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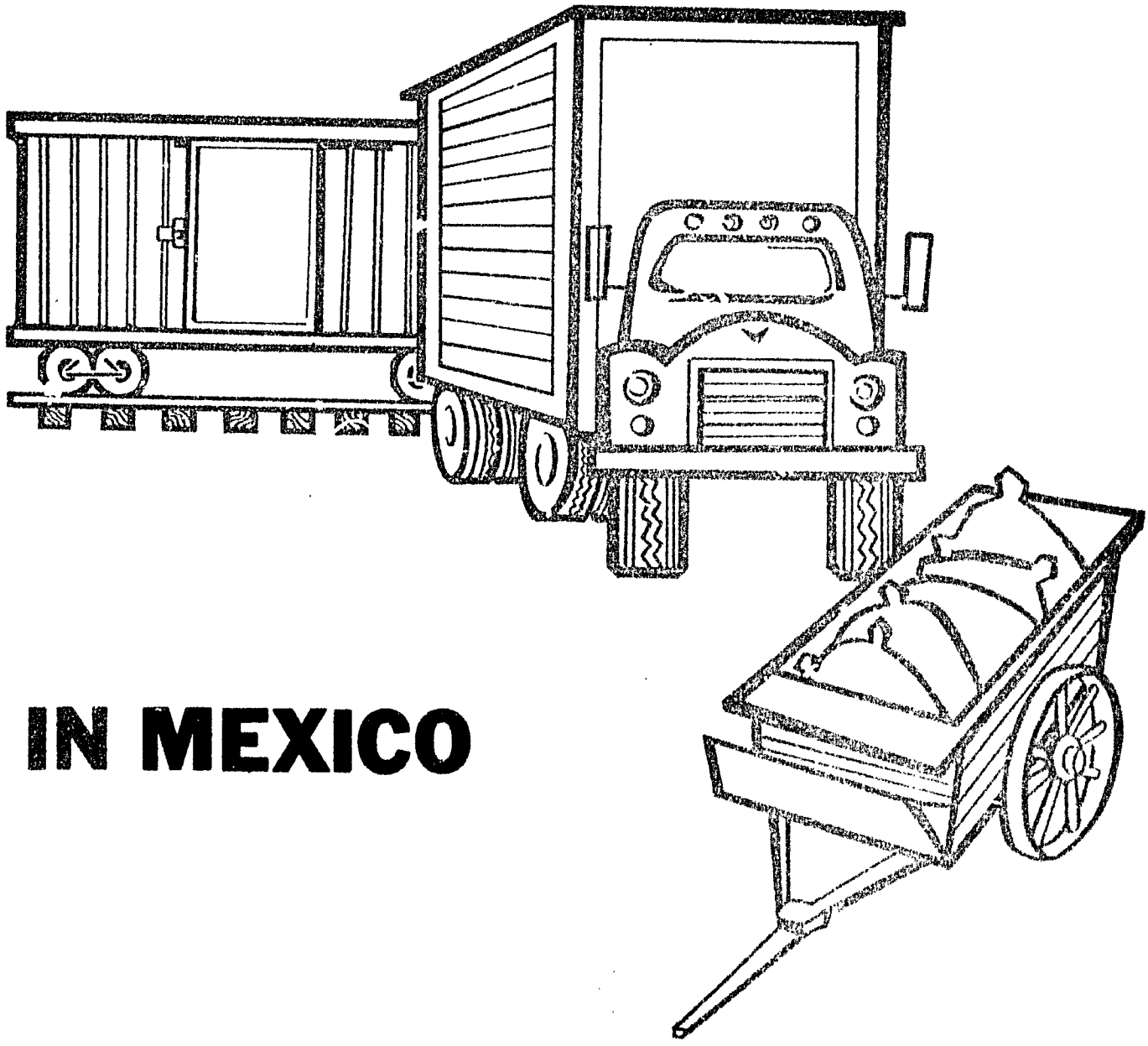

IN MEXICO

No. 3 in series of reports analyzing marketing systems potentially useful in developing nations. (Earlier reports were on Taiwan and Japan.)

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by

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PREFACE

This report is part of the work undertaken by the Tennessee Valley Authority (TVA) under the Participating Agency Service Agreement (PASA) with the U.S. Agency for International Development (AID) for technical assistance concerned with the improvement of fertilizer production, marketing, and utilization in developing countries. Under the plan of work, a TVA team visited Mexico to survey fertilizer distribution firms. This work was accomplished with the cooperation and assistance of Messrs. Antonio Harispuru, Adolfo Sisto, Pablo Pelletier, and Jose Navarro of Guanos y Fertilizantes de Mexico S.A. (Guanomex).

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FIGURES

SUMMARY

Mexico's experience in achieving large gains in fertilizer production and consumption over the past decade should be of interest to many developing countries because they share many points of similarity: limited land resources, tropical climate, need for irrigation expansion and improvement, active land reform programs, strong public sector involvement in fertilizer programs, etc. Also, Mexican farming methods range from the highly sophisticated and commercial to the subsistence and traditional types.

The country has the capacity to satisfy a major portion of its fertilizer needs through domestic production. The bulk of fertilizer production is concentrated in three companies: Guanomex, Pemex, and FFM. Three small companies produce the balance of the domestic production, which is primarily liquids.

By governmental decree, fertilizer distribution is the responsibility of Guanomex. However, small amounts of materials are distributed outside of Guanomex's normal distribution channels: accredited distributors, subdistributors, and agents; and direct operations with agricultural associations and banks.

Although Guanomex has virtually a monopoly on fertilizer distribution, there is quasi-competition among wholesale distributors within the states. Apparently, Guanomex's policy of authorizing distributorships has included the competitive aspect even though nearly all fertilizer is marketed by the public sector. Guanomex distributors have been carefully selected on the basis of management capability, financial position, community position, and willingness to distribute Guanomex materials. In turn, Guanomex has assisted the distributors with financial and credit support.

