CONSUMPTION TREND OF MODERN DAIRY PRODUCTS AND PROJECTIONS OF DAIRY CATTLE REQUIREMENTS IN NIGERIA

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ABSTRACT

This study estimates the requirements for modern dairy products as Liquid Milk Equivalents (LME) and the size of national cattle herd that can produce the LME under different scenarios of milk yield/offtake. Four dairy products viz: Condensed and Evaporated milk; Dry Milk Powder (skim and whole); Butter; Cheese and Curd were studied based on data obtained from secondary sources and analysed by trend projections based on regression analytical approach while standard conversion factors were used to convert each category of dairy product to its LME. The projected LME requirements were then used to estimate the National cattle population. Results showed that the LME requirements to meet the demand for Condensed and Evaporated Milk as well as Dry Powdered Milk vary from 13,480 tonnes in 1990 to 13,576 tonnes in year 2,000. Given the current consumption trend of these products, Nigeria has the required cattle herd potential to produce the LME. However, the establishment of appropriate milk collection logistics and adequate milk processing facilities are necessary prerequisites.

Keywords: Dairy Products, Consumption, Liquid Milk Equivalent, Cattle herd.

INTRODUCTION

The dairy products consumed in Nigeria can be categorised into the traditional dairy products and the modern products. Typical examples of the traditional dairy are fresh milk, (locally called Nono) and Kindirmo which is a variety of local cheese. The common modern dairy products include

condensed and evaporated milk, powdered milk, cream milk, cheese and butter. One significant difference between these two categories of milk products is that there are two distinct demands and markets for them. While the market and demand for the traditional products are limited to mostly rural areas, neighbourhood of Fulani cattle rearers and the lower echelon of the society, the modern dairy products, because of their longer shelf-lives, have a wider market and stronger demand in terms of geographical spread and income category.

Importation is the major source of modern dairy products in Nigeria. Like all imported commodities, the prices of these products have been going up in line with the depreciation of the Naira. The Naira was, before the adoption of open market auctioning of the available foreign exchange in less than ₦3.65 to 1 US \$ by 1986 to ₦22.000 in 1993. The corresponding prices of 450g of powdered milk (Nido brand) varied between ₦5.00, ₦21.60 and ₦77.00 respectively largely due to insufficient supply of foreign exchange thus demanding that Nigeria as a nation, looks inwards to meet the demand for some of the commodities which are presently being imported. To plan for and meet the demand for such commodities locally, the requirements for them must be estimated. Thus, the main objective of this study was to estimate the requirements for modern dairy products, in terms of the requirements for modern dairy products, in terms of the major individual products, Liquid Milk Equivalents (L.M.E.) and the size of the national cattle herd that can produce this LME.

The specific objectives of the study were to

- i) analyse the consumption of the major modern dairy products;
- ii) project the consumption requirements of the individual products;
- iii) estimate the LME for the projected quantities of modern dairy products; and
- iv) estimate the minimum dairy herd size required to produce the LME under different scenarios of milk yield/offtake.

METHODOLOGY

Data Collection

The data used for this study were obtained mostly from secondary sources, the most important sources being the Nigerian Trade Summaries and FAO Trade Yearbook (various issues). In addition, information on exchange rates was obtained from the Central Bank of Nigeria.

Analytical Technique

Projections of Modern Dairy Product Demand

Trend projections based on regression analytical approach was used to capture the trend in the observed data.

The trend model was formulated

$$T = a b t \dots (1)$$

where

T = the trend value for milk products which is assumed to be close to actual observation;

t = the time variable, which is used to capture variability over time with t , 1960 = 1, 1961 = 2, etc

a and b = parameters to be estimated

Equation (1) was log-linearised as

$$\ln T = \ln a + t \ln b \dots (2)$$

Estimation of Liquid Milk Equivalent

The conversion of each category of dairy product to its Liquid Milk Equivalent (LME) was based on standard conversion factors stated in Table 1.

Projection of Minimum Cattle Herd Size Requirement

Conceptually, the national cattle herd can be categorized into non-breeding and breeding herds. Depending on the culling percentage, a proportion of the breeding cows is expected to constitute the lactating cows per annum, while the milk offtake per cow for human consumption per day and the duration of the lactation period jointly determine the milk offtake per lactating cow per annum. The percentage of breeding cows in the national herd, as indicated by various sources, varies between 41% to 50% (De Leeuw, 1978) while the percentage of lactating cows among the breeding cows varies between 27% and 50% (De Leeuw Op. cit, Nwoko, 1986). Furthermore, the milk offtake per lactating cow per lactating period has been estimated to be between 140kg and 180kg (Nwoko, Op. cit; FAO production Yearbooks 1983-1986).

