

1. SUBJECT CLASSIFICATION	A. PRIMARY ECONOMICS
	B. SECONDARY AGRICULTURAL ECONOMICS

2. TITLE AND SUBTITLE
 ANALYTICAL DESCRIPTION OF THE DAIRY INDUSTRY OF NICARAGUA WITH RECOMMENDATIONS

3. AUTHOR(S)
 STEPHEN F. WHITTED

4. DOCUMENT DATE NOVEMBER 1973	5. NUMBER OF PAGES 88 PAGES	6. ARC NUMBER ARC NU-338.177-W624
-----------------------------------	--------------------------------	--------------------------------------

7. REFERENCE ORGANIZATION NAME AND ADDRESS
 UNIVERSITY OF MISSOURI
 DEPT. OF AGRICULTURAL ECONOMICS
 COLUMBIA, MISSOURI 65201

8. SUPPLEMENTARY NOTES (Sponsoring Organization, Publishers, Availability)

9. ABSTRACT
 The main body of this report is a concrete analytical description of the milk marketing system in Nicaragua. However, it is believed that a summary statement of the cause and effect relationships which exist in the system would facilitate a more complete understanding of the actual occurrences in the market. This summary has been constructed from an extensive and analytical observation of market data and long discussions with men of knowledge and authority in the marketing system.

Although the investigation is mainly concerned with the marketing of milk, it is not possible to intelligently analyze marketing without some knowledge of the nature of the product, production methods, how the product is delivered to the market place, sanitary controls, economic controls, sociological relationships, etc. These factors are referred to when it is necessary. But because of the essential brevity of the report, they will not be extensively discussed.

The statements in the preceding paragraph are especially true of milk and dairy products. The marketing system must adapt itself to the way milk is produced and brought to market. Also, when sanitary regulations are enacted and enforced, the economic market structure is inevitably altered. Therefore, even though this is an investigation of milk marketing in Nicaragua, it must from time to time take account of the production system and of the sanitary regulations placed into effect in the market. To have future relevance, it must also consider possible changes in both.

10. CONTROL NUMBER PN-AAB-011	11. PRICE OF DOCUMENT
----------------------------------	-----------------------

12. DESCRIPTORS MILK MARKETING SYSTEM, MARKET DATA, PRODUCTION METHODS, DELIVERY, SOCIOLOGY, SANITARY CONTROLS, ECONOMIC CONTROLS	13. PROJECT NUMBER 524-11-110-073
	14. CONTRACT NUMBER AID/CM/LA-C-73-21
	15. TYPE OF DOCUMENT SECTOR ANALYSIS

NU
338.177
W624

ANALYTICAL DESCRIPTION
OF
THE DAIRY INDUSTRY OF NICARAGUA
WITH RECOMMENDATIONS

Presented to
Vice-Minister Mayo Vega
and
United States Agency for International Development/Nicaragua

by
Dr. Stephen F. Whitted
Department of Agricultural Economics
University of Missouri-Columbia
Columbia, Missouri

A.I.D.
Reference Center
Room 1656 NS

November 10, 1973

ACKNOWLEDGEMENTS

The author wishes to express appreciation to those people who provided knowledge, time, and assistance in the preparation of this paper. Without their gracious cooperation, it would not have been possible for him, in a restricted period of time, to have assembled sufficient information to write the report.

Much data were furnished from the files of the Oficina Coordinadora de la Industria Laceta.

The managers of the four Managua pasteurizing plants and the manager of the PROLACSA plant also provided information and data.

Two persons merit a special designation because of their sustained personal contribution, Ing. Luis Navarro, UNASEC and Ing. Armando J. Gonzalez, USAID.

CONTENTS

	Page
Introduction	1
Milk Supply System to the Managua Pasteurizing Plants	5
Production Delivered to the Plants	5
Geographic Distribution of Farms	8
Prices to the Producers	10
Seasonality of Production	13
Structure of Production Per Herd	20
Transport and Handling	20
Quality Controls	27
Processing and Distribution from the Pasteurizing Plants	28
Pasteurized Milk and Milk Products Processed and Sold	28
The Distribution System	40
Price to Consumers	40
Quality Controls and Sanitary Aspects	44
Transport and Packaging	44
Productos Lacteos, S. A. PROLACSA (in Matagalpa)	45
Milk Supply System for PROLACSA	46
Production Delivered to the Plant	46
Geographic Distribution of Farms	49
Prices to the Producers	49
Seasonality of Production	50
Structure of Production - Herd Size	53

	Page
Transport and Handling	55
Quality Controls	55
Processing and Distribution - PROLACSA	57
Conclusions and Recommendations	61
Appendix A	68
Appendix B	77

LIST OF TABLES

Table	Page
I	Total Receipts of Milk By The Pasteurizing Plants in Managua, Annually, 1963-1972 6
II	Average Price Paid by the Pasteurizing Plants in Managua, Annually, 1963-1972 11
III	Prices Paid by the Pasteurizing Plants in Managua for Milk Used for Fluid Purposes ... 12
IV	Prices Paid by the Pasteurizing Plants in Managua for Milk Used for Industrial Purposes 12
V	Average Price for White Cheese, Butter and Raw Milk Paid by Consumers in Places Outside of Managua, During Dry and Rainy Seasons, by Years 14
VI	Total Receipts of Milk By the Pasteurizing Plants in the Managua Market, Week of Maximum Receipts, and Week of Minimum Receipts, Compared 16
VII	Total Receipts of Milk by the Pasteurizing Plants in the Managua Market, Greatest Increase from One Week to the Next, and the Increase from the Beginning of the Rise to the Week of Maximum Receipts 17
VIII	Milk Deliveries By A Selected Group of Producers Compared With Total Receipts By The Managua Pasteurizing Plants, 1968, 1972, 1973 19
IX	Milk Delivered To The Managua Pasteurizing Plants Classified According To Volume of Weekly Delivery By Each Producer, Average for 6 Selected Weeks During the Period 1964-1973 21
X	Milk Delivered To The Managua Pasteurizing Plants, Classified According To Volume of Weekly Delivery By Each Producer, (26 Oct.- 1 Nov.) 1964 21
XI	Milk Delivered To The Managua Pasteurizing Plants, Classified According To Volume of Weekly Delivery By Each Producer, (27-31 May) 1968 22

Table	Page
XII Milk Delivered To The Managua Pasteurizing Plants, Classified According To Volume Of Weekly Delivery By Each Producer, (19-25 Aug.) 1968	22
XIII Milk Delivered to the Managua Pasteurizing Plants, Classified According to Volume of Weekly Delivery by Each Producer, (6-12 Mar.) 1972	23
XIV Milk Delivered to the Managua Pasteurizing Plants, Classified According to Volume of Weekly Delivery by Each Producer, (31 Jul.-6 Aug.) 1972	23
XV Milk Delivered to the Managua Pasteurizing Plants, Classified According to Volume of Weekly Delivery by Each Producer, (28 May - 3 June) 1973	24
XVI Milk Delivered To The Managua Pasteurizing Plants, Classified According To Volume Of Weekly Delivery By Each Producer, By Selected Weeks, 1964-1973	25
XVII Milk Liquidated as Fluid in the Managua Milk Market, Annually, 1963-1973	29
XVIII Milk Liquidated As Industrial In The Managua Milk Market, Annually, 1963-1973	30
XIX Milk Liquidated as Fluid (Sold As Fluid By The Pasteurizing Plants) in the Managua Market, Week of Maximum Volume, and Week of Minimum Volume Compared.....	31
XX Milk Liquidated as Fluid (Sold as Fluid by The Pasteurizing Plants) in the Managua Market, Greatest Increase from One Week to the Next, and the Increase from the Beginning of the Rise to the Week of Maximum Volume.....	32
XXI Milk Liquidated as Industrial Class in the Managua Market, Week of Maximum Volume, and Week of Minimum Volume Compared	33
XXII Milk Liquidated as Industrial Class in the Managua Market, Greatest Increase from One Week to the Next, and the Increase from the Beginning of the Rise to the Week of Maximum Volume	34

Table	Page
XXIII Projected Demand for Milk	36
XXIV Income and Price Elasticity for Fluid Milk, Industrial Milk, Cheese and Butter	37
XXV Consumption of Fluid Milk, By Years	37
XXVI Consumption	38
XXVII LECHE: Requerimientos Previsibles	39
XXVIII Fluid Milk Sales by the Managua Pasteurizing Plants Into Other Cities, 1972-73	41
XXIX Principle Agricultural Exports From Nicaragua, And Their Value, 1970 and 1971	47
XXX Average Number of Cows Per Farm, Selling Milk to PROLACSA, for Selected Months 1971-1973	54
XXXI Exports of Dry Milk and Total Dairy Products Exported From Nicaragua, 1967-1971	60

LIST OF FIGURES

Figure		Page
1	Canales de Mercadeo, Nicaragua 1972 LECHE	3a
2	Managua Market, Total Milk Received, Liquidated as Fluid, and Liquidated as Industrial, by 51 Full Weeks, 1968	18a
3	Managua Market, Total Milk Received, Liquidated as Fluid, and Liquidated as Industrial, by 51 Full Weeks, 1971	18b
4	Managua Market, Total Milk Received by the Pasteurizing Plants, Liquidated As Fluid, and Liquidated as Industrial, by 51 Full Weeks, 1972	18c
5	Milk Receipts at the PROLACSA Plant, 1969- 1973 (in thousands of liters)	48
6	Average Monthly Deliveries of Milk Per Producer, 1968-1973	51
7	Number of Dairymen Selling Milk To The Plant By Months 1969-1973	52
8	Percent of Milk Received Which Was Too Acid For Manufacture Into Dry Whole Milk, 1969-1973	56

Introduction

This study was sponsored by the Unidad de Analisis Sectorial UNASEC, itself a part of the Comité Nacional Agropecuario. The general objective of the complete Sector Plan is to design a modern agriculture for Nicaragua. This will be in accordance with the following:^{1/}

"1. To increase and fortify its participation in the Gross National Product, GNP.

"2. To raise the physical and economic productivity of the production units.

"3. To raise the rural employment level.

"4. To improve the balance of payment situation.

"5. To permit a better redistribution of income with ample social feeling."

During the first visit to Nicaragua in April, 1973 a Spanish language outline of the dairy investigation, dated March 26, 1973 was provided. A few days after return to Missouri, a slightly modified English language version was received. (See Appendix B). The objectives quoted above and the outlines provided were continually kept in mind during the processes of data collection, information gathering, analysis, and writing.

Much of the basic data were obtained from the files of the Oficina Coordinadora de la Industria Lactea. In addition, men of authority with knowledge of the dairy industry were carefully and thoroughly interviewed. The schedules of interview questions were carefully constructed in the Spanish language and the interviews were conducted in Spanish. Copies of the questions and of the answers are in the files of UNASEC. Detailed data also were furnished by the Managua pasteurizing plants and by PROLACSA at Matagalpa.

The report is organized so that it can be read at 4 different levels, depending upon the time available for study and the depth of understanding desired.

1. For the most thorough perusal, the order of reading should be Appendix A, Introduction, Main body, Conclusions and recommendations.

^{1/} National Agricultural Committee, Sector Analysis, Nicaragua 1973, Organization, page 2.

2. For a less comprehensive view, omit Appendix A.
3. For the best understanding to be gained from a brief period of time, read the Introduction and the Conclusions and recommendations.
4. Some may wish to read only the Conclusions and recommendations.

Because some may choose to study only the Conclusions, it has been expanded into a larger section than is found in the usual report. It was so designated as a major heading in the outline provided. However, the recommendations are presented more in the nature of the suggestions due to the short time the author was permitted to remain in Nicaragua. Before implementation, any of them should be carefully investigated by some person well acquainted with the marketing situation and the animal agriculture of Nicaragua.

The dairy industry of Nicaragua is composed of three distinct and separate parts:

1. That portion which serves the population of Managua with pasteurized milk and other dairy products.

2. Productos Lacteos, S. A. (PROLACSA), located in the agricultural highlands of the country, receives milk from many widely scattered fincas and produces dry whole milk mostly for export to the Central American Common Market Countries.

3. The hundreds, perhaps thousands of fincas which produce raw milk for the use of their own people and many of which also make cuajada, white cheese, and butter. Most of the population, outside of Managua, is provided whatever dairy products are consumed, by these fincas. (Recently, the Managua pasteurizing plants have been providing milk for part of the consumers in some of the other major cities.)

These three segments, even though separate and distinct, interact economically at their peripheries with results resembling that when an attempt is made to mix oil and water. The study is mainly concerned with segments (1) and (2) since data on (3) are largely unavailable at this time. However, when segment (3) influences the principal commercial parts of the industry, that influence is acknowledged and discussed in so far as is possible. The important and significant part of the industry, composed of the many farmers who milk a few cows, produce for their own use and sell their small surplus of raw dairy products to consumers in nearby villages or cities, is not covered in this report except in the known instances when it becomes tangent to or penetrates the commercial sector. There are some excellent farms in this category.

The marketing system for dairy is well established. (Figure 1) However, it needs certain improvements to assure equity for each level of the market. Income distribution both for producers and consumers must be kept in mind as well as a sufficient level of profitability for the processing plants to allow them to survive, expand, and adopt more efficient technology as it becomes available.

Proper adjustment will not be easy because the Nicaraguan dairy industry is extremely complex, encompassing all levels of economic organization from the simple agrarian subsistence type enterprise to the Managua market which employs sophisticated accounting and handling procedures in the milk pool and the pasteurizing plants. It also shows evidence of advanced and innovative organization which probably should be developed further. The Fund for Development of the Dairy Industry "Fondo" could perhaps be developed, reorganized, and refined to provide the base for significant improvement in the organization of the marketing system. Also, the plant PROLACSA has shown remarkable progress and likely will contribute significantly to the general objectives quoted on page 1.

The industry is aggressive and has shown significant, although somewhat erratic growth since 1963, from which time data have been accumulated. Good evidence to support this statement is the rapid and orderly recovery from the devastation wrought by the earthquake early in the morning of December 23, 1972. (See two good reports published by the Oficina Coordinadora de la Industria Lactea. The first is dated February 9, 1973 and the second, April 26, 1973.^{2/})

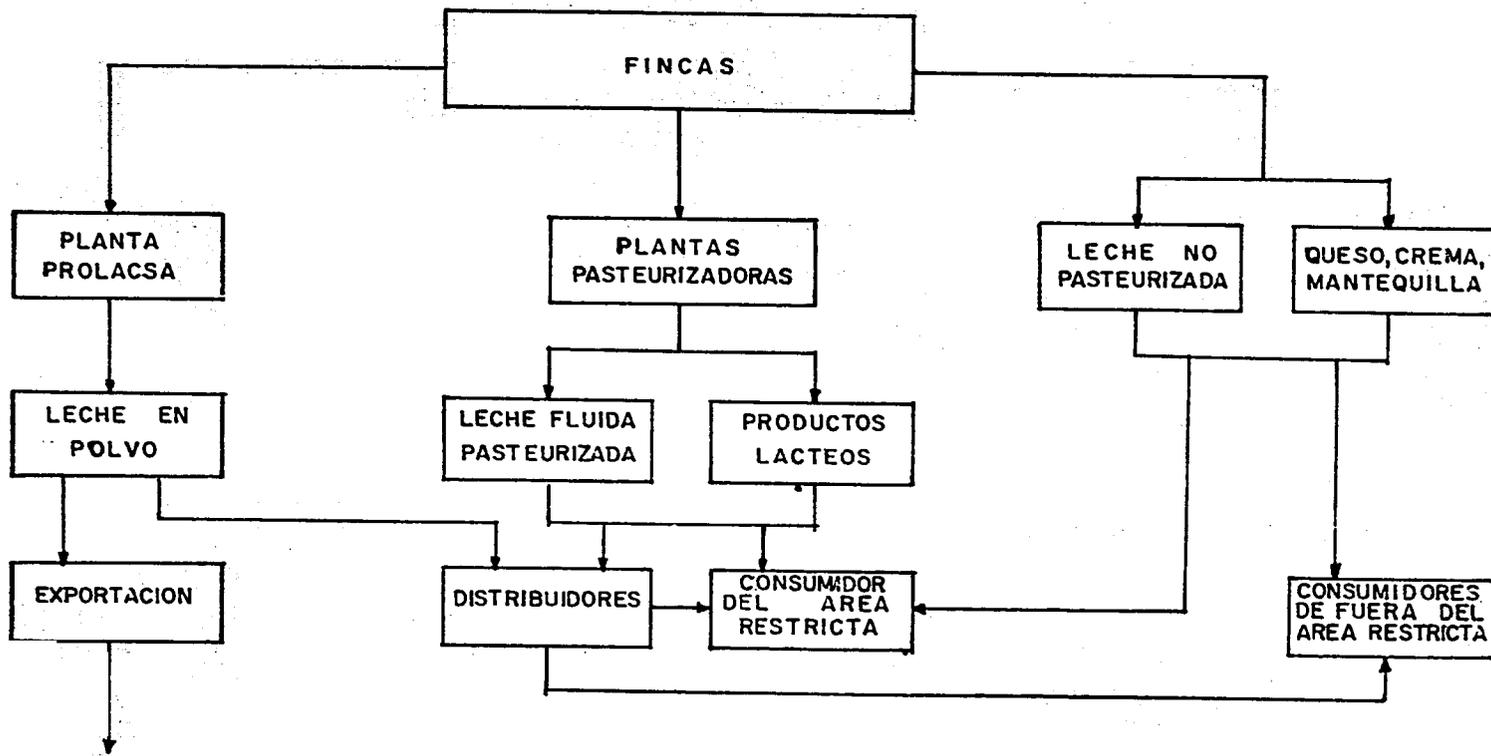
Nicaragua has growth potential in agriculture but growth in the past has been sporadic. The purpose of the general study, of which this is a part, is to formulate a plan which will develop the various segments of agriculture on a balanced basis and which will help the people who really need help. But not a plan which encourages excessive growth of one segment to the detriment of others or which fails to assist the persons who actually contribute to the production process or which fails to benefit the consumers for whom the products are destined. Any money, which might become available for development, should be channeled to sectors which need it and can effectively use it.

Our focus is on the welfare (benefit) of people -- all people which we can reach. Helping the prosperous, successful people is a goal only in as much as this will help the country and that in turn benefits all people or in as much as helping those people will enable them to benefit the disadvantaged; and we need some assurance that they will indeed do so.

^{2/} Reports addressed to the Ministro de Economia from the Coordinador de la Industria Lactea.

CANALES DE MERCADEO, NICARAGUA 1972
LECHE

Figure 1



Source: UNASEC

It is necessary to attempt continually to foresee what the secondary and tertiary results of a proposed solution to a specific problem will be. Care must be exercised that the solution to a problem does not through its secondary and tertiary effects create yet another perhaps even more serious problem.

