes the behavior of consumers when they are faced with a variety of goods with a common consumption objective. However, the goods and choices must be highly differentiated by their individual attributes.

Multinomial logit procedure was used to determine the extent to which selected socioeconomic and demographic characteristics of household head influence demands for the selected six main local dairy products. The general form of the multinomial logit model is according to Long (1997) and McFadden (1973) is to analyze households' local dairy products consumption behavior, we applied chi-square test of independence and multinomial logit model. Multinomial logit procedure was used to determine the extent to which selected socioeconomic and demographic characteristics of consumers influence these local dairy products types.According to the responses, dependent variables were created from the data, which indicated the consumption of butter, (0); fresh milk, (1); kindirimo, (2); nono, (3); yoghurt, (4); Cheese, (5). (Greene 2002).

The multinomial logit model for local dairy consumption preference is

$$Prob\ (Y_i = j) = \frac{e^{\acute{\beta} j x_i}}{\sum_{k=0}^{j} e^{\acute{\beta} j x_i}} for\ j\ 0,1,2,3,4,5, \dots, J. \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (35)$$

Where: iindex the observation, or individual, j and k index the choices, Y_i is the predicted probability of fluid milk consuming households selecting the J^{th} alternative, *xi* is a vector of variables including education level and age of household head, household size, having working housewife, presence of children less than seven years old, and household income and βj are vectors of unknown parameters.

The estimated equations provide a set of probabilities for the *J* +1 choice for a decision maker with characteristic x*i*. Before proceeding, we must remove indeterminacy in the Multinomial logit model which is under identified in the current form in Eq. (2). In order to identify the parameters of the model, it is required to remove indeterminacy in the model. We normalized the model assuming $\beta_0 = 0$ that is reference choice is "butter, (0)".

Eq. (35) can be expressed further as:

$$Prob\ (Y_i = jx_i) = \frac{e^{\acute{\beta} j_{x_i}}}{1 + \sum_{k=0}^{j} e^{\acute{\beta} j_{x_i}}} for\ j\ 0,1,2,3,4,5, \dots, J\ and\ \beta_0 = 0 \quad \dots\dots\dots\dots\dots\dots\dots (36)$$

Multinomial logit model (36) can be estimated by the maximum likelihood method. The coefficient estimates for the βj vectors that maximize the log likelihood function can be obtained using the Newton method using LIMDEP computer software (Greene, 2002) of Stata 11 package. Estimated coefficients β do not allow direct determination of marginal effects in multinomial logit models but measure the marginal change in the logarithms of odds alternatives *j* over the reference alternative. The coefficients in Eq. (36) are difficult to interpret. The marginal effects and predicted probabilities give better indications and represent changes in the dependent variable for given changes in a particular regressor whereas holding the other regressors at their sample means. These are obtained from the logit regression results by the following equation (Greene, 2002):

$$\delta_j = \frac{\partial P_j}{\partial x_i} = P_j \left[\beta_j - \sum_{k=0}^{j} P_k \beta_k \right] = P_j \left[\beta_j - \bar{\beta} \right] \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (37)$$

Analysis of variation on dairy products consumption across household's socio-demographic characteristics gives estimates of the multinomial models analysis that test the relationship between the probability of consuming each of the six major local dairy products and as described by the model. The following dichotomous ("dummy") socio-demographic

variables: (1) “Urban”, which takes value 1 if the household is located in an urban area and value 0 if located in a rural area; (2) “Western education”, which takes the value 1 if the household is at least holder of primary school leaving certificate and up to holder of tertiary institution certificate; and 0 otherwise; (3) “married”, which takes the value 1 if the household head in marriage and 0 otherwise; (4) “Male”, which takes the value 1 if the head of household is a man and “Female”, which takes the value equals 0, if the head of household is a woman; (5) “Young”, which takes the value 1 if the age of head of household is lesser age than 40 years and the value 0 otherwise; (6) “Larger” which takes the value 1 if the family size is large and the value 0 otherwise; (7) Non-poor which takes the value 1 if the head household monthly income and socio-economic status is high and 0 if the head household monthly income and socio-economic status is considered to be low and under that the of poverty line1. The McFadden psendo-R^2 is also an accompanying result from Stata 11 output and its value indicates the robustness of the multinomial logistic model estimates as it gets closer to 0.5; and at 1% level of probability.These variables are common variables that have been used in previous papers (Cornick et al., 1994, Gould, 1996, Hatirli et al., 2004, Hsu, Kao, 2001, Watanabe et al., 1997, Bus, Worsley, 2002, Akbay, Yildiz Tiryaki, 2008, Kilic, O., Akbay, C., Yildiz Tiryaki, G.,2009, Lefevre, 2011). The model is estimated using Stata Package.

3.4.4 Almost ideal demand system (AIDS)

Almost Ideal Demand Systemof Deaton and Muellbauer (1980) was selected as the specification for the demand system. Among the models which have been proposed to analyze consumption patterns, the Rotterdam model and the Translog model have been frequently used in the past (Feng and Chern, 2000). Nevertheless, the Almost Ideal Demand System (AIDS) proposed by Deaton and Muellbauer, (1980) is widely used in recent years

and has considerable advantages over both the Rotterdam and Translog models. It “gives an arbitrary first- order approximation to any demand system; satisfies the axioms of choice exactly; aggregates perfectly over consumers without invoking parallel linear Engel curves; has a functional form which is consistent with known household-budget data; simple to estimate, largely avoiding the need for non-linear estimation; and can be used to test the restrictions of homogeneity and symmetry through linear restrictions on fixed parameters” (Deaton and Muellbauer, 1980).

The AIDS demand system was used because of its flexibility and linearity and because it is a complete system subject to restrictions to satisfy the conditions of adding up, homogeneity, and symmetry. The AIDS demand relations, in budget-share form, hypothesizes that the portion of total expenditure that accrues to a particular commodity (or budget share) is related to prices and income.

3.4.5 Linear approximate almost ideal demand system (LA-AIDS)

This demand system was adopted and was use to achieve objectives five (v) and six (vi) of the study. This work was patterned to the work of Erhabor and Ojogbo (2011) in which they used LA-AIDs based on Deaton and Muellbauer (1980) to model rice consumption in three states of Nigeria. Other studies that have used LA-AIDS include; Chernet al., (2002)studied foodconsumption behaviour ofJapanese households. They analyzedthefood consumptionpatterns applyingLinear AlmostIdealDemand System (LA/AIDS)andnon-linearAlmostIdealDemandSystem(AIDS).They foundthatthe expenditureelasticity ofricewaspositiveandclosetoone,thisprovesthatriceconsumedin Japan isnormalgoods, and alsoMarshallian uncompensated andHicksiancompensated own- price elasticities for riceis highlyelastic.

Also, Zhuangand Abbott (2007) worked on Priceelasticitiesof keyagricultural commoditiesin China and study the relevant domestic andtrade elasticitiesforthe Chinesemarket and testthe hypothesis thatChina has marketpower in agricultural trade. Using the annualtimeseries d a t a for theperiod 1978-2001 and using LA/AIDSmodel they found that Chinahasmarketpowerinthetrade forwheat,rice, corn,pork,andpoultry meat.

Theestimated own-price elasticities for all commodities were relevantwithprevious studies andthe estimation approachwas appropriate for agricultural policyanalysis. Also, LeQuang (2008)studiedfooddemandinVietnambyusing alinearapproximation ofAlmost IdealDemandSystem(LA-AIDS),anextended AIDSmodel.He estimatedincomeandprice elasticitiesfor threedifferentcomponentsoffoodcategoriesandfoundthatricefoodand meat/fishfood were normalgoodswhilenon-rice food wasluxury. Again, Shengetal.,(2008) estimatedacomplete demandsystemoffoodinMalaysiaby usingLinearApproximate AlmostIdealDemand System (LA/AIDS)withincorporationof Stoneprice indexand Laspeyres priceindex.

Theresult showed that theapplication of Laspeyres priceindex producedmoreplausibleestimateofexpenditureandown-priceelasticity inMalaysiaand consumers areseekinghigh protein value food,as wellfunctionallyhealthyfoods. Furthermore, Armagan and Akbay (2008) performed an econometric analysisofurban households'animal product consumption pattern in in Aydin province Turkey. They estimate thedemandparameters and elasticities using LA-AIDS and obtained own-price elasticities which were negative and significant. Furthermore, they found that expenditure elasticity was significant with only meat andfish. Also, they found that price elasticity was higher than one onlyfor meat. Furthermore, Islam and Jabber (2010) analyzed the consumer preference

and demand for livestock products in urban Bangladesh 2010.

They analyzed and found the natureofpreferencefor different livestock productsand demand for different livestock products within the households' budget. They analyzed the household surveydata using LA-AIDSmodel on demand for qualityand safety of livestock products. They estimated household expenditure and showedthatthedemand forfoodwas unitary elasticinthemajorurbanareas in Bangladesh. Also, they found that there are high own-price elasticitiesforfish,cereals and vegetables. Moreover, Ulubasoglu et al., (2010), also analyzed the consumer behaviour forfood demand.in the households and. They found the estimates ofown-price,cross- priceandexpenditure elasticities in household expenditure survey from 1998/99 and 2003/2004 using LA/AIDSmodel. All possible items of different food categories wereanalyze.

However, conventional milk consumption studies tend to approach milk as a homogenous product in which different types of milk products are lumped together (see Deaton and Muellbauer, 1980). Nowadays studies rely on income and price to explain consumption behaviour, and any unexplained change in behaviour is assumed to be a result of sensorial characteristics such as taste and colour (Lusk, Roosen and Shogren; 2011). However, there is an increasing realization that, besides sensory characteristics, consumers also depend on information generated from other product quality characteristics including health attributes in particular (Grunert, Bech-larsen and Bredahl; 2001). A new wave of studies addressed this limitation of the conventional theory by developing a disaggregated approach, in which consumer's response to price and non-price attributes are integrated.

In this work, the complete demand functions for local dairy products and associated food

commodities and their elasticities were estimated given the assumption that consumers allocate their expenditure in two stages. In the first stage, the consumer decided how much to spend on each broad category of food. Allocation of expenditure on individual groups was determined by consumer's total income and group price index (Hein and Pompelli, 1989). In the same vein, the second stage which assumed weak separability of the direct utility function (Fan *et al.,* 1995), the group expenditure was allocated among the various commodities in that group. The model used, in generic budget share form is given as;

$$w_i = \alpha_i + \sum_{i=1}^{n} \gamma_{ij} \ln p_j + \beta_i \ln\left(\frac{m}{P}\right) + u_i \ldots where \ldots . i = 1, \ldots , n \ldots \ldots \ldots \ldots \ldots \ldots (38)$$

where w_i (≥ 0) is the budget share of food product i, p_j is the price of food commodity j, m is the total expenditure on food commodity in question, U_i's are random disturbances assumed with zero mean and constant variance, and P is a translog price index which was defined below.

Also, the explicit form of equation (38) above is given in the Appendix for the budget shares of the 16 categories of food groups considered in this research. And where w_i is average budget share of commodity *i* consumed by an household given by $w_i = \left(\frac{P_i Q_i}{X}\right)$; p_i is the weighted average price of items in group jth; Q_i is the quantity of goods in the group jth; x, is the total expenditure on the group of goods being analyzed; u_i, is the random error term; α, is the constant coefficient in the share equation representing the value of the budget share in the absence of income and price effects; γ, is the price coefficients or the slope of coefficient associated with any commodity's share equation; β, is the expenditure coefficient of commodity, *m* is total expenditure on all commodity; p_j is the price of the *j*th good; i.e.$p_1 - p_{16}$ equals the respective scaled up market prices of the budget shares for the 16 categories of food groups w_1 - w_{16}as earlier stated**.** *P* is the price index. However, in order to achieve a

linear equation, according to Deauton and Muellbauer (1980), *P*, a stone price index was used and given by;

$$\ln P = \alpha_o + \sum_{i=1}^{n} a_i \ln p_i + \frac{1}{2}\sum_{i=1}^{n}\sum_{j=1}^{n} \gamma_{ij} \ln p_i \ln p_j \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (39).$$

Furthermore, the age structure of the population and various other demographic factors that has been said by Heien and Wessells, (1988) to influence food demand was incorporated into the specified AIDS model by method of demographic translation rather than the widely used demographic scaling. This according to Pollak and Wales (1981) preserves the linearity of the system, whereas scaling is a highly nonlinear specification. This is given by;

$$\alpha_i = \rho_{io} + \sum_{k=1}^{s} \rho_{ik}\, d_k, \quad where \ldots\ldots\ldots\ldots\ldots i = 1, \ldots . . n \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (40)$$

where ρ_{io} and the ρ_{ik}'s are the estimated parameters and the d_k are the demographic variables, of which there are s. Socio-economic and demographic characteristics of the respondent household head that were included were age, sex, marital status, household size, level of education of household head and level of income. The dependent variables which are the budget shares for the 16 categories of food groups was specified as either zero (0) or some positive amount for each household. Those shares that are 0 was censored by an unobservable latent variable that induced the decision of not to purchase that particular item within the survey period. The decision to buy or not to buy was indicated by a binary indicator variable, which is a function of the latent variables and was estimated as a probit model (Lee, 1978). The assumptions underlying this model (and its proofs) was that the error terms from the model are approximately normal with zero means and a finite variance-covariance matrix that was constant over all observations that is, iid.

As described above, the estimation procedure involved two steps. First, a probit regression Y_{ih} was computed and the probability that a given household consumed the good in question was determined. This regression was then used to compute the inverse Mills ratio for each household. The inverse Mills ratio was then used as an instrument that incorporates the censoring latent variables in the second-stage estimation of the demand relations. Note that in the first stage, the decision to consume was modeled as a dichotomous choice problem.

$$Y_{ih} = f(p_{1h}, \dots . p_{nh}, m_h, d_{1h}, \dots ., d_{sh}) \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (41)$$

where$Y_{ih}$is 1 if the h^{th} household consumes the i^{th} food item, (i.e., if $w_{ih}>0$); and 0 if the household does not consume the item in question. In addition, food expenditure m_h is included in the specification, since Jackson (1984) showed that variety is an increasing function of income, and was proxied by expenditure. The model given by (41) was estimated using the probit technique for each of the 16 items in the food budget. For the *i*th food item and for the *h*th household, which consumes the item, the inverse Mills ratio was specified as;

$$R_{ih} = \frac{\phi(P_h, d_h, m_h)}{\Phi(P_h, d_h, m_h)} , \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . (42).$$

This was computed, where P_h was a vector of prices for the h^{th} household, m_h is the total expenditure per household, d_h was a vector of the demographic variables for the h^{th} household, and ϕ and Φ, were the density and cumulative-probability functions, respectively. For those households who do not consume the item in question, the inverse Mill ratio was specified as;

$$R_{ih} = \frac{\phi(P_h, d_h, m_h)}{\left(1 - \Phi(P_h, d_h, m_h)\right)} , \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . \dots \dots \dots \dots \dots \dots \dots (43).$$

The inverse Mills ratio for each item was then used as an instrumental variable in the second stage regression represented in equation (42), where m_h is the total expenditure per

household, β_i is the expenditure coefficient, ρ_{io} is the value of the budget share in the absence of price, income and demographic effects and γ_{ij} is price coefficients or the slope coefficient associated with any commodity in any other commodity's share equation.

$$w_{ih} = \rho_{io} + \sum_{k=1}^{s} \rho_{ik} d_{kh} + \sum_{j=1}^{n} \gamma_{ij} \ln p_{jh} + \beta_i \ln\left(\frac{m_h}{P_h}\right) + \delta_i R_{ih} + U_{ih}, \ldots\ldots\ldots (44)$$

where, following Deaton and Muellbauer (1980);

$$P_h = \sum_{i=1}^{n} w_i \ln p_{ih}, \ldots\ldots\ldots (45)$$

wherep_i is the price of the ith commodity for the hth household and was used as an approximation to (36) so that the estimation can remain linear. The system share equations provides a seemingly regression model.

However, equation (38) was the specification used to estimate the demand relations. The specification given by (38) pertains only to the first (*n* – 1) demand relations. It is well known that the variance-covariance matrix of error terms for the complete *n* equation demand system should be singular due to the adding-up property. Deleting one of the equations becomes the normal procedure, since the parameters for that relation can be computed residually from the others. In line with Pollak and Wales (1969) showed that the estimates was invariant to which good that was dropped; if all *n* relations are specified however, according to (38), the system will not add up. If all *n* equations were specified according to (38); adding up will require that $\sum_{j=1}^{n-1} \delta_j R_{jh} = 0$. Since R_{ik} can take on any value, such a restriction is restrictive in general.

To preserve the adding-up property, the *n*th (deleted) relation was specified as;

$$w_{ih} = \rho_{io} + \sum_{k=1}^{s} \rho_{ik}\, d_{kh} + \sum_{j=1}^{n} \gamma_{ij} \ln p_{jh} + \beta_i \ln\left(\frac{m_h}{P_h}\right) - \sum_{j-1}^{n-1} \delta_j R_{jh}, + U_{ih} \ldots\ldots (46)$$

The price and expenditure elasticity was derived from the parameter estimates of the model and the Marshallian demand elasticities were computed as follows;

$$\varepsilon_{ij}^{M} = -\delta_{ij} + \left(\frac{\gamma_{ij}}{w_i}\right) - \frac{\beta_i w_j}{w_i} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (47)$$

where, δ_{ij} is the Kronecker delta $\left(\delta_{ij} = 1\ for i = j and \delta_{ij} = 0\ for i \neq j\right)$ while the Hicksian demand elasticities were computed using:

$$\varepsilon_{ij}^{H} = -\delta_{ij} + \left(\frac{\gamma_{ij}}{w_i}\right) - \frac{w_i w_j}{w_i} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (48)$$

And the expenditure elasticities, computed using:

$$\eta_i = 1 + \left(\frac{\beta_i}{w_i}\right) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (49)$$

where equations(47), (48), $and (49)$represents own-price, cross-price and expenditure elasticity respectively.

Again, the following restrictions of economic theory were imposed on the model:

Adding up;

$$\sum_{i=1}^{n} \alpha_i = 0; \sum_{j-1}^{n} \gamma_{ij} = 0, j = 1, \ldots\ldots, n; \sum_{j-1}^{n} \beta_i = 0; \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (50)$$

Homogeneity;

$$\sum_{j-1}^{n} \gamma_{ij} = 0, i = 1, \dots \dots, n; \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . \dots \dots . \dots \dots (51)$$

and Symmetry;

$$\gamma_{ij} = \gamma_{ji} \dots \dots . . for \dots all \dots i, j(i = j). \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . . . . \dots \dots (52)$$

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Socio-Economic Characteristics of Heads of Household Consuming Local Dairy Products in Jigawa and Kaduna States, Nigeria.

Household consumption of local dairy products is often influenced by some socio-economic factors. The identified socio-economic factors of the sampled heads of households in the study area include: age, sex, marital status, family size, educational status and income status.

4.1.1 Age of the household heads

The age distribution of the household heads is as presented in Table 2. The majority (42% and 50%) of respondents in rural areas of Jigawa and Kaduna states respectively has a mean age of 36 years. Most respondents in urban Jigawa and Kaduna states representing 50% and 42% respectively are of the mean age of 46 years old. However, about 33% of household heads residing in Jigawa state (rural and urban areas) and about 29% of household heads living in Kaduna state (rural and urban areas) were of average age of 46 years and 36 years old respectively. Therefore, the result implied that most of the household heads are young adults especially in the rural areas of both states. For the pooled rural–urban Jigawa and Kaduna states indicated that average respondents in Jigawa state was 10 years older than their corresponding respondents in Kaduna state. This finding is in agreement with position of Mamman, Wudi and Halliru (2014) that 78.5% of the farming household heads in Jigawa state are within the age group of 25-54 with mean age of 49 years; which suggests active productive stage. When the pooled age in the entire study area was considered, over 58% of the respondents were 40 years old. Also, youthful populations are more likely to prefer to consume local dairy products because it is purchased as ready to serve food needless of further cooking, processing or preparations, that waste time. This narrative from

enumerated respondents on youthful age mannerism on food consumption has been largely supported in most literature. Most respondents alluded to this fact and explained that most of the local dairy products are energy laden foods that supply instant energy and replenishment during and after hard works with great drudgery such as plowing, ridging and other energy sapping jobs, as it readily refresh these workers of lost energy. This finding was supported by Neumark-sztainer, Story, Perry and Casey(1999) as they revealed that individuals belonging to younger age groups often prefer to spend less time in food preparation.

Again, that they are more inclined to prefer ready-to consume, processed, frozen, or canned fruits, vegetables and dairy products for convenience. Again, Ong, Kitchen and Jama (2008); and Rezai, Mohammed, Shamsudin and Chiew (2011); stated that Malaysian consumers between the age of 20 and 40 years old purchase more organic and “healthy” food like local dairy products while consumers aged 65 and over, were found to spend relatively more on beverages and tobacco products.

Table 2: Distribution of the household heads according to age.