The fertilizer pricing policy is the responsibility of Guanomex. Fertilizers are sold under the "price equalization" principle: prices at the main distributor level are uniform, but prices at the farm level may vary from state to state. Fertilizers are not subsidized in Mexico.

In order to delve deeper into the mechanics of fertilizer marketing in Mexico, information was obtained from 20 distributors in several major agricultural regions. The quantity of fertilizer sold in 1970 by the 20 distributors totaled nearly 5,25 000 tons, representing 18% of all fertilizer sold in Mexico during that period. Each firm sold an average of slightly over 26,000 tons of fertilizer valued at nearly US$1.9 million.

Almost 90% of the fertilizer sold by these distributors was bagged material, while liquid fertilizer accounted for 9% and ammonia for direct application, less than 1% of all sales. Retail sales of bulk material were practically nonexistent.

The most common types of bagged fertilizer sold, in order of importance, were: ammonium sulfate, normal superphosphate, mixed fertilizers, ammonium nitrate, and urea. These five fertilizers accounted for 83% of all sales by the 20 distributors. Peak fertilizer sales occurred in June and more than half of all sales took place during the period May through August.

Nearly three fourths of all fertilizer was sold on credit. The average term of credit was 186 days and the average interest rate was 10.8%. Most credit purchases were secured with letters of credit or promissory notes. Distributor performance of fertilizer related services was reported by 15 firms. The most frequently performed services were soil testing, field days, and farmer meetings. Delivery of fertilizer to the customer was not commonly practiced. Promotion techniques such as radio and newspaper advertising and distribution of fertilizer leaflets and publications were reported by a majority of the dealers.

Investment in facilities, equipment, and operating capital averaged US$490 000 per firm. Land and buildings accounted for 18%, handling and transport equipment, 19%, and operating capital 43% of total investment.

Operating expenses per firm averaged about US$169 000. Administrative costs represented the largest share of costs, 26%, followed by distribution costs, 23%, taxes and insurance, 21%, sales expenses, 14%, and depreciation and interest costs, 12%. The average operating cost per ton of fertilizer sold in 1970 was US$5.17, representing between 6 and 7% of the farmer cost of fertilizer.

Practically all of the distributors studied felt that the market for fertilizers would continue to grow at a rather rapid pace in Mexico, around 15% annually. Likewise, most dealers felt that the trend toward higher analysis materials would continue with increased use of mixed formula and liquid fertilizers. Considerable changes are anticipated in the services associated with fertilizer sales.

There are several areas that seem to need improvement. First, there are spot shortages of certain materials during the critical planting period in various locations. More careful planning and arrangement of transportation scheduling would alleviate this problem.

More emphasis needs to be given to tailoring segments of the distribution system to meet the needs of the ejidatarios (farmers receiving land through land reform) and other small farmers. The small farmers need assistance on selection, purchasing, financing, receiving, storing, and using fertilizers, many for the first time.

The Fertilizer Marketing System in Mexico

Mexico offers an excellent opportunity for studying agricultural development patterns relative to improving farm output and productivity in developing countries. Indigenous farming methods and systems range from the most sophisticated and commercial in the Northwest region to the subsistence and traditional types found in the Central and South regions.

The country's agricultural development has been greatly influenced by agrarian reform, rapid increases in the use of capital inputs (fertilizers, seed, machinery, chemicals, etc.), large public expenditures for irrigation projects, and various price support schemes for farm products. Therefore, to understand the fertilizer industry and marketing system in Mexico, a brief look at Mexican agriculture and related factors is essential.

Economic Trends

Several studies have adequately documented Mexico's record of economic growth, especially in the agricultural sector (1, 2). Between 1950 and 1965 Mexico's gross national product (GNP) increased at an average annual rate of 6.0%, per capita income increased nearly 50%. At the same time, the population growth rate averaged 3.4% annually, one of the highest in the world (3).

Since 1968 adjustments associated with the government's efforts to curb inflation brought about a decline in the economic growth rate. In 1970 the GNP grew at a rate of 7.7% (current prices). The Bank of Mexico estimated that GNP in 1971 slowed to about 3.8% or about half of the average rate.

The farm sector contributed to the downward trend in GNP, its share declined from 12.5% in 1968 to 11.6% in 1970. In 1968-70 the growth rate of Mexican agricultural production underwent variations which were caused primarily by marked changes in weather conditions from one period to another. The value added to total GNP by the farm sector increased 1.6% in 1968, declined 1.7% in 1969, then rose 5.5% in 1970 and about 3% in 1971.

This relatively slow growth rate in agriculture since 1968 and the changes in output have been sources of constant concern to the Mexican government, mainly because of the effect on the balance of payments, food prices, and on living conditions in rural areas. In fact, developments in agricultural production in any given year are usually reflected in the balance of payments position of the following year. For example, the severe drought of 1969 caused agricultural exports to drop from more than one-third of total exports in 1968 and 1969 to less than 28% in 1970. Furthermore, in the same period it was necessary to import certain food items in order to meet consumer needs at reasonably acceptable price levels.

The new strategy of the Mexican government places special emphasis on a higher degree of development in the farm sector. This has resulted in priority programs that benefit marginal rural areas by means of specific development programs and the establishment of institutions, such as arid zone committees and an inter-governmental committee charged with reviewing the coordination of agricultural policies. At the same time, price supports are provided for basic food grains and other grains, such as oilseeds, in an effort to encourage farmers to cultivate crops offering higher yields. Also, in order to reverse adverse balance of payments trends, specific programs have been implemented geared to stimulate the production of cotton, sugar, and other export crops.