If progress is to be stimulated in Nicaragua, it will be necessary to identify the persons or institutions which have influence, convince them that a problem exists, that it is important, then encourage them to help attack that problem.

Milk and dairy products are valuable sources of nutrition for the people to develop muscle, bone, and teeth. Milk production is a labor intensive enterprise (more than beef) and should continue to be encouraged up to the maximum point that markets (domestic and foreign) can be found. One of the objectives of the complete study is to increase the rural employment level. Development of a labor intensive enterprise in rural areas will achieve this benefit.

The national dairy industry can become important and prosperous, if efficiently organized to meet the needs of the Nicaraguan people, without exerting a detrimental effect on the primary livestock industry, beef.

The physical infrastructure, (roads, bridges, etc.) in the rural areas for milk collection and for provision of necessary services probably is more important for dairy than for most other farm enterprises. Sanitary and highly technical processing plants also are necessary. These, Nicaragua already possesses in good measure, for example: the Managua pasteurizing plants and PROLACSA at Matagalpa. However, as the industry continues to grow others may need to be added in other population centers.

MILK SUPPLY SYSTEM TO THE MANAGUA PASTEURIZING PLANTS

From 1964 to 1972, the total milk received by the Managua pasteurizing plants increased from 5,704,701 gallons to 12,375,907 gallons. (Table I) This was an average of 833,900 gallons increase per year and during those eight years, the total receipts of the plants more than doubled. The increase was 116%. The annual increases were not very consistent but there was an increase for every year but 1971, which showed a slight decrease. The largest yearly change was the 1,438,172 gallon increase from 1968 to 1969, which was a 15 per cent jump.

Production Delivered to the Plants. The universal practice was for the plants to receive the milk daily. One manager stated that milk was in his plant within a maximum of three hours after the morning milk was completed. Since a considerable number of farms have installed refrigerated holding tanks, actions taken to improve milk quality could make it possible to deliver milk from those farms to the plants every other day. Considerable savings in transportation costs could thereby be achieved which could partly pay for the increased costs of the improved sanitation practices.

One of the pasteurizing plant managers suggested that it would be wise for the College of Agriculture, or some other agency, to set up a demonstration farm. He believed that all management personnel on the dairy farms should be required to go there for a one month training period during which time they would observe, participate and receive training in production management, record keeping, sanitation practices, etc. At the successful completion of such a training period, the students should go back to their farms with an increase in salary.

The relatively short supply of milk in verano appears to cause more difficulty than the excess supply received in invierno. During verano most of the milk must be used for fluid purposes and there is not enough for butter, cheese, cream, etc. The invierno excess is converted into industrial products which can be consumed or stored for later use. Some of the plant managers believe, probably correctly, that the market fluid consumption volume is limited by the amount of milk which can be obtained during verano. Their idea is that sales can not be increased during invierno and cut back during verano. Customers tend to consume about the same amount of fluid milk during each season of the year. It is the opinion of some that in the future, it may become difficult to maintain a sufficient milk supply. The common opinion was that maintain-

TABLE I

Total Receipts of Milk By The Pasteurizing Plants in Managua,
Annually, 1963-1972

Year	Total Receipts (gallons)	Change from previous year (gallons)	Percent change from previous year
1963*	3,573,469*		
1964	5,704,701	2,131,232	+ 60*
1965	6,221,358	516,657	+ 9
1966	7,161,380	940,022	+ 15
1967	8,319,015	1,157,635	+ 16
1968	9,512,795	1,193,780	+ 14
1969	10,950,967	1,438,172	+ 15
1970	11,606,939	655,972	+ 6
1971	11,466,721	- 140,218	- 1.3
1972	12,375,907	909,186	+ 8
1973**	3,446,653		

Source of basic data: Oficina Coordinadora de la Industria Lactea.

* 1963 data are only for the period 1 April to 30 June and 12 August to 31 December. No liquidations were made during the period 1 July to 11 August 1963.

** 1973 data are only for the period 1 January to 27 May. This was not a normal period as the market was recovering from the disruption caused by the earthquake.

ing a sufficient supply of milk was a greater problem than selling the pasteurized milk and other dairy products. However, as is usually the situation in other markets, the present existing milk producers on the Managua market resist the importation of milk into the city from other areas in the country where it can be produced more efficiently and cheaply. It is true that the rights of the existing producers should be protected. However, as the market expands, changes should be made in the system so that milk can be received from areas where the dry season is not so severe as in the Managua area.

Another suggestion frequently encountered is also related to the short supply of milk in verano. Occasionally it is difficult to get some plants to divert some of their milk to others which may need it for pasteurizing. It has been said that some plants may keep excess A and AR grade milk for industrial purposes and others are forced to seek milk of lower quality for fluid use.

This problem can be attacked from several directions. In 1973, Dr. Boniche used the prerogative of the Oficina Coordinadora to liquidate all milk in the pool as fluido regardless of its actual utilization.

An ultimate solution towards which the market might choose to move could be a marketing association formed by the milk producers. This association would receive, cool, and control the milk. It would then apportion the milk to the plants according to their orders. The highest priority uses would receive the first allocations from the milk supply if there were not enough to fill all the orders.

Another possible solution would be to strengthen the "Fund for the Development of the Dairy Industry" (Fondo) and the La Salud processing plant. This plant could be designated to receive all milk for the market. Its function then would be to allocate milk to the other plants according to their needs. Under this situation, La Salud should not pasteurize and sell fluid milk but would process only the excess milk not required by the other plants. Other changes should be made to assure that it would be properly financed to perform these functions. In this connection, some other possibilities should be carefully considered. The present La Salud plant is located in a congested area on very valuable commercial land. The old machinery is largely depreciated out and was damaged by the earthquake. Now would be a good time to sell the property and build a new plant outside the congested business area. Perhaps a nearby village located on a good highway (such as Tipitapa) would provide a satisfactory location.

In any event, sufficient control should be exercised over the milk supply to assure that a sufficient volume of the higher grades of milk is made available for fluid use and that

the lower qualities and industrial milk are allocated for the manufacture of industrial products.

Some milk supply problems arise from the fact that there are not enough specialized dairy herds to fill the market requirements. A large portion of the milk is obtained from herds which are kept primarily for beef production and milk sales are not the major objective. Many farms of this type sell milk during the wet season but take no measures to obtain milk production for sale during the dry season. It was reported also that some of these farms send only their base (basico) milk to the plant during the wet season and sell the rest direct to consumers outside the Managua market as raw milk for a better price than the industrial milk price.

A few of the pasteurizing plant managers complained that raw milk was sold illegally in Managua for a lower price in competition with the higher quality, more expensive bottled and pasteurized milk. If true, this is a serious matter and the consequences go much further than the economic well being of the pasteurizing plants. A serious health problem could develop, which of course, is what the law makers wished to avoid when the 1963 pasteurization law was enacted.

More will be said on the subject of this paragraph in later sections but the initial statement needs to be made at this point. Nicaraguan dairy plants have found very excellent sales outlets in the Central American Common Market countries for its dry whole milk and dry skim milk. In fact the market is so good that it appears Nicaragua has been unable to fill the demand. Here is an opportunity to meet at least two worthy objectives with one decision. The increased exports, which seem to be entirely possible, would improve the balance of payments situation. The increased production necessary to fill the market needs would come from a labor intensive rural enterprise. This would provide increased rural employment and in addition undoubtedly would lead to a better distribution of income. The two most important processing plants in this regard are La Salud and PROLACSA. Since these plants have not been able to fill the market, each year (recently) imports from outside sources have been allowed to enter, and part of the market is lost (perhaps permanently). If the supply of dry skim milk in Nicaragua should go down to the point where Nicaragua itself had to import; the other countries likely would come to believe that Nicaragua was importing dry milk and selling it to them. Should this occur, Nicaragua undoubtedly would lose its preferred export status with the other Central American Common Market Countries.

Geographic Distribution of Farms. Not much data are available on this subject without extensive time consuming research. However, when milk deliveries are classified according to the weekly delivery per farm some important implications become

apparent. During the week, 6-12 March 1972, 19 producers each of whom delivered more than 2,000 gallons that week accounted for almost 40 per cent of total volume of milk delivered to the Managua market. Since 313 producers delivered to the market that week, those 19 producers were 6 per cent of the total number but sent 40 per cent of the milk to market.

Fourteen selected producers, each of whom delivered milk to the market throughout the period 1968 to 1973, consistently furnished the market 25 per cent to 30 percent of its milk during this time.

It is known that these large dairy farms are located in the Managua area. This would lead to the conclusion that the major source of milk supply is in the vicinity of the market.

However, there is information on the location of milk receiving stations serving the individual pasteurizing plants. In June, 1973, the Managua pasteurizing plants, in addition to receiving milk at the Managua plants, were also receiving milk at 13 other stations well distributed in the Pacific Zone. Some of these stations had been established for several years. Others were newly established as it had become necessary to reach out further from the market to obtain an adequate volume.

City or area	Number of plants or milk receiving stations
Managua	4
-----	-----
Rivas	3
Leon	2
Boaco	2
Granada	2
Mateare	1
La Paz Centro	1
Nagarote	1
Carazo	1

The pasteurizing plants have reached out further and further from the city for additional milk supplies as the market has grown. As the volume of milk needed by the market continues to increase, milk production in the vicinity of those receiving stations which show least seasonal variation in production should receive the most encouragement and promotion.

Prices to the Producers. Prices paid to the producers for their milk delivered to the market has increased steadily since 1963 when the milk pool was established. The average price per gallon paid by the pasteurizing plants in 1963 was C\$2.76. In the early months of 1973 this had increased to C\$3.64. (Table II) If the price of cattle feed and other inputs necessary for milk production continue to increase, no doubt further raises will become necessary.

A milk pricing formula related to the costs of these major inputs should be developed and used to move the price by the pasteurizing plants up (or down) as necessitated by the costs incurred by the dairy producers. It is imperative that the market receive sufficient milk for its needs. This quantity of milk will not be forthcoming if the producers are not adequately reimbursed for their costs.

On the other hand, excesses of milk are burdensome to handle and the pricing system should carefully avoid developing such.

The Managua milk pool has developed and is using a very sophisticated and complex pricing system. The plants pay for milk based on 5 grades related to quality: 1. AR (refrigerated), 2. A, 3. BR refrigerated, 4. B, and 5. Industrial.

The price also varies according to whether the producer has established a "base" or whether the milk is excess.

However, there is no variation in price according to the butterfat test.

It is not recommended that a price premium be paid for higher butterfat test. However, the plants should pay into the pool, just and fair compensation for the butterfat which they separate from the fluid milk and use to manufacture products such as butter, ice cream, etc.

If it should seem desirable to vary the price of milk according to its solids content, this variation should be based upon the total solids content, or on protein and fat, rather than upon fat alone.

It will be noted in Table III that there was a period of time when the plants were allowed to pay less for fluid milk to be sold outside the Managua market than for that they sold in Managua. Several of the plant managers believe that they still should be allowed to do so since they incur extra costs in serving their customers in distant cities. The possibility of reviving this practice should be investigated. It might even be beneficial to the dairy producers by causing a larger volume of milk to be used in the higher priced fluid class. The plants certainly are performing a valuable service by

TABLE II

Average Price Paid by the Pasteurizing Plants in Managua,
Annually, 1963-1972

Year	Average Price per gallon	Change from previous year	Percent change from previous year
1963*	C\$ 2.76	-----	--
1964	2.81	+ C\$ 0.05	+ 1%
1965	2.94	+ .13	4
1966	3.11	+ .17	5
1967	3.13	+ .02	1
1968	3.10	- .03	- 1
1969	2.95	- .15	- 5
1970	2.93	- .02	- 1
1971	3.21	+ .28	+10
1972	3.52	+ .31	10
1973**	3.64	+ .12	3

Source of basic data: Oficina Coordinadora de la Industria Lactea

*1963 data are only for the period 1 April to 30 June and 12 August to 31 December. No liquidations were made during the period 1 July to 11 August 1963.

**1973 data are only for the period 1 January to 27 May. This was not a normal period as the market was recovering from the disruption caused by the earthquake.

Note: In 1973, the exchange rate was C\$7 (Cordobas) = \$1 (US dollar)

TABLE III

Prices Paid by the Pasteurizing Plants in Managua for Milk
Used for Fluid Purposes

Date price was established	Fluid in Managua	Fluid sold Outside Managua
17 September 1965	C\$ 3.30	—
24 August 1968	3.40	—
11 December 1970	3.60	C\$ 2.00 to 2.80
3 June 1971	3.40 to 3.50	3.40 to 3.50
27 April 1972	4.10	3.50 to 4.10

Source: Oficina Coordinadora de la Industria Lactea.

TABLE IV

Prices Paid by the Pasteurizing Plants in Managua for Milk Used
For Industrial Purposes

Date price was established	
17 September 1965	C\$ 1.50
29 January 1968	3.10
5 February to 17 March 1968	3.40
22 April 1968	3.00
29 April 1968	3.30
13 May 1968	3.50
20 May to 26 May 1968	1.60
24 August 1968	1.80
10 September 1968	2.00
4 March 1971	2.80
26 May 1971	2.30
24 February 1972	2.80
15 March 1972	3.00

furnishing a higher quality pasteurized milk to the residents of the other cities.

These sales into cities outside the Managua pasteurization zone are one instance where different segments of the dairy industry come into contact with each other. A study of the prices in Table V will reveal some interesting relationships. Between September 1965 and May 1972, the price set for pasteurized milk was C\$1.25 per litre. After May 1972 it was C\$1.50. During the dry season, raw unpasteurized milk sold for nearly as much and in some instances for as much as the price set for pasteurized milk. However, during the wet season prices were much lower, in many years less than 1/3 as much.

Seasonality of Production. It is common for those persons involved in dairy marketing to complain about the variation of milk production during the different seasons of the year. The plant managers in Nicaragua are no exception to this rule. However, after a study of the tables and charts which follow in this section, it is believed that almost any one would agree that there is a serious problem of seasonal variation of milk production in the country. Also, the data indicate that the problem has not been improved since 1964.

The problem arises because, (due to the extreme perishability of milk) facilities must be provided to handle and process the maximum volume which is received during the day of greatest volume. A limited amount of storage tanks can be provided to allow some carryover from one day to the next but this can not ease the problem to any significant degree.

During the remainder of the year, those facilities are underutilized. However the fixed costs attributed to their ownership must continue to be paid. This causes the processing cost per unit to be much higher than it would be if production delivered from the farms were more nearly equal during the different seasons.

This market has a base plan which allows each producer to establish a "base" during the season of low production. During the rest of the year, he receives a higher price for the "base" portion of his production and a lower price for the "over base" portion. According to the hypothesis from which this plan was developed, the higher price paid for the "base" milk was supposed to encourage the dairyman to manage his herd so as to get maximum production during the low production season. The lower price for the "over base" was supposed to discourage the great surge of production which comes during the first part of the rainy season.

Some dairymen respond to this plan by managing their herds in such a manner as to obtain fairly uniform production throughout the year. They are rewarded for that management.

TABLE V

AVERAGE PRICE FOR WHITE CHEESE, BUTTER AND RAW MILK PAID BY CONSUMERS IN PLACES OUTSIDE OF MANAGUA, DURING DRY AND RAINY SEASONS, BY YEARS.

Commodities & Places	YEARS, SEASONS AND PRICE RANGE (CORDOBAS)					
	1971		1972		1973	
	DRY RANGE	RAINY RANGE	DRY RANGE	RAINY RANGE	DRY RANGE	RAINY RANGE
<u>White Cheese (lb)</u>						
BOACO	2.50-4.00	1.50-2.10	2.60-4.20	1.60-2.20	2.60-4.20	1.80-2.20
GRANADA	3.00-4.50	2.00-2.50	3.15-4.60	2.10-2.50	3.25-4.70	2.20-2.60
NAGAROTE	3.25-4.75	1.80-2.40	3.40-4.80	1.85-2.50	3.40-4.90	1.90-2.60
TEUSTEPE	2.40-3.80	1.60-2.10	2.50-4.00	1.70-2.30	2.70-4.20	1.80-2.20
<u>Butter (lb)</u>						
BOACO	4.00-4.80	4.00-4.80	4.00-4.80	4.00-4.80	4.25-5.00	4.00-5.00
GRANADA	4.50-5.25	4.00-4.80	4.50-5.25	4.00-4.80	4.70-5.70	4.20-5.00
NAGAROTE	4.00-4.60	4.10-4.70	4.20-4.70	4.20-4.80	4.40-5.00	4.20-4.80
TEUSTEPE	4.00-4.40	4.20-4.80	4.30-4.80	4.00-4.60	4.20-5.00	4.00-4.40
<u>Raw Milk (Quart)</u>						
BOACO	1.20-1.40	0.40-0.60	1.20-1.50	0.40-0.70	1.40-1.50	0.40-0.60
GRANADA	1.30-1.40	0.50-0.80	1.30-1.50	0.40-0.70	1.30-1.50	0.40-0.90
NAGAROTE	1.20-1.40	0.50-0.70	1.20-1.40	0.50-0.80	1.30-1.50	0.60-0.90
TEUSTEPE	1.10-1.20	0.40-0.60	1.20-1.30	0.40-0.70	1.30-1.50	0.40-0.60

Cheese It takes about one gallon of milk to make a pound of cheese.

Butter It takes about 3.8 gallons to make a pound of butter.
Assuming 3.8% butterfat, and 80% butterfat in butter.

Source: Files of UNASEC.

Many others, however, do not plan so as to maintain production during the dry season. A study of the data will show that the base plan has not been able to improve the seasonal pattern of production. However, it has rewarded those dairymen who managed their herds in such a manner as to supply the market in verano when its needs are more stringent.

Table VI gives an indication of the magnitude of the variation in milk deliveries to the Managua market. The top third shows comparisons of the volume received at the production peak with the average weekly receipts for the years 1964, and 1968-1972. As compared to the earlier years, the later years showed greater peaks of production above the average, whether measured in percentages or in gallons.

The middle third of the table shows comparisons of the volume received at the low point of production with the average weekly receipts for the same years. It shows that in later years, the low points of production fell further below the average than in the earlier years.

The bottom third of the table shows the difference between the troughs and the peaks of production for the same years. The magnitude of the swing from low to high tended to increase over the years since 1964.

The week of maximum receipts, with regularity, fell within the three week period from the middle of June to the first week in July. The week of minimum receipts was much more uncertain occurring twice in December, twice in May and once in October and once in January.

The degree of difference between the week of maximum production, for which handling and processing facilities must be available, and the week of minimum receipts, which indicates the lowest utilization of those facilities, provides an indication of the economic measure of costs resulting from the seasonal variation in milk production in Nicaragua.

However, there is also another part of the problem. In many years, a major part of the increase occurs within a very short period of time. This sudden surge of production severely tests the management skills of the Managua pasteurizing plant managers.

Table VII shows the sudden increases experienced during the years 1964 and 1968-1972. The top half of the table shows the greatest increase from one week to the next. In some years the receipts increased more than 30,000 gallons from one week to the next. This surge regularly occurs in May or June.