Region	Age group per state (years)	Number of Respondents			Percentage		
		Jigawa	Kaduna	Pooled	Jigawa	Kaduna	Pooled
Rural	21-30	20	10	30	16.67	8.33	12.50
	31-40	50	60	110	41.67	50.00	45.83
	41-50	20	10	30	16.67	8.33	12.50
	51-60	20	30	50	16.67	25.00	20.83
	61-70	10	10	20	8.33	8.33	8.33
	Total	120	120	240	100	100	100
Urban	21-30	10	20	30	8.33	16.67	12.50
	31-40	20	10	30	16.67	8.33	12.50
	41-50	60	50	110	50.00	41.67	45.83
	51-60	10	20	30	8.33	16.67	12.50
	61-70	20	20	40	16.67	16.67	16.67
	Total	120	120	240	100	100	100
Pooled	21-30	30	30	60	12.50	12.50	12.50
	31-40	70	70	140	29.17	29.17	29.17
	41-50	80	60	140	33.33	25.00	29.17
	51-60	30	50	80	12.50	20.83	16.67
	61-70	30	30	60	12.50	12.50	12.50
	TOTAL	**240**	**240**	**480**	**100**	**100**	**100**

Source; survey data 2018.

4.1.2 Sex of respondents

The result shown in Table 3 shows that in rural areas of Jigawa and Kaduna states, there were respectively more heads of households being male (73%) and (75%) than female 28% and 25%. Similarly in urban areas of Jigawa and Kaduna states, there were respectively more

heads of households being male (74%) and (73%) than female 26% and 28%. In the same vein, when the rural and urban areas of Jigawa and Kaduna states are being pooled, there are respectively more heads of households being male (73%) and (74%) than female 27% and 26%.

Most of the respondents commented that men are mostly the chief accounting officers of their homes in these localities. Anecdotal evidences put it that the men are expected to work and provide resources to ensure food is available at home, and to meet other vital family obligations like providing family security, paying for education of family members; and ultimate decision making in the home. Some findings including, Brush, Bruin and Welter (2009); Mordi, Simpson, Singh and Okafor, (2010); and Garba, (2011); are in line with this view but that in some society, women do assume complementary role in managing and providing basic needs of their family, while in some instances their role is only supplementary where they are historically restricted to home chores or family up keep. Akinleye (2009) in particular, described the household head in north western Nigeria as being patrilineal and mostly headed by male household head. Further, several studies revealed that gender and the presence of children in the house influence food purchasing decisions. Malaysian men were found to spend more than women on food and beverages away from home (Ong *et al.*, 2008).

Radam, Yacob, Siew Bee and Selamat 2010) found that females are generally more health-conscious than men and for households with children less than 12 years of age were generally less concerned about price and more interested in purchasing safe and wholesome food. Studies in other countries found that women are significantly more likely than men to purchase and consume organic food (Quah and Tan, 2010). Conversely, women are more

likely to consume full cream milk daily because they often use full fat whole milk in preparation of food recipe. Although previous studies contend that women are more health conscious than men, taste-nutrition trade-off appears to be driven also by educational achievement. Women were found to be less educated than men but were more likely to prefer and consume less-healthy sweetened condensed or full creamed milk daily. Norimah *et al.*, (2008) suggest that this difference is likely due to women being less knowledgeable than men about potential health benefits of consuming milk.

Table 3: Distribution of respondents according to sex

Region	**Sex of Respondents in Study Area.**	**Number of Respondents**			**Percentage**		
		Jigawa	Kaduna	Pooled	Jigawa	Kaduna	Pooled
Rural	Male	87	90	177	72.50	75.00	73.75
	Female	33	30	63	27.50	25.00	26.25
	Total	120	120	240	100	100	100
Urban	Male	89	87	176	74.17	72.50	73.33
	Female	31	33	64	25.83	27.50	26.67
	Total	120	120	240	100	100	100
Pooled	Male	176	177	353	73.33	73.75	73.54
	Female	64	63	127	26.67	26.25	26.46
	TOTAL	**240**	**240**	**480**	**100**	**100**	**100**

Source; survey data 2018

4.1.3 Marital status of respondents

The results revealed in Table 4 show the marital status of an average household head in the study area. It revealed that 73%, 56% and 65% of heads of household in rural areas of Jigawa, Kaduna and of the pooled data respectively were married. Similar result was shown

in Table 3; for urban area of Jigawa and Kaduna states where an equivalent 73%, of heads of the household are married for the two states and for the pooled data respectively.

However, only a few, 19% and 13% of the respondents were single in the respective urban areas of Jigawa and Kaduna states. For most married household heads, the likelihood is that, they might benefit from an additional person who can help in making informed decisions about food purchases and consumption in the households. Women can better advice their spouses on buying specific commodity cheaply at specific weekly markets days. Also they can advise on bargaining strategies and on information about a particular market and the prevailing market prices. This information can easily be obtained from other women folks. Their advice could also be on speculative buying in bulk of some commodities, resulting in savings against the rainy days. Thus, there will be more income savings among married couples, ceteris paribus. This finding was in line with Mamman *et. al.,* (2014), as they revealed that majority (82%) of the respondents among farming households in Jigawa state were married. They are the most likely consumer product in the household.

However, results shown in Table 4 also showed that fewer singles (17%) relative to the married respondents 69% for pooled urban Jigawa and Kaduna are heads of households. The singles usually are not known for preparing food but prefer to buy already prepared food away from home such food as local dairy products. Therefore policy on food nutrition on local dairy product should cognizance of the marital status of household heads appropriate policy. Sekhampu (2012) stressed that marital status of respondents was negatively associated with food expenditures in South Africa. The negative parameter indicates that with other variables kept constant, married respondents spend relatively less amount of money on food than their unmarried counterparts. This implied that the married households are more shrewd

in buying commodities, and are often speculative in buying; than singles that buy same quantity per meal at impulse and at higher price.

Table 4: Distribution of Respondents according to Marital Status

Region	Respondents Marital status in study area	Number of Respondents			Percentages		
		Jigawa	Kaduna	Total	Jigawa	Kaduna	Total
Rural	Married	88	67	155	73.33	55.83	64.58
	Divorced	6	16	22	5.00	13.33	9.16
	Single	18	24	42	15.00	20.00	17.50
	Widow	5	11	16	4.16	9.16	6.66
	Widower	3	2	5	2.50	1.66	2.08
	Total	120	120	240	100.00	100.00	100.00
Urban	Married	87	88	175	72.50	73.33	73.00
	Divorced	2	3	5	1.67	2.50	2.08
	Single	23	15	38	19.17	12.50	15.83
	Widow	4	12	16	3.33	10.00	6.66
	Widower	4	2	6	3.33	1.67	2.50
	Total	120	120	240	100.00	100.00	100.00
Pooled	Married	175	155	330	72.91	64.58	68.75
	Divorced	8	19	27	3.33	7.92	5.63
	Single	41	39	**80**	17.08	16.25	16.67
	Widow	9	23	**32**	3.75	9.58	6.67
	Widower	7	4	**11**	2.92	1.66	2.29
	TOTAL	**240**	**240**	**480**	**100.00**	**100.00**	**100.00**

Source; survey data 2018

4.1.4 Household size of respondents

The result indicated in Tables 5 show that majority (50%) of heads of households in rural areas of Jigawa states have an average household size of 12 people. While the majority (50%) of his Kaduna state counterpart has an average household size of 7 people. However, when the data for rural area in the two states were pooled together, the average household size was 9 as shown by the majority (59%) of rural dwellers heads of households. The result revealed

in Table 5 also show that majority (38%) of heads of households in urban area of Jigawa state have an average household size of 8 people. While the majority (54%) of his Kaduna state counterpart has an average household size of 8 people. However, when the data for urban area in the two states were pooled together the average household size was 8 people as shown by the majority (46%) of urban dwellers heads of households.

Further, when the data for rural and urban Jigawa state were pooled together, the average household size was 11 as shown by the majority (40%) of heads of household. When the data for rural and urban Kaduna state were pooled, the average household size was 7 people as shown by majority (52%) of the people. However, when the data for rural, urban Jigawa and Kaduna states were pooled, the average household size was 8 people as shown by majority 38% there.The above result show a considerable spread of people in household in rural, urban Jigawa and Kaduna state consuming local dairy products. However, anecdotal evidence suggested that families with larger household size especially with adults will most probably consume more local dairy products. Rehman *et al.*, (2014) in a related study reported that consumption of pulses is expected to rise with adult equivalent. Thus local dairy products consumption is not only dependent on the household size, but also on the age distribution I the household.

Table 5: Distribution of respondents according to household size

Region	Household size	Mean Household size	Number of Respondents			Percentage		
			Jigawa	Kaduna	Total	Jigawa	Kaduna	Total
Rural	0-4	9	10	20	30	8.33	16.67	12.50
	5-9		12	60	72	10.00	50.00	30.00
	10-14		60	10	70	50.00	8.33	29.17
	≥15		38	30	68	31.67	25.00	28.33
	Total		120	120	240	100	100	100
Urban	0-4	8	10	30	40	8.33	25.00	16.67
	5-9		45	65	110	37.50	54.17	45.83
	10-14		35	15	50	29.17	12.50	20.83
	≥15		30	10	40	25.00	8.33	16.67
	Total		120	120	240	100	100	100
Pooled	0-4	8	20	50	70	8.33	20.83	14.58
	5-9		57	125	182	23.75	52.08	37.92
	10-14		95	25	120	39.58	10.42	25.00
	≥15		68	40	108	28.33	16.67	22.50
Total			**240**	**240**	**240**	**240**	**480**	**100**

Source; survey data 2018

4.1.5 Respondents' level of education

The result presented in Table 6 shows that the majority, (about 60%) of heads of local dairy products consuming households in rural areas of Jigawa and Kaduna states has no formal education while more than 73% of heads of local dairy products consuming households in urban areas of Jigawa and Kaduna states has formal education. Although greater population of households consuming local dairy products resides in the rural areas, but with respondent's here being educationally disadvantaged, was a factor constraining them of great financial prosperity, and are thus with low purchasing power parity to buy but little and less of quality local dairy products.

As implied in literature by Adegboye (2016), the low educational attainments and rural characters of people are mirrored in the geographical distribution of poverty. He explained that the poverty situation in the country varies from one geographical location to another and noted that the northern states which are substantially rural have had less exposure to education and expresses more poverty than other parts of the country. Invariably, the northern states are referred to as consist of mainly people of low socio-economic status. Sekhampu, (2012), opinion also buttress on the fact that where the head of household has more education, he spends more on quality food than their less educated counterparts. Thus the educational attainment of household heads might be a good proxy for efficiency in food purchasing in the homes.

Again, as consumers become more educated they tend to become more conscious about health and wellness issues related to food choices and diet (Quah & Tan, 2010). Among other factors, education is a driving shifts in Asian diets away from starch-based staples (e.g. rice) and increasing demand for wheat-based staples, meat and dairy products as well as fruits and vegetables (Prescott *et al.*, (2002); Warr, Rodriguez & Penm, (2008)); Erhabor and Ojogho (2011) as well as Emodi, and Madukwe .(2011) also reported similar findings and observed that high income and educational attainment of respondents are some of the features associated with household demand in urban areas.

Table 6: Distribution of respondents according to their level of education

Region	Education of respondents in study area	Number of Respondents			Percentage		
		Jigawa	Kaduna	Pooled	Jigawa	Kaduna	Pooled
Rural	No formal education	35	37	**72**	29.17	30.83	30.00
	Quranic	35	36	**71**	29.17	30.00	29.58
	Primary	28	22	**50**	23.33	18.33	20.83
	Secondary	15	16	31	12.5	13.33	12.91
	Tertiary	7	9	16	5.83	7.50	6.66
	Total	120	120	240	100	100	100
Urban	No formal education	11	12	23	9.17	10.00	9.58
	Quranic	16	20	36	13.33	16.67	15.00
	Primary	30	28	58	25.00	23.33	24.16
	Secondary	32	33	65	26.67	27.50	27.08
	Tertiary	31	27	58	25.83	22.50	24.16
	Total	120	120	240	100	100	100
Pooled	No formal education	46	49	95	19.17	20.42	19.80
	Quranic	51	56	107	21.25	23.33	22.29
	Primary	58	50	108	24.17	20.83	22.50
	Secondary	47	49	96	19.58	20.42	20.00
	Tertiary	38	36	74	15.83	15	15.42
Total		**240**	**240**	**480**	**100**	**100**	**100**

Source; survey data 2018

4.1.6 Respondents income class

The result shown in Table 7 show the distribution of respondents based on their income class per month. Majority of households in rural part of Jigawa 58%, Kaduna 67% and of the pooled data 63%, were of low income class with average income of ₦15,000.00 close to the old Nigerian minimum monthly income of ₦17,500.00 per month. Owing to inflation and low purchasing power of the naira, such level of income is really not sufficient to make any appreciable exchange and purchases to meet basic family needs; including the purchase of local dairy products.

The income class of the urban dwellers for majority of heads of households in Jigawa 50%, Kaduna 67% and of the pooled data 58%, falls within the middle income class bracket with mean amount being ₦67,500.00 per month. This income is really too small for a middle class status with several economic challenges and bills to pay, that characterize the urban living and considering the current harsh economic challenges in Nigeria, including inflation and naira devaluation challenges facing the Nigerian economy. Such a pay, is just being managed by the households mostly to provide basic foods and for consumption of lowly priced food commodities like local dairy products.

Nevertheless, for the two states, the pooled data showed that about half of the respondents, 49% are of low income class with a mean income of ₦49,500.00 per month; while a considerable proportion, 45% of the remaining respondents are in the middle income group of monthly average income of ₦53,650.00 per month. This portends that majority of respondents are in lower middle income class and thus are more likely than their southern counterparts to consume more of the low priced food commodities such as the lowly priced local dairy products in the study area. This findings is in line with the notion that more than 4 out of every 10 Nigerian live in conditions of extreme poverty of less than three hundred and twenty naira per capital per day, which will barely provide for a quarter of nutritional requirements for healthy living (Mafimisebi, 2002). It is also in line with recent NBS (2019) poverty and inequality in Nigeria report, which highlights that 40% of total population, or almost 83 million people lives below the country's poverty line of 137,430.00 naira ($381.75) per year.

The result also corroborate with the assertion that in the six geo-political zones of the country 74% of people in the North-West were poor, living on less than one dollar a day; 78% in the

North-East and 70% in North Central; in contrast to 28%, 30% and 23% for South-West, South-South and South-East respectively (Barau, 2009). Household income is important as it determines how much can be spent on various needs of the household. The quantity and quality of a household's food consumption pattern are highly correlated with the purchasing power of the household. As a result of very low income, rural dwellers find it difficult to meet their requirement for balanced diet (Ishida *et al.,* 2003).

Also, Mohammed *et. al*., (2014) reported that there was high prevalence of dairy product consumption among the northern populace; supporting Jansen (1992) who reported 100 percent consumption prevalence for dairy products in northern Nigeria especially of the traditional types. Also, Akinyosoye (2014) reported that all the dairy products (fresh milk, powdered milk, tinned milk and others like ice cream, butter, cheese and yogurt) are consumed across Nigeria. Further, that an average household in northern Nigeria consistently out-spend their southern counterparts on the consumption of locally processed dairy products such as fresh milk, sour milk, with the reverse being the case on the consumption of processed dairy products such as powdered milk, tinned milk, ice cream, butter, cheese and yoghurt.

Table 7: Distribution of respondents according to class of income

Region	Income class	Income level	Mean income	Jigawa	Kaduna	Pooled	%Jigawa	%Kaduna	%Pooled
	Low	₦ 0 - ₦50,000	₦ 15,000	70	80	150	58.33	66.67	62.50
	Middle	₦ 51,000 - ₦ 100,000	₦ 52,000	45	30	75	37.50	25	31.25
	High	>₦ 100,000	₦ 108,000	5	10	15	4.17	8.33	6.25
Rural		Total		120	120	240	100	100	100
	Low	₦ 0 - ₦50,000	₦ 30,000	50	35	85	41.67	29.17	35.42
	Middle	₦ 51,000 - ₦ 100,000	₦ 67,500	60	80	140	50	66.67	58.33
	High	>₦ 100,000	₦ 150,000	10	5	15	8.33	4.17	6.25
Urban		Total		120	120	240	100	100	100
	Low	₦ 0 - ₦50,000	₦49,500.00	120	115	235	50	47.92	48.96
	Middle	₦ 51,000 - ₦ 100,000	₦ 53,650	105	110	215	43.75	45.83	44.79
	High	>₦ 100,000	₦ 120,000	15	15	30	6.25	6.25	6.25
Pooled		**Total**		**240**	**240**	**480**	**100**	**100**	**100**

Source; survey data 2018

4.1.6.1 Analysis of Chi-square distribution of household income class in rural and urban areas

The result indicated in Table 8 showed the distribution of chi-square analysis of household income class in rural and urban areas. Since the calculated chi-square value of 37.6 is greater than the Chi-square table value of (5.99) at 5 percent level of probability and (2) degree of freedom, we reject the earlier stated null hypothesis H_{o2}: The income classes of heads of household consuming local dairy products in rural and urban areas are not significantly different; and accept the stated alternative hypothesis H_{a2}: which stated that the income classes of heads of household consuming local dairy products in rural and urban areas are significantly different.

Table 8 Chi-Square distribution on household income classification in rural and urban regions.

S/n	Variables	Low Income	Medium Income	High Income	Total
1.	**Rural Areas**	150	75	15	**240**
	Expected Frequency	117.5	107.5	15	
2.	**Urban Areas**	85	140	15	**240**
	Expected Frequency	117.5	107.5	15	
	Total	**235**	**215**	**30**	**480**

Source; survey data 2018

*ChiSq = 9 + 9.8 + 0 + 9 + 9.8 + 0 = 37.
DF = 2, P-value = 0.05, Chi SqTab. = 5.99

4.2 Consumption Prevalence and Preference Structure of Local Dairy Product

The study revealed the nature of local dairy products consumptions prevalence and consumption preferences by stated reasons.

4.2.1 Consumption prevalence of local dairy products in rural and urban areas

The result shown in Table 9showed the consumption prevalence of local dairy products in rural and urban areas of Jigawa and Kaduna states. It showed that relative to other local dairy products, *kindirimo* was the most widely consumed local dairy products in rural areas of Jigawa and Kaduna states with respondents reporting 40% and 35% respectively. This percentage difference (slight though) explained by how much the households in rural Jigawa state consumed *Kindirimo*, than those in rural Kaduna state. Again, when data from the rural area in the two states were pooled, *kindirimo* remain the most widely demanded (37%) local dairy product in these rural localities.

In urban areas of Jigawa state *Nono* (36%), was shown as the most widely consumed local dairy product than *Kindirimo* (27%); but in Kaduna state, Kindirimo remain the most widely consumed local dairy product (25%), than *Nono* (19%) in urban areas of Kaduna state as shown. However, when the data from the urban centres of these states were pooled, an equal response (26%) was reported for both *Kindirimo* and *Nono* consumption prevalence there. Nevertheless, when the entire rural and urban areas of the two states were pooled, majority of the respondents in Jigawa state revealed that *Nono* (36%) was the most widely consumed local dairy product, as much more than *Kindirimo* (33%). A contrary response was obtained in the pooled rural and urban Kaduna state where respondents indicated that *Kindirimo* (28%) was more widely consumed than *Nono* (20%). The pooled data and regardless of whether rural or urban, indicated more widespread demand for *Kindirimo* (31%) than *Nono* (27%); but demand for *kindirimo* and *nono* surpasses that for other local dairy products in the area.

Table 9: Distribution of respondents based on rural and urban consumption of local dairy products in the study area

Region	Preferred Dairy Product	Number of Respondents			Percentage		
		Jigawa	Kaduna	Pooled	Jigawa	Kaduna	Pooled
Rural	Fresh milk	20	35	55	13.33	17.68	15.80
	Kindirimo	60	70	130	40	35.40	37.40
	Nono	53	45	98	35.33	22.73	28.16
	Yoghurt	5	30	35	3.33	15.15	10.06
	Butter	10	15	25	6.67	7.58	7.18
	Cheese	2	3	5	1.33	1.52	1.44
	Total	150*	198*	348*	100	100	100
Urban	Fresh milk	15	50	65	9.10	19.23	15.29
	Kindirimo	45	65	110	27.27	25.00	25.88
	Nono	60	50	110	36.36	19.23	25.88
	Yoghurt	25	40	65	15.15	15.38	15.29
	Butter	15	35	50	9.09	13.46	11.76
	Cheese	5	20	25	3.03	7.69	5.88
	Total	165*	260*	425*	100	100	100
Pooled	Fresh milk	35	85	120	11.11	18.56	15.52
	Kindirimo	105	135	240	33.33	29.48	31.05
	Nono	113	95	208	35.87	20.74	26.91
	Yoghurt	30	70	100	9.52	15.28	12.94
	Butter	25	50	75	7.94	10.92	9.70
	Cheese	7	23	30	2.22	5.02	3.88
Total		**315***	**485***	**773***	**100**	**100**	**100**

Source; survey data 2018 ***** = multiple responses

4.2.2 Consumption preference structure of local dairy products

Food markets in North western of Nigeria are undergoing a major structural change and the nation's rapidly rising middle class are moving to nutritious and high value foodstuffs thereby altering their prior food preferences according to Popkin, (2003) and Tschirley, Reardon, Dolislager and Synder (2015). Hence better understanding on how consumers respond to changes in nutritional characteristics of milk, and other vital reasons for which they prefer the specific product is vital in responding to this foreseeable future change.