Physical Resources

Although Mexico is the third largest country in Latin America, land for agricultural use is generally regarded as a scarce resource. The northern half of Mexico lies within the semiarid and arid climatic zones. Consequently, crop production in this region is nearly impossible without irrigation (4). The southern half of Mexico is in the torrid zone. The Tropic of Cancer crosses just above the tip of the Baja California peninsula. South of this boundary the country is dominated by the Central and Southern Mesas and the Chiapas Highlands, which are 4,000-8,000 feet above sea level (figure 1.)

The Central Mesa is the most densely populated region. Its climate is typical of tropical highlands (figure 2), with a long growing season and mild summers and winters. The Southern Mesa and Chiapas Highlands have some of the roughest mountains and gorges in the country making farming extremely difficult. Agriculture there is traditional with rural life dominating the region.

According to rainfall patterns, Mexico can be divided into four groups (5):

1. Arid land occupies about 52% of the country. Irrigation is essential for agricultural production.

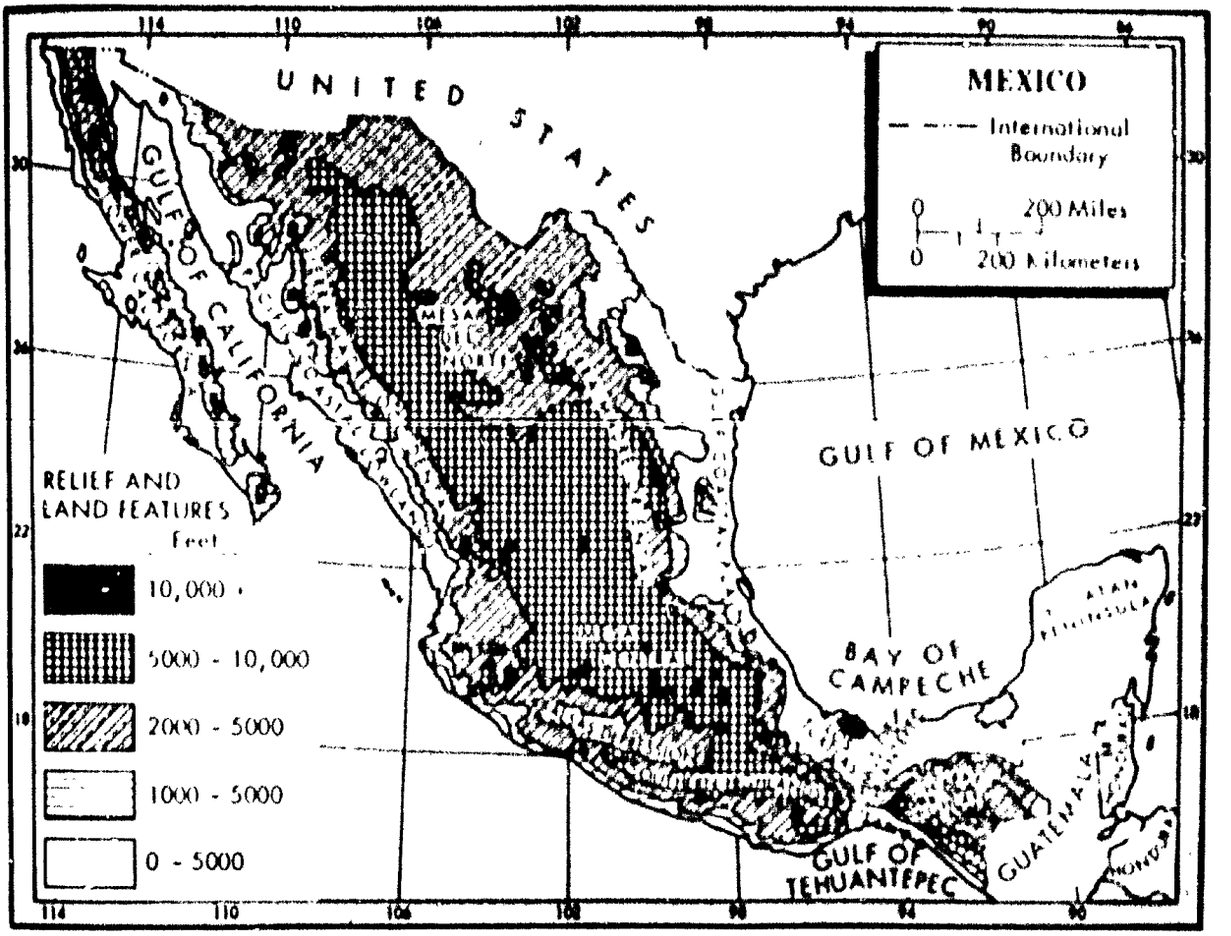
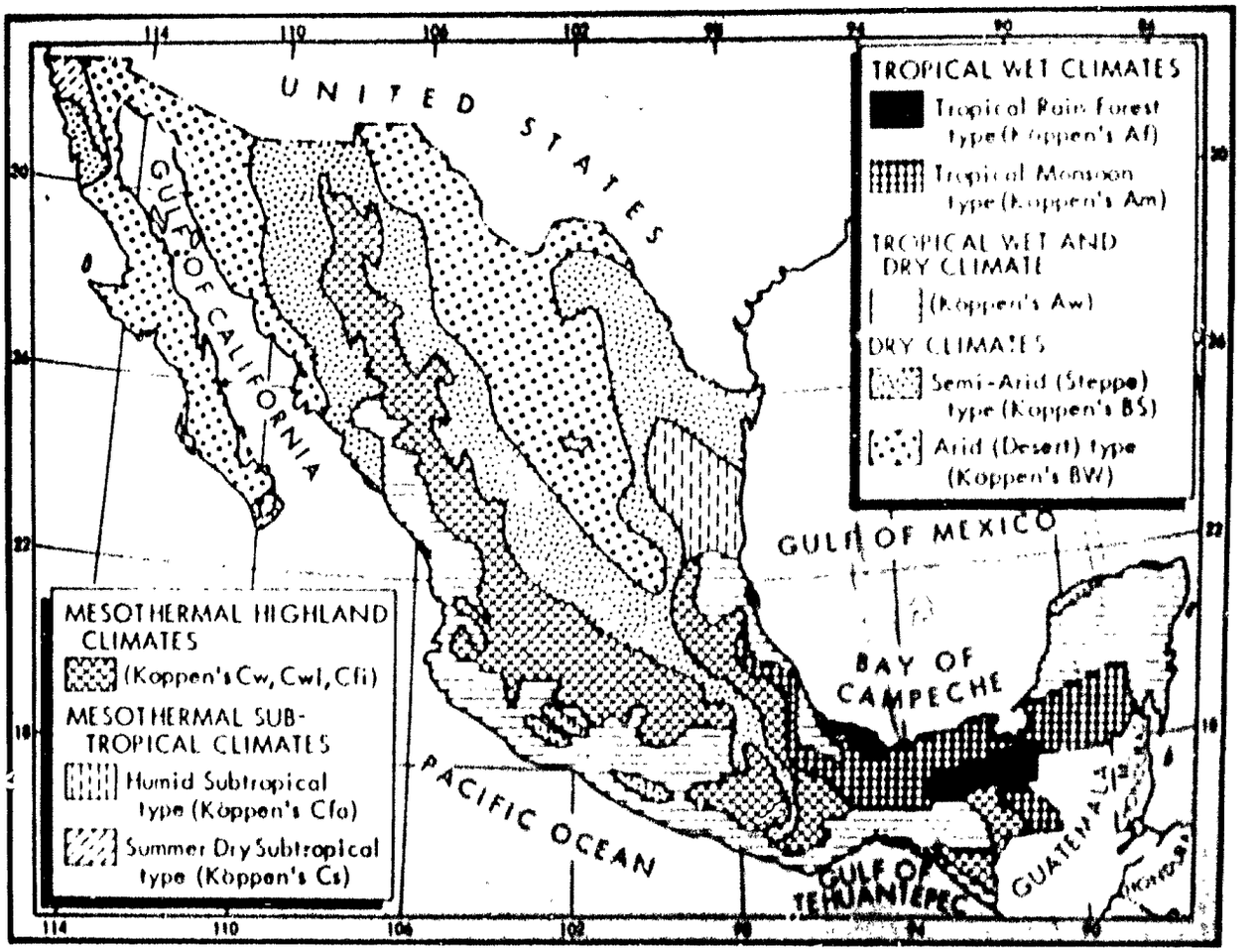