The bottom half of the table shows the magnitude and quickness of the climb in production from the beginning of

TABLE VI

TOTAL RECEIPTS OF MILK BY THE PASTEURIZING PLANTS IN THE MANAGUA MARKET, WEEK OF MAXIMUM RECEIPTS, AND WEEK OF MINIMUM RECEIPTS, COMPARED

<u>Week of Maximum Receipts</u>	<u>% of Average that year</u>	<u>Gallons</u>
1964 (15-21 June)	123	135,159
1968 (17-23 June)	115	207,745
1969 (30 June-6 July)	127	264,808
1970 (22-28 June)	132	292,008
1971 (21-27 June)	127	279,744
1972 (26 June-2 July)	129	314,093
*	*	*
<u>Week of Minimum Receipts</u>		
1964 (21-27 Dec.)	81	88,471
1968 (29 April-5 May)	92	165,920
1969 (20-26 October)	84	174,615
1970 (21-27 December)	81	180,556
1971 (25-31 January)	84	186,400
1972 (8-14 May)**	82	200,593
<u>Difference Between Minimum and Maximum</u>		
	<u>% Increase</u>	<u>Gallons Increase</u>
1964	52.8	46,688
1968	25.2	41,825
1969	51.7	90,193
1970	61.7	111,452
1971	50.1	93,344
1972	56.6	113,500

**The week of the earthquake when adjusted to a 7 day basis was a little less.

TABLE VII

TOTAL RECEIPTS OF MILK BY THE PASTEURIZING PLANTS IN THE MANAGUA MARKET, GREATEST INCREASE FROM ONE WEEK TO THE NEXT, AND THE INCREASE FROM THE BEGINNING OF THE RISE TO THE WEEK OF MAXIMUM RECEIPTS

<u>Greatest Increase from One Week to the Next</u>	<u>% Increase</u>	<u>Gallons Increase</u>
1964 (4-10 May to 11-17 May)	14.3	16,513
1968 (3-9 Jun to 10-16 June)	12.0	22,222
1969 (19-25 May to 26 May- 1 June)	8.6	19,223
1970 (25-31 May to 1-7 June)	8.6	22,062
1971 (17-23 May to 24-30 May)	17.2	35,648
1972 (22-28 May to 29 May-4 June)	14.5	31,619
*	*	*
<u>Increase From Beginning of Rise to Week of Maximum Receipts</u>		
1964 (27 Apr.-3 May) (15-21 June)	26.3	28,154
1968 (29 Apr.-5 May) (17-23 June)	25.2	41,825
1969 (21-27 Apr.) (30 June-6 July)	32.5	65,002
1970 (11-17 May) (22-28 June)	24.8	58,081
1971 (10-16 May) (21-27 June)	39.9	79,741
1972 (8-14 May) (26 June- 2 July)	56.6	113,500

the rise to the peak of production. The average length of time over which the production increase spreads is about six weeks.

The decline from the peak is more gradual and so typically extends over a longer period of time.

Figures 2, 3, and 4 show the variation in production on a weekly basis for the years 1968, 1971, and 1972.

There are two possible methods of attack on the problem of seasonal variation in milk production. (1) Production methods on the dairy farms can be improved so that a more uniform flow of milk is received throughout the year. (2) The marketing system can be designed to handle the varying volumes of milk delivered to it from the dairy farms during different weeks of the year.

Certain people with extensive knowledge of the Nicaraguan dairy industry said that some dairymen delivered practically the same volume of milk to the market during each week of the year. The records of 14 dairymen, (on whose farms the dairy enterprise was an important source of income), who delivered milk to the Managua market during the entire period, 1968 to 1973 were analyzed to determine whether they would support that statement. (Table VIII). Their volume of deliveries was compared to that of the total market for a week before the rains came and a week after the rains began in 1968, 1972, and 1973. In every instance their increase in production after the rains arrived was much less than that for the total market. This provides strong support to the belief that it is possible to manage a dairy herd so as to obtain uniform milk production throughout the year.

The market system has demonstrated that it can handle and process the widely fluctuating volumes which have been provided to it.

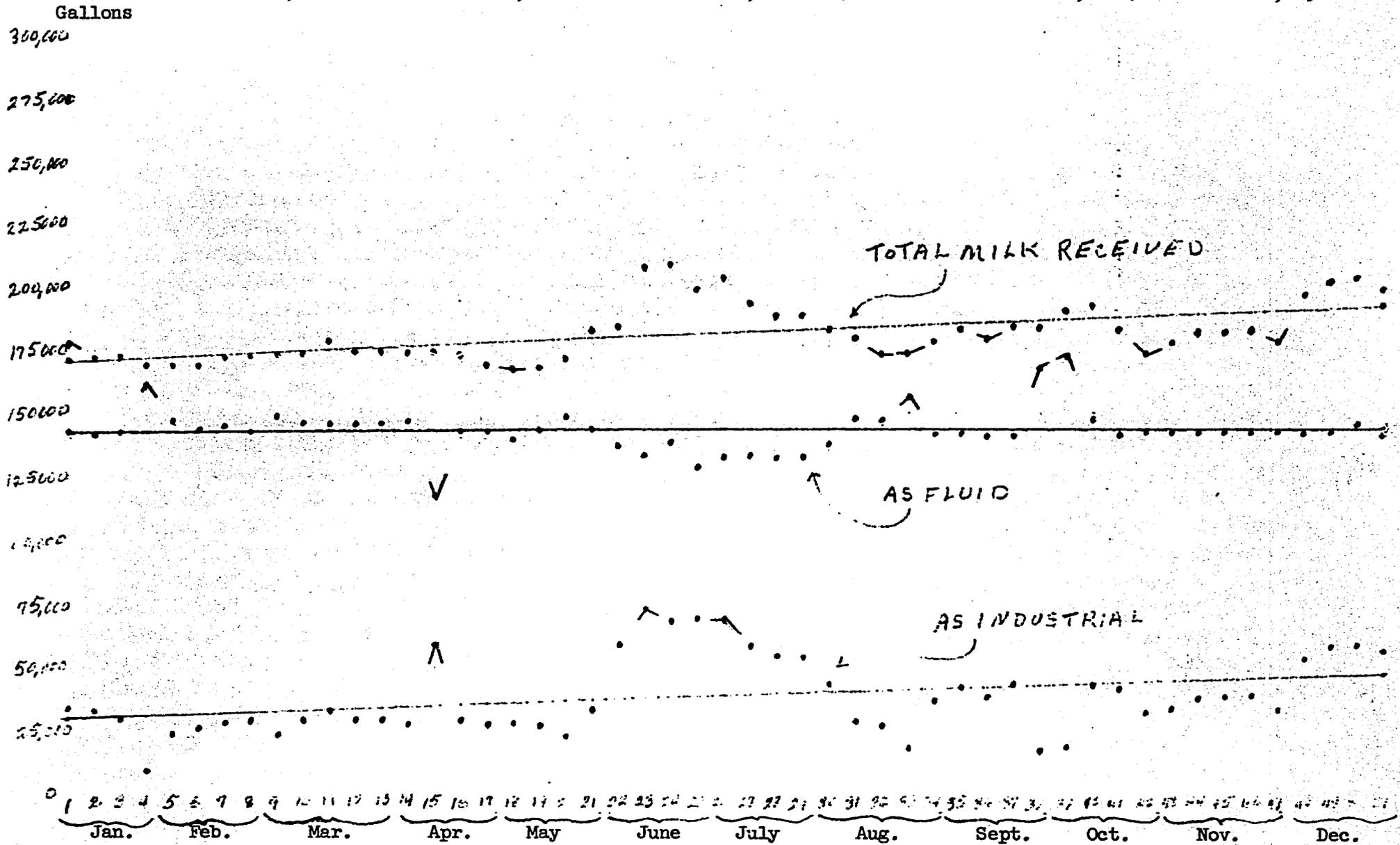
Relative costs and economic evaluation of the two methods of attack would require extensive cost accounting research. No doubt, per gallon costs of producing milk uniformly throughout the year are higher, than higher production during favorable seasons and lower production during adverse seasons.

When the marketing and processing facilities are required to store large volumes of products and maintain excess processing capacity throughout most of the year, extra costs also are incurred.

During the next few years, in the near future, the market must be organized to take the milk as it is produced on the dairy farms. Over a longer period of time, an educational program should be initiated whereby qualified production

FIGURE 2

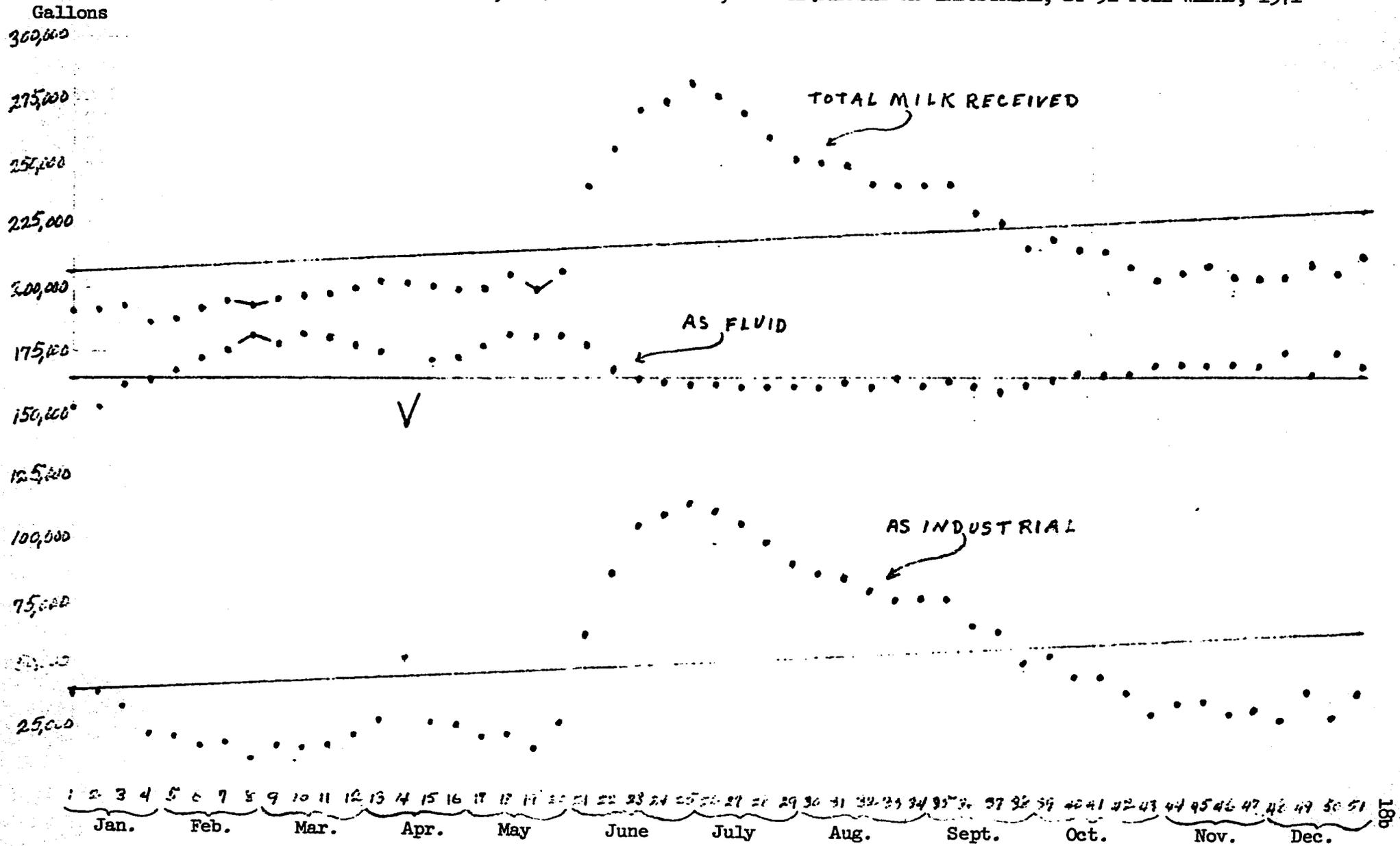
MANAGUA MARKET, TOTAL MILK RECEIVED, LIQUIDATED AS FLUID, AND LIQUIDATED AS INDUSTRIAL, BY 51 FULL WEEKS, 1968



Source: Data furnished by OCIL. Basic calculations in the files of UNASEC.

FIGURE 3

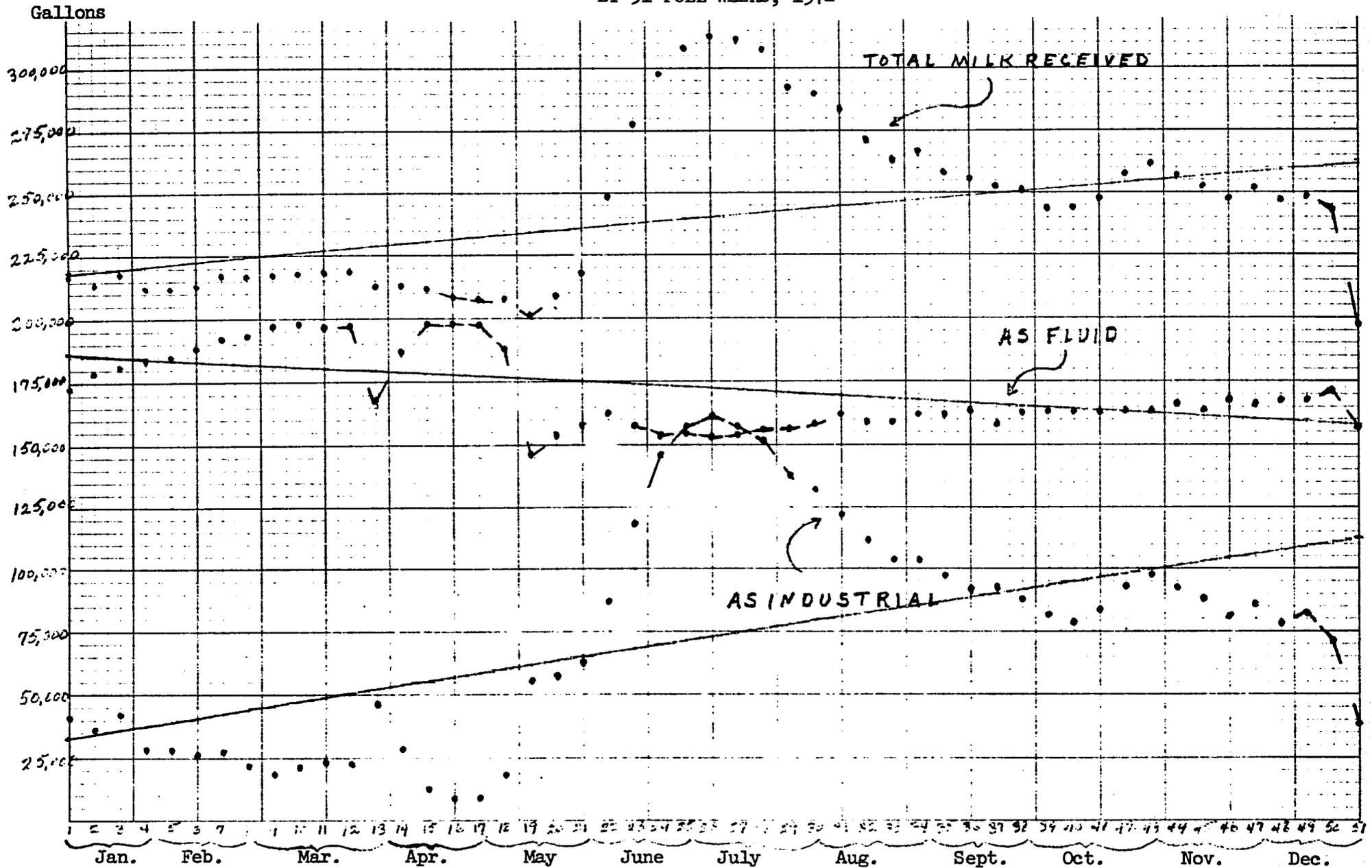
MANAGUA MARKET, TOTAL MILK RECEIVED, LIQUIDATED AS FLUID, AND LIQUIDATED AS INDUSTRIAL, BY 51 FULL WEEKS, 1971



Source: Data furnished by OCIL. Basic calculations in the files of UNASEC.

FIGURE 4

MANAGUA MARKET, TOTAL MILK RECEIVED BY THE PASTEURIZING PLANTS, LIQUIDATED AS FLUID, AND LIQUIDATED AS INDUSTRIAL, BY 51 FULL WEEKS, 1972



Source: Data furnished by OCIL. Basic calculations in the files of UNASEC.

TABLE VIII

Milk Deliveries By A Selected Group Of Producers Compared With
Total Receipts By The Managua Pasteurizing Plants,
1968, 1972, 1973

Weeks for which data were available	Selected group of producers		Total receipts by Managua pasteurizing plants	
	gallons	% change	gallon	% change
1968 (14 producers)				
(27-31 May)	42,599		141,081	
(19-25 Aug)	46,807	+ 9.9%	174,312	+ 23.6%
1972 (14 producers)				
(6-12 Mar.)	59,593		218,417	
(31 July-6 Aug.)	59,777	+ 0.3%	284,990	+ 30.5%
1973 (16 producers)				
(9-15 April)	68,875		184,117	
(28 May-3 June)	70,542	+ 2.4%	202,829	+ 10.2%

Note: The 14 selected producers who delivered during the entire period 1968-1973 furnished 25%-30% of the total milk to the Managua pasteurizing plants.

experts are enabled to teach the dairymen how to produce uniformly in all seasons of the year.

Structure of Production per Herd: Data which already have been presented in preceding sections have shown that a few dairymen furnish a larger proportion of the milk for the market.

Records of each producer were analyzed for 6 selected weeks during the period 1964 to 1974. (Table IX) This table shows the volume and the percentage of the market supply furnished by each group of producers classified according to weekly volume of milk delivered to the market. During this period of time, 20 dairymen, (each delivering over 2,000 gallons of milk per week), represented 7.64 per cent of the dairymen on the market, but furnished 40.67 per cent of the milk. One hundred sixty dairymen, (each delivering less than 500 gallons of milk per week), represented over 60 per cent of the producers but furnished only 18.13 per cent of the milk.

Tables X through XV are arranged so that the reader may investigate changes in the number of producers and their volume of deliveries according to the various size classifications. Table XVI shows the same data organized according to size classes.

The 0 to 500 gallon per week classification has gained in importance over time both in number of producers and in volume of milk delivered. In 1973 this class contained two thirds of the producers and delivered over one fifth of the milk.

The largest size category has increased its percentage of the total deliveries somewhat and has maintained approximately the same percentage of producer numbers.