4.2.2.1 Consumption preference for fresh milk

The result presented in Table 10 showed that majority of the respondents alluded to preference for fresh milk consumption because of its health benefits. About 55% and 45% of respondents in rural and urban regions respectively confirmed this. In agreement, Luciano *et. al.,* (2004) in their study observed that the overwhelming majority of respondents (92%) considered dairy products as a health drink. Again, Akinyosoye (2006) posited that the demand for dairy products in Nigeria, is principally based on the perceived health benefits for adults, pregnant mothers, babies and children.

Another reason that informed the decision of majority of respondents in rural (23%) and urban regions (31%) respectively to prefer fresh milk is due to availability and proximity of the sellers, which translates to fair price of obtaining the product as indicated by reduced cost in Table 4.10. This finding corroborates Belete, Azage, Fekadu and Berhanu (2010) who found that large proportion of respondents who consumed whole fresh milk might be due to large number of producers who are there to sell whole fresh milk due to short distance to urban centre, and due to access to markets and lack of traditional taboo that restricts selling of whole fresh milk.

Table 10: Distribution of respondents according to reason for fresh milk consumption preference.

Reason for preference for fresh milk	Number of Respondents			Percentage		
	Rural	Urban	Pooled	Rural	Urban	Total
Convenience	17	10	27	6.25	3.6	4.9
Habit	12	14	26	4.4	5.1	4.8
Health benefits	150	122	272	55.1	44.5	49.8
Reduced cost	62	86	148	22.8	31.4	27.1
Taste	24	34	58	8.8	12.4	10.6
Thirst	7	8	15	2.6	2.9	2.7
Total	**272***	**274***	**546**	**100**	**100**	**100**

Source; survey data 2018 ***** = multiple responses

4.2.2.2 Consumption preference for kindirimo

The resultpresented in Table 11shows that about 38% and 47% of the respondents in each of rural and urban regions respectively consumed *Kindirimo* for its taste. They indicated likeness for this product because of its great taste and aroma. Also they perceived *kindirimo*'s healthy oil content as a strong appealing feature influencing their desire for consuming the product. Also most respondents in rural regions (19%) and urban regions (17%) expressed a perceived health benefit for consuming *kindirimo* as another reason for consuming the product. They see *kindirimo* as a complete food that is nourishing the body. This corroborates with Alemayehu *et. al.*, (2016) as they reported that consumers viewed whole milk, to be more nutritious, better flavored, and safer than milk with reduced-fat milk.

Table 11: Distribution of respondents according to reason for *kindirimo* consumption preference.

Reason for preference for *Kindirimo*	Number of Respondents			Percentage		
	Rural	**Urban**	**Pooled**	**Rural**	**Urban**	**Total**
Convenience	35	36	71	13.7	14.5	14.1
Habit	29	17	46	11.3	6.9	9.1
Health benefits	56	50	106	21.9	20.2	21.0
Reduced cost	29	26	55	11.3	10.5	10.9
Taste	98	110	208	38.3	44.4	41.3
Thirst	9	9	18	3.5	3.6	3.5
Total	**256***	**248**	**504**	**100.00**	**100.00**	**100.00**

Source; survey data 2018 ***** = multiple responses

4.2.2.3 Consumption Preference for Nono

The results in Table 12 revealed that most consumers of *Nono*, respectively 40.0% and 45.8% respondents in rural and urban regions do so because it is affordable and cost less per kg than other local dairy products in the study area. However, as shown in Table 12, the respondents differs in the next strong reason for consuming *Nono*. In rural area 21.6% of respondents prefers *nono* as well because it is custom and habitual to consume *nono* daily. The urban respondents (16.4%) showed that their next most preference reason for consuming *nono* was that it is less viscous and easily quench thirst and refreshes the body. When the entire study area was considered about 43% of head of households attested that *nono* is a relatively cheaper protein and dairy drink. These findings corroborate with French, (2003) and Drewnowski (2004) as they affirmed that high cost and perishability nature of some nutritious foods discourages younger heads of households especially with large family size from consume these products.

Table 12: Distribution of respondents according to reason for *Nono* consumption preference.

Reason for preference of *nono*	Number of Respondents			Percentage		
	Rural	**Urban**	**Pooled**	**Rural**	**Urban**	**Pooled**
Convenience	25	20	45	10.2	7.6	8.9
Habit	53	18	71	21.6	6.9	14.0
Health benefits	24	37	61	9.8	14.1	12.0
Reduced cost	98	120	218	40.0	45.8	43.0
Taste	27	24	51	11.0	9.2	10.1
Thirst	18	43	61	7.3	16.4	12.0
Total	**245**	**262***	507	**100**	**100**	**100**

Source; survey data 2018 ***** = multiple responses

4.2.2.4 Consumption preference for yoghurt

The results in Table 13 shows that majority of respondents in rural and urban regions representing 41.0% and 36.7% respectively prefer to consume yoghurt for its health benefit. Yoghurt consumption is of immense health benefit. Scientists have found that the intake of yogurt with active cultures may aid digestion, ease diarrhea, boost immunity, fight infection and protect against cancer (Chandra, 2002; Adam *et. al.,* 2004; Adolfsson, *et. al.,* 2004). However, these specific health benefits was said to depend on the strain and viability of the culture in yogurt (Meydani and Ha, 2000). In addition to these extrinsic factors, yogurt is also been perceived by consumers as a healthy food (Hashim, Khalil and Afifi. 2009) and individual health attitudes and belief play a role in yoghurt consumption patterns. Trondsen, Eggen, Lund and Braaten (2004) found that among Norweigan women, those who believed that food is important for health had higher fish consumption. Larson, Neumark-Sztainer, Wall and Story, (2006) found

that among American female adolescents, health attitudes were significantly and positively related to milk intake.

Table 13: Distribution of respondents according to reason for Yoghurt consumption preference.

Reason for preference for yoghurt	Number of Respondents			Percentage		
	Rural	Urban	Pooled	Rural	Urban	Total
Convenience	32	30	62	13.4	13.1	13.2
Habit	20	16	36	8.4	7.0	7.7
Health benefits	98	84	182	41.0	36.7	38.9
Reduced cost	22	24	46	9.2	10.5	9.8
Taste	58	68	126	24.3	29.7	27.0
Thirst	9	7	16	3.7	3.0	3.4
Total	**239***	**229***	**468**	**100**	**100**	**100**

Source; survey data 2018 ***** = multiple responses

4.2.2.5 Consumption preference for butter

The results in Table 14 show that majority of respondents in rural (64 %) and urban regions (60 %) love to consume butter especially for its taste attribute. They love its aromatic flavor and taste. Butter after being semi-processed is often added to stew, meals and porridges to enhance taste, color and aroma. No emphasis on its health implications was stressed however. When the entire states were pooled, majority (62.1%) of the respondents reported tasty attribute of butter motivated them to consume the product. This is in consonant with the work of Krause, Lopetcharat and Drake (2007) as they reported that butter was viewed by most consumers as a tasty and natural product, and that such factors influenced their purchase decisions. Further, the next important reason for Butter consumption by the household (19.5 %) is habitual, and that it is customary and cultural to put semi-processed butter in foods and stews, they emphasize on their perpetual addition of local dairy butter (*Mai-shanu*) in their meal mainly for its flavored aroma and taste in food; and that has become habitual.

Table 14: Distribution of respondents according to reasons for Butter consumption preference.

Reason for preference for butter	Number of Respondents			Percentage		
	Rural	Urban	Pooled	Rural	Urban	Total
Convenience	22	31	53	7.6	12.3	9.9
Habit	65	40	105	22.5	15.9	19.4
Health benefits	12	23	35	4.2	9.1	6.5
Reduced cost	5	6	11	1.7	2.4	2.0
Taste	184	150	334	63.7	59.5	61.7
Thirst	1	2	3	0.3	0.8	0.5
Total	**289***	**252***	**541***	**100**	**100**	**100**

Source; survey data 2018 ***** = multiple responses

4.2.2.6 Consumption preference for cheese

The results in Table 15 shows that respondents in rural and urban regions representing 38.5% and 48.5% respectively consume local cheese mainly because of the taste of the product. Again, the second most important reason respondent gave for preferring to consume cheese (25.9%) was its good health implication. They believed cheese is a good protein substitute of meat, fish or eggs, when these become expensive. Similarly study on consumers preference for local cheese by Parcell and Gedikoglu (2012) indicated that consumers prefer domestic artisan cheese compared to processed cheese and imported french cheese owing to itstaste attribute; and that this attitude was positive and statistically significant in most of the study area.

Table 15: Distribution of respondents according to reason for Cheese consumption preference.

Reason for preference for cheese	Number of Respondents			Percentage		
	Rural	Urban	Pooled	Rural	Urban	Pooled
Convenience	30	31	61	11.6	10.0	10.7
Habit	11	12	23	4.2	3.9	4.0
Health benefits	78	69	147	30.1	22.3	25.8
Reduced cost	39	47	86	15.0	15.2	15.1
Taste	100	150	250	38.6	48.4	44.0
Thirst	1	1	2	0.4	0.3	0.3
Total	**259***	**310***	**569***	**100**	**100**	**100**

Source; survey data 2018 ***** = multiple responses

4.2.3 Summary of Stated Reason for Household Consumption Preference

The result as indicated in Table 16 showed the summary of totals of reasons why households preferred the consumption of one local dairy product above the other one.

Table 16: Distribution of stated reasons for households' consumption preferences

Variables	Fresh Milk	*Kindirimo*	*Nono*	Yoghurt	Butter	Cheese	Total
Convenience	27	71	45	62	53	61	319
Habit	26	46	71	36	105	23	307
Health benefits	272	106	61	182	35	147	803
Reduced cost	148	55	218	46	11	86	564
Taste	58	208	51	126	334	250	1027
Thirst	15	18	61	16	3	2	115
Total	**546***	**504***	**507**	**468**	**538**	**568**	**3135**

Source; survey data 2018 ***** = multiple responses

4.2.3 Consumption Preference Structure for Local Dairy Products Away from Home

Sources of local dairy products away from home refer to the various ways and means by which the respondents acquired dairy products other than the one produced and consumed at home. According to All Africa (2009), the consumption of food away from home –FAFH, comes into

relevance owing to increases in the number of fast food outlets at every street corner in highbrow and down town areas of urban and semi-urban areas within the last two decades in Nigeria. This situation is increasing both in the developed and developing countries. For example, Pingali, P. (2007) revealed a rising popularity of FAFH in Asian countries, while Bai, J., C. Zhang, F. Qiao, and Wahl, T. (2012) argued that rising income and demographic factors contribute to increase in consumption of FAFH in China.

A similar finding was also observe in Malaysia by Tan, (2010), Turkey by Gal *et al.*, (2007), and US by Liu, M., Kasteridis, P. and Yen, S. T. (2013) among others. Educational institution; eating establishment; supermarkets, dairy shops; and open market / local vendor; are five possible sources by which respondents acquire local dairy products in the study area as shown in Tables 17 to Table 22. Differences in households' shopping pattern and retail attribute forms of the selected local dairy products were reported. However, these products were viewed as heterogenous products in category, based on the insight that each product has a different shelf life

4.2.3.1 Fresh milk consumption away from home.

The results presented in Table 17 show that majority of respondents; 75% and 63% households in rural and urban regions respectively who consume fresh milk away from home purchase it from the local dairy vendor, otherwise called open markets. When the data from the entire region were pooled, the resulting 69% of the respondents bought their fresh milk from local dairy vendor. The main reason advanced by respondents for the purchase of fresh milk through this source is the regular and timely supply of fresh quality milk from the traditional women hawkers

whom they were accustomed with. Sometimes, advance payments aremade to these women sellers and supplies are made without fail. These itinerant women milk hawkers were also known to make home deliveries and as a result there is room for haggling which normally results in a good buy. In a similar study reported by Fuller, Beghin and Rozelle (2004); it was observed that distribution channels matter a lot in the acquisition of dairy product, and that certain dairy products tend to flow through particular marketing venues, but not through others, while in some cases, there is more than one main marketing channel.

It should however be noted that most respondents use more than one source in the acquisition of their dairy products. One of the reasons for this is that some dairy products were generally available from a particular source only, as such its consumers must use that channel irrespective of whether it was their normal source of dairy products.

Also, certain niche markets for fresh milk from some institutions include NAPRI yoghurt in ABU Zaria; MILCOPAL yoghurt in urban regions of Kaduna Town among others. Here, the products are sold at some perimeter distances and also outside the institutions. The majority of the respondents 13% and 29% in rural and urban regions respectively purchase their fresh milk from these institutional sources. Most households around these places are well educated consumers that have full knowledge of information about their purchase hence there is no sceptiscism. This attitude in the regions is contrary to the findings of Alemayehu *et. al.,*. 2016 who posited that consumers subtly indicate their social position through consumption of fat-saturated milk products, which they considered as status symbol. Hence, for consumers who

prefer taste, additional information might not invalidate the belief that fat-modified milk products is less tasty than conventional milk products.

Table 17: Distribution of households'Fresh milk consumption away from home

Local dairy products	Source of Purchase away from home per state	Number of Respondents			Percentage		
		Rural	Urban	Pooled	Rural	Urban	Pooled
Fresh milk	Buy from institutions	30	70	100	12.50	29.17	20.83
	Buy from eating establishment	5	1	6	2.08	0.42	1.25
	Buy from supermarkets	2	13	15	0.83	5.42	3.13
	Buy from dairy shops	23	6	29	9.58	2.50	6.04
	Buy from open market / local vendor	180	150	330	75	62.50	68.75
Total		**240**	**240**	**480**	**100**	**100**	**100**

Source; survey data 2018.

4.2.3.2 *Kindirimo*consumption away from home

The results presented in Table 18 show that majority of the respondents; 74% and 67% in rural and urban regions respectively who consume *kindirimo* away from home purchased it from the local dairy vendor or open markets. When the data from the two states were pooled, the resulting 70% of the respondents bought their *kindirimo* from local dairy vendors or otherwise, at open market. The respondent explanation for the purchase of *kindirimo* through this source is because the traditional channel is associated with supplying naturally tasty, appealing aroma and attractive products. This is opposed to the submission of Popkin, (2003); and Tschirley *et al;* (2015) who found that food markets in Africa are undergoing a major structural change. The continent's rapidly rising middle class are moving towards nutritious and high value foods. Hence a better understanding on how consumers respond to changes in nutritional characteristics

of milk, and how they value nutritional information labeling, is key in responding to this foreseeable future change.

However, some heads of households in rural (17%) and urban (23%) regions respectively claimed, they often buy yoghurt from dairy shops, and when the data from the two states were pooled about 20% of respondents purchased yoghurt from dairy shops. They prefer buying from dairy shops because the products are often purchased in chilled form. Again, because dairy shops offer other range of local dairy products and complimentary products for sale. Therefore, such outlet offers a wide range of things that allow for one stop shopping for local dairy products. Also, such places are mostly available in less affluent areas and they cater for low income households needs. This is in line with Alemayehu, *et. al.,* (2016),who reported that because more men in Ethiopia were employed than women. They face a higher opportunity cost in terms of time. They are thus more inclined to buy milk from modern retailers as they offer one-stop shopping.

Table 18: Distribution of households'*Kindirimo*consumption away from home

Local dairy products	Source of Purchase away from home per state	Number of Respondents Rural	Urban	Pooled	Percentage Rural	Urban	Pooled
Kindirimo	Buy from institution	0	0	0	0	0	0
	Buy from eating establishment	20	15	35	8.33	6.25	7.29
	Buy from supermarkets	2	10	12	0.83	4.17	2.50
	Buy from dairy shops	40	55	95	16.67	22.92	19.79
	Buy from open market / local vendor	178	160	338	74.12	66.67	70.42
Total		**240**	**240**	**480**	**100**	**100**	**100**

Source; survey data 2018

4.2.3.3 *Nono*consumption sources away from home.

The results presented in Table 19 show that majority of the respondents; 67% and 63% in rural and urban regions respectively who consume *nono* away from home purchased it from the local dairy vendor or open markets. When data from the two states were pooled, the resulting 65% of the respondent bought their *nono* from local dairy vendor otherwise called open market. The main reason advanced by the respondents for the purchase of *nono* through this source is that the sellers make home delivery and there are rooms for bargaining. Other reasons respondents gave was that they are used to buying from open markets. Most 29% of the respondent in rural and urban areas buy Nono from eating establishment and does so because it is served chilled and because *fura* a millet cereal based process doughy food is available there as complementary with *Nono.*

This reason is however opposed to Jabbar and Admassu (2010) who reported that many Ethiopians drink milk outside home (particularly in cafes and restaurants); and are careless of the lower safety standard offered there, nor of milk adulteration; compare to their counterparts shopping from modern retailers.

Table 19: Distribution of households'*Nono*consumption away from home

Local dairy product	Source of Purchase away from home per state	Number of Respondents			Percentage		
		Rural	Urban	Pooled	Rural	Urban	Pooled
Nono	Institution	0	0	0	0	0	0
	Eating establishment	70	70	140	29.17	29.17	29.17
	Supermarkets	0	0	0	0	0	0
	Dairy shops	10	20	30	4.17	8.33	6.25
	Local vendor	160	150	310	66.67	62.50	64.58
Total		**240**	**240**	**480**	**100**	**100**	**100**

Source; survey data 2018

4.2.3.4 Yoghurt consumption away from home

The results presented in Table 20 show that majority of the respondents, 38% and 29% in rural and urban regions respectively who consume yoghurt away from home purchased it from the super market. When the data from entire region were pooled, the resulting 33% of respondents bought their yoghurt from super market. The main reason they are more inclined to buying milk from modern supermarkets is because such outlet offers one-stop shopping for some range of local dairy products besides yoghurt. Aside, supermarket provide an attractive environment for shopping with different payment methods apart from cash. Frozen dairy products can also be purchased in bulk and freeze at home for consumers with refrigerator.

Table 20: Distribution of households'Yoghurt consumption away from home

Local dairy products	Source of Purchase away from home per state	Number of Respondents			Percentage		
		Rural	Urban	Pooled	Rural	Urban	Pooled
Yoghurt	Institution	38	125	163	15.83	52.08	33.96
	Eating establishment	60	20	80	25.00	8.33	16.67
	Supermarkets	90	70	160	37.50	29.17	33.33
	Dairy shops	50	20	70	20.83	8.33	14.58
	Local vendor	2	5	7	0.83	2.08	1.46
Total		**240**	**240**	**480**	**100**	**100**	**100**

Source; survey data 2018.

4.2.3.5 Butter consumption away from home.

The results presented in Table 21 show that majority of respondents; 58% and 67% of in rural and urban study areas respectively who consume butter away from home purchased it from the local dairy vendor or open markets. When the data from the entire region were pooled, the resulting 63% of respondents bought their butter from local dairy vendor at the open market. The main reason advanced by the respondents for the purchase of butter through this source is proximity of open markets which allows for frequent purchases. The respondents claim that the retail outlets offer good quality butter at affordable prices. They also have perceived quality of the products via these outlets. Further, it appears that respondents also appreciate the reputation of traditional retailers that sells the butter.

This is conversely to respondents that purchase from modern retailers; According to Alemelehu *et al.,* (2016), posited that these outlets are perceived to compete mostly on safety attributes (cleanliness and hygiene in particular), which implicitly indicate the quality of dairy products. In

turn, this offers an assurance in purchase decisions; by shopping from a modern retail, consumers are more confident about what they buy (Gorton *et al.*, 2011; Jabbar and Admassu, 2010).

Table 21: Distribution of household's Butter consumption away from home

Local dairy product	Source of Purchase away from home per state	Number of Respondents			Percentage		
		Rural	Urban	Pooled	Rural	Urban	Pooled
Butter	Institution	0	0	0	0	0	0
	Eating establishment	83	49	132	34.58	20.42	27.50
	Supermarkets	2	3	5	0.83	1.25	1.04
	Dairy shops	15	28	43	6.25	11.67	8.96
	Local vendor	140	160	300	58.33	66.67	62.50
Total		**240**	**240**	**480**	**100**	**100**	**100**

Source; survey data 2018.

4.2.3.6 Cheese consumption away from home

The results presented in Table 22 show that majority of the respondents; 88% and 71% in rural and urban regions respectively who consume cheese away from home purchased it from the local dairy vendor or open markets. When the data from the two states were pooled, 79% of respondents bought their cheese from local dairy vendor or otherwise, at open market. The main reasons advanced by the respondents for the purchase of cheese through this source was availability of fresh cheese and other dairy products in the open market. This finding is in line with reports that dairy products provides essential nutrients and other health benefits (McGill *et al;* 2008; Warr *et al.*,2008; Boniface and Wendy 2012; Bilatu, Zelealem and Anil 2012).

Table 22: Distribution of household's Cheese consumption away from home

Local dairy products	Source of Purchase away from home per state	Number of Respondents			Percentage		
		Rural	Urban	Pooled	Rural	Urban	Pooled
Cheese	Institution	0	0	0	0	0	0
	Eating establishment	10	40	50	4.17	16.67	10.42
	Supermarkets	0	0	0	0	0	0
	Dairy shops	20	30	50	8.33	12.50	10.42
	Local vendor	210	170	380	87.50	70.83	79.17
Total		**240**	**240**	**480**	**100**	**100**	**100**

Source; survey data 2018.