Figure 1. Topography of Mexico

Figure 2. Climate of Mexico (4)



2. Semiarid lands account for 30.5% of the total area. Irrigation is not absolutely essential for production but is required for remunerative agriculture.

3. Ten and one-half percent of the country lies in the semihumid climate where rainfall averages 500-1,000 millimeter (mm) annually. With some irrigation in times of drought, land can be cultivated year-round.

4. Seven percent of the land lies in the humid climatic region.

Agricultural Productivity

Total Mexican agricultural production increased at the annual rate of 5.2% during the period 1955-71 (figure 3). However, food production increased faster—about 7%. Crop production constitutes about two-thirds of Mexican gross agricultural product; livestock production, forestry, and fishing account for the remaining one-third.

An important feature of these fairly high average rates of growth of agricultural and food production is that not all regions meet the national average. The highest rate of growth for crop production is in the Northwest region, followed by the Pacific side of the South region and Gulf areas. The slowest growth in production has been in the Central region. This is the oldest settled region of the country where most of the traditional crops are cultivated (figure 4).

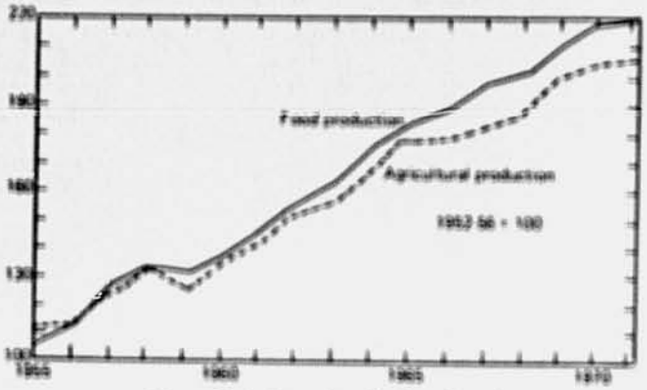


Figure 3. Index of agricultural and food production in Mexico, 1955-71 (6)

Figure 4. Guanomex fertilizer marketing regions

Mexico's total cropland area is approximately 24 million hectares (ha) (the potential cropland is considerably greater) (7), of which nearly 14 million is harvested annually. Table 1 shows the acreage, production, and yield of seven important crops. They accounted for nearly 11.5 million ha harvested in 1971. Maize (corn) represents over 60% of the acreage and, combined with beans and wheat, accounts for over 90% of the area used for the seven crops.

Production of the seven crops has moved upward over the period, due to both expansion in the area planted and increased yields, depending on the crop. The increase in maize production was primarily the result of acreage expansion, while cotton experienced an improvement in yields, only. Likewise, nearly all of the increase in wheat production was due to higher yield levels. Bean production showed significant improvement with both acreage expansion and yield increases responsible.

Increases in production of the major crops occurred in all regions of the country, though sometimes to an insignificant degree. The increased production of corn, beans, and cotton—the traditional crops of Mexico—originated mostly in the Central region. The Northwest region contributed most of the increased wheat production and much of the larger cotton crop. The increase in sugarcane production came mostly from the Gulf and North regions, while coffee production increases were concentrated in the South and Gulf regions.