Transport and Handling. A considerable number of the dairymen continue to deliver their milk to the plants themselves. However, in most instances the plants are satisfied with this arrangement. For a plant with a large number of producers delivering their own milk, this can cause considerable traffic congestion around the plant at certain times of the day. This, of course, is an undesirable condition.

As more producers install refrigerated milk tanks on their farms and as the dairies expand their receipts through milk receiving stations located in other cities, the congestion will diminish.

Those plants receiving milk from a relatively few large volume producers with refrigerated milk tanks do send tank trucks to the farms to pick up the milk. However, a large volume of milk is delivered either to the plant or to a milk receiving station by the producer himself.

TABLE IX

Milk Delivered To The Managua Pasteurizing Plants Classified According To Volume of Weekly Delivery By Each Producer, Average for 6 Selected Weeks During The Period 1964-1973

Class Gallons per week	Average Number of Producers	% of Producers	Average Total Deliveries by Producers in this class gallons	% of the total deliveries to the plants
0-500 gal.	160	61.06%	33,978	18.13%
501-1000 gal.	53	20.23	37,286	19.89
1001-2000 gal.	29	11.07	39,958	21.31
2001-3000 gal.	10	3.82	22,986	12.26
3001-12,000 gal.	10	3.82	53,261	28.41
Total Market	262	100	187,469	100

TABLE X

Milk Delivered To The Managua Pasteurizing Plants, Classified According To Volume of Weekly Delivery By Each Producer, (26 Oct.-1 Nov.) 1964

Class gallons Per week	Number producers	average delivery per producer (gallons)	total deliveries by producers in this class (gallons)	% of the total delivered to plants	% of the producers
0-500 gal.	62	210	13,043	12.64%	50.00%
501-1,000 gal.	30	715	21,460	20.80	24.19
1,001-2,000 gal.	20	1,365	27,310	26.47	16.13
2,001-3,000 gal.	8	2,393	19,145	18.55	6.45
3,001-12,000 gal.	4	5,557	22,228	21.54	3.23
Total Market	124	832.15	103,186	100	100

TABLE XI

Milk Delivered To The Managua Pasteurizing Plants, Classified According To Volume of Weekly Delivery By Each Producer, (27-31 May) 1968

Class gallons per week	Number producers	Average delivery per producer (gallons)	Total Deliveries by producers in this class (gallons)	% of the total delivered to plants	% of the producers
0-500 gal.	159	193	30,678	21.75%	67.38%
501-1,000 gal.	43	699	30,052	21.30	18.22
1,001-2,000 gal.	19	1,392	26,441	18.74	8.05
2,001-3,000 gal.	6	2,335	14,008	9.93	2.54
3,001-12,000 gal.	9	4,434	39,902	28.28	3.81
Total Market	236	597.80	141,081	100	100

TABLE XII

Milk Delivered To The Managua Pasteurizing Plants, Classified According To Volume Of Weekly Delivery By Each Producer, (19-25 Aug) 1968

Class gallons per week	Number Producers	Average delivery per producer (gallons)	Total Deliveries by producers in this class (gallons)	% of the total delivered to plants	% of the producers
0-500 gal.	143	215	30,800	17.67%	60.34%
501-1,000 gal.	46	723	33,249	19.08	19.41
1,001-2,000 gal.	27	1,339	36,159	20.74	11.39
2,001-3,000 gal.	9	2,271	20,435	11.72	3.80
3,001-12,000 gal.	12	4,472	53,669	30.79	5.06
Total Market	237	735.49	174,312	100	100

TABLE XIII

Milk Delivered to the Managua Pasteurizing Plants, Classified According to Volume of Weekly Delivery by Each Producer, (6-12 Mar.) 1972

Class gallons per week	Number Producers	Average delivery per producer (gallons)	Total Deliveries by producers in this class (gallons)	% of the total delivered to plants	% of the producer
0-500 gal.	192	199	38,176	17.48%	61.34%
501-1,000 gal.	67	689	46,168	21.14	21.41
1,001-2,000 gal.	35	1,349	47,215	21.62	11.18
2,001-3,000 gal.	8	2,263	18,100	8.29	2.56
3,001-12,000 gal.	11	6,251	68,758	31.47	3.51
Total Market	313	697.82	218,417	100	100

TABLE XIV

Milk Delivered to the Managua Pasteurizing Plants, Classified According to Volume of Weekly Delivery by Each Producer, (31 Jul.-6 Aug.) 1972

Class gallons per week	Number producers	Average delivery per producer (gallons)	Total Deliveries by producers in this class (gallons)	% of the total delivered to plants	% of the producers
0-500 gal.	197	243	47,886	16.80%	55.81%
501-1,000 gal.	74	690	51,066	17.92	20.96
1,001-2,000 gal.	54	1,381	74,576	26.17	15.30
2,001-3,000 gal.	15	2,451	36,758	12.90	4.25
3,001-12,000 gal.	13	5,746	74,704	26.21	3.68
Total Market	353	807.34	284,990	100	100

TABLE XV

Milk Delivered to the Managua Pasteurizing Plants, Classified According to Volume of Weekly Delivery by Each Producer, (28 May-3 June) 1973

Class gallons per week	Number Producers	Average delivery per producer (gallons)	Total Deliveries by producers in this class (gallons)	% of the total delivered to plants	% of the producers
0-500 gal.	205	211	43,284	21.34%	66.99%
501-1,000 gal.	58	719	41,721	20.57	18.96
1,001-2,000 gal.	21	1,336	28,047	13.83	6.86
2,001-3,000 gal.	12	2,456	29,469	14.53	3.92
3,001-12,000 gal.	10	6,031	60,308	29.73	3.27
Total Market	306	662.84	202,829	100.00	100.00

TABLE XVI

Milk Delivered To The Managua Pasteurizing Plants, Classified According To Volume Of Weekly Delivery By Each Producer, By Selected Weeks,** 1964-1973

	Number producers	% of producers	Total Deliveries by Producers in this class (gallons)	% of the total deliveries to plants
<u>0 - 500 gal.</u>				
26 Oct. 1 Nov. 1964	62	50.00%	13,043	12.64%
27 - 31 May 1968*	159	67.38	30,678	21.75
19 - 25 Aug. 1968	143	60.34	30,800	17.67
6 - 12 Mar. 1972	192	61.34	38,176	17.48
31 Jul. - 6 Aug. 1972	197	55.81	47,886	16.80
28 May - 3 June 1973	205	66.99	43,284	21.34
*	*	*	*	*
<u>501 - 1000 gal.</u>				
26 Oct. - 1 Nov. 1964	30	24.19%	21,460	20.80%
27 - 31 May 1968*	43	18.22	30,052	21.30
19 - 25 Aug. 1968	46	19.41	33,249	19.08
6 - 12 Mar. 1972	67	21.41	46,168	21.14
31 Jul. - 6 Aug. 1972	74	20.96	51,066	17.92
28 May - 3 June 1973	58	18.96	41,721	20.57
*	*	*	*	*
<u>1,001 - 2,000 gal.</u>				
26 Oct. - 1 Nov. 1964	20	16.13%	27,310	26.47%
27 - 31 May 1968*	19	8.05	26,441	18.74
19 - 25 Aug. 1968	27	11.39	36,159	20.74
6 - 12 Mar. 1972	35	11.18	47,215	21.62
31 Jul. - 6 Aug. 1972	54	15.30	74,576	26.17
28 May - 3 June 1973	21	6.86	28,047	13.83
*	*	*	*	*
<u>2,001 - 3,000 gal.</u>				
26 Oct. - 1 Nov. 1964	8	6.45%	19,145	18.55%
27 - 31 May 1968*	6	2.54	14,008	9.93
19 - 25 Aug. 1968	9	3.80	20,435	11.72
6 - 12 Mar. 1972	8	2.56	18,100	8.29
31 Jul. 6 Aug. 1972	15	4.25	36,758	12.90
28 May - 3 June 1973	12	3.92	29,469	14.53
*	*	*	*	*

TABLE XVI (continued)

	Number producers	% of producers	Total Deliveries by Producers in this class (gallons)	% of the total deliveries to plants
3,001 - 12,000 gal.				
26 Oct. 1 Nov. 1964	4	3.23%	22,228	21.54%
27 - 31 May 1968*	9	3.81	39,902	28.28
19 - 25 Aug. 1968	12	5.06	53,669	30.79
6 - 12 Mar. 1972	11	3.51	68,758	31.47
31 Jul. - 6 Aug. 1972	13	3.68	74,704	26.21
28 May - 3 June 1973	10	3.27	60,308	29.73
*	*	*	*	*

* Only 5 days milk receipts reported for this week.

** These weeks were selected by the Oficina Coordinador De La Industria Lactea from their records which survived the earthquake as representative of the verano and invierno production periods.

When milk is transported by trucks owned by the plant, whether directly from the farm (in a few instances) or from a receiving station; a deduction is made from the price paid the producer to cover the costs of that transportation. These deductions range from C\$0.07 - C\$0.35 depending on the distance involved. When the milk is received and cooled at a receiving station, there also may be a charge for that service.

The milk collection system as it now exists appears to operate satisfactorily. If, in the future, more farms expand their dairy enterprises and install refrigerated milk tanks, provisions may have to be made for tank trucks to go to those farms to get the milk. This will necessitate the construction of all weather roads and bridges to make this milk available to the market on a daily basis or on every second day.

As sanitary conditions are improved on the farms in conjunction with use of the refrigerated tanks, it may be possible to pick up the milk at those farms only every two days instead of daily. This would result in considerable savings in transportation costs by reducing the number of trips.

Quality Controls. There are no inspections of the farms or sanitary controls exercised over production practices on the farms. However, samples of the milk from each farm are subjected to scientific tests in the laboratories of the plants. Essentially three tests are made which determine the grade of the milk and the use to be made of it.

(1) A sediment test determines the amount of solid foreign material which has been allowed to get into the milk.

(2) The milk is tested with a cryoscope to detect any adulteration with water.

(3) A methylene blue test determines the extent of bacterial contamination.

The original pasteurization law enacted in 1963 was designed to protect the health of the citizens of Managua. Any changes or additions should be to further enhance those safeguards. It is known that the quality of milk received by the processing plants greatly affects the quality of the products they produce.

PROCESSING AND DISTRIBUTION
FROM THE PASTEURIZING PLANTS

In 1973, there were four pasteurizing plants serving the city of Managua; Eskimo, La Completa, La Perfecta, and La Salud. At that time, these plants also had begun to make pasteurized milk available to citizens of other cities in Nicaragua. They had survived a disastrous earthquake and had made a remarkable recovery.

Pasteurized Milk and Milk Products Processed and Sold.

The volume of milk accounted in the records of the OCIL as fluid has increased greatly since 1964, the first full year of records. The volume of fluid milk in 1972 was 8,656,840 gallons almost 75 percent more than the 4,995,141 gallons in 1964. (Table XVII). Increases were quite consistent with the exception of slight declines in 1969 and 1972.

The volume of milk classified as industrial varies to a much greater extent than that used for fluid purposes. (Table XVIII) This is because, due to the nature of the demand for it, fluid milk has the highest priority in the market. Milk needed for fluid use is allocated to that purpose up to the amount required and only milk excess to those needs is used for industrial purposes. However, the volume of milk used for industrial purposes also has increased. The 3,719,067 gallons of milk classified for industrial use in 1972 was over 5 times the 709,560 gallons classified for such use in 1964.

Figures 2, 3 and 4 on pages 18a, 18b, and 18c show the weekly variation in (1) total milk received by the plants (2) fluid use, and (3) milk classified for industrial use.

Since the volume allocated for fluid use is fairly uniform from week to week, the variation in milk received by the plants causes a much greater fluctuation in the amount which must be manufactured into industrial products. There are two significant fluctuations in the weekly demand for fluid milk. During Holy Week it declines drastically. Also during the weeks when production is at its highest, fluid demand tends to decline. Table XIX shows the variation in fluid use between the week of maximum volume and the week of minimum volume during the years 1968-72. The week of minimum volume consistently came during the months of March, April, May. The week of maximum volume was not nearly so consistent. Table XX shows the greatest increase from one week to the next and from the beginning of rise to week of maximum fluid use. These two measures of fluctuation in demand for fluid milk show substantial variation.

However, when Table XIX is compared to Table XXI and Table XX is compared to Table XXII it is evident that the

TABLE XVII

Milk Liquidated as Fluid in the Managua Milk Market, Annually,
1963-1973

Year	Fluid gallons	Change from Previous Year gallons	Percent Change From Previous Year
1963*	3,127,936	--	--
1964	4,995,141	1,867,205	+ 60%
1965	5,678,506	683,365	14
1966	6,417,848	739,342	13
1967	7,355,919	938,071	15
1968	7,492,223	136,304	2
1969	7,356,202	- 136,021	- 2
1970	7,481,550	125,348	+ 2
1971	8,827,770	1,346,220	18
1972	8,656,840	- 170,930	- 2
1973**	2,595,951	6,060,889	--

* 1963 data are only for the period 1 April to 30 June and 12 August to 31 December. No liquidations were made during the period 1 July - 11 August 1963.

** 1973 data are only for the period 1 January to 27 May. This was not a normal period as the market was recovering from the disruption caused by the earthquake.

TABLE XVIII

Milk Liquidated As Industrial In The Managua Milk Market, Annually,
1963-1973

Year	Industrial gallons	Change from Previous Year gallons	Percent Change From Previous Year
1963*	445,533	--	--
1964	709,560	264,027	+ 59%
1965	542,852	- 166,708	- 24
1966	743,532	200,680	+ 37
1967	963,096	219,564	30
1968	2,020,572	1,057,476	110
1969	3,594,765	1,574,193	78
1970	4,125,389	530,624	15
1971	2,638,951	- 1,486,438	- 36
1972	3,719,067	1,080,116	+ 41
1973**	849,702	--	--

* 1963 data are only for the period 1 April to 30 June and 12 August to 31 December. No liquidations were made during the period of 1 July to 11 August 1963.

** 1973 data are only for the period 1 January to 27 May. This was not a normal period as the market was recovering from the disruption caused by the earthquake.

TABLE XIX

MILK LIQUIDATED AS FLUID (SOLD AS FLUID BY THE PASTEURIZING PLANTS)
IN THE MANAGUA MARKET, WEEK OF MAXIMUM VOLUME, AND WEEK OF MINIMUM
VOLUME COMPAR. **

<u>Week of Maximum Volume</u>	<u>% of Average that year</u>	<u>Gallons</u>
1968 (30 Sept. - 6 Oct.)	120	172,675
1969 (17-23 March)	106	149,089
1970 (4-10 May)	107	152,703
1971 (3-9 May)	108	182,352
1972 (10-16 April)	117	199,535
*	*	*
<u>Week of Minimum Volume</u>		
1968 (8-14 April)***	81	116,703
1969 (31 March-6 April)***	85	119,349
1970 (23-29 March)***	85	120,396
1971 (5-11 April)***	88	148,720
1972 (8-14 May)****	85	145,495
<u>Difference Between Min. and Max.</u>		
	<u>% increase</u>	
1968	48	55,972
1969	25	29,740
1970	27	32,307
1971	23	33,632
1972	37	54,040

**** Week following the price increase from C\$1.25 to C\$1.50.

*** Holy Week

** That liquidated as fluid is not always identical with fluid consumption, as the OCIL has the authority, and occasionally exercises it, to charge the plants for fluid use more than they sell when the market is short of milk and the plants do not voluntarily shift milk among themselves to meet the bottling needs.

TABLE XX

MILK LIQUIDATED AS FLUID (SOLD AS FLUID BY THE PASTEURIZING PLANTS) IN THE MANAGUA MARKET, GREATEST INCREASE FROM ONE WEEK TO THE NEXT, AND THE INCREASE FROM THE BEGINNING OF THE RISE TO THE WEEK OF MAXIMUM VOLUME.**

<u>Greatest Increase from One Week to the Next</u>	<u>% Increase</u>	<u>Gallons Increase</u>
1968 (16-22 Sept.) (23-29 Sept.)	19.4	27,323
1969 (31 March-6 April) (7-13 Apr.)	18.2	21,679
1970 (23-29 March) (30 Mar.- 5 Apr.)	21.5	25,913
1971 (5-11 April) (12-18 Apr.)	16.9	25,133
1972 (27-31 Mar.) (1-9 Apr.)	10.7	17,997
*	*	*
 <u>Increase from Beginning of Rise to Week of Maximum Volume</u>		
1968 (9-15 Sept.) (30 Sept. - 6 Oct.)	22.8	32,105
1969 (31 Mar.- 6 April) (14-20 Apr.)	22.9	27,390
1970 (23-29 Mar.) (4-10 May)	26.8	32,306
1971 (5-11 April) (3-9 May)	22.6	33,632
1972 (27-31 March) (10-16 April)	18.7	31,493

** That liquidated as fluid is not always identical with fluid consumption, as the OCIL has the authority, and occasionally exercises it, to charge the plants for fluid use more than they sold when the market is short of milk and the plants do not voluntarily shift milk among themselves to meet the bottling needs.

TABLE XXI

MILK LIQUIDATED AS INDUSTRIAL CLASS IN THE MANAGUA MARKET, WEEK OF MAXIMUM VOLUME, AND WEEK OF MINIMUM VOLUME COMPARED.

<u>Week of Maximum Volume</u>	<u>% of Average that year</u>	<u>Gallons</u>
1968 (10-16 June)	191	72,741
1969 (30-June-6 July)	187	128,576
1970 (22-28 June)	197	154,267
1971 (21-27 June)	227	116,164
1972 (26 June-2 July)	219	160,370
*	*	*
<u>Week of Minimum Volume</u>		
1968 (22-28 Jan)	25	9,608
1969 (3-9 Nov.)	51	35,348
1970 (14-20 Dec.)	42	32,725
1971 (22-28 Feb.)	25	12,816
1972 (17-23 April)	13	9,399
<u>Difference between Minimum & Maximum</u>	<u>% Increase</u>	<u>Gallons Increase</u>
1968	657	63,133
1969	264	93,228
1970	371	121,542
1971	806	103,348
1972	1,606	150,971

TABLE XXII

MILK LIQUIDATED AS INDUSTRIAL CLASS IN THE MANAGUA MARKET, GREATEST INCREASE FROM ONE WEEK TO THE NEXT, AND THE INCREASE FROM THE BEGINNING OF THE RISE TO THE WEEK OF MAXIMUM VOLUME

<u>Greatest Increase From One Week to the Next</u>	<u>% Increase</u>	<u>Gallons Increase</u>
1968 (1-7 April) (8-14 April)	116.8	30,887
1969 (24-30 March) (31 Mar-6 Apr)**	51.8	29,033
1970 (16-22 March) (23-29 March)**	40.2	27,814
1971 (17-23 May) (24-30 May)	144.5	38,007
1972 (1-7 May) (8-14 May)***	189.8	36,085
*	*	*
<u>Increase From Beginning of Rise to Week of Maximum Volume</u>		
1968 (13-19 May) (10-16 June)	246.5	51,749
1969 (14-20 April) (30 June-6 July)	139.2	74,830
1970 (4-10 May) (22-28 June)	84.5	70,652
1971 (10-16 May) (21-27 June)	540.9	98,039
1972 (17-23 April) (26 June-2 July)	1,606.3	150,971

** Holy Week

*** Week following the retail price rise from C\$1.25 to C\$1.50

ability of the plant managers must be of a very high order to handle the sudden and drastic increase in the volume of milk which must be converted to industrial uses.