4.3 Average Monthly Expenditure on Local Dairy Products

4.3.1 Average monthly expenditure on local dairy products in rural areas.

The results presented in Table 23 show average household monthly consumption expenditure on six main local dairy products (fresh milk, *kindirimo*, *nono*, yoghurt, butter and cheese); in rural areas of Jigawa and Kaduna states. However, the term "Others"; in Tables 23, 24 and 25; include baby instant formula, evaporated milk, powdered milk, flavored milk, ice cream, soya cheese, soya drinks, cereal drinks, sugar and syrups and other related drinks like carbonated drinks, alcohols etc; which are complementary or supplementary products to any of the six main local dairy products (Table 23).

The results presented in Table 23 revealed that in rural areas of Jigawa state, an average household spent a total of ₦4,590.00 on the local dairy products while their Kaduna state counterpart spent about ₦8,019.20. Again, by disaggregating on the local dairy products, an average household in rural Jigawa state spent the highest allocative amount of ₦1,056.00 on 8.8

litres of *nono*, followed by ₦780.00 in purchasing 5.2 litres of *kindirimo*; and the least monthly expenditure was ₦104.00 on 0.4 litres of yoghurt.

The resultshown in Table 23 showed that in rural Kaduna state, an average household spent the highest average amount of ₦927.2 monthly on 7.6 litres of *nono* below those of their rural Jigawa state counterparts. Next to this, was a monthly allocation of ₦821.5 for the purchase of 5.3 litres of *kindirimo* and the least was ₦125 for 0.5kg of cheese.However, when the data from rural areas of Jigawa and Kaduna states were pooled, an average rural household spent highest amount of ₦980.1 on 8.1 litres of *nono,* followed by ₦777.8 on 5.1 litres of *kindirimo* and the lowest amount was ₦117.5 on 0.5kg of cheese.Although consumer behaviors in preferences and attitudes toward consumption of dairy products differ substantially across countries, globally, demand for dairy products is increasing as consumers in developing countries become more affluent (Ishida *et al.,* 2003; Warr *et al.,* 2008). Much of this demand growth is driven by growing evidence and awareness that dairy products can provide essential vitamins and nutrients as well as other health benefits (McGill *et al.,* 2008; Wang, *et al.,* 2013). In the rural area, respondents consume more of *kindirimo* and *nono* because traditionally they are use for refreshment because of they are energy laden with great taste. It is also considered as relatively cheaper product to consume for nutrient replenishment.

Table 23: Average household monthly expenditures on local dairy products in rural areas of Jigawa and Kaduna State.

Rural Jigawa					Rural Kaduna				Rural Pooled			
Local dairy products	**Unit value (₦/)**	**Jigawa mean Qty (L)**	**Jigawa mean value (₦/L)**	**Jigawa (SD)**	**Unit value (₦/L)**	**Kaduna mean Qty (L)**	**Kaduna mean value(₦/L)**	**Kaduna (SD)**	**Unit value (₦/L)**	**Pooled mean Qty(L)**	**Jigawa & Kaduna mean value(₦/L)**	**Jigawa & Kaduna (SD)**
Fresh milk	200.0	1.6	320.0	231.4	220.0	2.0	440	355.5	210	1.9	399.0	345.3
Kindirimo	150.0	5.2	780.0	250.4	155.0	5.3	821.5	432.4	153	5.1	777.8	340.2
Nono	120.0	8.8	1,056.0	663.3	122.0	7.6	927.2	360.5	121	8.1	980.1	832.4
Yoghurt	260.0	0.4	104.0	137.2	265.0	1.7	450.5	398.4	263	1.4	367.5	350.3
Butter	700.0	0.3	210.0	297.5	750.0	0.5	375.0	333.8	725	0.4	290.0	233.2
Cheese	220.0	0.5	110.0	125.0	250.0	0.5	125.0	231.2	235	0.5	117.5	567.7
Others Drinks	100.0	20.1	2,010.0	586.3	160.0	30.5	4,880.0	697.7	130	25.3	3,289.0	798.3
TOTAL			**4590**	**3567**			**8,019.2**	**5032**			**6221.0**	**4232**

Source; survey data 2018.

4.3.2 Average monthly expenditure on selected local dairy products in the urban area.

The results shown in Table 24 show that in the urban areas of Jigawa state, an average household spent total of ₦6,843.00 monthly on local dairy products, while their Kaduna counterpart spent ₦11,122.00. A household in urban Jigawa state spent the highest allocative amount of ₦1,100.00 per month on 5.5 litres of *kindirimo*, followed by ₦1,005.00 on 6.7 litres of *nono* and the least monthly amount spent on local dairy was ₦138.00 for the purchase of 0.6kg of cheese. The results in Table 24 revealed that in urban Kaduna state, a head of household spent the highest allocative amount of ₦1,776.00 per month on 6.7 litres of *kindirimo* more than that spent by their counterpart household head in urban Jigawa state.

The following monthly expenditure was ₦1,230.00 on 1.5kg of butter and the least monthly expenditure was ₦150.00 on the purchase of 0.6 kg of cheese. However, for the pooled data for the two states, an average household's highest expenditure of ₦1,421.30 was for the purchase of 6.1 litres of *kindirimo*; followed by ₦1,038.50 for the purchase of 6.7 litres of *nono* while the lowest consumption expenditure was ₦118.00 for 0.5kg of cheese.

The results presented in Table 24 showed that in the pooled data for urban Jigawa and Kaduna states, the households consumed *kindirimo* the most with about 17% of monthly allocation for local dairy product purchases. This was followed by *nono* with about 13% monthly allocation; while the least monthly allocation of 2.0% was for the consumption of 0.6kg of cheese. Although, in less developed countries like Nigeria, the per capita consumption of dairy products was said to be generally low, but with demand currently being fuelled by high population and income growth; urbanization and development of fast food still growing; by changes in lifestyles

to a more westernized one; expansion of cold storage facilities and improvement in products' shelf life. This study also found that there is increasing dairy product consumptions in urban areas of the study area, as shown in Table 24. This finding is in line with Mohammed *et al.*, (2014) who reported that, there was high prevalence of dairy product consumption among the northern populace. This also corroborates with Jansen (1992) who reported 100 percent consumption prevalence for dairy products in northern Nigeria especially of the traditional types.

Also, Akinyosoye (2006) reported that all the dairy products (fresh milk, powdered milk, tinned milk and others like ice cream, butter, cheese and yogurt) are consumed across Nigeria. The study further stated that an average household in northern Nigeria consistently out-spend their southern counterparts on the locally processed dairy products such as fresh milk, sour milk and with the reverse being the case for processed dairy products such as powdered milk, tinned milk, ice cream, butter, cheese and yogurt.

However, slight variation was observed in the level of local dairy demand across rural, urban regions of Jigawa and of Kaduna states as shown in Tables 22, 23, and 24. These are in line with NBS (2012) describing that zonal variation exists in consumption of local dairy products, at a close examination of a representative state within one zone and when compared with another state within another zone.

Table 24: Average Household Monthly Expenditure on Local Dairy Products in Urban Areas of Jigawa and Kaduna State.

Urban Jigawa					Urban Kaduna				Urban Pooled			
Local dairy products	**Unit value (₦/L)**	**Jigawa mean Qty (L)**	**Jigawa mean value (₦/L)**	**Jigawa (SD)**	**Unit value (₦/L)**	**Kaduna mean Qty (L)**	**Kaduna mean value(₦/L)**	**Kaduna (SD)**	**Unit value (₦/L)**	**Pooled mean Qty(L)**	**Jigawa & Kaduna mean value(₦/L)**	**Jigawa & Kaduna (SD)**
Fresh milk	250	1.9	475.0	288.0	270.0	2.4	648.0	420.5	210.0	1.9	399.0	376
Kindirimo	200	5.5	1,100.0	245.4	265.0	6.7	1,776.0	860.4	233.0	6.1	1,421.3	368
Nono	150	6.7	1,005.0	203.1	160.0	6.6	1,056.0	450	155.0	6.7	1,038.5	993
Yoghurt	250	1.8	450.0	207.2	265.0	2.5	663.0	350	248.0	1.9	471.2	345
Butter	750	0.9	675.0	357.6	820.0	1.5	1,230.0	710	785.0	0.9	706.5	274
Cheese	230	0.6	138.0	87.0	250.0	0.6	150.0	139	235.0	0.5	118.0	668
Others drinks	120	25.0	3,000.0	480.2	200.0	28.0	5,600.0	978	160.0	25.3	4,048.0	828
Total			**6843**	**3676**			**11,123.0**	**3902**			**8203**	**3004**

Source; survey data 2018.

4.3.3 Mean Monthly Expenditure on Local Dairy Products in the Entire Study Area.

The results presented in Table 25 show an average monthly consumption expenditure on selected local dairy products by an average household in the entire rural and urban areas of the two states (Jigawa and Kaduna States). In the pooled data of the rural and urban areas of Jigawa state, an average household spent a total of ₦5,643.00 monthly on the selected local dairy products compared to ₦9,488.00 in Kaduna State. However, an average household in rural urban Jigawa State spent the highest allocative amount of ₦975.00 to purchase 7.5 litres of*nono*, followed by *kindirimo* in which 5.3 litres was bought at ₦901.00; and the least was ₦138.00 spent on the purchase of 0.6kg of Cheese.

The results presented in Table 25 showed that the average household in rural urban Kaduna state spent the highest allocative amount of ₦1,470.00 to buy 6.0 litres of *kindirimo* more than that which was purchased by household for the pooled data for rural and urban areas of Jigawa state. Next to *kindirimo* in allocative amount was ₦938.00 for the purchase of 6.7 litres of*nono* on monthly basis. This was followed by the purchase of 2.1 litres of fresh milk for ₦567.00; and the least monthly amount spent was ₦150.00 for 0.6 kg of cheese.

However, when the rural urban areas of Jigawa and Kaduna states were combined, the results in Table 25 showed that an average household spent the highest amount of ₦1,188.00 on 5.4 litres of *kindirimo*. This monthly expenditure amount was followed by ₦905.00 used in buying 6.7 litres of *nono* and the lowest consumption expenditure of ₦141.00 was used to buy 0.6kg of cheese.

Table 25: Average Household Monthly Expenditure on Local Dairy Products in Pooled Jigawa, Kaduna and Entire States.

S/n	Pooled Jigawa					Pooled Kaduna				Pooled Entire States (North West)			
	Selected Local dairy products	Unit value (₦/L)	Jigawa mean Qty (L)	Jigawa mean value (₦/L)	Jigawa (SD)	Unit value (₦/L)	Kaduna mean Qty (L)	Kaduna mean value(₦/L)	Kaduna (SD)	Unit value (₦/L)	Pooled mean Qty (L)	Pooled (NW) mean value(₦/L)	Pooled (SD)
1.	Fresh milk	230.0	1.8	414.0	387	270.0	2.1	567.0	443	240.0	1.9	456.0	335
2.	*Kindirimo*	170.0	5.3	901.0	764	245.0	6.0	1,470.0	795	220.0	5.4	1,188.0	465
3.	*Nono*	130.0	7.5	975.0	894	140.0	6.7	938.0	555	135.0	6.7	904.5	432
4.	Yoghurt	250.0	1.1	275.0	226	265.0	2.2	583.0	432	255.0	1.9	484.5	244
5.	Butter	720.0	0.6	432.0	376	800.0	0.7	560.0	443	730.0	0.6	438.0	233
6.	Cheese	230.0	0.6	138.0	188	250.0	0.6	150.0	112	235.0	0.6	141.0	102
7.	Others Drinks	110.0	22.8	2,508.0	1698	180.0	29	5,220.0	2213	140.0	25.3	3,542.0	2676
Total				**5,643.0**	3342			**9,488.0**	3546			**7,154.0**	3321

Source; survey data 2018.

4.4 Factors Affecting Local Dairy Products Consumption in the Study Area

The results revealed in Table 26 showed a multinomial logit model analysis involving the use of maximum likelihood estimation method. The overall model is significant at 0.01 level as indicated by the Chi-square value of 715.85. The McFadden pseudo R^2 of 0.42 calculated indicated that the model is of a good fit, more so that the data used were cross-sectional (McFadden 1973). The values obtained indicate that the independent variables included in the multinomial logit model explains the significant proportion in the variations of intention of households to purchase local dairy products.

The marginal effects and predicted probabilities of the model are as shown in Table 26. These represent the effects of socio-demographic characteristics of households as they affect the probability of local dairy products consumption in the study area. The marginal effects represent the change in a dependent variable for a given change in a particular regressor while holding the other regressors at their sample means. The estimated coefficients and standard errors revealed which factors influences the intentions of households' consumption of the local dairy products. A statistically significant coefficient suggests that the likelihood of the consumption of the product will increase/decrease as the response of the explanatory variable increases/decreases (Borooah, 2002).

The result revealed in Table 26 shows that the households residing in urban areas had higher probability of consuming *kindirimo* (0.739)*, fresh milk (0.632)* andyoghurt (0.616)* than the households living in the rural areas. However, they were less likely than those in rural areas to consume *nono* (-0.918)* and indifference towards cheeses (0.177) consumption. Thus, most

households in the rural areas are characterized by low socio-economic status which influences their choice of local dairy products' consumption; including given more preference to consumption of less expensive local dairy products such as *nono*. The result in Table 26 further buttressed the marginal effect of households' consumption of *kindirimo* and fresh milk in urban areas which is 45.7% and 25.1% in urban areas; while the marginal effect of the main product *nono* that was consumed in the rural area is 32.1%.

The results indicated in Table 26 show that households that posses higher level of western education ranging from secondary to tertiary had a higher probability of consuming yoghurt (0.624)* and fresh milk (0.598*). However, they are less likely than those without western education to consume *kindirimo* (-0.397)*, *nono* (-0.285)* and indifferent towards consumption of cheese (1.643). The result showed that educational attainment matters in relation to the consumption of fresh milk and yoghurt in the study area. Also, the level of enlightenment of these respondents could be the reason why their local dairy products health concerns was so important. Negassa (2009), stressed that the level of education is related to the ability to process more complex information and make decisions. Thus educational level is found to be a significant factor influencing the consumption choices of local dairy products among households in the study area. The level of education of the respondents informed their decision for healthy drink such as fresh milk with vitamins and minerals and how fat yoghurt with probiotic attributes; unlike the illiterates to whom this information is far from being the basis of their local dairy choices. Furthermore, it has been well established that increased consumption of healthful foods such as low-fat dairy products (Zemel and Miller, 2004), is associated with lower mortality rates from obesity and related metabolic diseases Zemel and Miller (2004); Johnston, Tjonn, and

Swan (2004). These benefits have been mainly attributed to their vitamin / mineral (Zemel and Miller 2004; Johnston *et al.,* 2004; Tucker, 2004) and phytochemical content (Tucker, 2004); in the overall, these information about eating healthily is mainly achieved through being educated. The marginal effect of household heads consumption of yoghurt and fresh milk respectively are positively influenced by level of education factor 35.7% and 25.8% while the illiterates without high level of western education are influenced to consume more of *nono (*26.8%) in the study area.

Also, the result presented in Table 26 revealed that households that are married have higher probability of consuming fresh milk (0.732)*, yoghurt (0.596)* and cheese (0.552)* than their unmarried counterparts. However, they are less likely than the unmarried head of households to consume *nono* (-0.421)* and *kindirimo* (-0.385)*. Unmarried individuals have been noted to consume junk foods or less healthful diets (Gerrior *et. al;* 1995); than married couples. Married couples are expected to think through their nutrition and eating habits than the unmarried ones because they often consult their partners rather than make impulsive consumption decisions; as such, they will most likely reject *kindirimo* because of its high fat content. On the other hand, the unmarried individuals are often motivated to consume *kindirimo* based on its taste and sensory attributes.

The result in Table 26 showed that 34.1% and 9.2% are the marginal effects of married couples consumption of yoghurt and cheese respectively by the households.

Furthermore, it was revealed in Table 26 that male headed households have higher probability of consuming *kindirimo* 0.744* and *Nono* 0.731* than female head of household but conversely with a lower probability of consuming fresh milk (-0.652)*. It was also shown that the probability of consuming yoghurt (0.323) and cheese (0.228) was not significantly different between male and female headed households. Most of the male headed households' reported that *kindirimo* and *nono* have sedative features and give the needed energy for farm and construction works which require much energy. However, according to Radam *et al.*,(2010), females were generally more health-conscious than men and consumers in households with children less than 12 years of age were generally less concerned about price and more interested in purchasing safe and wholesome food. The marginal effect for male headed households' that consume *nono* and *kindirimo* are respectively 35.8% and 24.1% (Table 26).

The result shown in Table 26 indicated that households' with younger heads have higher probability of consuming *kindirimo* (0.738)*, *nono* (0.675)* and yoghurt (0.573)*, but a lower probability of consuming fresh milk (-0.311) and cheese (-0.232)* than households older with heads. They are also of the opinion that *kindirimo* and *nono* are tastier drinks that doubles as foods with sedative attributes which make the body to regain energy lost due to hard labour. Furthermore, it was reported that individuals belonging to younger age groups prefer to spend less time in food preparation (Neumark-Sztainer *et al;* 1999). Again, younger heads of households were more inclined to prefer ready-to-eat, processed, frozen, or canned fruits, packaged dairy and vegetables for convenience. Yet, the high costs of some of these nutritious foods owing to their high processing costs and / or their highly perishable nature may be a strong impediment to consumer eating healthily. (French, 2003; Drewnowski, 2004). Further,

Akinyosoye (2014) on the other handstressed that households headed by younger persons tend to consume more of fresh milk, ice cream, butter and yogurt as against powdered and tinned milk which are the more preferred products of the older persons. This piece of information on dairy can guide in decision concerning production and marketing of dairy products. Also, younger heads of households should be considered in line with their sensory attributes such as taste or smell choices in consumption than older ones. Bus and Worsley (2003) opined the same that Australian consumers perceived whole milk to be of lower quality than other types of milk and also that women and elderly consumers in particular were more likely to consume reduced fat milk as against milk with higher fat content.

Result in Table 4.26 revealed that the marginal effect for households with younger heads for yoghurt and *nono* demand are 32.1% and 11.3% respectively. These are more than for households with older heads which 11.2% and 8.6% respectively. However, households with older heads have higher probability (0.463*) than households with younger heads (-0.311) in consumption of fresh milk and with marginal effect of 14.5% and 8.9% respectfully for households with older and younger heads respectively (Table 26).

The results as indicated in Table 26 show that households with large family size had higher probability of consuming *nono* (0.634)* and yoghurt (0.556)* than households with small family size. Conversely, households with small family size most likely will consume more fresh milk (-0.466)* and *kindirimo* (-0.203)* than households with large family size. Table 26 also showed that there is no significant difference in the probability of consuming cheese (0.103) among households for either family size. Furthermore, results in Table 26 showed that large family size

has a converse marginal effect (12.7%) with respect to consumption of fresh milk which is -0.127, which implies that such households will prefer to consume other dairies in place of fresh milk. However, as revealed in the results from Table 26, the marginal effect for small households implies that they will consume more in budget share for fresh milk 21.5% more than they will consume other local dairy products. Households with small families will spend 37.8% of their budget share on yoghurt than more than on other local dairy, ceteris paribus (Table 26).

Finally, there was a higher probability of consuming fresh milk (0.842)***, followed by yoghurt (0.732)*** and then *kindirimo* (0.576)* by non-poor households than by poor heads of households (Table 26). However, there is higher probability that the poor households will consume *nono* (-0.341) than the non-poor households in the study area. The two categories of households show low responsiveness to cheese (0.112), in the study area. This findings was in accordance with World Bank, (2006); which described poverty in Nigeria as being concentrated in the rural areas, where over 70 percent of the nation's poor lives; in which most families there cannot afford three square meals a day due to low income.

Here, households mostly live on such income that barely provide for a quarter of nutritional requirements for healthy living. Thus, these poor respondents often consume cheaper local dairy products which most a time just serve to fill their stomach, like *nono*. Conversely, the richer households can afford to pay for the consumption of fresh milk, *kindirimo* and yoghurt which are mostly perceived as expensive for most of the poor. This result also supports the finding that the Taiwanese who consume relatively greater amounts of quality fluid milk have statistically higher levels of incomes than those who consume mostly yogurt drinks and flavored milk (Hsu & Lin,

2006). A similar study of U.S. consumers also found low fat milk consumption as positively related to age, education level and income (Robb *et al.,* 2007). Also higher income consumers were more likely to purchase organic food products (Quah & Tan, 2010; Rezai *et al.,* 2011) and more likely to be willing to pay a premium for "MSG-free" meat (Radam *et al.,* 2010). Ironically, when the respective marginal effects of expenditure on fresh milk, *kindirimo* and yoghurt were considered, only a smaller fragments of the rich households incomes 18.8%, 19.2% and 13.3% were expended respectively on these products; but most of the household low income earners spend relatively higher percentage of their earnings on the respective local dairy products 23.7%, 9.9% and 13.3% as earlier mentioned. The results implied that if income of the poor is increased there is more likelihood they will consume more of these nutrient laden products.