Land Reform and Irrigation Programs

Among the many factors affecting Mexican agricultural productivity, agrarian reform and irrigation schemes have played major roles. The agrarian reform program began over a half century ago, and its pace has varied under the policies of different administrations. Between 1940 and 1967, nearly 47 million ha was expropriated from large farms and distributed to 2.3 million "ejidatarios" (landless peasants) (4). Since enactment of the new Agrarian Reform Law of April 1971, an additional 6 million ha has been distributed to nearly 75,000 families. Although land reform programs

Table 1. Average production and yield of selected crops in Mexico, 1961-71 (8)

	1961-65[a]	1967	1968	1969	1970	1971
Acreage[b]						
Maize	6,960	7,612	7,675	7,016	7,500	8,000
Wheat	762	762	704	834	840	710
Sugarcane	393	473	504	521	525	530
Cotton	779	661	705	534	450	NA
Dry beans	1,829	1,894	1,793	1,712	2,000	2,000
Coffee	316	290	291	355	355	355
Millet	205	665	857	917	950	600
Production[c]						
Maize	7,317	8,596	8,978	8,496	9,000	9,500
Wheat	1,537	2,058	1,767	2,317	2,436	1,900
Sugarcane	23,308	27,644	31,635	31,583	32,550	33,000
Cotton	502	496	557	386	364	NA
Dry beans	761	899	840	823	1,000	1,100
Coffee[d]	1,572	1,740	1,719	1,729	1,839	1,920
Millet	452	1,605	2,128	2,405	2,565	1,500
Yield[e]						
Maize	10.5	11.3	11.7	12.1	12.0	11.9
Wheat	20.5	27.0	25.1	28.5	29.0	26.8
Sugarcane	594	585	628	607	620	623
Cotton	6.4	7.5	7.9	7.2	8.1	NA
Dry beans	4.2	4.8	4.7	4.8	5.0	5.5
Coffee	5.0	6.0	5.9	4.9	5.2	5.4
Millet	22.1	24.1	24.8	26.2	27.0	25.0

[a] Four-year average
[b] 1,000 hectares
[c] 1,000 metric tons
[d] 100 metric tons
[e] 100 kg/ha

NA = Not available

have been fairly successful in Mexico, it is estimated that about 4 million members of the farm labor force still live near a subsistence level. Another 3 million are small farmers who are faced with grave problems because of insufficient credit, marketing and irrigation facilities, and educational services.

Irrigation has been, and still is, one of the principal tools for increasing the quantity and quality of agricultural land in Mexico. It is estimated that nearly 12 million ha can be irrigated, 8.5 million ha with surface water and 3.5 million ha with groundwater. In 1970 nearly 5 million ha was actually under irrigation, including both private and public projects.

Irrigation projects continue to receive top priority. Between September 1970 and August 1971, the Department of Water Resources (SRH) had 7,220 irrigation projects under construction and completed 15 storage dams, 16 diversion canals, and rehabilitated 7 irrigation districts (3). The impact of irrigation is evidenced by the fact that about 40% of the crop output is harvested in irrigation districts, although these areas account for only about 15% of the total cultivated area.

Development of the Fertilizer Industry[1]

Mexico has the capacity to satisfy a major portion of its fertilizer needs through domestic production. This situation is largely the result of a concerted effort of the government to achieve a better standard of living for the Mexican farmer through improved agricultural production. To help achieve this goal, Guanos y Fertilizantes de Mexico, S.A. (Guanomex) was formed in 1943 to ensure adequate supplies of fertilizers at prices that would encourage widespread use of fertilizer by the country's farmers.

Between 1943 and 1965 Guanomex was joined by a number of other private- and government-owned fertilizer companies. The bulk of the finished fertilizer production, however, was accounted for by Fertilizantes de Monclova, S.A.; Fertilizantes del Istmo, S.A., (Fertismo); Fertilizantes del Bajio, S.A.; Fertilizantes Delta, S.A.; Petroleos Mexicanos (Pemex); along with Guanomex (figure 5).

During the early 1960's the Mexican fertilizer industry showed serious deficiencies. Productivity and profits in the industry were low and the distribution of the material was not orderly. The inability of the industry to meet the requirements of official agricultural programs resulted in a merger of the major firms with Guanomex by government decree.

In 1965 the Monclova plant was merged with Guanomex, followed by the Bajio and Delta plants in 1966 and the Fertismo plant in 1967. Some smaller firms have also been taken over by Guanomex while a few small private companies devoted mostly to formula preparations still operate independently. With the exception of Pemex, the state-owned petrochemical enterprise, all of the major nitrogen fertilizer production facilities are now under the control of Guanomex. Most of the recently constructed ammonia production facilities are controlled by Pemex.[2]

By 1970 these mergers resulted in the concentration of slightly more than 60% of the domestic fertilizer nitrogen capacity in the hands of Guanomex. Most of the remainder of the nitrogen supply, comprised of anhydrous ammonia for direct application, originates from Pemex. Small tonnages of ammonium sulfate also originate from Industrias Quimicas de Mexico, S.A.; ASARCO Mexicano, S.A.; Altos Hornos de Mexico; and Cia Mexicana de Coque.

The structure of the Mexican phosphatic fertilizer industry has, likewise, developed in the direction of greater government ownership of production facilities but not to the extent of nitrogen capacity. In 1970 phosphate fertilizer capacity was distributed between Guanomex, 48%, and Fertilizantes Fosfatados Mexicanos, S.A. (FFM), 52%. Guanomex's entrance into fertilizer production in the late 1940's consisted mainly of single superphosphate. Triple superphosphate was also produced by Guanomex for a number of years, but this production has been largely relinquished since FFM was formed and initiated production. Single superphosphate is the only finished phosphate material currently produced by Guanomex; FFM supplied all of the triple superphosphate needs along with substantial quantities of phosphoric acid for domestic needs and export.[3]

While reserves of phosphate rock have been located in Mexico and are being exploited to a certain extent, a large portion of the primary material is still imported. The sulfur requirements, however, are supplied entirely from domestic sources.