The projected LME requirements were used to estimate the national cattle populations which can provide the LME requirements at specified levels of:

- (a) milk offtake per lactating cow per lactation period; (b) percentage of lactating cows among breeding cows; and (c) the percentage of breeding cows among the national herd through a backward interaction as follows:

- i) Number of (LCR) Lactating cows required per annum

LME requirement

Milk offtake per lactating cow per annum

- ii) Number of (BCR) Breeding Cows required

LCR X 100

percentage of lactating cow among breeding cows

- iii) Population of Dairy Cattle Required (PCD)

BCR X 100

percentage of Breeding cows among the national Herd

In this study, the values of the three relevant parameters used are shown in Table 2:

TABLE 1: STANDARD CONVERSION FACTORS FOR DAIRY PRODUCTS TO LIQUID MILK EQUIVALENTS

Product	Conversion Factor (LME per product)
i) Condensed and Evaporated Milk	2
ii) Dry Milk Powder (skim and Whole)	7.6
iii) Butter	6.6
iv) Cheese and Curd	4.4

Source: FAO (1978)

TABLE 2: ASSUMED PARAMETERS FOR DAIRY CATTLE HERD

Parameter	Lower Limit	Value of parameter	Upper Limit
Milk offtake per lactating cow per lactating period	140kg		180kg
Percentage of lactating cow among breeding cows	27%		50%
Percentage of breeding cows among national herd	41%		50%

(Based on De Leeuw, 1978 and Nwoko, 1986)

RESULTS AND DISCUSSION

Trends in Imports of Modern Dairy Product

Table 3 shows the five-yearly average of modern dairy products imported into Nigeria between 1955 and 1989. Condensed and dry powdered milk jointly accounted for over 95 percent of the total import of dairy products during the period. Significant increase was recorded in the annual imports of these dairy products from 1955 to 1984. The increase was most significant between 1975 and 1984.

Information on the five-yearly averages of the value of the imported dairy products between 1955 and 1989 is presented in Table 4. The escalating values of milk products' imports from 1970s through the early 1980s is noteworthy. Comparison of the import figures for 1980-84 and 1985-89 in Tables 3 and 4 show the quantities of dairy imports decreased from 1980-84 to 1985-89, there was an increase in the Naira values of import from N464,341,000 in 1980-84 to N861,805,000 in 1985-89. This increase in Naira value of imports could be attributed to the very large depreciation of the Naira with respect to the other currencies.

Estimated Trend Equations

The estimated trend equations are presented in Table 5. The very low adjusted R^2 for equations 6,7 and 8 is an indication of poor goodness of fit, thus implying that the model and/or the time variable did not capture most of the variability in the observed data. Other forms of the trend equation were tried but the goodness of fit was not better. However, the three products, whose trend equations have very poor goodness of fit, namely; butter, cheese and curd as well as cream milk, were relatively insignificant when their demands were compared with those of condensed and evaporated milk and dry powdered milk. Infact they accounted for less than 5% of the quantity of dairy products imported during the period under consideration (Table 3).

Projected Demand and Liquid Milk Equivalent

Based on the equations presented in Table 5, the national requirements of Condensed and Evaporated milk as well as Dry Powered milk for the years 1990 through 2000 were estimated. The estimates were then converted to LME based on the factors contained in Table 1. The results of these calculations are presented in Table 6 which shows that, based

TABLE 3: FIVE-YEARLY AVERAGE OF MILK PRODUCTS IMPORTS INTO NIGERIA (1955 - 1989) ('000kg)

Products	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	Total	%
Butter	155	274	303	402	2,790	623	424	4,971	0.98
Cheese & Curd	177	990	694	359	1,074	414	372	4,080	0.80
Condensed & Evaporated	8,537	12,611	23,092	48,730	82,298	129,839	35,500	340,607	66.87
Dry Powder	3,180	1,993	5,632	16,002	34,614	57,688	20,717	139,826	27.45
Others	980	14,263	-	-	-	1,356	1,307	19,906	3.91
Total	13,029	30,131	29,721	65,493	120,776	191,920	58,320	509,390	100.01

Sources: Nigeria Trade Summary, 1986, 1988.

Nwoko, 1986; 1990 Adeneye.