Table 26 Coefficient of Socio-economic and Demographic Factors Influencing the Consumption of Local Dairy Products

Variables	Fresh Milk Coefft(SE)	Marginal Effects	Kindirimo Coefft(SE)	Marginal Effects	Nono Coefft(SE)	Marginal Effects	Yoghurt Coefft(SE)	Marginal Effects	Cheese Coefft(SE)	Marginal Effects
Urban	0.632** (0.023)	0.251	0.739 (0.033)	0.457	-0.198* (0.020)	0.011	0.616*(0.024)	0.143	0.177 (0.017)	0.012
Rural	-0.121** (0.471)	0.132	0.111 (0.535)	0.122	0.543* (0.642)	0.321	-0.024* (0.24)	0.012	0.354 (0.532)	0.155
Educated.	0.598*** (0.012)	0.258	-0.397 (0.016)	0.201	-0.285* (0.038)	0.040	0.624**(0.010)	0.357	1.643 (0.022)	0.019
Illiterate	-0.113*** (0.323)	0.018	0.343 (0.856)	0.126	0.457* (756)	0.268	-0.532** (0.010)	0.019	0.245 (0.022)	0.120
Married	0.732 (0.011)	0.043	-0.385 (0.015)	0.084	-0.421 (0.024)	0.321	0.596* (0.134)	0.341	0.552* (0.039)	0.092
Unmarried	0.452(0.856)	0.234	0.453 (0.841)	0.129	0.521 (0.312)	0.345	0.324* (0.321)	0.111	0.324* (0.039)	0.039
Male	-0.652 (0.030)	0.142	0.744* (0.040)	0.241	0.731* (0.037)	0.358	0.323 (0.035)	0.094	0.228 (0.011)	0.023
Female	0.874 (0.436)	0.325	-0.323* (0.575)	0.115	0.323* (0.242)	0.111	0.539 (0.035)	0.237	0.112 (0.051)	0.052
Younger age	-0.311* (0.017)	0.089	0.738* (0.018)	0.462	0.675* (0.026)	0.113	0.573**(0.037)	0.321	0.232 (0.237)	0.013
Older age	0.463* (0.798)	0.145	-0.321* (0.245)	0.149	0.321* (0.172)	0.086	0.754** (0.037)	0.112	0.563 (0.604)	0.453
Larger family	-0.466* (0.019)	-0.127	-0.205 (0.029)	-0.097	0.634* (0.024)	0.162	0.156*(0.043)	0.111	0.103 (0.414)	0.148
Smaller family	0.234* (0.342)	0.215	0.753 (0.893)	0.132	0.934* (0.422)	0.043	0.474*** (0.654)	0.378	0.099 (0.214)	0.123
Higher Income	0.842*** (0.018)	0.188	0.576* (0.027)	0.192	-0.341* (0.033)	0.010	0.732*** (0.027)	0.133	0.112 (0.019)	0.014
Low Income	-0.456*** (0.532)	0.237	0.321* (0.462)	0.099	0.783* (0.347)	0.389	-0.653* (0.242)	0.211	0.321 (0.019)	0.147
Constant	-1.015* (0.021)		5.001*(0.011)		8.975*(0.004)		0.622*(0.002)		3.954*(0.006)	

Source: Field survey, 2018

Chi-square : 715.85
Log likelihood: -923.462. Restricted log likelihood: -994.352.
P-value 0.0000
R2 value : 0.42

4.5 Expenditure, Own price and Cross-price elasticities of Demand for Local Dairy Products.

4.5.1 Expenditure elasticity and marginal expenditure share for local dairy products

The result of marginal expenditure share and expenditure elasticity for each local dairy products and associated products were estimated using the LAIDS model as shown in Table 27. The marginal expenditure share is estimated as the product of expenditure elasticity and the expenditure shares for each of the local dairy or associated food group. The estimated marginal expenditure shares reported in Table 27 indicate that, for an increase in future incomes, households would allocate proportionately more of their income on fresh milk with the largest value representing 17.66% increase in expenditure, followed by *kindirimo* with 16.27% increase in expenditure and following in descending order of magnitude are; butter 12.09% increase in expenditure; *nono* 11.85%, cereal drink 11.62%, yoghurt 8.04%, powdered milk 4.36%, sugar and syrup 3.98%, others 3.18%, soya cheese 2.76% evaporated milk 2.33%, cheese 1.69%, flavored milk 1.38%, ice cream 1.18%, baby food 0.93%, and the least was soya drink 0.68%.

The marginal expenditure shares also sum to unity (100%) and thus conforming to the adding up condition of the AIDS model analysis. Therefore, null hypothesis that household head income status does not have effect on the class of local dairy products consumed is rejected and the alternative hypothesis which states that such a relation exist was accepted. The policy implication is that income redistribution among the populace should be done especially among those feeding poorly so that they can consume more nutrient laden local dairy products like fresh milk, yoghurt thus improving their health and productivity. The results indicated that the expenditure elasticity for the various local dairy and associated products are all positives, which implies that an increase in income will lead to a decrease in rate of demand for these commodities and vice versa, as they are normal commodities.

However, the expenditure elasticity's of some of the local dairy products and associated products such as powdered milk (0.97), flavored milk (0.91), *nono* (0.84), sugar and syrups (0.75), cereal drink (0.65), others (0.63), soya cheese (0.51), cheese (0.42), baby food (0.32) and soya drink (0.32) are less than unity; and were thereby regarded as necessity products. That is the demand for such products increases less than the percentage rise in income. According to Salvatore (1992) depending on the level of the consumer's income; expenditure elasticity for a good may vary. Thus a good may be a luxury at "low" levels of income, a necessity at "intermediate" levels of income and an inferior good at "high" levels of income. Therefore, since the majority of respondents in the study region are of the "Low-to-intermediate" income level, they consider most of these products as necessity goods which implies that no substantial change in these local dairy products' expenditure pattern will happen following an increase in future total expenditure on local dairy product. The demand for necessities and inferior goods are relatively insensitive to income changes.

The expenditure elasticity of some of the local dairy and associated products such as evaporated milk (1.78), fresh milk (1.11), *kindirimo* (1.09), butter (1.09), yoghurt (1.08) and ice cream (1.03) are more than unity and are thus described as luxury commodities. This implies that following an increase in future total local dairy group's expenditure allocation, a more than proportionate increase in the consumption of these products will be possible. The expenditure elasticity reported in Table 27 show that the consumption of evaporated milk in the study area increases with income. An increase of 1% in the expenditure on local dairy products group increases evaporated milk demand by 1.78%. Also, fresh milk demand in the study area

increases with income. An increase of 1% in the expenditure on local dairy product increases fresh milk demand by 1.11%. Also, *kindirimo* demand in the study area increases with income. An increase of 1% in the expenditure on local dairy product increases *kindirimo* demand by 1.09%. Also, butter demand in the study area increases with income. An increase of 1% in the expenditure on local dairy product increases butter demand by 1.09%. Also, yoghurt demand in the study area increases with income. An increase of 1% in the expenditure on local dairy product increases yoghurt demand by 1.08%. Also, ice cream demand in study area increases with income. An increase of 1% in the expenditure on local dairy product group increases ice cream demand by 1.03%. This implies that policies that positively affect the income of poor people may boost their demand for these afore mentioned local dairy products in the study area.

From the result, the importance of local dairy product including fresh milk, *kindirimo*, butter, and yoghurt, in the Nigerian diet in particular will increase as economic growth continues. According to Chidi (2011), the complaint of some dairy farmers in Nigeria, is that recombined milk (powdered) has taken over their markets thus making it difficult for them to sell the fresh milk, *kindirimo*, yoghurt and *nono*, and others produced on their farms. According to them, the prolonged use of recombined milk has virtually stifled fresh milk market in addition to the problem of lack of storage facility by consumers.

However, fresh milk is richer and easily used up by the body because it is coming fresh from the farm and it retains the freshness and original taste of the milk but these qualities of the milk are difficult to retain in powdered milk or evaporated milk. Therefore, it is imperative that government make deliberate effort to develop the local dairy sub-sector to improve on the supply

side through increase production and productivity of local dairy to meet the ever growing fresh milk demand.

Table 27: Budget share, expenditure elasticity and average marginal expenditure share of local dairy and associated products.

S/n	Local dairy products	Budget share	Expenditure Elasticity (e_m)	Marginal expenditure share
1	Fresh milk	0.1591	1.11	0.1766.
2	*Kindirimo*	0.1493	1.09	0.1627.
3	*Nono*	0.1411	0.84	0.1185.
4	Yoghurt	0.0744	1.08	0.0804.
5	Butter	0.1109	1.09	0.1209.
6	Cheese	0.0402	0.42	0.0169
7	Baby food	0.0292	0.32	0.0093
8	Evaporated milk	0.0131	1.78	0.0233.
9	Powdered milk	0.0449	0.97	0.0436.
10	Flavored milk	0.0152	0.91	0.0138
11	Ice cream	0.0115	1.03	0.0118.
12	Soya cheese	0.0541	0.51	0.0276.
13	Soya drinks	0.0211	0.32	0.0068.
14	Cereal drinks	0.1787	0.65	0.1162.
15	Sugar & syrup	0.0531	0.75	0.0398.
16	Others	0.0505	0.63	0.0318.

Source; survey data 2018

4.5.2 Own price and cross price elasticity of demand for local dairy and associated products

4.5.2.1 Uncompensated marshallian own price elasticity of demand for local dairy and associated products

Table 28 shows the computed Marshallian own-price and expenditure elasticities of demand. The results show that all own-price elasticities had the expected a priori sign and were significant at 5% level. The own price elasticity of demand for local dairy and associated products measures the relative responsiveness in the quantity of each of these commodities demanded to changes in their respective prices. The coefficient of price elasticity of demand (e), relating as it does the percentage change in quantity demanded of each the of local dairy and their associated products to the corresponding percentage change in their respective prices. Therefore, if the percentage increase in the quantity of a commodity demanded is smaller than the percentage fall in its own price, the coefficient of price elasticity of demand is smaller than one; such commodity is said to be inelastic.

However, for the following commodities including baby food (-0.019), soya cheese (-0.026), soya drink (-0.035), flavored milk (-0.036), "other local dairies" (-0.039), cheese (-0.057), *nono* (-0.076), sugar & syrup (-0.078) and cereal drink (-0.086). It implies that a 1% increase in the price of each and every one of these local dairy and associated products would lead to a decrease in consumption of less than 1% for such product. Such as a ₦1 increase in the price of baby food (-0.019) would only amount to a decrease in baby food consumption demand by 1.9 kobo. A ₦1 increase in the price of soya cheese (-0.026) would only amount to a decrease in soya cheese consumption demand by 2.6 kobo. A ₦1 increase in the price of soya drink (-0.035)

would only amount to a decrease in soya drink consumption demand by 3.5 kobo. A ₦1 increase in the price of flavored milk (-0.036) would only amount to a decrease in flavored milk consumption demand by 3.6 kobo. A ₦1 increase in the price of "other local dairies" (-0.039) would only amount to a decrease in "other local dairies" consumption demand by 3.9 kobo. A ₦1 increase in the price of cheese (-0.057) would only amount to a decrease in cheese consumption demand by 5.7 kobo. A ₦1 increase in the price of *nono* (-0.076) would only amount to a decrease in *nono*consumption demand by 7.6 kobo. A ₦1 increase in the price of sugar & syrup (-0.078) would only amount to a decrease in sugar & syrup consumption demand by 7.8 kobo.

Lastly, a ₦1 increase in the price of cereal drink (-0.086), would only amount to a decrease in cereal drink's consumption demand by 8.6 kobo. It therefore portends that when there is price falls for each of these products, total expenditure will not rise as proportionately as long as $e < 1$. Thus total expenditure move in same direction as prices when $e < 1$. However, deductions from some respondents revealed a number of intrinsic reasons given for supporting their demand considerations for some products. For instance, *nono* (-0.076) is less inelastic than some other local dairies listed as inelastic, including baby food (-0.019), soya cheese (-0.026), soya drink (-0.035), flavored milk (-0.036), "other local dairies" (-0.039) and cheese (-0.057) owing to the fact that there is relatively greater percentage of income spent on this commodity than those of the others here listed. It is therefore closer to being elastic than others here listed.

Also, for baby food (-0.019), soya cheese (-0.026), soya drink (-0.035), flavored milk (-0.036) and "other local dairies" (-0.039) have their own-price elasticity's values as close to zero; which

suggest that demand for such commodities are price-independent and least sensitive to their own price changes. These scenarios are possible considering products such as soya cheese and soya drink's which are partly supplied from households' own production. Here, the daily quantity consumed often depend not directly on forces of market price behaviors, but on how much is produced at home for the home consumption.

Also, considering baby food (-0.019), with its own price elasticity's value being very close to zero. This is a product commonly served as infant baby formula by nursing mothers, to their babies. It is a kind of necessity when the mother's milk is not enough or the mother is unable due to work or sickness to breast feed their babies. These consumers will most likely disregard forces of market price, but just buy in other to meet their babies basic food need. At such instances, the mothers are price takers. More so that such instant baby food is a must buy commodity by mothers for their newly born babies after the mandated six month of exclusive breast feeding.

Also, most flavored milks are often purchased by consumers for special occasions such as birthdays, weddings and festivals. For these special occasions, the product are often purchased to supplements "other local drinks" including local tea and beverages, local beer and alcohol, carbonated drinks, fruits and vegetable drinks and porridges etc. These are often produced at household level, and are important consumer items. Thus, flavored milk, like those other local dairy related drinks were products with price elasticities near zero. Such commodities were in other words absolute necessities, and market reaction to upward price movement is insignificant to affect their demand.

The results in Table 28 show that the households' demand for evaporate milk (-1.407), fresh milk (-1.151), yoghurt (-1.103), powdered milk (-1.103), *kindirimo* (-1.097), butter (-1.095) and ice cream (-1.011) are elastic. That is, when the price of such a local dairy or its associated product falls, total expenditure rises for such a product as long as the coefficient of price elasticity is greater than 1 (e > 1). The percentage increase in quantity (which by itself tends to increase total expenditure on the said commodity) is greater than the percentage fall in price (which by itself tends to reduce total expenditure on the said commodity); therefore, total expenditure on such commodity increases. These are the cases for evaporated milk (-1.407), fresh milk (-1.151), yoghurt (-1.103), powdered milk (-1.103), *kindirimo* (-1.097) and butter (-1.095). However, total expenditure reaches a maximum when e = 1 and decline thereafter as it is the case for ice cream (-1.011). The opposite occurs for price rises. Thus, total expenditure moves in the opposite direction as prices when e > 1. Therefore, for evaporated milk with coefficient of price elasticity (-1.407) implies that a 1% increase in the price of evaporated milk would lead to a decrease in evaporated milk consumption by 1.41%. For fresh milk with coefficient of price elasticity (-1.151) implies that a 1% increase in the price of fresh milk would lead to a decrease in fresh milk consumption by 1.15%..

For yoghurt with coefficient of price elasticity (-1.103) implies that a 1% increase in the price of yoghurt would lead to a decrease in yoghurt consumption by 1.10%. For powdered milk with coefficient of price elasticity (-1.103) implies that a 1% increase in the price of powdered milk would lead to a decrease in powdered milk consumption by 1.10%. For *kindirimo* with coefficient of price elasticity (-1.097) implies that a 1% increase in the price of *kindirimo* would lead to a decrease in *kindirimo* consumption of 1.10%. For ice cream with coefficient of price

elasticity (-1.011) implies that a 1% increase in the price of ice cream would lead to a decrease in ice cream consumption of 1.01%. And lastly for butter with coefficient of price elasticity (-1.095) implies that a 1% increase in the price of butter would lead to a decrease in butter consumption of 1.10%.

4.5.2.2 Uncompensated Marshallian cross price elasticity of demand for local dairy and associated products

The results presented in Table 28 show the non-diagonal elements as the Marshallian cross price elasticity for local dairy and associated products consumed by households in the study area. As expected these cross elasticities are generally lower in absolute terms than the own price elasticities. This implies that consumers were more responsive to changes in own prices than the prices of other products. However, with cross price elasticities close to zero, most of the food groups seem to be unrelated. Further, the cross price effects presented in the Table 28 indicate the gross substitution and complementary effects of local dairy and associated commodities group exist. The positive sign of cross price elasticity indicates that two goods are substitutes and the negative sign indicates that two goods are complements.

The results revealed in Table 28 show that the consumption of fresh milk showed the highest substitutability response with the price of powdered milk (0.512). The result also showed that the second most substitutability response for the consumption of fresh milk is with the price of evaporated milk (0.306). This was followed respectively by the substitutability response of fresh milk consumption with the price of yoghurt (0.288), with the price of *kindirimo* (0.249), with the price of flavored milk (0.244), with the price of ice cream (0.141) and with the price of

nono(0.128). However, the result showed that fresh milk showed a complementary response for the price of cereal drink (-0.518) and for the price of sugar and syrup (-0.322). Nonetheless, fresh milk showed an unrelated responses for the price of baby food (-0.010), for the price of soya drink (0.034), for the price of "others" (-0.035), for the price of butter (-0.036), for the price of soya cheese (0.044) and for the price of cheese (0.044) with their cross price elasticities being close to zero.

The results indicated in Table 28 also revealed that the consumption of *kindirimo* showed the highest substitutability response with the price of *nono* (0.467). The second highest substitutability response was that of the consumption of *kindirimo* with the price of yoghurt (0.386) which was followed by that with the price of flavored drink (0.220) and lastly by a weaker substitutability response of the consumption of kindirimo with the price of fresh milk (0.105). However, the consumption of *kindirimo* showed a complementary response with the price of cereal drink (-0.431) and with the price of sugar and syrup (-0.308).

Nonetheless, households consumption of *kindirimo* showed an unrelated responses with the price of soya cheese (0.004), with the price of cheese (-0.007), with the price of soya drink (0.008), with the price of ice-cream (-0.015), with the price of butter (-0.031), with the price of baby food (-0.035), with the price of evaporated milk (0.036), with the price of powdered milk (-0.041), with the price of "others" (0.044) as shown in Table 28 with cross price elasticities being close to zero.

The consumption of *nono* showed the highest substitutability response for the price of *kindirimo* (0.574). The second substitutability response is the consumption of *nono* with the price of yoghurt (0.156) followed by those with the price of fresh milk (0.147), those with the price of flavored milk (0.106), with the price of evaporated milk (0.103), and lastly by a weaker substitutability response of consumption of nono with the price of powdered milk with the price of powdered milk (0.095). However, the most complementary response of consumption of *nono* is with the price of cereal drink (-0.452) and with the price sugar and syrup (-0.265). Nonetheless, household consumption of *nono* showed unrelated responses with the price of soya cheese (0.013), with the price of cheese (0.014), with the price of soya drink, (0.024) with the price of ice-cream, (0.021), with the price of butter (0.051), with the price of baby food (0.070), and with the price of "others" (0.018) as shown in Table 28 with cross price elasticities being close to zero.

Moreover, the consumption of yoghurt showed the highest substitutability response with the price of fresh milk (0.176). The second strongest substitutability response for yoghurt consumption is with the price of ice cream (0.172), followed by those with the price of flavored milk (0.156), with the price of *kindirimo* (0.129), with the price of evaporated milk (0.104), and follow by a weak substitutability response of yoghurt consumption with the price of *nono* (0.099), with the price of others (0.098) and with the price of powdered milk (0.095).

However, the most complementary response for the consumption of yoghurt is that with the price of cereal drink (-0.147) and with the price sugar and syrup (-0.101). Nonetheless, household consumption of yoghurt showed unrelated responses with the price of butter (0.046), with the

price of soya cheese (-0.032), with the price of soya drink (0.023) and with the price of cheese (0.015); as shown in Table 4.27 with cross price elasticities being close to zero. Furthermore, the consumption of butter showed the highest substitutability response with the price of cheese (0.099). The second most substitutability response is the consumption of butter with the price of soya cheese (0.078) and with the price of sugar and syrup (0.074). However, the most complementary response of consumption of butter is the cross price elasticity of butter with the price of *kindirimo* (-0.095), with the price of cereal drink (-0.091) and with the price of yoghurt (-0.070). Nonetheless, household consumption of butter showed unrelated responses for the price of fresh milk (-0.056), with the price of evaporated milk (-0.044), with the price of flavored milk (-0.043) with the price of *nono* (-0.039), with the price of ice cream (-0.028), with the price of soya drink (-0.024), with the price of powdered milk (-0.019) and with the price of baby food (-0.005) as shown in Table 28 with cross price elasticities being close to zero.

Lastly, the consumption of cheese showed the highest but weak substitutability response with the price of evaporated milk (0.054) and with the price of soya cheese (0.051). However, a weak complementary response of consumption of cheese is with the price of yoghurt (-0.055). Nonetheless, household consumption of cheese showed unrelated responses with the price of baby food (-0.042), with the price of cereal drink (-0.040), with the price of powdered milk (-0.040), with the price of sugar and syrup (-0.035), with the price of others (-0.035), with the price of flavored milk (-0.032), with the price of *nono* (-0.031), with the price of fresh milk (-0.025), with the price of butter (-0.021), with the price of soya drink (-0.021), with the price of ice cream (-0.013) and with the price of *kindirimo* (-0.012) as shown in Table 27 with cross price elasticities being close to zero.

Table 28: Uncompensated Marshallian own price, cross price and expenditure elasticity of demand for local dairy and associated products in study area.