It must be said that the plant managers and the workers in those plants deserve praise for their ability to deal with this problem.

Only one plant furnished data on the variation in manufacture of industrial products between the week of low production and the week of high production in 1972. However, this information will serve as a measure of the problem which exists.

Butter:

May 8 - 14	8,407 pounds
June 26 - July 2	56,890 pounds

Cheese:

May 8 - 14	800 pounds
June 26 - July 2	1,830 pounds

Dry Milk

May 8 - 14	15,273 pounds
June 26 - July 2	98,157 pounds

This discussion of pasteurized milk and milk products processed and sold would not be complete without some consideration of future needs and estimated supply of milk to meet those needs. Such estimates have been projected by Mr. Francisco Barea, a member of the research staff of UNASEC. (Table XXIII). He has graciously supplied this information so that it could be incorporated into this study. It could provide the basic information for more detailed investigations which may be conducted in the future.

According to Mr. Barea's calculations, Nicaragua will produce enough milk to meet its domestic needs until about 1977. However, since dairy production is a long range operation, plans should be made in the near future to meet Nicaragua's expanded needs after 1977. Dairy production is relatively slow to respond to changed conditions, so those plans should be implemented somewhat prior to 1977. This will be discussed further in the section on PROLACSA, but added milk production will be needed to satisfy the export market for dry whole and dry skim milk to the Central American Common Market.

Tables XXIV, XXV, and XXVI are included to insure that they are preserved along with the other data for those future studies.

The third column in Table XXVII contains information on the minimum nutritional requirements which should be supplied

TABLE XXIII

Projected Demand for Milk

Years	Production Mill. Gal.	Consumption per capita		Total Consumption			Animal Consump. & Waste	Surplus
		Fluid Gal.	Industrial Gal.	Fluid	Industrial	Total		
		-----In Million Gal.-----						
1973	119.0	19.3	27.4	39.3	55.8	95.1	21.4	2.5
1974	124.1	19.9	28.0	41.6	58.6	100.2	22.3	1.6
1975	131.9	20.6	28.6	44.3	61.5	105.8	23.7	2.4
1976	138.1	21.3	29.2	47.1	64.1	111.7	24.9	1.5
1977	143.3	22.0	29.8	50.0	67.8	117.8	25.4	0.1

Source: Personal elaboration by Mr. Francisco Barea, UNASEC using data provided by the Central Bank.

TABLE XXI

INCOME AND PRICE ELASTICITY FOR FLUID MILK, INDUSTRIAL MILK,
CHEESE AND BUTTER

	<u>Income Elasticity</u>		<u>Price Elasticity</u>
	Barea (1)	GAFICA (2)	Barea (1)
Fluid Milk	.77	.5	-1.054
Industrial Milk	.3		- .8
Cheese		.4	
Butter		.2	

(1) Barea's elaboration based on time series, 1960-71.

(2) GAFICA's elaboration based on cross section - Household survey conducted in 1965.

TABLE XXV

CONSUMPTION OF FLUID MILK, BY YEARS
Gal. per capita

1964	12.3
1965	13.5
1966	13.8
1967	14.1
1968	15.3
1969	16.1
1970	17.4
1971	18.7

Source: Data provided by Mr. Francisco Barea, UNASEC.

TABLE XXVI

CONSUMPTION

	<u>Fluid Milk Consumption (Thousand Gal.)</u>	<u>Industrial Milk* Consumption (Thousand Gal.)</u>
1964	19,870	32,419
1965	22,050	35,976
1966	23,102	36,135
1967	24,232	36,347
1968	27,031	39,548
1969	29,322	45,099
1970	32,566	48,645
1971	35,989	53,984

Source: Personal elaboration by Mr. Francisco Barea, UNASEC, using basic data provided by the Central Bank of Nicaragua.

* Includes milk for butter, cheese, ice cream, etc.

TABLE XXVII

LECHE: Requerimientos previsibles

Año	Demanda proyectada	Requerimientos ^{1/} nutricionales	Producción ^{2/}	Disponibilidad	
				Demanda (%)	Requerimientos (%)
(MILLONES DE GALONES)					
1973	39.3	62.5	97.6	248.4	156.2
1974	41.6	64.3	101.8	244.7	158.3
1975	44.3	66.2	108.2	244.2	163.4
1966	47.1	68.0	113.2	240.3	166.5
1977	50.0	70.0	117.9	235.8	168.4

FUENTE: U N A S E C

Junio 7, 1973

1/: En base a los requerimientos mínimos recomendados por INCAP.

2/: Producción neta, después de deducirle pérdidas y consumo animal.

FBS/eq.

from milk according to INCAP.

The Distribution System. The plants reported that their fluid milk deliveries directly to homes had declined to between 3 percent to 8 percent. After streets and homes were destroyed by the earthquake, delivery to homes almost ceased to exist. One plant estimated that it had fallen to 2 percent. The others did not even report their estimate for 1973.

Two to five per cent is delivered to restaurants.

Therefore the major part of the pasteurized milk is delivered by the plants to stores and supermarkets.

Ten years or so ago, some plants began to deliver and sell pasteurized milk to other cities away from the Managua area. Presently all of the Managua plants sell pasteurized milk in other cities. In 1972, these sales outside of Managua were 756,900 gallons, almost nine per cent of total fluid milk sales. (Table XXVIII).

After the earthquake, much of the population left Managua and many moved to the outlying cities. During the early months of 1973, sales outside of Managua were approximately double those of 1972.

Nearly all cities in the Pacific zone are presently served by the Managua plants. One plant lists over 30 cities and some milk is even occasionally flown to the Atlantic coast.

In forward planning, for which it should be commended, a committee has suggested that milk pasteurization laws should be enacted in some of the other major cities. It is probably wise that the decision was made to defer such action until the Managua plants attain the capacity to fully supply the demand in those cities.

An alternative to this should also be considered. It is possible that a small to medium sized glass bottling and pasteurization plant, which would involve a small investment, could efficiently serve the largest of these cities. Such a plant would reduce transporting milk back and forth. It also would increase employment in that city and tend to reduce congestion in Managua itself.

Price to Consumers. The price to consumers for pasteurized milk has been set by law for many years. Before 1965 it was C\$1.15 per litro. In September 1965 the price was increased to C\$1.25. In April 1972 it was again increased to C\$1.50.

Since the price of feed for cattle has recently increased substantially, if it has not already been increased, it probably will be necessary to increase the price again to ensure an adequate supply for the market.

TABLE XXVIII

FLUID MILK SALES BY THE MANAGUA PASTEURIZING PLANTS
INTO OTHER CITIES, 1972-73*

Week	<u>La Salud</u>	<u>Eskimo</u>	<u>La Completa</u>	<u>La Perfecta</u>	Total from plants
	-----gallons-----				
<u>1972</u>					
3-9 January	4,657		1,852	8,487	14,996
10-16 January	5,502		2,150	9,060	16,712
17-23 January	5,262		2,245	9,169	16,676
24-30 January	5,886		2,575	10,160	18,621
31 Jan. - 6 Feb.	5,101		2,439	9,563	17,103
7-13 February	5,840		2,780	11,151	19,771
14-20 February	5,783		2,678	10,446	18,907
21-27 February	6,257		2,873	11,121	20,251
28 Feb. - 5 March	6,360		2,679	11,000	20,039
6-12 March	6,802		2,763	11,839	21,404
13-19 March	6,216		2,476	10,828	19,520
20-26 March	5,410		2,609	12,089	20,108
27-31 March	4,814		1,840	8,360	15,014
1-9 April	7,788		2,998	13,682	24,468
10-16 April	5,858		2,470	6,847	15,175
17-23 April	6,859		3,228	2,607	12,694
24-30 April	10,071		4,135	708	14,914
1-7 May	4,861		1,266	137	6,264
8-14 May	2,437		2,437	6,317	11,191
15-21 May	7,013	240	2,255	6,810	16,318
22-28 May	5,352	753	2,199	6,510	14,814
29 May - 4 June	6,785	982	2,228	7,004	16,999
5-11 June	5,464	945	1,876	6,127	14,412
12-18 June	4,569	1,004	1,531	6,087	13,191
19-25 June	4,704	964	1,513	5,874	13,055
26 June - 2 July	4,705	954	1,463	6,067	13,189
3-9 July	4,290	---	1,505	5,844	11,639
10-16 July	4,845	905	1,527	6,113	13,390

*Designated in the records of OCIL as "Fuera".

TABLE XXVIII (continued)

Week	La Salud	Eskimo	La Completa -----gallons-----	La Perfecta	Total from plants
17-23 July	4,354	963	1,408	5,917	12,642
24-30 July	5,070	1,000	1,399	6,193	13,662
31 July - 6 Aug.	4,471	1,154	1,434	6,307	13,366
7-13 August	4,843	1,107	1,482	6,475	13,907
14-20 August	4,487	969	1,366	6,254	13,076
21-27 August	4,770	1,525	1,499	6,464	14,258
28 Aug. - 3 Sept.	4,563	1,352	1,569	6,276	13,760
4-10 September	4,925	1,370	1,675	6,926	14,896
11-17 September	4,833	1,408	1,758	6,722	14,721
18-24 September	5,062	1,432	1,626	6,826	14,946
25 Sept. - 1 Oct.	4,583	1,420	1,550	6,634	14,187
2-8 October	4,807	1,788	1,275	6,950	14,820
9-15 October	4,454	1,641	1,558	6,515	14,168
16-22 October	4,498	1,416	1,580	6,825	14,319
23-29 October	3,716	1,336	1,549	6,644	13,245
30 Oct. - 5 Nov.	4,254	1,609	1,534	6,984	14,381
6-12 November	4,244	1,566	1,583	6,781	14,174
13-19 November	4,897	1,546	1,622	6,887	14,952
20-26 November	4,544	1,558	1,545	6,735	14,382
27 Nov. - 3 Dec.	4,892	1,685	1,631	7,164	15,372
4-10 December	This week not available from preserved records				
11-17 December	5,202	1,750	1,597	7,452	16,001
18-22 December	4,206	1,366	1,183	--	6,755
					756,825
<u>1973</u>					
8-14 January		4,137	6,026	14,273	24,436
15-21 January		4,873	5,572	16,927	27,372
22-28 January		5,593	5,852	18,941	30,386
29 Jan. - 4 Feb.		5,473	5,911	21,561	32,945
5-11 February		5,678	5,817	23,670	35,165
12-18 February		6,535	5,234	24,490	36,259
19-25 February		7,103	5,039	25,768	37,910
26 Feb. - 4 Mar.		7,054	4,949	26,510	38,513
5-11 March		8,966	4,894	27,591	41,451

TABLE XXVIII (continued)

Week	La Salud	Eskimo	La Completa	La Perfecta	Total from plants
	-----gallons-----				
12-18 March	2,337	8,360	4,431	26,421	41,549
19-25 March	4,799	5,570	4,454	25,078	39,901
26 March - 2 Apr.	5,446	5,338	5,087	25,024	40,895
2-8 April	6,608	5,945	5,625	23,113	41,291
9-15 April	6,682	4,733	8,061	22,638	42,114
16-22 April	7,969	7,919	7,496	22,547	45,931
23-27 April	7,257	5,937	9,784	22,883	45,861
30 Apr. - 6 May	7,879	4,720	9,312	23,542	45,453
7-13 May	7,282	5,577	12,596	23,094	48,549
14-20 May	7,523	5,846	12,772	22,629	48,770
21-27 May	6,747	7,248	12,667	21,455	48,117
May 28 - 3 June	This week not available				
4-10 June	6,678	6,345	11,128	20,398	44,549
11-17 June	6,392	5,767	10,125	19,004	41,288
18-24 June	5,889	6,412	10,087	18,467	40,855
25 June - 1 July	5,957	7,954	10,178	18,281	42,370
2-8 July	6,422	7,158	10,182	17,071	40,833
9-15 July	6,290	6,377	8,677	16,117	37,461
16-22 July	6,158	7,125	8,760	15,445	37,488
23-29 July	6,577	5,664	8,632	15,562	36,435

Quality Controls and Sanitary Aspects. The Ministry of Public Health and the management of the pasteurizing plants maintain the sanitary conditions under which the milk is processed. Scientific tests are routinely made to check quality and sanitation.

The pasteurizing law was originally enacted to protect the health and well being of the citizens of Managua. Continuous inspection and testing programs should be maintained to ensure that this goal is attained on a continuing basis.

Transport and Packaging. The market has rapidly changed from selling all the pasteurized milk in glass bottles to a mixture of bottles, paper cartons, and plastic containers. One plant now uses only paper cartons and another only plastic containers. The paper cartons and the plastic containers are desirable because of their ease of handling through the present distribution system, mostly through stores and supermarkets.

However, they have certain economic disadvantages. First, they are relatively expensive and cost a substantial amount of foreign exchange. Second, when milk must be returned from the store to the plant, the expensive container is destroyed.

At least one plant is experimenting with a small, individual size of plastic container. This container may have advantages for certain consumers who wish to purchase more often in smaller quantities.

PRODUCTOS LACTEOS, S. A.

PROLACSA
(in Matagalpa)

At the time of the visit to PROLACSA, a loan had just been approved to double the capacity of the plant. At that time the plant had efficient, well maintained facilities which were well managed and operated by a competent staff.

Also at that time, the main problem of the plant was obtaining an adequate supply of raw milk to keep the facilities operating efficiently and to satisfy its market demands. Even after the planned expansion of its facilities, the Nestlé Company has assured PROLACSA that it can market the entire output of the plant. One step of the expansion is the building of a large new milk receiving station. The capacity is planned to be 60,000 liters per day and it will be one of the largest in the country.

For the near future, the major restriction on output and sales will be the available supply of milk.

Two of the most important actions which should be taken soon to relieve this restriction are:

1. Continue the road improvement program.

Development of the roads is progressing but the program needs assurance of continuance and needs to be accelerated.

2. Provide financing to milk producers at a more favorable rate of interest.

At the time of the interview, the program for increasing milk production was being slowed by the high interest rates, which at that time were about 13 per cent. Financing to improve their milk production facilities (such as improved pastures) is needed by dairymen at a lower rate of interest. A high rate of interest is detrimental to the growth of the dairy industry. It is also detrimental to the economic growth of the country.

The Nestlé corporation is interested in developing human capital. In line with this philosophy, the plant is purchasing machinery to prepare land for pasture production. It plans to conduct experiments with soil preparation, fertilization, grass varieties, etc., to help the dairymen increase the carrying capacity of their pastures. The soil preparation machinery will be made available to milk producers for a fee. The plant also is experimenting with hay making machinery and procedures.

Dairying is a safer investment for development because this plant is presently selling in 4 countries besides Nicaragua, and could sell in 2 more. It is agreed that the beef market is very attractive at the moment but it is much more volatile than dairying.

Planned changes should be made slowly. But preliminary investigation by plant personnel indicates that a properly managed dairy enterprise can return as much per mz as beef. Some believe dairying can match the per mz income from cotton production. Dairying is labor intensive and land intensive.

One other point needs to be made at this time. Several agencies of the government may from time to time send out technicians to give advice to the producers. At a certain time one may go out with a program of production practices. At another time, another technician will go to the farmers with yet other recommendations. All the recommendations may be beneficial, but as a result of the different presentations, the producers become confused and take only a portion of the action required. Also, often there is interaction between or among the needed practices so that little improvement is achieved when only part of the program is adopted and placed into use.

Present technical assistance provided to the producers by the plant itself amounts to C\$0.10 per liter of milk received.

This plant produces the major portion of the dry milk exported from Nicaragua and is a significant earner of foreign exchange. (Table XXIX)

MILK SUPPLY SYSTEM FOR PROLACSA

Production Delivered To The Plant. The quantity of milk received by the plant has increased dramatically since it started operations on September 15, 1969. Because of the extreme hot dry weather in early 1973 milk receipts were declining at a time of year when they usually would be increasing. (Figure 5).

The original milk supply was obtained by first taking a census of fincas in the original supply area. Fincas were then selected, milk collection routes were planned and transportation arrangements were made. Government personnel helped with the preliminary arrangements. The plant does not now have production contracts with its dairymen but will purchase any milk of acceptable quality delivered to it or to one of its receiving stations.

Here is one of the instances where different segments of the Nicaragua dairy industry came into contact with each other.