TABLE 4: FIVE-YEARLY AVERAGE VALUE OF IMPORTED MILK PRODUCTS, NIGERIA (1955 - 1989) ('000N)

Products	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	Total	%
Butter	112	274	147	369	1,584	2,615	2,334	7,435	1.86
Cheese & Curd	132	212	273	468	1,296	2,318	1,570	6,269	1.56
Condensed (Sweetened)	2,176	3,331	6,055	15,591	54,840	33,073	66,574	181,640	45.33
Dry Powder	854	847	2,124	6,637	37,926	50,453	94,201	193,042	48.17
Others	737	1,130	-	-	-	2,809	7,681	12,357	3.08
Total	4,011	5,794	8,599	23,065	95,646	91,268	172,360	400,743	100.00

TABLE 5: ESTIMATED TREND EQUATIONS FOR DAIRY PRODUCTS IMPORT

Equation	Dependent Variable	Constant	Trend Coefficient	R ²	F
4	LnCE	8.4407	0.07016*	(0.0145)	0.4645
5	LnDP	6.2360	0.1346*	(0.0232)	0.5376
6	LnCC	5.1895	-0.0180	(0.0184)	0.0339
7	LnBU	4.2370	0.0590	(0.0248)	0.2501
8	LnCM	4.7030	0.0796*	0.2501	10.3378

Standard errors are indicated in parenthesis.

CE = Condensed and Evaporated Milk; DP = Dry Powder Milk;

BU = Butter; CM = Cream Milk; Ln = Natural Logarithm.

*

Significant at 5% level.

CC = Cheese and Curd;

TABLE 6: ESTIMATED MODERN DAIRY PRODUCT REQUIREMENT

Year	Milk Products ('000kg)		
	Condensed and Evaporated	Dry Powder	Total Requirement in LME ('000kg)
1990	4665	546	13480
1991	4666	547	13489
1992	4667	548	13499
1993	4668	549	13508
1994	4669	550	13518
1995	4670	551	13528
1996	4671	552	13537
1997	4672	553	13547
1998	4673	554	13556
1999	4674	555	13566
2000	4675	556	13576

Source: Author's Calculations based on equations in Table 4

TABLE 7: ESTIMATES OF DAIRY CATTLE REQUIRED UNDER TWO SCENARIOS OF MILK OFFTAKE

YEAR	TOTAL REQUIREMENT (IN TONNES)	LOWER MILK OFFTAKE LIMIT			UPPER MILK OFFTAKE LIMIT		
		(LCR)	(BCR)	(PDC)	(LCR)	(BCR)	(PDC)
1990	13,480	96,286	356,614	869,790	74,889	277,366	676,503
1991	13,489	96,350	356,852	870,370	74,939	277,551	676,955
1992	13,499	96,421	357,116	871,016	74,994	277,757	677,457
1993	13,508	96,486	357,354	871,596	75,044	277,942	677,908
1994	13,518	96,557	357,619	872,242	75,100	278,148	678,410
1995	13,528	96,629	357,884	872,887	75,156	278,354	678,912
1996	13,537	96,693	358,122	873,468	75,206	278,539	679,364
1997	13,547	96,764	358,386	874,113	75,261	278,745	679,816
1998	13,556	96,829	358,624	874,694	75,311	278,930	680,317
1999	13,566	96,900	358,889	875,339	75,367	279,136	680,817
2000	13,576	96,971	359,153	875,984	75,422	279,342	681,321

*LCR = Number of Lactating Cows Required; BCR = Number of Breeding Cows Required; PDC = Population of Dairy Cattle Required
Source: Author's Calculations.

on the cumulative effects of factors influencing the consumption of dairy products as reflected in the trend equations, the LME requirements to meet the demand for Condensed and Evaporated Milk as well as Dry Powdered milk vary from 13,480 tonnes in 1990 to 13,576 tonnes in 2000. The low rate of increase in the consumption of dairy products as indicated by these estimates, is a reflection of the state of the economy in the last few years.

Population of Cattle Required to produce the projected LME

The estimated cattle population that will produce the projected LME under the two specified levels of milk offtake per annum is presented in Table 7. The table shows that for the lower limit of milk offtake 875,984 cattle will be required to produce the required LME by year 2000. The corresponding dairy cattle population, based on the upper limit of milk offtake is 681,321. Assuming a national cattle population of about twelve million (FMAW & RD, 1992), the estimated cattle population required to produce the LME of Nigeria's demand of modern dairy product is less than 10% of the national cattle herd. This implies that, given the appropriate milk collection logistics, as well as adequate milk processing facility, Nigeria can meet her demand for modern dairy products locally. It may, however, lead to a reduction in fresh milk availability to meet the demand for traditional dairy products in the short run.

In conclusion, the spread and level of demand for modern dairy in Nigeria as well as the cost of importing them demands that efforts be made to produce the dairy products locally. To achieve this, however, Nigeria must have the capacity to produce the LME of her requirements of modern dairy products. This study has shown that, given the current trend in the consumption of these products, Nigeria has the required cattle herd potential to produce the LME. The two constraints that must be overcome, however, are the establishment of the appropriate milk collection logistics and adequate milk processing facility.

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