Marshalian / uncompensated price elasticities																	
Local dairy & associated product	**Fresh milk**	***Kindirimo***	***Nono***	**Yoghurt**	**Butter**	**Cheese**	**Baby food**	**Evaporated milk**	**Powdered milk**	**Flavored milk**	**Ice cream**	**Soya cheese**	**Soya drink**	**Cereal drink**	**Sugar & syrup**	**Others**	**Expd. elasticity**
Fresh milk	*-1.151*	*-0.035*	*0.147*	*0.176*	*-0.056*	*-0.025*	*-0.004*	*-0.104*	*0.101*	*0.004*	*-0.004*	*-0.021*	*0.021*	*-0.081*	*-0.023*	*-0.008*	1.11
Kindirimo	*-0.049*	*-1.097*	*0.574*	*0.129*	*-0.095*	*0.012*	*-0.005*	*0.103*	*0.087*	*0.017*	*-0.021*	*-0.013*	*-0.020*	*-0.056*	*-0.017*	*-0.022*	1.09
Nono	*-0.128*	*0.467*	*-0.760*	*-0.099*	*-0.039*	*-0.031*	*-0.014*	*-0.091*	*-0.961*	*-0.006*	*-0.050*	*-0.009*	*-0.030*	*-0.060*	*-0.003*	*-0.012*	0.84
Yoghurt	*0.288*	*0.386*	*0.156*	*-1.103*	*-0.070*	*-0.055*	*-0.010*	*-0.034*	*-0.019*	*0.021*	*-0.032*	*-0.018*	*0.010*	*-0.051*	*0.034*	*-0.002*	1.08
Butter	*-0.036*	*-0.031*	*-0.051*	*-0.046*	*-1.095*	*-0.021*	*-0.006*	*-0.047*	*-0.020*	*-0.016*	*-0.075*	*-0.020*	*-0.021*	*-0.052*	*-0.042*	*-0.023*	1.09
Cheese	*-0.044*	*-0.007*	*0.014*	*-0.015*	*0.099*	*-0.057*	*-0.016*	*-0.049*	*-0.023*	*-0.013*	*-0.005*	*0.005*	*-0.014*	*-0.023*	*-0.043*	*-0.034*	0.42
Baby food	*-0.010*	*-0.035*	*0.070*	*-0.010*	*-0.005*	*-0.042*	*-0.019*	*-0.097*	*-0.039*	*-0.032*	*-0.029*	*-0.021*	*-0.004*	*-0.051*	*-0.012*	*-0.037*	0.32
Evaporated milk	*0.306*	*0.036*	*0.103*	*0.104*	*-0.044*	*0.054*	*-0.013*	*-1.407*	*0.018*	*-0.008*	*-0.021*	*-0.016*	*-0.028*	*-0.010*	*-0.056*	*-0.021*	1.78
Powdered milk	*0.512*	*-0.041*	*0.950*	*0.095*	*-0.019*	*-0.040*	*-0.001*	*0.188*	*-1.103*	*-0.021*	*-0.043*	*-0.019*	*-0.032*	*-0.029*	*-0.070*	*-0.012*	0.97
Flavored milk	*0.244*	*0.220*	*0.106*	*0.156*	*-0.043*	*-0.032*	*-0.015*	*0.121*	*-0.028*	*-0.036*	*-0.065*	*-0.002*	*0.029*	*-0.032*	*-0.021*	*-0.019*	0.91
Ice cream	*-0.141*	*-0.015*	*-0.021*	*-0.172*	*-0.028*	*-0.013*	*-0.007*	*-0.011*	*-0.032*	*0.026*	*-1.011*	*-0.025*	*-0.032*	*-0.080*	*-0.032*	*-0.023*	1.03
Soya cheese	*-0.045*	*-0.004*	*-0.013*	*-0.032*	*0.078*	*0.051*	*0.003*	*-0.016*	*-0.101*	*-0.015*	*-0.057*	*-0.026*	*-0.020*	*-0.032*	*-0.012*	*-0.018*	0.51
Soya drinks	*-0.034*	*0.008*	*-0.024*	*0.023*	*-0.024*	*-0.021*	*-0.014*	*0.174*	*-0.022*	*-0.031*	*-0.025*	*-0.012*	*0.035*	*-0.021*	*-0.031*	*-0.020*	0.32
Cereal drinks	*-0.518*	*-0.431*	*-0.452*	*-0.147*	*-0.091*	*-0.040*	*-0.009*	*-0.132*	*-0.089*	*-0.006*	*-0.065*	*-0.08*	*-0.009*	*-0.086*	*-0.008*	*-0.022*	0.65
Sugar & syrup	*-0.322*	*-0.308*	*-0.265*	*-0.101*	*0.074*	*-0.035*	*-0.011*	*-0.087*	*-0.100*	*0.019*	*0.135*	*-0.021*	*0.011*	*-0.043*	*-0.078*	*-0.015*	0.75
Others	*-0.035*	*0.044*	*0.018*	*0.098*	*-0.086*	*-0.035*	*-0.011*	*-0.057*	*-0.010*	*-0.026*	*-0.035*	*-0.002*	*-0.032*	*-0.063*	*-0.070*	*0.039*	0.63
intercept	*0.023*	*0.015*	*0.031*	*0.095*	*0.059*	*0.099*	*0.053*	*0.052*	*0.0563*	*0.024*	*0.018*	*0.027*	*0.031*	*0.045*	*0.033*	*0.026*	
R^2	*0.383*	*0.269*	*0.326*	*0.432*	*0.513*	*0.325*	*0.449*	*0.512*	*0.507*	*0,389*	*0.428*	*0.315*	*0.488*	*0.423*	*0.533*	*0.289*	

Source; survey data 2018

4.6.3 Compensated Hicksian own price and cross price elasticity of demand for local dairy and associated products demand

The result revealed in Table 29 showed the value of Hicksian own price and cross price elasticities are majorly negative but greater than the corresponding uncompensated marshallian price elasticities. This suggests that the substitution effect outweighs the income effect. The compensated own price elasticity of evaporated milk (-1.613), fresh milk (-1.195), powdered milk (-1.113), yoghurt (-1.121), *kindirimo* (-1.105), butter (-1.099) and ice cream (-1.0023) were elastic. This means that a price increase of 1% will cause a reduction in the demand of the respective evaporated milk by 1.6%, fresh milk 1.2%, powdered milk 1.1%, yoghurt 1.1%, *kindirimo* 1.1%, butter 1% and ice cream 1%.

The result in the Table 4.28 showed that increasing the price of evaporated milk, fresh milk, powdered milk, yoghurt, *kindirimo*, butter and ice cream in the study area will less than proportionately decrease the budget share of these respective products in the local dairy and associate commodities expenditures in the study area. However, the Hicksian compensated own price elasticity of demand for cereal drink (-0.094), sugar and syrup (-0.088), *nono* (-0.086), cheese (-0.063), flavored milk (-0.044), soya drink (-0.042), others (-0.040), soya cheese (-0.031) and baby food (-0.024) were price inelastic.

Economists use the Hicksian demand curve for what is called "welfare analysis" - to figure out how much better or worse off people are as a result of a price change. Therefore, the effects of a price change of a said local dairy product depend on how many good alternatives local dairy

products or associated commodities are available, so they need to be measured just looking at the pure substitution effect, without having to look at the income effect at the same time.

Table 29: Compensated Hicksian Own price and Cross price elasticities of demand for local dairy products.

Local dairies & Related product	**Fresh milk**	***Kindirimo***	***Nono***	**Yoghurt**	**Butter**	**Cheese**	**Baby food**	**Evaporated milk**	**Powdered milk**	**Flavored milk**	**Ice cream**	**Soya cheese**	**Soya drink**	**Cereal drink**	**Sugar & syrup**	**Others**
Fresh milk	*-1.195*	*-0.042*	*-0.055*	*0.181*	*-0.061*	*-0.035*	*-0.191*	*-0.098*	*0.173*	*0.194*	*-0.065*	*-0.099*	*0.165*	*-0.095*	*-0.143*	*-0.064*
Kindirimo	*-0.051*	*-1.105*	*0.213*	*0.299*	*0.031*	*0.020*	*-0.123*	*0.121*	*0.132*	*0.213*	*-0.034*	*-0.223*	*-0.032*	*-0.264*	*-0.132*	*-0.034*
Nono	*-0.032*	*0.555*	*-0.860*	*-0.014*	*-0.088*	*-0.043*	*-0.134*	*-0.096*	*-0.070*	*-0.021*	*-0.061*	*-0.045*	*-0.092*	*-0.212*	*-0.215*	*-0.224*
Yoghurt	*0.301*	*0.398*	*0.220*	*-1.121*	*-0.090*	*-0.071*	*-0.039*	*-0.041*	*-0.045*	*0.311*	*-0.039*	*-0.083*	*0.121*	*-0.167*	*0.121*	*-0.099*
Butter	*-0.048*	*-0.036*	*-0.079*	*-0.058*	*-1.099*	*-0.050*	*-0.155*	*-0.054*	*-0.039*	*-0.043*	*-0.088*	*-0.088*	*-0.039*	*-0.105*	*-0.054*	*-0.045*
Cheese	*-0.052*	*-0.017*	*-0.034*	*-0.032*	*0.035*	*-0.063*	*-0.103*	*-0.061*	*-0.032*	*-0.027*	*-0.013*	*0.132*	*-0.032*	*-0.034*	*-0.083*	*-0.052*
Baby food	*-0.019*	*-0.047*	*-0.047*	*-0.021*	*-0.040*	*-0.049*	*-0.024*	*-0.102*	*-0.058*	*-0.044*	*-0.039*	*-0.039*	*-0.123*	*-0.266*	*-0.021*	*-0.059*
Evaporated milk	*0.359*	*-0.069*	*0.159*	*0.197*	*-0.059*	*-0.062*	*-0.042*	*-1.613*	*0.191*	*-0.092*	*-0.044*	*-0.074*	*-0.031*	*-0.132*	*-0.066*	*-0.069*
Powdered milk	*0.612*	*-0.082*	*-0.941*	*0.202*	*-0.028*	*-0.099*	*-0.170*	*0.195*	*-1.113*	*-0.030*	*-0.049*	*-0.083*	*-0.048*	*-0.295*	*-0.085*	*-0.031*
Flavored milk	*0.265*	*0.046*	*0.161*	*0.251*	*-0.062*	*-0.078*	*-0.033*	*0.137*	*-0.031*	*-0.044*	*-0.073*	*-0.047*	*0.306*	*-0.049*	*-0.042*	*-0.103*
Ice cream	*-0.056*	*-0.036*	*-0.033*	*-0.090*	*-0.039*	*-0.032*	*-0.099*	*-0.026*	*-0.039*	*0.159*	*-1.023*	*-0.055*	*-0.043*	*-0.097*	*-0.049*	*-0.045*
Soya cheese	*-0.049*	*-0.024*	*-0.021*	*-0.049*	*-0.094*	*-0.163*	*0.043*	*-0.031*	*-0.142*	*-0.082*	*-0.063*	*-0.031*	*-0.099*	*-0.053*	*-0.036*	*-0.191*
Soya drinks	*-0.044*	*0.323*	*-0.031*	*0.133*	*-0.041*	*-0.161*	*-0.167*	*0.188*	*-0.040*	*-0.039*	*-0.034*	*-0.066*	*-0.042*	*-0.038*	*-0.052*	*-0.049*
Cereal drinks	*-0.029*	*-0.287*	*-0.461*	*-0.161*	*-0.099*	*-0.170*	*-0.290*	*-0.143*	*-0.151*	*-0.121*	*-0.077*	*-0.082*	*-0.264*	*-0.094*	*-0.185*	*-0.239*
Sugar & syrup	*-0.367*	*-0.372*	*-0.301*	*0.273*	*-0.082*	*-0.0372*	*-0.130*	*-0.090*	*-0.129*	*0.173*	*0.144*	*-0.045*	*0.149*	*-0.432*	*-0.088*	*-0.233*
Others	*-0.047*	*-0.089*	*0.139*	*0.112*	*-0.094*	*-0.0367*	*-0.035*	*-0.061*	*-0.024*	*-0.084*	*-0.054*	*-0.099*	*-0.069*	*-0.089*	*-0.091*	*-0.040*
Intercept	*0.034*	*0.031*	*0.044*	*0.075*	*0.045*	*0.032*	*0.073*	*0.046*	*0.029*	*0.024*	*0.048*	*0.057*	*0.082*	*0.033*	*0.083*	*0.086*
R^2	*0.399*	*0.361*	*0.421*	*0.399*	*0.498*	*0.465*	*0.457*	*0.539*	*0.533*	*0,392*	*0.488*	*0.485*	*0.432*	*0.423*	*0.576*	*0.489*

Source; survey data 2018

4.7 Constraints to Household Local Dairy Products Demand

4.7.1 Constraints to Local Dairy Products Consumption

The cross tabulation result presented in Table 30 show the summary chi-square tabulated value (37.7) less thanchi-square calculated value (142.4) and significant at 5% level of probability and 25% degrees of freedom. This lead to the rejection of the null hypothesis stating that there is independence between the statedconstraints to local dairy products and its consumption. The alternative hypothesis which stated that there is relationship between the stated constraints and the local dairy products consumption in the study area is hereby accepted. The result show that majority of households (320) complained that inadequate storage facilities have effects on Fresh milk consumption the most.

However, FAO (2011) posited that a food loss at consumer level is minimal in most developing countries as their limited level of household income makes them to buy smaller amount of food that often enough for meals on the day of purchase. Again that most of the households knew cooling is useful to keep milk fresh using refrigerator in their home and stored raw milk in a temperature range of -2 to 5 ^{o}C; but such facilities are grossly inadequate in their homes.

The mostcomplaint by the household was unhygienic product handling (199) affecting household consumption of *kindirimo*. Similarly, the constraint of product adulteration is hampering the most (220) the most household consumption of n*ono* in study area. This is in line with Agza et al., (2013) who described that microbiological hazards are often introduced into milk during primary production and processing in unhygienic manner resulting in the rise in the bacterial

count of the milk. Also that the sources of chemical hazards introduction in milk can vary including air, soil, water, substances used in animal husbandry practices and animal feedstuffs. The concerns for the chemical hazard are environmental contaminants and adulterants added in milk, which may cause illness or adverse health effectsto consumers.

Most of the households consuming yoghurt said poor product processing was the most (180) associated constraints against their demand for the product. However, the main constraints affecting butter consumption (130) by the household wasthe implications of health talk.Though knowledge of the consumers in the study area cannot be underestimated however, awareness on dairy product handling, public health hazards of raw milk and post-pasteurized contamination, necessary labeling information on packed products, and quality standards of dairy products, need to be enhanced through better processing of the product (yoghurt) and adequate health talks on consumption of the product (butter) which some of the respondents alluded to as influence their level of consumption of these products. These assertions are in line with Bilatu (2013) who stresses that milk picks up many bacteria from the time it leaves the teat of the cow until it reaches to the table for consumption or further processing and as a result microbial contamination of the dairy product is the overall effect gained during milk production and handling, including cleanliness level of the milking utensils, condition of storage, manner of transport as well as the cleanliness and healthiness of the udder of the individual animal.

Furthermore, unavailability and untimely supply of butter (162) and freshmilk (150) were main complaint against household consumption of these products in the study area. This was in line

with Adefalu et al., (2015) findings in Kwara State who opined that affordability and availability were the most important constraints to dairy products consumption.

Table 30 Chi-Square summary statistics on constraints to local dairy products consumption

Variables	Freshmilk	Kindirimo	Nono	Yoghurt	Butter	Cheese	Chi-square	p-value
Unhygienic product	65	199	134	30	80	83	142.4	0.05
Product adulteration	98	70	220	90	20	15		
Poor storability	320	22	87	129	19	20		
Poor products processing	16	140	115	180	16	148		
Health talk implication	27	181	25	10	130	20		
Unavailability / untimely supply	150	20	18	30	162	116		

Source; survey data 2018

However, a cross tabulation result revealed in Table 31 show the most constraints against fresh milk, *kindirimo*, *nono*, yoghurt, butter and cheese consumption among households in the regions. All the stated constraints were statistically significant at 5% level of probability with exception of the one variable (unhygienic product) in both rural and urban areas. Most fresh milk consuming rural household (68) complained of poor storability and inadequate storage facilities than their urban counterpart (34); they also complaint of health talk implications (74) more than their urban counterparts (32) as main factors affecting their consumption of these fresh milk. However, the urban freshmilk consuming households complained more (98) of unavailability and untimely supply of the products than their rural counterparts (15).Furthermore, from Table 31 it was shown that household consuming kindirimo complaints more (72) of poor product

processing than their rural counterpart (53).Also the results in Table 31 indicated that urban households responded that adulteration of nono (82) is more constraint against its consumption than their rural counterparts (43).

It was further revealed in the Table 31 that rural households consuming yoghurt complained more (74) of implication of health talk as chief motivating factor in consuming yoghurt than their urban counterparts complained (20). This is a good omen for development as many rural consumers seems appreciate good health counsels on consuming yoghurt healthily. The urban households explained more of unavailability ability untimely supply of butter than their rural counterparts (12) as the main reason constraining their consumption of butter in the study area.

Table 31 Chi-Square summary statistics of constraints to local dairy products consumption in the regions

Variables	Regions	Freshmilk	Kindirimo	Nono	Yoghurt	Butter	Cheese	Chi-square	p-value
Unhygienic product								6.3	0.05
	Rural	15	14	18	12	15	19		
	Urban	45	38	47	25	23	25		
Product adulteration								17.0	0.05
	Rural	12	1	43	11	13	11		
	Urban	22	34	82	38	22	18		
Poor storability								17.8	0.05
	Rural	68	52	48	62	34	25		
	Urban	34	25	18	28	25	35		
Poor products processing								55.5	0.05
	Rural	42	72	38	42	12	13		
	Urban	35	53	64	23	52	48		
Health talk implication								63.7	0.05
	Rural	74	58	25	74	45	20		
	Urban	32	28	68	20	24	14		
Unavailability / untimely supply								208.8	0.05
	Rural	15	12	15	82	12	18		
	Urban	98	88	82	12	72	62		

Source; survey data 2018

CHAPTER FIVE

5.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

In recent years, so little account of the nature of household demand of local dairy product and of the very important consequences that arises from the peculiarities of household demand for this class of products in the study areaare reported. On the premises that these gaps existed in the literature, this study aimed to provide empirical datato inform and support policy reforms, and that which seeks to address challenges of nutrition and food demand among rural and urban households. Thus, the study analyzes households demand for local dairy products in Jigawa and Kaduna States of Nigeria.

The study described the socio-economic characteristics of households consuming local dairy products in the study area, profile the household's consumption of local dairy products, assess the level of expenditure on the household consumption of local dairy products, determined the factors that influence household demand for local dairy products, estimate expenditure, own price and cross price elasticities of local dairy products and described the constraints to household consumption of local dairy products in the study area.

A multistage random sampling technique was used, to select from Jigawa and Kaduna States, a sample size of 420 households. These stages ofsampling were carried out including: 4 agro-ecological zones, 16 local government areas, 18 districts and 16 wards levels. A total of 512 households were earlier considered but 420 households were analyzed completely.Well-structured questionnaires were used to collect data from the respondents. Information obtained

from them includes their socio-economic characteristics, consumption records and constraints to consumption of local dairy products.

The data were analyzed using descriptive statistics, Linear Almost Ideal Demand System (LAIDS) model, Multinomial logit model and Chi-quare analysis.The study found that most of the household heads (58%) in the entire the study area were young with the mean age of 40years. Most of them were men (73%) and were the chief accounting officers in their homes. Also, most of the head of household were married (68.8%). However, there were more married household heads in the urban areas (73%) than in the rural areas (64%). The average household size (38%) was eight (8) people per household. The household heads in entire study area were considerably educated (64.58%) having one form of education or the other ranging from primary to tertiary education.

However, the urban household heads were more educated (72%) than their rural counterparts (38%). Majority of the household heads (94%) fall within the low to middle income bracket receiving a disposable average income of ₦ 50,000.00 monthly. Those at the high income bracket are the minority (6%) receiving a disposable average monthly income of ₦120,000.00 and above.The study also explained the factors influencing households' consumption of local dairy products and found that households residing in urban areas have higher probability of consuming *kindirimo* (0.739)*, fresh milk (0.632)* and yoghurt (0.616)* than households living in the rural areas. However, they were less likely than those in rural areas to consume *nono* (-0.918)* and indifferent towards consumption of cheese (0.177) consumption. The result was further buttressed by the marginal effect of households' consumption of the local dairy

products. Such as*kindirimo* and fresh milk household consumptions in urban areas which were 45.7% and 25.1 % respectively.

Also, the studyfound thatthe marginal expenditure share whichwas earlier defined as a product of expenditure elasticity and expenditure share per product was found to sums up to unity (100%); this however is in conformity with the adding up condition of the AIDS model system analysis. Thus,this confirms the rejection of the null hypothesis which states that the household's head income status does not have effect on the class of local dairy products consumed by the households.

The marginal expenditure share of fresh milk is the largest (0.1766) which implies a 17.7% increase in expenditure on fresh milk should there be an increase in income to consume local dairy products. However, the expenditure elasticities for the following local dairy products were less than unity: powdered milk (0.97), flavored milk (0.91), *nono* (0.84), sugar and syrups (0.75), cereal drink (0.65), others (0.63), soya cheese (0.51), cheese (0.42), baby food (0.32) and soya drink (0.32). They are thus regarded as necessity products and the demand for them increases less than the percentage rise in income.However, for evaporated milk with expenditure elasticity of 1.78 which is more than unity, implies that an increase of 1% in expenditure on local dairy product increases evaporated milk demand by 1.78% and thus is referred to as luxury product.