TABLE XXIX
 PRINCIPLE AGRICULTURAL EXPORTS FROM NICARAGUA, AND THEIR VALUE,
 1970 and 1971

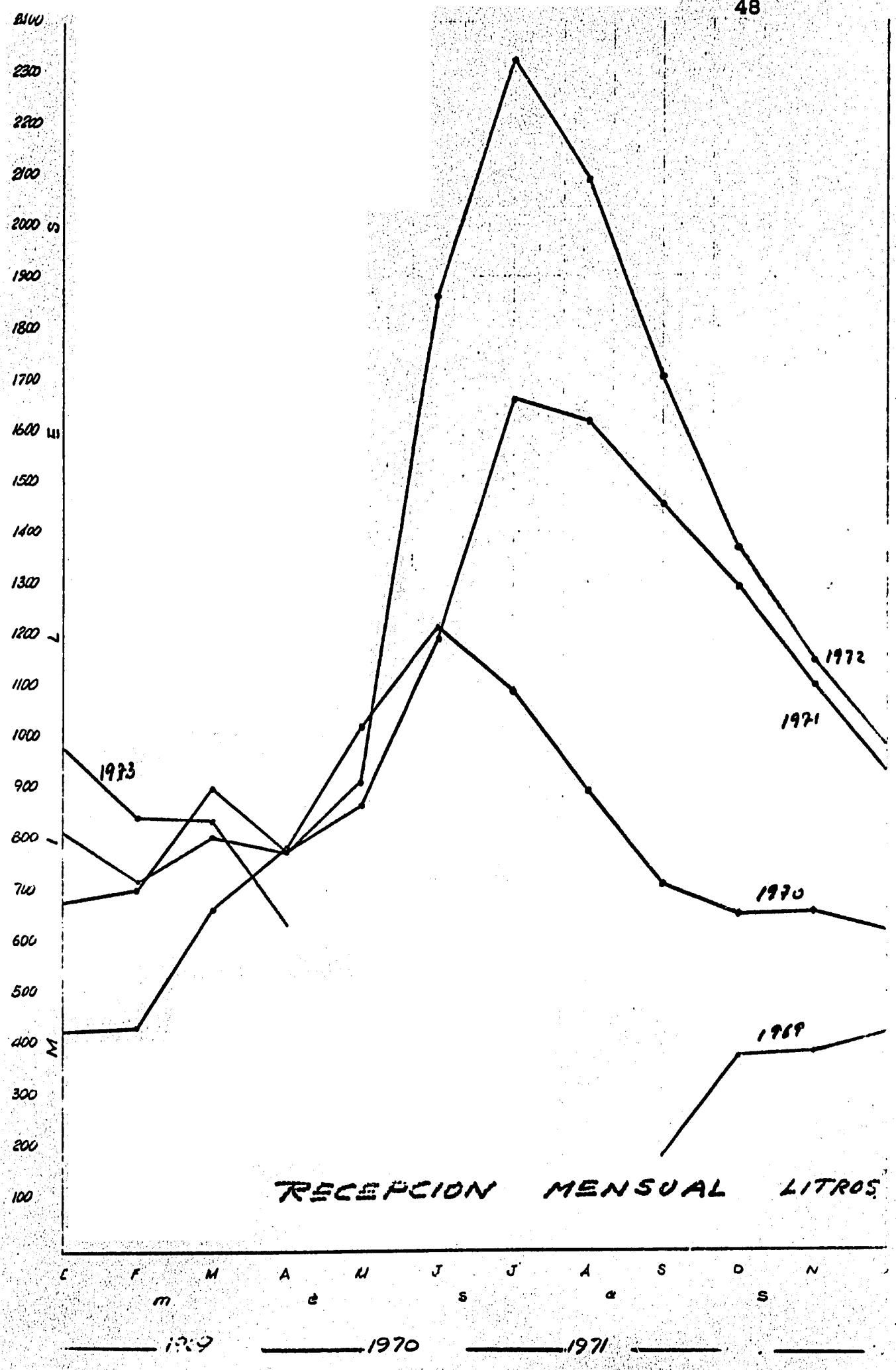
	<u>1970</u>	<u>1971</u>
	----U.S. \$ 000----	
1st Cottoi.	34,247	41,308
2nd Coffee	32,086	29,251
3rd Beef	26,577	28,671
4th Cane Sugar	9,826	11,620
5th Metals & Minerals	7,985	6,537
6th Shrimps	6,107	5,796
7th Lumber	2,479	3,689
8th Cotton Seed Oil	3,844	3,833
9th Powdered Milk	--	2,500

Estimated exports of powered milk by PROLACSA, 1973 \$5. million.

Source: "Comercio Exterior de Nicaragua por Productos", 1971.

Note: In 1970 and 1971, the exchange rate was C\$ 7 (Cordobas)
 = \$1 (US dollar)

Figure 5
Milk Receipts at the PROIACSA plant, 1969-1973
(in thousands of liters)



RECEPCION MENSUAL LITROS

1969 1970 1971

The manager believes that he could obtain more milk if the Managua pasteurizing plants did not compete with him for milk in certain areas. Also his purchase price must be sufficiently high to attract milk from ranchers in his area who would otherwise use the milk to make white cheese, butter, and cream. Both of these instances of competition are desirable and it is hoped that the competition allocates the available milk supply to the highest and best use.

Milk is delivered to the plant or to its receiving station daily. None of the dairymen supplying this plant own refrigerated milk tanks.

The plant manager said that in some cases certain of his dairymen quit delivering milk to the plant because they preferred to go back to beef cattle breeding and raising.

Geographic Distribution of Farms. The plant manager did not have the location of the farms readily available. However, those farms are near either the plant at Matagalpa or one of the milk receiving stations.

The plant presently is operating 3 receiving stations at Matiguas, Camoapa, and Juigalpa. Three others were under construction. The large one at Muy Muy (60,000 liters daily capacity) and two smaller ones at Rio Blanco and Rio Negro.

During the rainy season, the plant receives about 60 per cent of its milk through these stations.

Prices to the Producers. When the plant started operation a study of the cost of the production was made and the initial price was based on this. The price paid at first was C\$0.33 per liter. As the plant has succeeded in attaining favorable balances, the price has been raised.

In 1970, the price during the months of January to March was C\$0.61 per liter and was reduced to about C\$0.41 per liter for the remainder of the year.

In 1971, the C\$0.61 price was maintained until April, was lowered to about C\$0.50 for a month and then in June lowered to C\$0.41.

In 1972, the C\$0.61 price was again maintained until April. However, for the month of May the price was maintained at C\$0.55 instead of 0.50 as in 1972. On June 1 it again went down to the 0.41 price until November when it was raised to 0.55.

In 1973, the plan was to hold the C\$0.61 price until the first of May, go down to 0.55 and hold until 1 July, go down to 0.50 until 1 October when it would raise to 0.55 through December.

The pricing goal is C\$0.61 for the entire year.

All producers receive the same price regardless of location or butterfat content. The philosophy of the plant is that all producers should receive the same price and that philosophy has been maintained.

The plant does not have contracts with any of the producers. If they have milk they want to sell, the plant will buy it at the price it can afford to pay.

These special services provided by the plant are not exactly the same as part of the price paid to the producers but they do comprise part of the cost of milk to the plant.

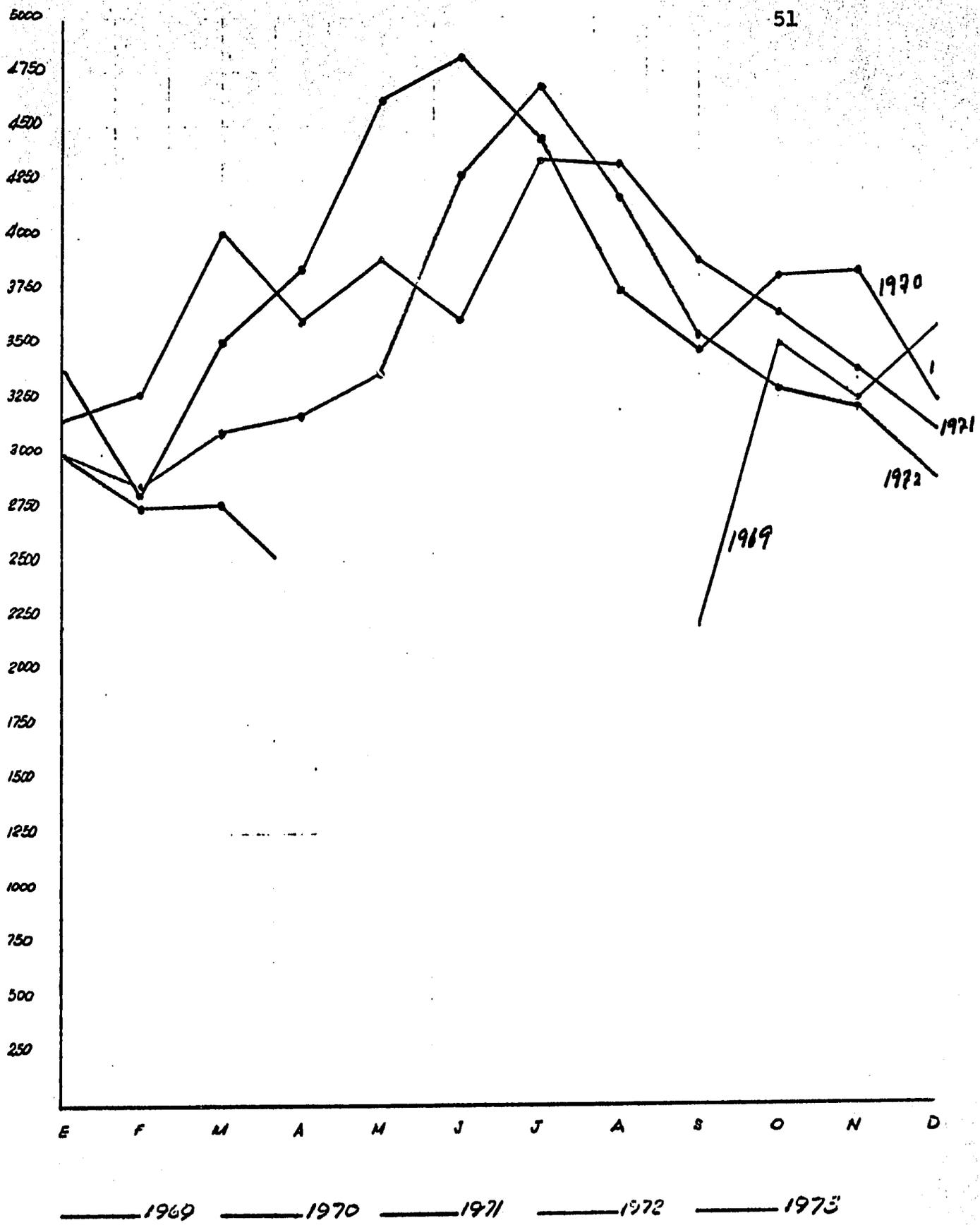
1. Credit up to 2 years with interest at 10 per cent annually. Deductions are made from the milk deliveries to make the payments on interest and capital. The credit is extended to buy bulls, heifers, improvement on the farm, or for personal needs. The cattle are used to secure the loan. All these loans have been paid religiously.
2. Equipment is furnished at cost, such as milk cans, buckets, etc. If necessary, the producer has up to one year to pay.
3. Feed for the cattle during verano at cost.
4. Materials at cost such as wire for fences, detergents, filters, etc.
5. Medicines at 7 per cent discount.
6. Technical assistance without cost. The technicians are provided vehicles and travel expenses. These include 2 agronomists, 5 veterinarians, and 6 inspectors. The plant also has at times provided help for home improvement and better living.

Seasonality of Production. Refer back to Figure 5 to get a picture of the problem of seasonal production faced by this plant. Nothing has been done up until the present time to attack this problem as the plant has wanted all the milk it could get no matter which season of the year.

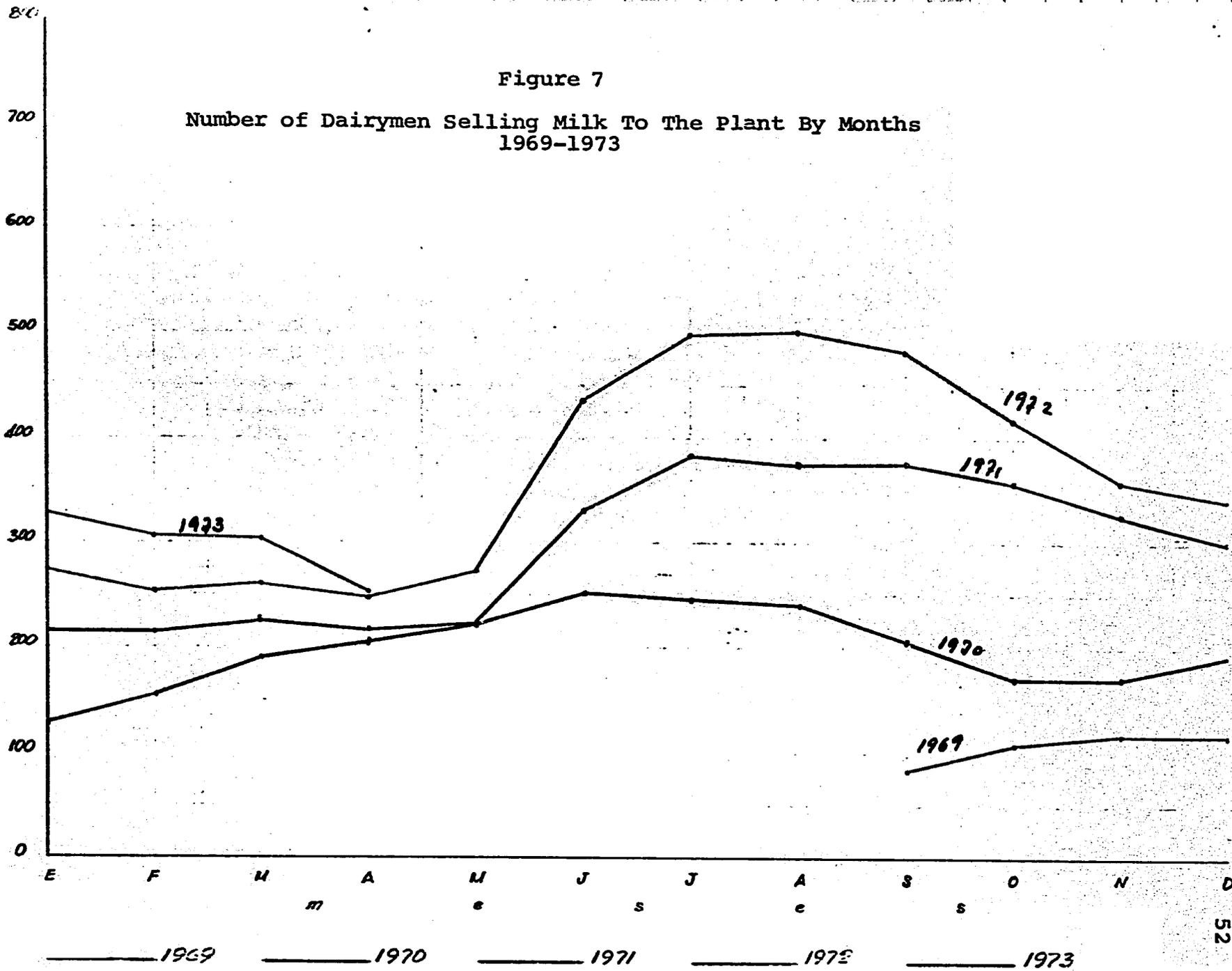
The problem for this plant is based on the fact that average monthly deliveries per producer fluctuate drastically. (Figure 6). This is then compounded by the fact that a large number of the producers sell milk only during the favorable season and completely discontinue selling milk during the dry season. (Figure 7).

For quick reference, the data on this figure are summarized in the text table below.

Figure 6
Average Monthly Deliveries of Milk Per Producer, 1969-1973



PROMEDIO MENSUAL / LITROS POR PROVEEDOR



CANTIDAD DE PROVEEDORES

Year	Number of Dairymen selling milk to the plant	
	Dry season	Rainy season
1970	120	250
1971	210	380
1972	250	500
1973	260	530 (July) (Estimated)

The problems caused by this situation are:

1. Plant operates at less than full capacity most of the year.
2. High fixed and general costs regardless of the volume of milk processed.
3. Necessitates a larger installation to process the excess milk received in invierno.
4. High amortization costs per unit of production.

Recommendations of the plant manager:

1. Better roads and bridges more completely covering the territory served by the plant.
2. More improved and better pastures.
3. Credit available at lower rates of interest.
4. Better management of the cattle.
5. More attention to the health of the milk cows.

Structure of Production - Herd size. None of the farms serving the plant are specialized dairy herds. All of them have other enterprises. Nearly all or perhaps all of them raise calves. Most of the milk is obtained by taking part of the milk from a nursing cow.

The estimated milk production per day per cow in April 1972 was 1.5 liters.

Data were not available on the amount of milk received from herds of various sizes. The average size of herds at selected time intervals are shown in (Table XXX). Figure 6 also shows the average monthly deliveries of milk per producer.

TABLE XXX

AVERAGE NUMBER OF COWS PER FARM, SELLING MILK TO PROLACSA,
FOR SELECTED MONTHS 1971-1973

Month	Cows -----	Farms Number -----	Cows per farm
June 1971	19,819	330	60
January 1972	15,854	263	60
April 1972	13,424	245	55
June 1972	29,598	437	68
January 1973	16,289	328	50
April 1973	10,967	253	43

Transport and Handling. Milk is brought to the plant in 10 gallon cans and also in tank trucks. The milk is cooled at the first point of receipt, either at the plant or at the receiving station. Also the cans which were used to transport the milk from the farm are washed at that point. The receiving station at Matiguas uses diesel power for cooling; the two at Camoapa, and Juigalpa have electric power but also are provided with standby emergency generators.

Quality Controls. Quality problems are closely related to transport and handling. Since nearly all of the farms are located on unpaved roads, and many of the bridges or stream crossings are faulty in some areas; great difficulties arise at certain times of the year.

The plant manager attributes the greatly increased percentage of acid milk received during certain months to nearly impassible roads during heavy rain storms. Such milk cannot be used by the plant for its product, dry whole milk for human consumption, so great economic waste occurs.

At certain times, the per cent of acid milk greatly increases (Figure 8). Also the pattern of the amount of spoiled milk supports his belief.

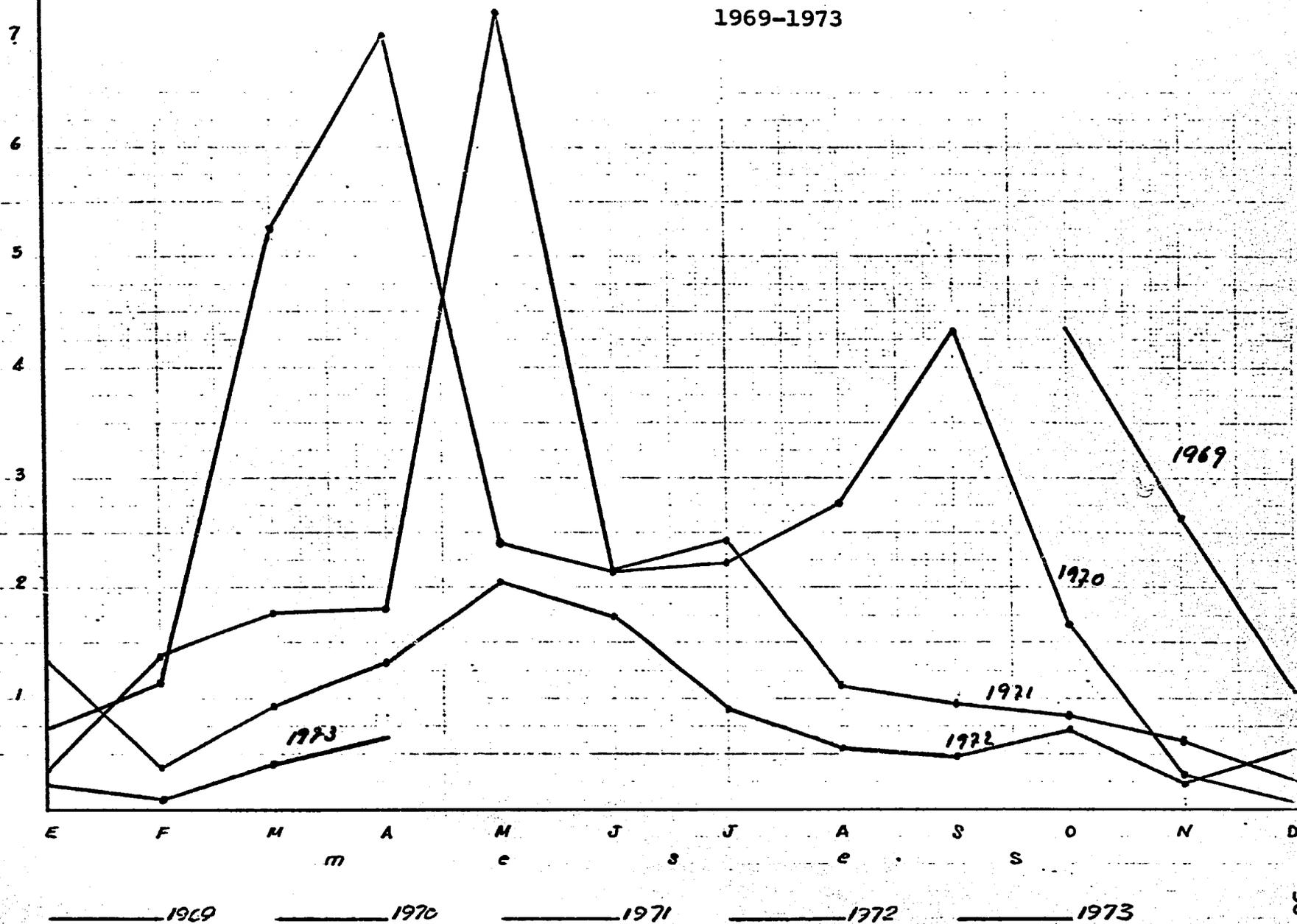
The plant exercises control over quality; on the farms, during the transport, at the receiving stations and in the plant. The farms are inspected by plant personnel and strict laboratory control is exercised in the receiving stations and the central plant. The norms are established by Nestlé.