In 1970 the government accounted for 78% of the country's total fertilizer production capacity (table 2 and Appendix table A-1).[4]

From an actual production standpoint, government facilities accounted for nearly 95% of the total nutrients produced in Mexico in 1970. Government-owned facilities produced more than 98% of the total nitrogen (N) and 80% of the total phosphate (P_2O_5).

[1] Survey of information from Guanomex, unpublished.

[2] Two earlier constructed ammonia plants are still under the control of Guanomex, although recent production figures would indicate that only one of the plants remains in operation.

[3] FFM differs from Guanomex in that it is considered a private enterprise, although controlling interest is held by Banco de Mexico, the financial agent of the Mexican government.

[4] This measure is based on the nutrient content of fertilizer materials that could be produced by the existing facilities.

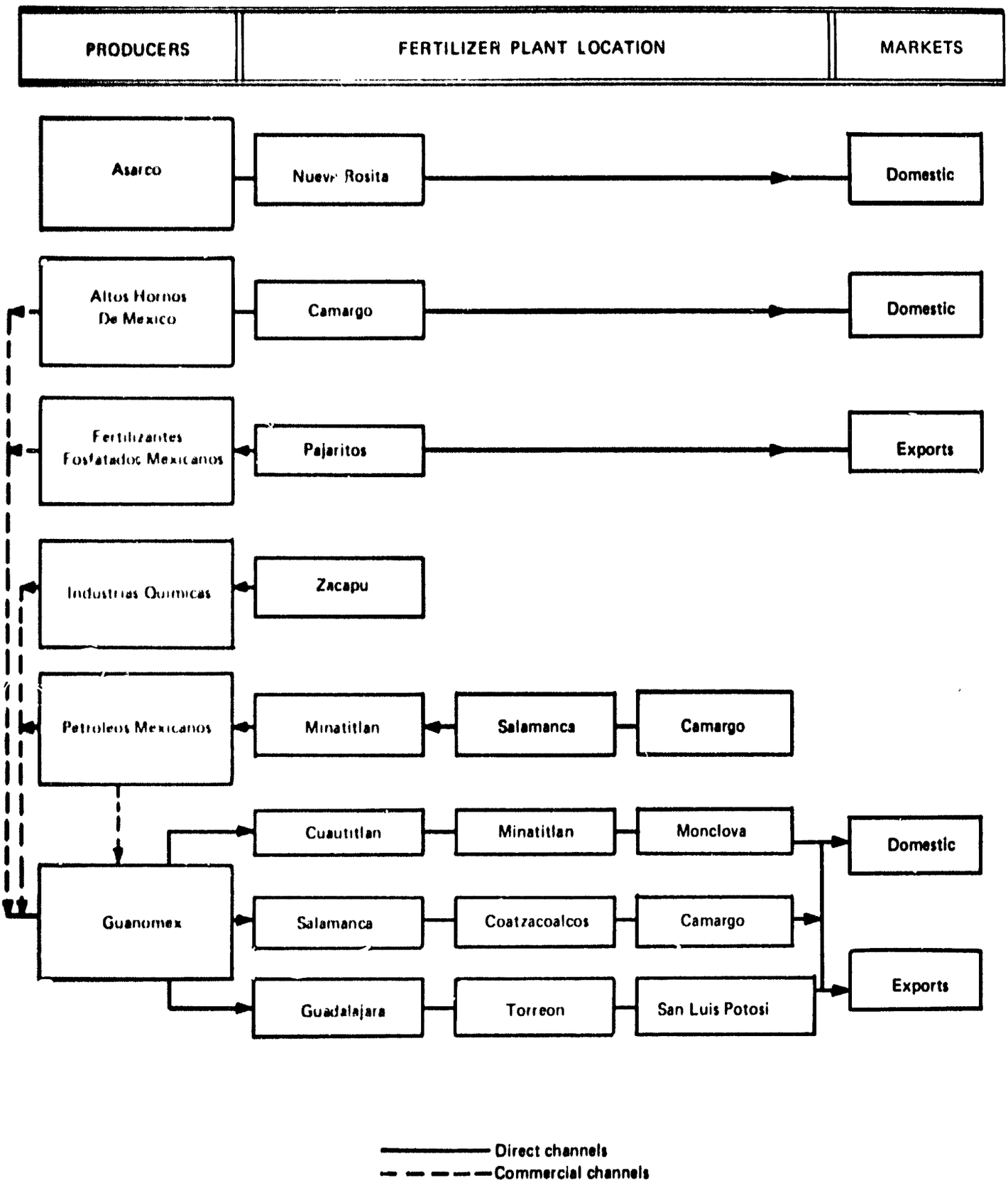


Figure 5. Organization of fertilizer industry in Mexico, 1970-71

Table 2. Distribution of fertilizer capacity and production by ownership, 1970

Type of ownership	Capacity				Production			
	N	P_2O_5	K_2O	Total	N	P_2O_5	K_2O	Total
	percent							
Government–total	96.1	47.5	100.0	78.5	98.4	79.9	100.0	94.5
Guanomex	60.5	47.5	100.0	56.5	55.5	79.9	100.0	61.9
Pemex	35.6	–	–	22.0	42.9	–	–	32.7
Private–total	3.9	52.5	–	21.5	1.6	20.1	–	5.5
FFM	–	52.5	–	19.1	–	20.1	–	4.3
Other firms	3.9	–	–	2.4	1.6	–	–	1.2

Growth of annual fertilizer production capacity between 1950 and 1971 by type of fertilizer is presented in table A-2.

Guanomex has nine plants for the production of finished fertilizers. They are located at Camargo, Coatzacoalcos, Cuautitlan, Guadalajara, Minatitlan, Monclova, Salamanca (Bajio plant), San Luis Potosi, and Torreon. Pemex has three ammonia plants located at Camargo, Minatitlan, and Salamanca and FFM's phosphate plant is located at Pajaritos (Coatzacoalcos). Other plants of lesser importance include Industrias Quimicas de Mexico located at Zacapu, ASARCO Mexicano at Nueva Rosita, Cia. Mexicana de Coque at Monclova, and Altos Hornos de Mexico at Camargo.