The computed Marshallian own-price elasticities of demand for local dairies by households showed the right sign, negative and were significant ($P < 0.05$). This implies that all the local

dairy products and associated local dairy products listed therein are normal goods, hence, their consumption decreases when their prices increase. The demand for evaporate milk (-1.407), fresh milk (-1.151), yoghurt (-1.103), powdered milk (-1.103), *kindirimo* (-1.097), butter (-1.095) and ice cream (-1.011) were found to be elastic. However, demand for baby food (-0.019), soya cheese (-0.026), soya drink (-0.035), flavored milk (-0.036), "other local dairies" (-0.039), cheese (-0.057), *nono* (-0.076), sugar & syrup (-0.078) and cereal drink (-0.086) were found to be inelastic.This implies that a 1% increase in the price of each and every one of these local dairy and associated products would lead to a decrease in consumption of less than 1% for such product.

As expected the cross price elasticities are generally lower in absolute value than the own price elasticities; implying that consumers were more responsive to changes in own prices than the prices of other products. However, with cross price elasticities close to zero, most of the food groups seem to be unrelated. Further, the cross price effects indicate the gross substitution and complementary effects of local dairy and associated commodities group exist. The positive sign of cross price elasticity indicates that two goods are substitutes and the negative sign indicates that two goods are complements.In this study, the consumption of fresh milk showed the highest substitutability response with the price of powdered milk (0.512).

The second most substitute's response of the consumption of fresh milk was with the price of evaporated milk (0.306), and followed respectively by those with the price of yoghurt (0.288). However, households consumption of fresh milk showed a complementary response with the price of cereal drink (-0.518) and with the price of sugar and syrup (-0.322). Nonetheless,

households consumption of fresh milk showed an unrelated responses with the price of baby food (-0.010), and with the price of soya drink (0.034), with their cross price elasticities being close to zero.

The types of constraints to households consumption of local dairy products in the study area includespoor storability, unavailability and un-timeliness of local dairy product supplies which are the two main constraints against fresh milk consumption by households. Unhygienic nature of products and the presence or absence of health talk received by households affects *kindirimo*'s consumption. Also, product adulteration and Unhygienic nature of product handling affect *nono* consumption by households; whilepoor processing of yoghurt followed by poor storability of product affect yoghurt consumption by households. Also, unavailability and untimely product supply, and health talk affects butter consumption by households. Lastly, cheese consumption by households was affected by poor processing technique.

5.2 Conclusion

Based on the findings of this study, the socio-economic and demographic characteristics of local dairy products consuming households were described. The average households' monthly expenditure on each of the local dairy products in the respective rural and urban region was found as well. The relative probability of factors influencing the households' consumption of one local dairy product relative to another was estimated, including respondents regions of residence, income status and education status. These were found to be significant at 5% level of probability.The estimated expenditure, own-price and cross price elasticities of the major local dairy products consumed were found to be significant at 1% level of significance.

Thesehousehold local dairy consumptions wererespectively categorized as: normal, necessity or inferior goods; inelastic and elastic products; and substitute or complement products The study identified the major constraints influencing the consumption of each of the products among rural and urban households in the study area.

Therefore, evidence from this study on households demand for local dairy products will add to literature relevance information that will encourage government initiatives and structural changes towardsboosting the domestic dairy industry, reduce importation of dairy products and thereby guaranty self-sufficiency in domestic production andimprovement in the nutrition and well-being of the populace. The result will also enhance policy at various levels in local dairy product price fixing, improvement in the income and income redistribution among different sphere of the populace.

5.3 Recommendations

i. The study recommends that nutritional promotion including policy for raising awareness on nutritional information labels on packaged local dairy products should be made mandatory for sellers compliance. This information might encourage households to opt for milk with low fat content such as *nono*. The quality and taste of nono can be improved via flavoring. Increased consumers acceptability for consumption of more products can be achieved as consumers are ready to accept alteration to sensorial characteristics of milk in return for more nutritional qualities of milk products.

ii. The response patterns of local dairy products' prevalence in the study area can point out to policy makers and development agencies on the possibilities of matching specific local

dairy product's demand of the people with appropriate price fixings and product supplies. This can make such policy pro-people. Marketers, entrepreneurs and policy advisors can also use such base line information on households' levels of local dairy products expenditures and products' consumption prevalence for better regional planning, investment, production, promotion and marketing of local dairy products. This is in line with FAO (2012), which state that investments targeting livestock for livelihoods and livestock for business are constrained by several information gaps both on the farm and beyond the farm. Therefore filling these data gaps should be given priority by decision makers such as sponsoring base line, mid- term review and evaluation of research on local dairy demand, supply and marketing locally, regionally and nationally.

iii. Adequate training workshops and seminars should be organized to enlighten households on local dairy products nutrition and other health benefits and implications. So that they can make informed decision to consume local dairy products in a healthy manner. The local dairy entrepreneurs should be regulated to maintain good hygiene, good processing methods that will allow for quality products that meet market standard. Also, infrastructure such as refrigerators, cold rooms can be provided to cooperatives selling local dairy products and a token paid by members for maintenance of facilities.

iv. The elasticity parameters provided in this study can be used in explaining the paradox of poverty in the midst of plenty which the entrepreneurs should carefully avoid. It implies that a greater yield of local dairy output, instead of bringing prosperity to the producer/salers might ruin them, if the demand for such local dairy product is inelastic, more output of an inelastic product like *nono* for sale will bring a large fall in its price. In this case, the local dairy producers will be the losers, for the total revenue obtained by

them from bumper *nono* production is less than that from a less harvest of local dairy products that are elastic such as fresh milk or butter that are elastic will offer. Such policies like lowering price of the commodity will also substantially increase consumption of local dairy products such as *nono* and cheese, since the main reason of consuming the product was because they are cheaper; and because they are inelastic, any policy that lower such products prices will increase households' consumption.

v. Furthermore, policies such as import substitutions and export promotions, increasing levy or tariff on imported dairies and policy that will increase local dairy production and productivity should also be placed concurrently in order to have simultaneous and impactful effect on the availability, affordability and accessibility of local dairy products, and at better stabilized prices. Also, dairy development initiatives are needed in the overall in order to attract more stakeholders to invest in this sector.

vi. Also, there is need to modernize the local dairy products through development of better product packaging, improvement in product quality and taste, and in establishment of nutritional standards and nutritional information label on the local dairy products. This will offer nutritional information about the products and stimulate more demand for these products.

vii. The study is also relevant for local entrepreneurs; the knowledge of the concept of elasticity will prompt them in spending large sum of money on advertising their local dairy products. This is because, for elastic dairy products like fresh milk, yoghurt, and *kindirimo*, advertisement could make these products become less elastic, such that if prices for these products were raised, there will not be reduction in their sales.

viii. The elasticity of demand parameters can help cooperatives and government cooperate in fixing minimum prices for the range of local dairy products per unit to encourage households' consumption of the products. They can also provide some price support programs and create buffer stocks meant to stabilize local dairy product prices. They can buy back and collect excess dairy products from local sellers and keep in cold rooms in dairy collection centres. This will help in nullifying the effect of excess milk harvest during wet season, and thus encourage producers to produce and process more products during such period. Therefore, the guaranteed minimum price will help the dairy producers in selling their local dairy products without incurring a loss in total income and in stabilizing local dairy products prices making the products available and affordable to households all year round.

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Appendix 1 on Chi-Square Distribution on Household Level of Education and Consumption of Local Products in Rural and Urban Regions

Observed (O)	**Expected (E)**	**O-E**	**$(O-E)^2$**	**$(O-E)^2/E$**
72	**47.5**	**24.5**	**600.25**	**12.63684**
71	**53.5**	**17.5**	**306.25**	**5.724299**
50	**54**	**-4**	**16**	**0.296296**
31	**48**	**-17**	**289**	**6.020833**
16	**37**	**-21**	**441**	**11.91892**
23	**47.5**	**-24.5**	**600.25**	**12.63684**
36	**53.5**	**-17.5**	**306.25**	**5.724299**
58	**54**	**4**	**16**	**0.296296**
65	**48**	**17**	**289**	**6.020833**
58	**37**	**21**	**441**	**11.91892**
		0	**$\sum(O-E)^2/E$**	**73.19438**

Appendix 2: showing Chi square Distribution of local dairy product consumption base on rural and urban region

O	E	O-E	(O-E)^2	(O-E)^2/E
55	54.02	0.98	0.9604	0.017779
130	108.05	21.95	481.8025	4.45907
98	93.64	4.36	19.0096	0.203007
35	45.02	-10.02	100.4004	2.230129
25	33.76	-8.76	76.7376	2.273033
5	13.51	-8.51	72.4201	5.360481
65	65.98	-0.98	0.9604	0.014556
110	131.95	-21.95	481.8025	3.651402
110	114.36	-4.36	19.0096	0.166226
65	54.98	10.02	100.4004	1.826126
50	41.24	8.76	76.7376	1.860757
25	16.49	8.51	72.4201	4.391759
		0	0	26.45432

Appendix 3: showing Chi square Distribution of Income classification of household heads base on rural and urban region

O	E	O-E	(O-E)^2	(O-E)^2/E
150	117.5	32.5	1056.25	8.989362
75	107.5	-32.5	1056.25	9.825581
15	15	0	0	0
85	117.5	-32.5	1056.25	8.989362
140	107.5	32.5	1056.25	9.825581
15	15	0	0	0
		0		37.62989

Appendix 4: Stated reasons for Household consumption preference of local dairy products

O	E	O-E	(O-E)^2	(O-E)^2/E
27	**55.6**	**-28.6**	**817.96**	**14.71151**
71	**51.3**	**19.7**	**388.09**	**7.565107**
45	**51.6**	**-6.6**	**43.56**	**0.844186**
62	**47**	**15**	**225**	**4.787234**
53	**55**	**-2**	**4**	**0.072727**
61	**58**	**3**	**9**	**0.155172**
26	**53.5**	**-27.5**	**756.25**	**14.13551**
46	**49.4**	**-3.4**	**11.56**	**0.234008**
71	**49.6**	**21.4**	**457.96**	**9.233065**
36	**45.8**	**-9.8**	**96.04**	**2.096943**
105	**53**	**52**	**2704**	**51.01887**

23	**55.7**	**-32.7**	**1069.29**	**19.19731**
272	**139.9**	**132.1**	**17450.41**	**124.7349**
106	**129.1**	**-23.1**	**533.61**	**4.133308**
61	**129.9**	**-68.9**	**4747.21**	**36.54511**
182	**119.9**	**62.1**	**3856.41**	**32.16355**
35	**138.6**	**-103.6**	**10732.96**	**77.43838**
147	**145.7**	**1.3**	**1.69**	**0.011599**
148	**98.2**	**49.8**	**2480.04**	**25.25499**
55	**90.7**	**-35.7**	**1274.49**	**14.05171**
218	**91.2**	**126.8**	**16078.24**	**176.2965**
46	**84.2**	**-38.2**	**1459.24**	**17.33064**
11	**97.3**	**-86.3**	**7447.69**	**76.54358**
86	**102.4**	**-16.4**	**268.96**	**2.626563**
58	**178.9**	**-120.9**	**14616.81**	**81.7038**
208	**165.5**	**42.5**	**1806.25**	**10.9139**
51	**166.1**	**-115.1**	**13248.01**	**79.75924**
126	**153.3**	**-27.3**	**745.29**	**4.861644**
334	**177.2**	**156.8**	**24586.24**	**138.7485**
250	**186.4**	**63.6**	**4044.96**	**21.70043**
15	**20**	**-5**	**25**	**1.25**
18	**18.5**	**-0.5**	**0.25**	**0.013514**
61	**18.6**	**42.4**	**1797.76**	**96.65376**

16	**17.2**	**-1.2**	**1.44**	**0.083721**
3	**19.8**	**-16.8**	**282.24**	**14.25455**
2	**20.9**	**-18.9**	**357.21**	**17.09139**
		0		**1178.217**

Appendix 5: Chi-Square Test on Household Consumption of Local Dairy ProductsAway From Home.

OBSERVED (O)	EXPECTED (E)	$(O-E)$	$(O-E)^2$	$(O-E)^2/E$
150	81.63	68.37	4674.457	57.26396
1	37.92	-36.92	1363.086	35.94637
1	31.42	-30.42	925.3764	29.45183
100	79.88	20.12	404.8144	5.067782
30	35.11	-5.11	26.1121	0.743723
1	17.03	-16.03	256.9609	15.08872
10	99.52	-89.52	8013.83	80.52482
40	46.23	-6.23	38.8129	0.839561
5	38.31	-33.31	1109.556	28.96257
150	97.38	52.62	2768.864	28.4336
100	42.8	57.2	3271.84	76.44486
40	20.76	19.24	370.1776	17.83129
120	62.6	57.4	3294.76	52.63195
20	29.08	-9.08	82.4464	2.835158
1	24.1	-23.1	533.61	22.14149
55	61.25	-6.25	39.0625	0.637755
20	26.92	-6.92	47.8864	1.778841
1	13.06	-12.06	145.4436	11.13657
160	100.67	59.33	3520.049	34.96622
45	46.76	-1.76	3.0976	0.066245
12	38.75	-26.75	715.5625	18.46613
110	98.51	11.49	132.0201	1.34017
10	43.3	-33.3	1108.89	25.60947
12	21	-9	81	3.857143
25	120.58	-95.58	9135.536	75.76328
110	56.01	53.99	2914.92	52.04285
160	46.42	113.58	12900.42	277.9064
40	117.98	-77.98	6080.88	51.54162
40	51.86	-11.86	140.6596	2.712295
43	25.15	17.85	318.6225	12.66889

		0.01	$\chi^2 = \sum \frac{(O-E)^2}{E} =$	1024.702

Appendix 6: Analysis of Chi-square distribution of relationships Constraints to Local dairy products consumption

S/N	OBSERVED (O)	EXPECTED (E)	(O-E)	(O-E)/E
1.	**65**	112	-47	-0.41964
2.	**199**	107	92	0.859813
3.	**134**	103	31	0.300971
4.	**30**	95	-65	-0.68421
5.	**80**	88	-8	-0.09091
6.	**83**	85	-2	-0.02353
7.	**98**	97	1	0.010309
8.	**70**	93	-23	-0.24731
9.	**220**	90	130	1.444444
10.	**90**	83	7	0.084337
11.	**20**	77	-57	-0.74026
12.	**15**	74	-59	-0.7973
13.	**320**	113	207	1.831858
14.	**22**	108	-86	-0.7963
15.	**87**	104	-17	-0.16346
16.	**129**	96	33	0.34375
17.	**19**	89	-70	-0.78652
18.	**20**	86	-66	-0.76744

19.	**16**	116	-100	-0.86207
20.	**140**	111	29	0.261261
21.	**115**	108	7	0.064815
22.	**180**	99	81	0.818182
23.	**16**	92	-76	-0.82609
24.	**148**	89	59	0.662921
25.	**27**	74	-47	-0.63514
26.	**181**	71	110	1.549296
27.	**25**	69	-44	-0.63768
28.	**10**	63	-53	-0.84127
29.	**130**	59	71	1.20339
30.	**20**	57	-37	-0.64912
31.	**150**	94	56	0.595745
32.	**20**	90	-70	-0.77778
33.	**18**	87	-69	-0.7931
34.	**30**	80	-50	-0.625
35.	**162**	74	88	1.189189
36.	**116**	72	44	0.611111
37.	**14**	84	-70	-0.83333
38.	**29**	81	-52	-0.64198
39.	**40**	78	-38	-0.48718
40.	**120**	72	48	0.666667

41.	**119**	67	52	0.776119
42.	**124**	64	60	0.9375
43.			0	0.085068

Appendix 7

Explicit Form of AIDS Model Households' Demand / Budget Share for the 16 Local dairy products

$$w_1 = \alpha_{11} + \gamma_{11}\ln p_1 + \gamma_{12}\ln p_2 + \gamma_{13}\ln p_3 + \gamma_{14}\ln p_4 + \gamma_{15}\ln p_5 + \gamma_{16}\ln p_6 + \gamma_{17}\ln p_7 + \gamma_{18}\ln p_8 + \gamma_{19}\ln p_9 + \gamma_{1,10}\ln p_{10} + \gamma_{1,11}\ln p_{11} + \gamma_{1,12}\ln p_{12} + \gamma_{1,13}\ln p_{13} + \gamma_{1,14}\ln p_{14} + \gamma_{1,15}\ln p_{15} + \gamma_{1,16}\ln p_{16} + \beta_1 \ln\left(\frac{m}{P}\right) + u_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

$$w_2 = \alpha_{21} + \gamma_{21}\ln p_1 + \gamma_{22}\ln p_2 + \gamma_{23}\ln p_3 + \gamma_{24}\ln p_4 + \gamma_{25}\ln p_5 + \gamma_{26}\ln p_6 + \gamma_{27}\ln p_7 + \gamma_{28}\ln p_8 + \gamma_{29}\ln p_9 + \gamma_{2,10}\ln p_{10} + \gamma_{2,11}\ln p_{11} + \gamma_{2,12}\ln p_{12} + \gamma_{2,13}\ln p_{13} + \gamma_{2,14}\ln p_{14} + \gamma_{2,15}\ln p_{15} + \gamma_{2,16}\ln p_{16} + \beta_2 \ln\left(\frac{m}{P}\right) + u_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots (11)$$

$$w_3 = \alpha_{31} + \gamma_{31}\ln p_1 + \gamma_{32}\ln p_2 + \gamma_{33}\ln p_3 + \gamma_{34}\ln p_4 + \gamma_{35}\ln p_5 + \gamma_{36}\ln p_6 + \gamma_{37}\ln p_7 + \gamma_{38}\ln p_8 + \gamma_{39}\ln p_9 + \gamma_{3,10}\ln p_{10} + \gamma_{3,11}\ln p_{11} + \gamma_{3,12}\ln p_{12} + \gamma_{3,13}\ln p_{13} + \gamma_{3,14}\ln p_{14} + \gamma_{3,15}\ln p_{15} + \gamma_{3,16}\ln p_{16} + \beta_3 \ln\left(\frac{m}{P}\right) + u_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots (12)$$

$$w_4 = \alpha_{41} + \gamma_{41}\ln p_1 + \gamma_{42}\ln p_2 + \gamma_{43}\ln p_3 + \gamma_{44}\ln p_4 + \gamma_{45}\ln p_5 + \gamma_{46}\ln p_6 + \gamma_{47}\ln p_7 + \gamma_{48}\ln p_8 + \gamma_{49}\ln p_9 + \gamma_{4,10}\ln p_{10} + \gamma_{4,11}\ln p_{11} + \gamma_{4,12}\ln p_{12} + \gamma_{4,13}\ln p_{13} + \gamma_{4,14}\ln p_{14} + \gamma_{4,15}\ln p_{15} + \gamma_{4,16}\ln p_{16} + \beta_4 \ln\left(\frac{m}{P}\right) + u_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots (13)$$

$$w_5 = \alpha_{51} + \gamma_{51}\ln p_1 + \gamma_{52}\ln p_2 + \gamma_{53}\ln p_3 + \gamma_{54}\ln p_4 + \gamma_{55}\ln p_5 + \gamma_{56}\ln p_6 + \gamma_{57}\ln p_7 + \gamma_{58}\ln p_8 + \gamma_{59}\ln p_9 + \gamma_{5,10}\ln p_{10} + \gamma_{5,11}\ln p_{11} + \gamma_{5,12}\ln p_{12} + \gamma_{5,13}\ln p_{13} + \gamma_{5,14}\ln p_{14} + \gamma_{5,15}\ln p_{15} + \gamma_{5,16}\ln p_{16} + \beta_5 \ln\left(\frac{m}{P}\right) + u_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots (14)$$

$$w_6 = \alpha_{61} + \gamma_{61}\ln p_1 + \gamma_{62}\ln p_2 + \gamma_{63}\ln p_3 + \gamma_{64}\ln p_4 + \gamma_{65}\ln p_5 + \gamma_{66}\ln p_6 + \gamma_{67}\ln p_7 + \gamma_{68}\ln p_8 + \gamma_{69}\ln p_9 + \gamma_{6,10}\ln p_{10} + \gamma_{6,11}\ln p_{11} + \gamma_{6,12}\ln p_{12} + \gamma_{6,13}\ln p_{13} + \gamma_{6,14}\ln p_{14} + \gamma_{6,15}\ln p_{15} + \gamma_{6,16}\ln p_{16} + \beta_6 \ln\left(\frac{m}{P}\right) + u_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots (15)$$

$$w_7 = \alpha_{71} + \gamma_{71}\ln p_1 + \gamma_{72}\ln p_2 + \gamma_{33}\ln p_3 + \gamma_{74}\ln p_4 + \gamma_{75}\ln p_5 + \gamma_{76}\ln p_6 + \gamma_{77}\ln p_7 + \gamma_{78}\ln p_8 + \gamma_{79}\ln p_9 + \gamma_{7,10}\ln p_{10} + \gamma_{7,11}\ln p_{11} + \gamma_{7,12}\ln p_{12} + \gamma_{7,13}\ln p_{13} + \gamma_{7,14}\ln p_{14} + \gamma_{7,15}\ln p_{15} + \gamma_{7,16}\ln p_{16} + \beta_7 \ln\left(\frac{m}{P}\right) + u_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots (16)$$