Tests used are:

1. Alcohol
2. Acidity
3. Methylene blue reduction
4. Butterfat content
5. Density
6. Cryoscope
7. Filtration for sedimentation

Figure 8

PERCENT OF MILK RECEIVED WHICH WAS TOO ACID FOR MANUFACTURE INTO DRY WHOLE MILK,
1969-1973



% LECHE ACIDA

PROCESSING AND DISTRIBUTION

PROLACSA

This plant at the present time produces one product, dry whole milk. Its principal markets are Guatemala, El Salvador, and Nicaragua. At times in the past, sales also have been made to Honduras and Costa Rica. Up to the present time, its potential market outlets have exceeded its output. The capacity of the plant is being expanded but there will still remain the problem of obtaining sufficient milk for processing.

Production has been expanded rapidly since the initiation of operations.

1970	2,785,000 lbs. dry milk
1971	4,176,000 lbs. dry milk
1972	4,723,000 lbs. dry milk

To maintain quality in a tropical, humid climate the product is hermetically sealed in a metal container with an inert gas. The most popular container is 5 pounds but 1 pound and 2½ pound containers are also used.

Only about 7 to 10 per cent of the output is sold in Nicaragua but the 1 pound container is preferred in the home country.

The processing system has been set up and is operated so that no production "bottlenecks" cause serious problems.

Milk received from the dairymen averages 3.9 per cent butterfat. The product contains 26-28 per cent butterfat and is held constant throughout the production year. Any extra butterfat remaining is combined with dry skim milk purchased from the plants in Managua.

The entire output of the plant is sold within the Central American Common Market.

Sales From the Plant	1971	1972
	(million cordobas)	
Guatemala	8.6	11.6
El Salvador	6.2	8.5
Honduras	1.3	1.8
Costa Rica	2.1	1.9
Nicaragua	<u>1.4</u>	<u>3.0</u>
Total	19.6	26.8

The Nestlé corporation is the exclusive marketing channel for the output of this plant. Not only does this give the plant access to the Central American Common Market, but also to the world market through the world wide market contacts of Nestlé.

Prices at wholesale and at retail for that portion of the dry whole milk sold in Managua on 23 July, 1973 were:

<u>Dry Whole Milk</u>	<u>Wholesale*</u>	<u>Retail</u>
"Lirio Blanco" 1 lb.	C\$ 5.10	C\$ 5.85/tin can
NIDO 1 lb.	6.70	7.50/tin can
NIDO 5 lbs.	30.00	34.50/tin can

*Estimated by the plant manager.

The 1 lb. and the 5 lbs. cans are the most important sizes with a small quantity packaged in 2½ lbs. size.

	Percentage of sales
1 lb. can	48%
2½ lbs. can	4
5 lbs. can	48

The costs of the plant were estimated to be divided among the following categories according to the indicated percentages.

Paid to the producers for milk	74%
Plant operating costs	11%
Materials	4%
Services (electricity, fuel, etc.)	4%
Ingredients incorporated into the product	7%

The plant manager is satisfied with the present arrangements whereby transportation of the product from the plant is handled by private transportation companies.

There is a problem, however, in the movement of the product to foreign markets which is not related to the operations of the transportation companies. The Nicaraguan Customs House requires the product to be unloaded from the trucks and reloaded back on them. Many cans of powdered milk are damaged in this process. Not only does this cause loss to PROLACSA, it also causes loss of foreign exchange to the economy of Nicaragua. The solution is simple and without cost. Simply require the people at the customs house to give better treatment to the

merchandise. It might be possible to arrange some kind of system of inspection which would allow the product to be inspected while remaining loaded on the truck and so remove the necessity for the unloading and loading process altogether.

The total output of the plant is packaged in family size hermetically sealed tin plate containers. No bulk dry milk is sold because there is not sufficient raw milk available to the plant to make it worth while. Other Central American Common Market Countries receive about 90 per cent of the product. About 10 per cent is consumed in Nicaragua.

It has been calculated that the potential annual sales of dry whole milk from this plant could be as great as 20 million pounds. Other outlets, besides the family package of dry whole milk, could be, milk solids manufactured to specification for use in ice cream, cookies and crackers, sausages and wieners, candies and chocolates, and special infant diet formulas. The last item in particular has great potential not only for profit but also to improve human life in the market area available to the plant. Sterile, nutritious infant food in convenient form and package would fill a real need.

Selling the product from this plant has gone well from the beginning because of the connections with Nestlé. The Nestlé trade mark was recognized and well regarded by consumers in the Central American Countries.

The capacity of the plant is being doubled and the management does not now have any bottlenecks in the processing system and does not foresee the development of any. Its principal need is for a greater quantity of milk of higher quality. There are sufficient markets in Central America to take its output.

The roadblocks to increased milk receipts by the plant were discussed in a previous section. The needs are for better development of milk production programs on the farms, better sources of financing, and better roads and bridges.

Data from the annual report of the Customs Office of Nicaragua show the progress which has been made by this plant in gaining foreign exchange for the country. (Table XXXI).

In 1971, the dairy industry brought in foreign exchange of U. S. \$2,436,012. Almost three-fourths (74%) of this became income for milk producers in the rural areas. Since dairy is a labor intensive enterprise, most of this could be counted as returns to labor, a very favorable result as indicated by the objectives set by the Comité Nacional Agropecuario.

TABLE XXXI

EXPORTS OF DRY MILK AND TOTAL DAIRY PRODUCTS EXPORTED FROM
NICARAGUA, 1967-1971

Year	Dry Whole Milk		Dry Skim Milk	
	Kgs	US\$	Kgs	US\$
1967	--	--	--	--
1968	43,838	\$25,501	74,520	\$51,269
1969	122,146	104,203	283,146	182,676
1970	1,432,414	1,596,184	3,600	3,650
1971	2,094,578	2,288,614	6,798	6,149
	Total dairy products exported			
	Kgs	US\$		
1967	208,012	\$118,676		
1968	544,659	336,682		
1969	1,169,702	814,841		
1970	1,795,736	1,863,728		
1971	2,295,312	2,436,012		

Source: Annual report of the customs office of Nicaragua.

CONCLUSIONS AND RECOMMENDATIONS

The Nicaraguan dairy industry is progressive and aggressive. It provides benefits of different kinds to a wide variety and a vast number of people. To many, it is their source of income. It provides income to urban people who work in the processing plants and to those who engage in distribution of dairy products. It provides income to many rural people, in widely dispersed areas, who produce the raw milk for processing and distribution.

To many, it provides a reliable, economical, palatable, nutritious food. To the ice cream lovers it is the source of great pleasure.

In 1971, the dairy industry brought in foreign exchange of US \$2,436,012. About three-fourths of this became income for milk producers in rural areas. Most of this could be counted as returns to labor, and exercised a favorable influence on the distribution of income.

Presently beef exports earn more foreign exchange than any other animal product. However, milk is important and has some worthwhile advantages. Milk exports give promise of being more stable since they go to several countries rather than to just one as is the case with beef. Also dairy, if well managed and efficiently operated can give as high returns per m² as beef and perhaps as high as some of the important cash crops.

The dairy industry should share in the development of the agricultural sector of the Nicaraguan economy. It will repay investments made in it of money, planning, and management with generous returns.

Presently many problems of the dairy industry are associated with the way milk is produced and delivered to the market. There is wide seasonal variation in production with shortages or near shortages during the dry season and substantial excesses during the rainy season.

This problem can be attacked by providing market facilities to handle the milk as it presently is produced and delivered from the farm. It can be attacked by a broad based educational program with dairy producers. The goal would be improved herd management also probably including improved pastures for increased year around forage production. A combination of the two methods likely will provide the solution.

Let us look first at some suggestions for action to increase the efficiency and quality of milk production and perhaps also lead to a more uniform pattern of seasonal receipts of milk for the market.

An educational program should be developed and implemented to improve farm production practices. Possible mechanisms for conducting the program will be discussed but the philosophy, and content of the program and the competence and attitudes of the people who conduct it are more important than the mechanism employed.^{1/}

The educational goal should be to explain to farmers biological phenomena, the facts of plant and animal life. They should understand the essential difference between health and disease, and also the relationships between wellbeing of plants, animals and humans. All this must be accomplished in language which the farmer can understand and which will motivate him to action. The action to which he is motivated should improve not only his own wellbeing but also, at the same time, that of the entire society -- the entire population.

If man (gente) is to survive and realize any kind of a satisfactory life in Nicaragua, this task must be successfully accomplished and that quite soon. The beginning should be made now.

The producers must be allowed to try recommended practices and to determine for themselves whether in fact they are better for him. It is true that each individual farmer must work out his own best combination of practices. Experimental results have a fairly wide variability, so the individual farmer can not be certain to obtain exactly the same results in every instance.

Specific recommendations on production practices can be found in various publications.^{2/}

Another report deals with a dairy cattle development program, the PROLACSA project, initial stage road system and a plan for a fourfold increase in milk production on more than 200 dairy farms.^{3/}

^{1/} Ministerio De Agricultura y Ganaderia, Comisión Nacional, 1972-1976, Plan Nacional de Educación Superior, Investigación y Extension Agrícola, Volumen V, Managua, Oct. de 1971. Page 64, 76, and page 82. This report estimated a deficit of milk production, annually for the period up to 1976.

^{2/} Banco Nacional De Nicaragua, Intervention Operativa Para El Desarrollo Ganadero, Relacion Final 1969, Latinoconsult Argentina, S.A., pages 57ff.

^{3/} Agro-Economic Development In Nicaragua, report published by the National Plant Food Institute, 1700 K Street, N.W., Washington, D. C. 20006, June, 1969, page 115 and page 157.

It already has been shown that proper management can increase production efficiency and lead to more uniform seasonal production. (See discussion on page 18 of this report.)

Perhaps a two level extension program could be initiated. (1) Radio could reach many people with a minimum of cost and effort. It is reported that many people have the battery operated transistor radios. This communications medium can reach people at all levels of literacy. Printed materials are important but their usefulness is limited to those with education. (2) Personal work also is essential. This must be conducted under the supervision of trained specialists. (This part of the program could be extended to include not only producers but also processors and retailers, that is for those aspects of the program which should be developed for them.

It is possible that experienced people who do not have college degrees can effectively work directly with the dairymen, but they should be directly under the supervision of a trained technician and should have easy access to him for the answers to questions they are not capable of answering. Each one of these people should not be responsible for more than 20 to 30 dairymen. Their program should include, in addition to animal management; proper fertilization, irrigation, and management for pasture, silage, and grain.

A research and demonstration farm or farms should be established to carry on a continuing program of improved forage production, crop and herd management, and proper feeding for efficient milk production.

If dairymen are to make any substantial progress in more efficient and sustained production a system of record keeping should be initiated.

It also should be a coordinated program. Several agencies, government and/or private may participate, but the recommendations should be specifically devised and reasonably uniform for the different production areas.

One goal which should be pursued is to work toward more specialization between beef and milk production. This does not mean there should not be both beef and dairy on the same farm. It means that the beef and dairy herds should be managed separately and differently.

There are different methods by which such an educational program might be carried out. The most obvious method is for it to be done by the government under the supervision of the College of Agriculture or the Minister of Agriculture.

Another method could be to strengthen and improve the financial condition of the Fund For The Development of the Dairy Industry (Fondo) and allow it to sponsor the program.

A third method, perhaps not as effective as the previous two methods, is for the dairymen to organize into groups of 20-30 to finance and organize programs of management and record keeping for each group.

It is possible that the record keeping program could be organized separately from the production management program and paid for directly by those who are willing to pay something extra for the service and use the records to improve their management.

Two problems exist in the marketing system which need attention. (1) During the season of low production, a method is needed to equitably allocate the short supply of milk to the highest and most important use. (2) During the season of high production, an efficient method of managing and manufacturing the milk excess to fluid needs should be established.

If the plant, La Salud, were moved to a less congested area, modernized, and adequately financed it could perform both purposes. All the milk would be received and cooled by it. The needs of the other plants would be allocated to them (meeting the fluid needs of all before supplies were allocated for industrial products) and any excess would be manufactured in the La Salud plant. If this method were used, the plant should be financed in such a manner that it would not be necessary for it to pasteurize, bottle, and sell fluid milk. This function should be left to the other plants. Under this system, one plant would specialize in receiving, allocating, and manufacturing excess milk. The other plants would specialize in pasteurizing, bottling or packaging, distributing, and selling fluid milk. They would be relieved of dealing directly with the farmers and would be guaranteed the exact amount of milk they needed for pasteurizing -- no more and no less.

Among the industrial products, ice cream, and other frozen dairy products, should be given special consideration. Ice cream is a nutritious product and is greatly enjoyed by the Nicaraguan people. Milk and butterfat for ice cream production should receive an allocation priority above the other industrial products and second only to fluid pasteurized milk. The pasteurizing plants have developed markets for their individual brands of ice cream and should receive allocations of milk and butterfat to continue their production of it. Plants with facilities for producing special types of cheese should receive a third level of priority for that product.

If the Oficina Coordinadora were given more authority, it could perform the allocating function and the plant facilities could continue to be used much as at present.

In any event, the Oficina Coordinadora should be given authority and financing to audit the records of all the plants on a continuing basis.

The system of roads and bridges needs to be further developed so that it is possible to get the milk production delivered to the market in an expeditious manner on a daily basis. A good beginning has been made.^{4/} This is particularly imperative for the expanded PROLACSA plant to assure it adequate supplies of milk. A milk collection system is essential to a healthy dairy industry. This requires year around passable roads and bridges, and an efficient organization. It also must have profitable milk production in a fairly compact area. Special services needed by dairymen need to be available to them and depend in large measure upon a good system of roads. Some of these services are: (1) veterinarian, (2) artificial insemination, (3) laboratory services for soil testing, feed analysis, and animal pathological tests.

A pricing formula should be developed to move the price paid producers up (or down) to keep it in proper cost relationship with the major items of production such as feed. The milk price also needs to be maintained at the right level as compared to beef so that producers do not shift back and forth between the two enterprises to such an extent as to disrupt the supply.

Data in Table XXX provide some indication that early in 1973 farmers were selling their cows. From January to April the number of cows on farms delivering milk to PROLACSA declined from 16,289 to 10,967 and the average number of cows per farm was reduced from 50 to 43. These data are not conclusive but the situation existing at that time could have encouraged farmers to take such an action. Beef prices had increased while milk prices were held steady. Also dry weather had damaged the pastures and feed prices were increasing.

A special system of supervised credit for agricultural producers should be set up. Stable, assured credit at reasonable rates of interest is essential for the proper development of Nicaraguan agriculture. Proper supervision is necessary to assure that those who have the ability to utilize it obtain credit and also to assure that the credit granted is efficiently applied to the production process.

^{4/} Decreto No. 9-D, Publicando en "La Gaceta" No. 278 del 7 de Diciembre de 1965.

A dairy marketing research person with at least the M.S. degree in agricultural economics, and a thesis on some phase of dairy marketing, or equivalent training should be placed on the staff of the Fondo or the OCIL.

The Managua pasteurizing plants are to be commended for their efforts to make pasteurized milk available to the citizens of other cities. Consideration should be given to establishing small pasteurizing plants to use only a small glass bottling machine and simple pasteurizing equipment in some of the other major cities. This would encourage decentralization of the dairy industry and allow greater economic activity and development in those other cities. Milk has been transported from the Rivas area to Managua, processed and hauled back to Rivas for sale to customers there. If the efficiency of the larger plants in Managua is enough greater than that of a smaller plant located in Rivas to offset the transportation costs both ways, this is economically feasible. If not, a plant should be placed in Rivas and other cities to serve the people there.

It might be more satisfactory to subsidize milk consumption to low income people and children, rather than attempting to maintain or increase consumption by keeping the price low to producers.

Constant vigilance should be exercised to maintain or increase milk quality.

Planning should begin now to increase milk production for the Managua market which research by UNASEC indicates will be needed soon after 1977. The PROLACSA plant will need increased milk production to utilize its expanded facilities and to satisfy its increasing export markets to other Central American Common Market Countries.

Nicaragua should have a dairy labeling law to protect its consumers and also its ethical dairy processing plants. Such a law would not necessarily prohibit mixing butter and margarine or even mixing potatoes with butter, but the consumer has the right to know what product and what quality is being purchased.

The personnel in the customs house should handle the containers of dry whole milk exported by PROLACSA more carefully. Damage to those containers is costly not only to the plant but also to the entire Nicaraguan economy since that damage reduces the amount of foreign exchange which otherwise would be obtained.

As the market for dairy products expands, the increased milk production should be developed in those areas of the country most ecologically suited to year around milk production.

No attempt should be made to encourage widespread adoption of milk machines. They should instead only be installed when the special circumstances existing on a particular dairy farm indicate such to be beneficial for that farm. It is better to use hand labor to provide jobs for deserving people. With proper procedures, hand milking can maintain milk quality comparable to that milked by machines. Hand milking tends to reduce the mastitis problem. It also eliminates the highly technical problem of keeping the machines properly adjusted and properly sanitized.

This long list of suggestions should not be interpreted to indicate that the dairy industry of Nicaragua must adopt any or all of them to remain viable and prosperous. Rather, an attempt has been made to explore a wide variety of possible actions some of which, after thorough investigation, might be beneficial.

The national dairy industry can be important and prosperous, if efficiently organized to meet the needs of the Nicaraguan people and to supply certain export markets available in nearby countries. It can be important and prosperous without exerting any detrimental effect on the primary livestock industry, beef.