Fertilizer Production Trends

Early production of fertilizer in Mexico was concentrated in single superphosphate and ammonium sulfate (table A-3). Production of fertilizer totaled only 4,077 tons of nutrients in 1950. It rose to 86,965 tons of nutrients in 1960, with ammonium sulfate being the most important. By 1965 production totaled 290,913 tons of nutrients, and drastic changes had occurred in the composition of fertilizers produced. Ammonium sulfate was still the predominant fertilizer on a total product basis, but anhydrous ammonia far exceeded it on a nutrient basis. Ammonium nitrate production continued to grow, but was surpassed by urea. Other new entrants to the scene at this time included substantial quantities of complex or mixed fertilizer along with triple superphosphate.

Total production in 1970 exceeded 534,000 tons of nutrients. Nitrogen fertilizer totaled 407,000 tons (76%) and phosphate materials made up 114,000 tons (21%). Anhydrous ammonia for direct application was the single most important fertilizer, followed by complex fertilizers, ammonium sulfate, and urea.

Utilization of fertilizer production facilities in 1970 was relatively low (table 3). Obviously, this is a result of the rapid expansion of capacity in recent years in anticipation of greater future needs. Ammonium nitrate capacity is utilized at the rate of 85%. Slightly more than three-fourths of the urea capacity and about two-thirds of the ammonium sulfate and complex fertilizers capacity were utilized. The extremely low utilization of triple superphosphate capacity is undoubtedly due to the fact the FFM plant has just come onstream. No attempt was made to determine utilization of anhydrous ammonia capacity since a major share of its production is used as an intermediate and in other nonfertilizer production.

Table 3. Capacity utilization of fertilizer production facilities, 1970

Type of fertilizer	Percent of capacity utilized
Ammonium sulfate	67.8
Ammonium nitrate	85.4
Urea	77.3
Single superphosphate	59.3
Triple superphosphate	19.4
Complex	67.3

Fertilizer imports have played various roles in the development of the fertilizer industry in Mexico (table A-4). Until the mid-1960's, significant quantities of finished fertilizers were imported. As domestic capacity has developed, less reliance has been placed on imports.

Anhydrous ammonia has been imported for use in the Northwest for direct field application as well as for manufacture of other materials. Imports reached a peak of 174,000 tons in 1968 but have dropped sharply since. Rock phosphate requirements have been met largely by imports as have all potash requirements.

Exports of fertilizers from Mexico are rather insignificant and have occurred only since 1965 (table A-5). Shipments in 1970 totaled 12,306 tons of nutrients with urea making up the bulk of the exports.

Trends in Consumption

Total fertilizer consumption, taking into account domestic production, imports, and exports, is presented in table A-6. Consumption of all fertilizers in Mexico in 1950 was

less than 12,000 tons of nutrients. Very significant increases have been recorded in every period analyzed since that time. Total nutrient consumption in 1970 totaled 544,537 tons. Nitrogen materials accounted for 75% of the total, phosphate accounted for 22%, and potash fertilizers, 4%.

Fertilizer consumption per hectare of cultivated land for the country as a whole was 23 kilograms (kg) in 1970. However, since only 23% of the cultivated land was fertilized, the consumption rate on that portion of land fertilized was nearly 98 kg/ha (table 4). This compares to an estimate of 95 kg/ha in 1966-67. While the quantity of nutrients consumed per hectare has increased only slightly, the amount of land fertilized has increased by 39% during this period.

Regional consumption of fertilizer differs considerably from that found for the entire country. The Northwest region, for example, had by far the largest total consumption of fertilizer, the highest nitrogen application rate per hectare (127 kg), and the second highest total nutrient application rate (138 kg). The highest fertilization rate occurred in the South (149 kg), but the total consumption for that region was the lowest of all regions in the country. The lowest fertilization rate was found in the Central region, 68 kg.

The nutrient ratio of fertilizer consumption for the entire fertilized area was 18.7:5.4:1.0 in 1970. The nutrient ratio was 4:2:1 in 1957 and 11:4:1 in 1967. Again, extreme variability exists in this ratio when the various regions are compared. On the one extreme, the Northwest had a ratio of 158.5:13.4:1.0, while, on the other, the South had 2.9:1.4:1.0. This points out the heavy use of nitrogen found in the Northwest where irrigation and direct application of anhydrous ammonia are commonplace.

Fertilizer Marketing at the National Level

Final distribution of all solid fertilizers in Mexico is the responsibility of Guanomex. Apparently, all of the fertilizer produced by privately owned production facilities also is distributed through Guanomex channels. The phosphatic materials produced by FFM are marketed by Guanomex and it appears that the ammonium sulfate produced by other private firms is handled similarly.

Distribution of anhydrous ammonia appears to be handled in a slightly different fashion in that Pemex is responsible for movement of ammonia to the Guanomex distributors where final distribution to farmers is made by Guanomex. Apparently, imported ammonia for direct application is handled directly by Guanomex, but Pemex makes the initial distribution since much of the domestically produced product must be moved long distances. However, Guanomex is attempting to take on more of the distribution responsibility in that it is requesting permission to construct a number of storage and outlet points in the heavy use areas.

The final distribution of materials to farmers by Guanomex is handled through two main channels: (1) a distribution network consisting of distributors (comisionistas), subdistributors, and agents and (2) direct operations with agricultural associations and credit unions, official agricultural banks, and sugar producing and refining associations (figure 6).