$$w_8 = \alpha_{81} + \gamma_{81}\ln p_1 + \gamma_{82}\ln p_2 + \gamma_{83}\ln p_3 + \gamma_{84}\ln p_4 + \gamma_{85}\ln p_5 + \gamma_{86}\ln p_6 + \gamma_{87}\ln p_7 + \gamma_{88}\ln p_8 + \gamma_{89}\ln p_9 + \gamma_{8,10}\ln p_{10} + \gamma_{8,11}\ln p_{11} + \gamma_{8,12}\ln p_{12} + \gamma_{8,13}\ln p_{13} + \gamma_{8,14}\ln p_{14} + \gamma_{8,15}\ln p_{15} + \gamma_{8,16}\ln p_{16} + \beta_8 \ln\left(\frac{m}{P}\right) + u_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots (17)$$

$$w_9 = \alpha_{9,1} + \gamma_{9,1}\ln p_1 + \gamma_{9,2}\ln p_2 + \gamma_{9,3}\ln p_3 + \gamma_{9,4}\ln p_4 + \gamma_{9,5}\ln p_5 + \gamma_{9,6}\ln p_6 + \gamma_{9,7}\ln p_7 + \gamma_{9,8}\ln p_8 + \gamma_{9,9}\ln p_9 + \gamma_{9,10}\ln p_{10} + \gamma_{9,11}\ln p_{11} + \gamma_{9,12}\ln p_{12} + \gamma_{9,13}\ln p_{13} + \gamma_{9,14}\ln p_{14} + \gamma_{9,15}\ln p_{15} + \gamma_{9,16}\ln p_{16} + \beta_9 \ln\left(\frac{m}{P}\right) + u_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots (18)$$

$$w_{10} = \alpha_{10,1} + \gamma_{10,1}\ln p_1 + \gamma_{10,2}\ln p_2 + \gamma_{10,3}\ln p_3 + \gamma_{10,4}\ln p_4 + \gamma_{10,5}\ln p_5 + \gamma_{10,6}\ln p_6 + \gamma_{10,7}\ln p_7 + \gamma_{10,8}\ln p_8 + \gamma_{10,9}\ln p_9 + \gamma_{10,10}\ln p_{10} + \gamma_{10,11}\ln p_{11} + \gamma_{10,12}\ln p_{12} + \gamma_{10,13}\ln p_{13} + \gamma_{10,14}\ln p_{14} + \gamma_{10,15}\ln p_{15} + \gamma_{10,16}\ln p_{16} + \beta_{10} \ln\left(\frac{m}{P}\right) + u_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots (19)$$

$$w_{11} = \alpha_{11,1} + \gamma_{11,1}\ln p_1 + \gamma_{11,2}\ln p_2 + \gamma_{*11,3}\ln p_3 + \gamma_{11,4}\ln p_4 + \gamma_{11,5}\ln p_5 + \gamma_{11,6}\ln p_6 + \gamma_{11,7}\ln p_7 + \gamma_{11,8}\ln p_8 + \gamma_{11,9}\ln p_9 + \gamma_{11,10}\ln p_{10} + \gamma_{11,11}\ln p_{11} + \gamma_{11,12}\ln p_{12} + \gamma_{11,13}\ln p_{13} + \gamma_{11,14}\ln p_{14} + \gamma_{11,15}\ln p_{15} + \gamma_{11,16}\ln p_{16} + \beta_{11} \ln\left(\frac{m}{P}\right) + u_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots (20)$$

$$w_{12} = \alpha_{12,1} + \gamma_{12,1}\ln p_1 + \gamma_{12,2}\ln p_2 + \gamma_{12,3}\ln p_3 + \gamma_{12,4}\ln p_4 + \gamma_{12,5}\ln p_5 + \gamma_{12,6}\ln p_6 + \gamma_{12,7}\ln p_7 + \gamma_{12,8}\ln p_8 + \gamma_{12,9}\ln p_9 + \gamma_{12,10}\ln p_{10} + \gamma_{12,11}\ln p_{11} + \gamma_{12,12}\ln p_{12} + \gamma_{12,13}\ln p_{13} + \gamma_{12,14}\ln p_{14} + \gamma_{12,15}\ln p_{15} + \gamma_{12,16}\ln p_{16} + \beta_{12} \ln\left(\frac{m}{P}\right) + u_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots (21)$$

$$w_{13} = \alpha_{13,1} + \gamma_{13,1}\ln p_1 + \gamma_{13,2}\ln p_2 + \gamma_{13,3}\ln p_3 + \gamma_{13,4}\ln p_4 + \gamma_{13,5}\ln p_5 + \gamma_{13,6}\ln p_6 + \gamma_{13,7}\ln p_7 + \gamma_{13,8}\ln p_8 + \gamma_{13,9}\ln p_9 + \gamma_{13,10}\ln p_{10} + \gamma_{13,11}\ln p_{11} + \gamma_{13,12}\ln p_{12} + \gamma_{13,13}\ln p_{13} + \gamma_{13,14}\ln p_{14} + \gamma_{13,15}\ln p_{15} + \gamma_{13,16}\ln p_{16} + \beta_{13} \ln\left(\frac{m}{P}\right) + u_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots (22)$$

$$w_{14} = \alpha_{14,1} + \gamma_{14,1}\ln p_1 + \gamma_{14,2}\ln p_2 + \gamma_{14,3}\ln p_3 + \gamma_{14,4}\ln p_4 + \gamma_{14,5}\ln p_5 + \gamma_{14,6}\ln p_6 + \gamma_{14,7}\ln p_7 + \gamma_{14,8}\ln p_8 + \gamma_{14,9}\ln p_9 + \gamma_{14,10}\ln p_{10} + \gamma_{14,11}\ln p_{11} + \gamma_{14,12}\ln p_{12} + \gamma_{14,13}\ln p_{13} + \gamma_{14,14}\ln p_{14} + \gamma_{14,15}\ln p_{15} + \gamma_{14,16}\ln p_{16} + \beta_{14} \ln\left(\frac{m}{P}\right) + u_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots (23)$$

$$w_{15} = \alpha_{15,1} + \gamma_{15,1}\ln p_1 + \gamma_{15,2}\ln p_2 + \gamma_{15,3}\ln p_3 + \gamma_{15,4}\ln p_4 + \gamma_{15,5}\ln p_5 + \gamma_{15,6}\ln p_6 + \gamma_{15,7}\ln p_7 + \gamma_{15,8}\ln p_8 + \gamma_{15,9}\ln p_9 + \gamma_{15,10}\ln p_{10} + \gamma_{15,11}\ln p_{11} + \gamma_{15,12}\ln p_{12} + \gamma_{15,13}\ln p_{13} + \gamma_{15,14}\ln p_{14} + \gamma_{15,15}\ln p_{15} + \gamma_{15,16}\ln p_{16} + \beta_{15} \ln\left(\frac{m}{P}\right) + u_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots (24)$$

$$w_{16} = \alpha_{16,1} + \gamma_{16,1} \ln p_1 + \gamma_{16,2} \ln p_2 + \gamma_{16,3} \ln p_3 + \gamma_{16,4} \ln p_4 + \gamma_{16,5} \ln p_5 + \gamma_{16,6} \ln p_6 + \gamma_{16,7} \ln p_7 + \gamma_{16,8} \ln p_8 + \gamma_{16,9} \ln p_9 + \gamma_{16,10} \ln p_{10} + \gamma_{16,11} \ln p_{11} + \gamma_{16,12} \ln p_{12} + \gamma_{16,13} \ln p_{13} + \gamma_{16,14} \ln p_{14} + \gamma_{16,15} \ln p_{15} + \gamma_{16,16} \ln p_{16} + \beta_{16} \ln \left(\frac{m}{P}\right) + u_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots (25)$$

Appendix 8

AN ANALYSIS OF HOUSEHOLD DEMAND FOR LOCAL DAIRY PRODUCT IN NORTHWESTERN NIGERIA, A CASE STUDY OF JIGAWA AND KADUNA STATES NIGERIA

HOUSEHOLD SURVEY QUESTIONNAIRE

This questionnaire is designed to collect data for a research project, the title of which is given above. You are requested to kindly supply the following information about your general household characteristics; Food consumption and food demand. All responses will be treated with absolute confidentiality.

(A) Household Demographic and Socio-economic characteristics

	graphic / Socio-economic Characteristics	**nses**	**for Option**
	onnaire number		
	f interview		
	rial zone		
	t / Village		
	on type	( ) or Urban ( )	
	hold code number		
	of respondent		
	of the year	( ) or Dry ( )	iny ; 2 = Dry.
	spondent household head (HH)?		s 0 = No

	relationship to HH?		fe 2 = husband 3 = adult child. (N.B. Interview should only be carried out with one of the three adult members i.e. Husband, Wife or Adult child living at home).
	Years)		
			ıle 0 = female
	l status		narried, 2 = single, 3 = widow or widower vorced or separated
	hold size:		
	of adult male (>15 years)		
	f adult female (>15 years)		
	boys:		
	ears)		
ii	years)		
	girls:		
	ears)		
ii	years)		

	spouses		
	tional status		o formal education uranic education imary education condary education rtiary education
	on		ristianity am adition o religion thers (specify)
	Ethnicity		 usa lani oruba nuri o thers (specify)
	yment status		employed unemployed
	ccupation		gricultural on-agricultural
	n-agricultural is your		vil service

	option, what then is your main occupation?		ivate job ading age labor tisan)thers, specify.

(B). Food and Consumption Expenditure Pattern Data

22. How do you normally eat food in this household (Tick option)

- ❖ Food is usually shared to household based on age (1)
- ❖ Food is usually shared to household based on sex (2)
- ❖ Food is usually shared to household based on age & sex (3)
- ❖ Food is usually shared to household based on first come first serve (4)
- ❖ No specific method of sharing food (5)
- ❖ Others, specify (99).

23. Who take decision as to what type of food to eat in this household, (Tick option)

- ❖ The household head (HH) alone (1)
- ❖ The wife (2)
- ❖ Both the HH and the wife (3)
- ❖ All the children together (4)
- ❖ The male children alone (5)
- ❖ The female children alone (6)
- ❖ The house girls (7)

- ❖ Others specify (99)

24. What determine the type of food to be eaten in this household (Tick option)

- ❖ The type of food that we produce from our farm (1)
- ❖ The type of food that we can afford to buy in the market (2)
- ❖ The type of food that will give us balanced diet (3)
- ❖ The type of food that is readily available to us (4)
- ❖ Others, specify (99)

25. What determine the quantity of food to be eaten in this household (Tick one)

- ❖ The total amount of food that we have in the household (1)
- ❖ The number of people in the household (2)
- ❖ The amount of money we have to buy food in the market (3)
- ❖ The amount of food we ate during the last meal (4)
- ❖ Others, specify (99)

26. How many varieties of local dairy products and related products did you consume in your household in the past seven (7) days?

i. ( ) ii. ( ) iii. ( ) iv. ( ) v. ( ) vi. ( ) vii. ( ) viii. ( ) ix. ( ) x. ( ) xi. ( ) xii. ( ) xiii. ( ) xiv. ( ) xv ( ) xvi ( ).

What varieties of local dairy products do you consumed away from home in the last 7 days (e.g restaurants, during ceremony etc)

	27. Selected local dairy products consumed outside (Fresh milk, *Kindirimo*, *Nono*, Yoghurt…)	28. Quantity eaten (Kg/L)	29. Value in Naira (₦)

i. Buy from educational institution			
ii. Buy from Eating establishment			
iii. Received from aid organization			
iv. Received from employer			
v. Received from guest			
vi. Buy from local vendor			

30. If farming is either your main or part of occupation; kindly complete the Table below by stating the quantity and values of food and/or livestock produced in the last 6 months? Otherwise, complete only the last five (5) columns of these sub-sections.

N. B: If your option is to just fill the last five (5) columns; then the associated questions refers to the

Quantity and prices of commodities to which the respondents relates in the past two (2) weeks of the interview date.

			xv)	xv)	xv)	xv)	xv)	xv)	xv)	xv)
		of Produce / Commodity.	Quantity Produced. (Kg or L)	**Quantity Purchased. L**)	Quantity Given out as gift r L)	**Quantity consumed. L**)	Quantity sold or resold. L)	**et Price of the Commodity. (₦/Kg or ₦/L)**	Value of commodity sold (₦/Kg or ₦/L)	**Value of commodity consumed (₦/Kgo r ₦/L**)
Products and Associated Variable s	i.	Fresh milk								
	ii.	Fermented Unskimmed milk (*Kindirimo*)								
	iii.	Fermented skimmed milk (*Nono*)								
	iv.	Local pasteurized skimmed milk (Yoghurt)								
	v.	Butter								
	vi.	Cheese								
	vii.	Instant formular Baby food								
	viii.	Evaporated Milk								
	ix.	Powdered milk								
	x.	Flavored milk								

	xi.	Ice cream								
	xii.	Soya cheese								
	xiii.	Soya drink								
	xiv.	Cereal drink								
	xv.	Sugar and syrup								
	xvi.	Others associated products								

C. Local dairy product Price and Income Pattern Data

64. What would you say about the price of local dairy product in the past 6 month in your area?

Increased ( ) Decreased ( ) Unchanged ( ) cannot say ( ).

65. & 66. What would you say was the impact of price and household income on the following household's characteristic for the past 6 month? (Please tick one per row each under food price and household income)

s/no	**Household characteristic**	**65. Food price**				**66. Household income**			
		I	**D**	**U**	**CS**	**I**	**D**	**U**	**CS**
i.	Household local dairy consumption								
ii.	Household demand for quality local dairy product								
iii.	Household cash expenditure on local dairy product								

iv.	Household cash expenditure on other food products								
v.	Household total home production of local dairy product								

I= increased, D= Decrease, U= unchanged and CS= can't say

D. Assessment of Credit impact on Consumption of Local Dairy Products

67. Are you a **member** of any cooperative society? **Yes (1) No (0)** _____

68. **Ifyes to 67, whattypes** of society is your own?

Credit and thrift cooperative (i)

Multipurpose cooperative (ii)

Group farmer's cooperative (iii)

Producers' cooperative (iv)

Consumers' cooperative (v)

Other Society if any _____

69. What **kind of benefit** have you enjoyed from this society in the last 12 months?

-

---

70. **Access to credit facilities**: please specify, by ticking as appropriate whether you have access to the following types of credit and sources of the credit

Types of credit facilities	Yes	No
A. Credit for agricultural production		
B. Credit for consumption		

71. **If yes to 70;** from which **source** do you get which of the credit and the **amount** in the last one-year (please fill as appropriate).

Source of credits	A) Agriculture credit		B) Consumption credit	
	i. Amount (#)	ii. Interest paid (#)	i. Amount (#)	ii. Interest paid (#)
72. Agriculture bank				
73. Commercial bank				
74. Money lender				
75. Cooperative				
76. Government loan				
77. Relatives friend				
78. Others (specify)				

79. What amount of consumption credit did you expend on buying food in the last 7 days ___ naira

80. What proportion of consumption credit did you expend on dairy products ___ naira; What proportion (Tick)of consumption credit did you expend on specific local dairy products in Table below:

	of dairy Produce /Commodity.	**e (Tic k)**	**than half (Tick k)**	**(Tick)**	**than half (Tick k)**	**er (Tick)**	**than quarter(Tick)**	**s (specify) (Tick)**
i.	Fresh milk							
ii.	Fermented Unskimmed milk (*Kindirimo*)							
iii.	Fermented skimmed milk (*Nono*)							
iv.	Local pasteurized skimmed milk (Yoghurt)							
v.	Butter							
vi.	Cheese							
vii.	Instant formular Baby food							
viii.	Evaporated Milk							
ix.	Powdered milk							
x.	Flavored milk							
xi.	Ice cream							
xii.	Soya cheese							
xiii.	Soya drink							
xiv.	Cereal drink							
xv.	Sugar and syrup							
xvi.	Others associated products							

E. Constraints of Households to Dairy Product Consumption

82. Have you **problems in consuming** or buying dairy products? Yes=1, No=2____

83. if yes, please **list** the **three** most important problems that affect your purchase/ consume the dairy products listed.

	of dairy Produce /Commodity.	**em 1**	**em 2**	**em 3**	**em 4**	**em 5**	**Problem 6**	**Problem 7**
i. ii.	Fresh milk							
iii.	Fermented Unskimmed milk (*Kindirimo*)							
iv.	Fermented skimmed milk (*Nono*)							
v.	Local pasteurized skimmed milk (Yoghurt)							
vi.	Butter							
vii.	Cheese							
;ienic product =1, Product adulteration =2, Poor storability = 3, Poor product processing =4, Implication of health talk = 5, Unavailability/Untimely product supply = 6, Lack of consumption credit =7.								

SUMMARY SHEET ON HOUSEHOLD DAIRY PRODUCT PURCHASING BEHAVIOR

Table1; Household reporting purchases (percent of sample)

Household reporting purchases	**1. Fresh milk**	**2. Fermented Unskimmed milk (*Kindirim***	**3. Fermented skimmed milk (*Nono*)**	**4. Local pasteurized skimmed milk (Yoghurt)**	**5. Butter**	**6. Cheese**	**7. Instant formular Baby food**	**8. Evaporated Milk**

		***o*)**						

Jigawa **Kaduna** **Total sample**								
Household reporting purchases	**9. Powdered milk**	**10. Flavored Milk**	**11. Ice cream**	**12. Soya cheese**	**13. Soya drink**	**14. Cereal drink**	**15. Sugar and syrup**	**16. Other associated product**
Jigawa								
Kaduna								
Total sample								

Table2; Average purchases per-week (number of purchases)

Average purchases per-week	**1. Fresh milk**	**2. Fermented Unskimmed milk (*Kindirimo*)**	**3. Fermented skimmed milk (*Nono*)**	**4. Local pasteurized skimmed milk (Yoghurt)**	**5. Butter**	**6. Cheese**	**7. Instant formular Baby food**	**8. Evaporated Milk**

Jigawa								
Kaduna								
Total sample								

Average purchases per-week	**9. Powdered milk**	**10. Flavored Milk**	**11. Ice cream**	**12. Soya cheese**	**13. Soya drink**	**14. Cereal drink**	**15. Sugar and syrup**	**16. Other associated product**
Jigawa								
Kaduna								
Total sample								

Table3; Average 6 month quantity purchase per capita (kg)

Average 6 month quantity purchase per capita	**1. Fresh milk**	**2. Fermented Unskimmed milk (*Kindirimo*)**	**3. Fermented skimmed milk (*Nono*)**	**4. Local pasteurized skimmed milk (Yoghurt)**	**5. Butter**	**6. Cheese**	**7. Instant formular Baby food**	**8. Evaporated Milk**
Jigawa								
Kaduna								
Total sample								

Average 6 month quantity purchase per capita	9. Powdered milk	10. Flavored Milk	11. Ice cream	12. Soya cheese	13. Soya drink	14. Cereal drink	15. Sugar and syrup	16. Other associated product
Jigawa								
Kaduna								
Total sample								

Table4; Distribution of respondents according to the preferred dairy product

Variables	Jigawa (%)	Kaduna (%)	Entire (%)
Fresh milk			
Fermented Unskimmed milk (*Kindirimo*)			
Fermented skimmed milk (*Nono*)			
Local pasteurized skimmed milk (Yoghurt)			
Butter			
Cheese			
Instant formular Baby food			
Evaporated Milk			
Powdered milk			
Flavored milk			
Ice cream			
Soya cheese			
Soya drink			
Cereal drink			
Sugar and syrup			
Others associated products			
Total			

Source; field survey 2017

Table5; Distribution of respondents according to the Factors responsible for the preference

Factors responsible for the preference	Jigawa (%)	Kaduna (%)	Entire (%)
Income			
Taste			
Price			

Proximity to market			
Health reasons			
Religion			
Other			

Source; field survey 2017

Table 1; Definition variables and descriptive statistics

Variables	***Mean***	***SD***
Specific Demographic characteristics		
Presence of young children (< 6 years 1 = yes; 0 = no)		
Economic characteristics		
Per capita income (in ₦; adjusted to adult equivalent		
Ownership of refrigerator (1 = yes; 0 = no)		
Ownership of motor car (1 = yes; 0 = no)		
Dairy consumption structure/characteristics		
Access to fluid milk (1 yes; 0 = no)		
Buy from open market/local vendor (1 = yes; 0 = no)		
Buy from dairy Shop (1= yes; 0 = no)		
Buy from educational institution (1= yes; 0 = no)		
Buy from supermarkets (1= yes; 0 = no)		
Buy from eating establishment (1= yes; 0 = no)		
Trust the retailer for milk quality (1= yes ; 0 = no)		
Fresh Milk converted		

to other milk (if 1=yes, specify in litres)		
Respondents health concerns		
Attitude to fat content in milk (five point likert scale)		
Health problem due to milk consumption (1 = yes; 0 = no)		
Milk preference (1=cow milk; 0 = goat milk)		
Familiarity about milk production system (1= yes; 0= no)		
Usage of milk for other purpose (1= yes; 0= no)		
Type of household (1=male headed; 0 female headed)		
Observation	480	

Source; field survey, 2017