APPENDIX A

ABSTRACT ANALYTICAL DESCRIPTION OF THE MILK MARKETING SYSTEM
IN MANAGUA

The main body of this report is a concrete analytical description of the milk marketing system in Nicaragua. However, it is believed that a summary statement of the cause and effect relationships which exist in the system would facilitate a more complete understanding of the actual occurrences in the market. This summary has been constructed from an extensive and analytical observation of market data and long discussions with men of knowledge and authority in the marketing system. To more easily and completely assimilate the implications of the data and material reported herein, this appendix should be studied first. This is particularly true for the person with a practical and analytical mind.

Although the investigation is mainly concerned with the marketing of milk, it is not possible to intelligently analyze marketing without some knowledge of the nature of the product, production methods, how the product is delivered to the market place, sanitary controls, economic controls, sociological relationships, etc. These factors will be referred to when it is necessary. But because of the essential brevity of the report, they will not be extensively discussed.

The statements in the preceding paragraph are especially true of milk and dairy products. The marketing system must adapt itself to the way milk is produced and brought to market. Also, when sanitary regulations are enacted and enforced, the economic market structure is inevitably altered. Therefore, even though this is an investigation of milk marketing in Nicaragua, it must from time to time take account of the production system and of the sanitary regulations placed into effect in the market. To have future relevance, it must also consider possible changes in both.

The author was charged to write a practical report with direct application to Nicaragua and this he has attempted to do. A report, to assume real meaning to a practical mind, must have a logical framework around which to organize the multitude of facts which have been collected. Without the economic organizational background, the facts cannot be meaningfully interpreted and used. This appendix has been constructed for that specific purpose.

First, let it be assumed:
(most people will agree that these are realistic assumptions)

1. Consumers desire --
 - a. healthfully safe and wholesome dairy products
 - b. approximately the same quantity each week of the year on a marketwide basis
 - c. reasonably stable prices
2. Production --
 - a. is greater in invierno than in verano
 - b. for fluid use, cannot be stored from the season of great production for consumption during the season of smaller production
 - c. sanitary and quality control is difficult and costly

Milk is one of the most regulated food products. This is true in Nicaragua as it also is in most of the other principal countries of the world. Consumers should have available to them a product which is nutritionally wholesome and which will not endanger their health. Many have regarded it as a necessity. Many still do.

Milk should be produced and handled under carefully controlled conditions. Because of its unique nutritional value, it is a favorable medium for bacterial growth. Contrast it to meat, which also is a valuable and desirable food. In milk, any impurity quickly becomes dispersed throughout the mass. With meat, the outside layer can be trimmed off and thereby most of the dirt discarded. Thus, within a reasonable period of time, there is not much danger to the health of the consumer if any reasonable care has been exercised in handling. The extra care necessitated by the nature of milk is costly in terms of money and human time and effort.

Only a few short years ago, in the Managua market, unbelievable conditions existed. Filth and adulteration were commonplace. It is possible that such conditions still exist in some localities at a distance from the city. For house to house delivery, milk was dipped from cans into pitchers and jars on the dusty street. In stores, the milk was dipped into the family pitcher over the milk can. Milk often ran over the outside of the pitcher and over the storekeeper's thumb back into the remaining milk to be purchased by subsequent customers. The loquacious merchants loved to visit

and physiologists say it is impossible to talk without discharging spittle spray from the mouth.

Since 1963, when the compulsory pasteurization law was enacted, conditions of course have greatly improved.

Dairy regulations are mainly of two distinct kinds, sanitary and economic. Their principal purposes are to:

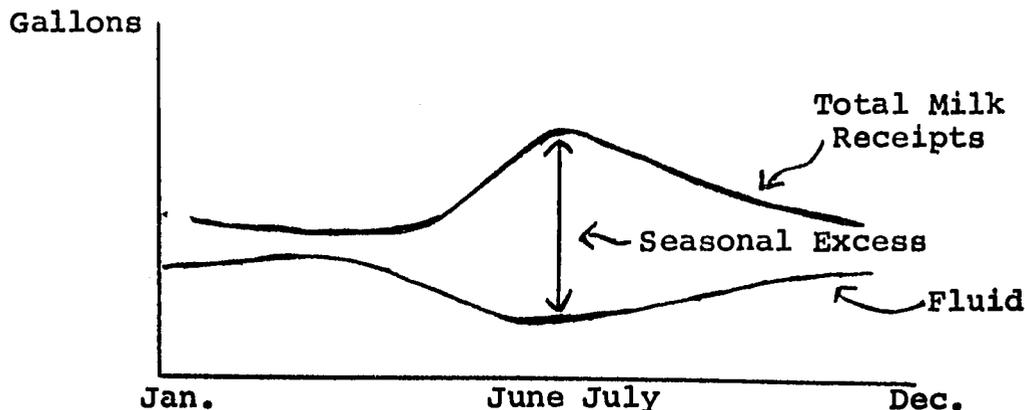
1. Protect the public health.
2. Assure the public an adequate quantity of pure and wholesome milk at reasonable and stable prices.

Probably a third type of regulation should be added; to protect the purchasing consumer from fraudulent and misleading claims and labels.

Suffice it at this time to say that the 1963 compulsory pasteurization law completely changed the structure of the market. Previous to its enactment, any person who had milk and wished to sell it could bring it to the city and proceed up one street and down another in search of buyers. After the law, all milk for fluid consumption was required to be channeled through the relatively few approved pasteurizing plants. As will be shown, this had economic consequences.

To provide the population with an adequate quantity of wholesome milk at reasonable and stable prices is a more complex matter and will require a more lengthy treatment.

Consumers want about the same quantity of milk one week as in any other week, in one month as in any other month. Producers, however, due to the changing weather, crop and grass responses to the weather, and the physiology of the cows; do not furnish equal quantities during the different seasons of the year. And fresh milk cannot be stored during periods of high production for use as fluid milk at a later season of low production. Fresh milk is produced daily and the market must make provisions to receive it, buy it, process it and sell it daily. The hypothetical curves showing seasonal changes in milk receipts and the quantity of fluid sales illustrate the wide variation in the excess which must be disposed of in some economic manner. If consumers could be persuaded to drink

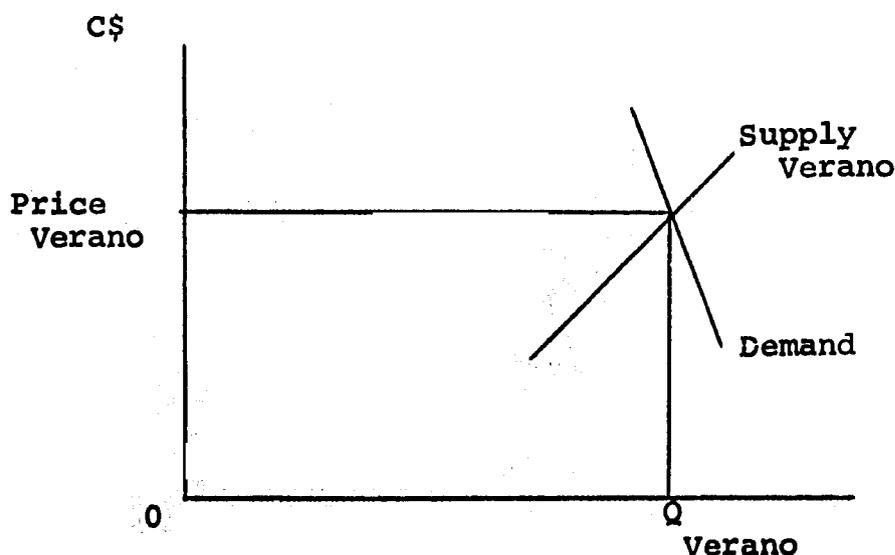


much more milk in invierno and not much in verano so that fluid sales and milk production were maintained fairly equal on a day to day and week to week basis, the main milk marketing problem would be that of maintaining acceptable quality and that could be solved by sanitary regulations. If milk production could be so managed that cows would give as much milk in verano as in invierno the problem of equating production and sales could be solved in that manner. However, unfortunately, up until the present time neither possibility has become a reality. Cows will not nor will humans modify their characteristics to simplify the marketing problem. Rather the market must adapt itself to the production and consumption characteristics of the commodity.

The big problem was (and is) what to do about the big seasonal excess of milk.

Before 1963, before economic regulation of the Managua dairy industry, the free market, the unhampered interaction of supply and demand forces were allowed to do the job. It must be admitted that they did do the job. However, it is quite obvious that the situation was unacceptable, or the difficulties of complex economic regulation would not have been initiated. A fairly simple analysis will show why this was true. The hypothetical supply and demand curves are sufficiently representative of reality to show why. According to the simplest economic theory, the intersection of the supply and the demand curves was supposed to denote the price and also the quantity at which exactly the same amount of the product would offered for sale as the quantity which consumers would be willing to buy at that price. Unfortunately, with milk the simple supposedly logical economic theory would not work very well:

A little further analysis will show why it would not satisfactorily regulate the market for fluid milk.

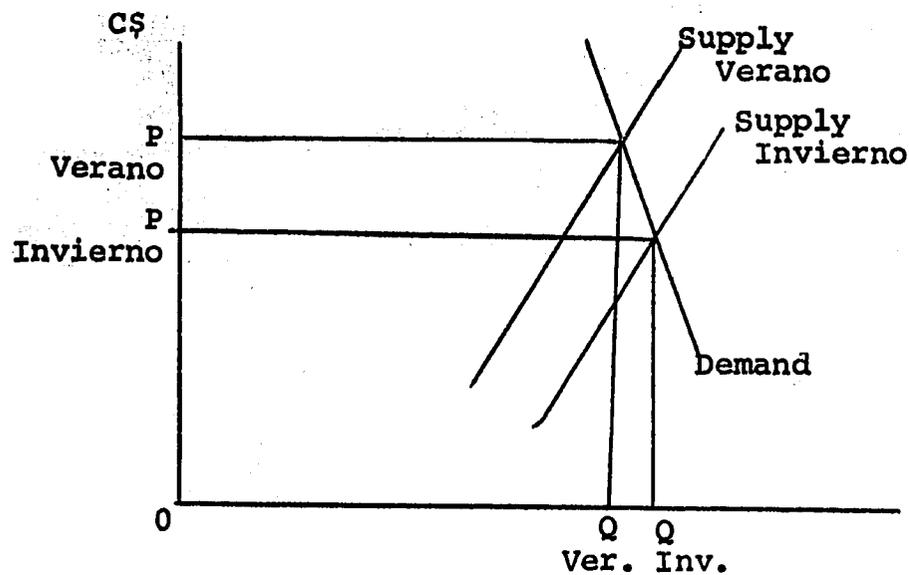


It is not necessary to be an economist to use a demand or a supply curve. The demand curve nearly always slopes down and to the right. It only relates quantities purchased to various prices. In most instances, people will buy more of a product when the price is low and less when the price is higher. Therefore, the (D) demand curve merely shows the way consumers feel about milk and milk prices. The (D) demand curve for fluid milk has a quite steep slope because, over an extended period of time, people do not change the quantity they purchase to any great extent in response to a reasonable change in price.

The (S) supply curve nearly always slopes up and to the right. It only relates quantities which will be offered for sale to various prices. In most instances producers will offer more of a product when the price is high and less when the price is lower. Therefore, the (S) supply curve merely shows the way producers feel about producing and selling milk in relation to milk prices. It takes a substantial price change to influence the quantity of milk delivered to the market very much, particularly in a short period of time. The supply curve only shows the relationship between price and the quantity delivered to the market. With milk, (besides price) there are other very important factors. Milk production (quantity produced) responds more quickly to some of these other factors such as weather, season of the year, and technology than to price changes. Provided, of course, that the level of prices is sufficient to cover the costs of production for most of the producers delivering to the market.

The original simple theory (illustrated by the graph above) assumes that (1) the demand and (2) the supply for fluid milk responds as has been indicated above. It also assumes that (3) an equilibrium price and quantity will be established at the intersection of the two curves whereby the price will induce producers to offer the same quantity that consumers will wish to purchase at that price. The first two assumptions are essentially correct. However, in the case of fluid milk, the third one is not fulfilled.

The third assumption is not fulfilled because it is based upon yet another implicit assumption that there is one stable demand and one stable supply for fluid milk. The demand for milk is quite stable. However, the supply for milk is not stable at all. In fact there is a different supply of milk delivered to the market nearly every week of the year (perhaps nearly every day) even though the price is held constant. Instead of there being one supply for milk, there are many changes during the year. Only two will be shown to illustrate the point, One for verano, one for invierno.



The economic principles work. But economic policies based upon an incomplete understanding of those economic principles will not achieve the desired results.

During the period of time under non-regulated competition, there was an extremely low price during invierno with more milk for sale than consumers were willing to buy at any reasonable price. During verano, the hot, dry weather and short pasture caused the cows to reduce their milk output sharply. The reduced milk delivery to the market in conjunction with the steep demand curve caused a big increase in price.

The actual situation with a quite stable demand and a big seasonal change in supply was causing a very undesirable condition. In verano, a shortage of milk and a high price. In invierno, an excess of milk and a low price.

Consumers didn't like the wide fluctuations in price. Also they didn't like the uncertainty during verano as to whether there would be enough milk for them when they wanted it.

Producers didn't like the wide change in price -- especially the extremely low price during invierno.

It was a chaotic situation. No one was pleased with it. The Nicaraguan economists and policy makers recognized that it was an intolerable condition and resolved to improve it.

In 1963, they imposed both economic and sanitary regulation. It must be recognized at this point that regulation does not displace or eliminate the economic principles. Rather it employs them to achieve the desired results. Few would say that the present situation in the dairy industry is perfect. However, few would deny that the

present situation is a great improvement over that which existed prior to the enactment of the 1963 regulations.

Prices have been stabilized over long periods of time. During the last few years, the market has received an adequate supply of milk. The situation existing during the verano months of 1973 should not be blamed on the economic regulations. Rather it appears to be due to the severe disruption of the market which was caused by the earthquake in December 1973, and perhaps also partly to weather and general inflation in costs for input items.

The economic principles supporting the 1963 regulations will now be examined. This is necessary to explain the measure of success which they have achieved. It is also necessary to a further and continuing study of those regulations. All economic regulation should be subjected to constant scrutiny and improvement to assure that it is in harmony with the existing situation and that it is continuing to achieve the desired results.

In previous paragraphs, it has been shown that the existence of several supply curves, rather than only one, prevented the non-regulated competition from achieving a reliable and adequate quantity of milk for the market and caused wide seasonal fluctuations in price rather than the desired price stability. Let it now be shown that the existence of more than one demand curve provided a means for ameliorating the situation.

In reality, there is a separate demand curve for milk to be used in each different product. When more than two are used, the analysis becomes extremely complex and would serve no useful purpose here.^{1/}

Two demand curves will be sufficient for this analysis and appear to adequately serve the Managua market at the present time. At some future time, it may become desirable to add extra classes of milk for processing into certain specific products.

As a result of analytical observations, some people began to believe that milk for fluid consumption had a higher priority for use. Consumers appeared to be more concerned about their fluid milk than about milk for their butter, cheese, etc.

Milk to be manufactured into butter, cheese, etc., had a lower priority for several reasons. Consumers regard these products differently because there are some available substitutes for them. There are (presently) few suitable substitutes for fluid milk. Also these other products could be manufactured during invierno and stored for use during verano. Fluid milk cannot, of course, be stored.

^{1/}Studies have been conducted at the University of Missouri involving 6 demands for 6 classes of dairy products. At various times, some markets used only 2, some used 3.

The price to the pasteurizing plants and to the consumers for fluido is set at a higher level and they take the quantity which is desired at that price. This quantity varies by a relatively small proportion during the seasons of the year. During invierno, the fluid sales tend to decline slightly and during Holy Week (Semana Santa) they drop off sharply, but quickly recover.

On the other hand, the quantity which is utilized in the industrial class fluctuates from a very small quantity during some weeks (approaching zero on some days) to over one third to nearly one half during other weeks.^{2/}

This system will operate reasonably well, (subject to occasional strains), as long as the milk is properly allocated among the various products and among the pasteurizing plants, properly classified and priced (as fluido or industrial) or until some new factor becomes dominant in the market.

^{2/} Data from the Oficina Coordinadora Industria Lactea are subjected to analysis in the main body of the report.

APPENDIX B

UNASECMILKAnálisis de la Situación Lechera

- I.- Estudio del abastecimiento de leche a las plantas -
pasteurizadoras (cuenca lechera), considerándose
- Precios al Productor
 - Volúmenes entregados y frecuencia
 - Estructura de la producción por tamaño de finca y lugar de origen.
 - Estacionalidad de la producción
 - Transporte y empaque
- II.- Estudio del procesamiento de la leche en las plantas y su distribución final.
- Productos y subproductos obtenidos (determinación de coeficiente)
 - Precios al consumidor
 - Sistema de distribución local de leche y productos derivados.
 - Control de calidad y aspectos sanitarios
 - Principales problemas
- III.- Estudio del abastecimiento de leche a la Planta Pro-
lacsá.
- Precios al productor
 - Volúmenes entregados y frecuencia
 - Estructura de la producción por tamaño de finca y lugar de origen.
 - Estacionalidad de la producción
 - Transporte y empaque

(2)

IV.- Estudio del procesamiento de leche a la Planta PROLACSA y su distribución final.

- Venta local y exportación (Mercado Centroamericano y otros mercados)
- Precios al consumidor
- Transporte y empaque
- Sistema de distribución
- Posibilidad de ampliación de actuales mercados y - factibilidad de nuevos mercados.

V.- Conclusiones y Recomendaciones específicas para Nicaragua.

Marzo 26, 1973

National Agricultural Committee
UNASEC - NICARAGUA

Marketing

Framework for the Analysis of Milk Industry

I. Study on the Milk Supplying System to the Pasteurizing Plants

- Production delivered to the plants, frequency
- Geographic distribution of farms
- Prices to the producers
- Seasonality on production
- Structure on production per herd/farm-size
- Transport and handling
- Quality controls

II. Processing and Distribution

- Pasteurized Milk and Milk products processed and sold
- Distribution System
- Price to consumer
- Quality Controls and sanitary aspects
- Transport and packaging

III. Study on the Milk Supplying System to the PROLACSA Plant in Matagalpa

- Production delivered to PROLACSA, frequency

- Geographic distribution of farms
- Prices to the producers
- Seasonality on production
- Structure on production per herd/farm-size
- Transport and handling
- Quality controls

IV. Processing and Distribution - PROLACSA

- Production, local sales of Dry milk
- Central American Common Market - Export - Import
- Distribution system
- Prices to the consumer
- Transport, handling and packaging
- Feasibility of enlarging traditional markets

V. Conclusions and specific recommendations for Nicaragua

April 26, 1973

LN/eq.