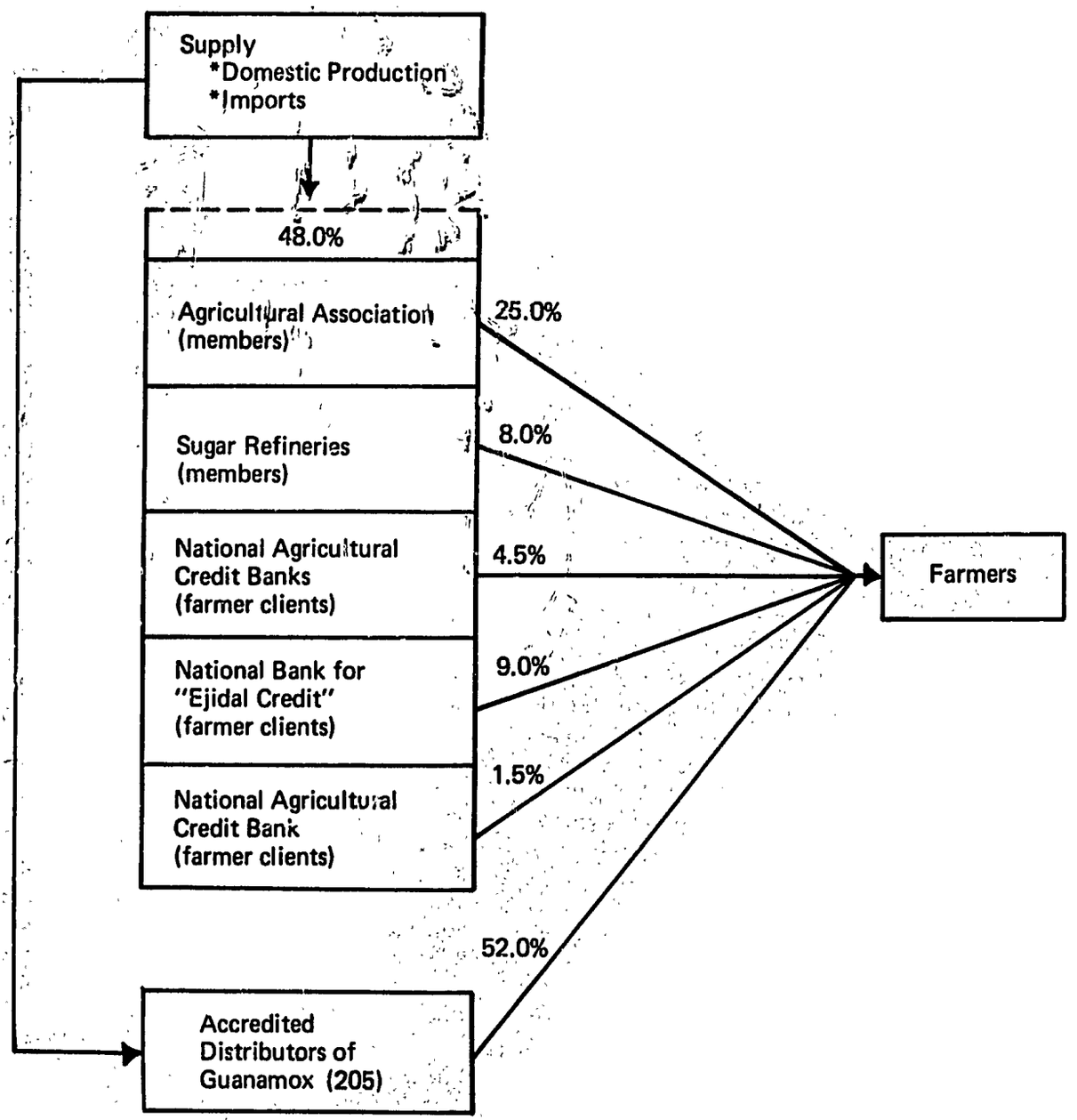
From an organizational standpoint, Guanomex has the country divided into five marketing zones or regions (figure 4). Each of the zones has a regional office with a sales manager. Each region has a number of accredited distributors who in turn may have a number of subdistributors (retailers) or agents. The distributors deal direct with Guanomex for their purchases and in turn sell direct to farmers or to subdistributors and/or agents.

In 1970 there were 205 accredited distributors of fertilizer in Mexico (table 5). Privately owned distributors totaled 189 and accounted for 82% of all fertilizer distributed. Thirteen "cooperatives" (agricultural associations, unions, etc.) sold about 4%, while the remaining sales were made through three Guanomex-owned and operated facilities.

A large portion (84%) of the distributors sold less than 10,000 tons of product and accounted for only 31% of all

Table 4. Fertilizer consumption by region, 1970

Region	Cultivated land (ha)	Fertilized land (ha)	Fertilizer consumption: Total nutrients (mt) N	P_2O_5	K_2O	Total	Rates/fertilized ha (kg) N	P_2O_5	K_2O	Total
Northwest	2,051,000	1,235,000	156,656	13,239	953	170,848	126.8	10.7	0.8	138.3
North	4,188,400	573,000	53,710	15,184	702	69,596	93.7	26.5	1.2	121.4
West	1,929,400	999,600	50,120	19,277	1,555	70,952	50.1	19.3	1.6	71.0
Central	4,053,100	1,127,600	45,752	26,308	5,220	77,280	40.6	23.3	4.6	68.5
Bajio	4,419,800	1,343,400	74,074	31,321	4,636	110,031	55.1	23.3	3.5	81.9
South	7,175,300	307,000	24,687	12,516	8,627	45,830	80.4	40.8	28.1	149.3
Country total	23,817,000	5,585,600	404,999	117,845	21,693	544,537	72.5	21.1	3.9	97.5



Source: Guanos y Fertilizantes de Mexico S. A.

Figure 6. Fertilizer distribution channels in Mexico, 1970

Table 5. Fertilizer distributors by size and ownership categories, 1970

Type of ownership	Size categories (thousand mt of product) <1,000	1,000-9,999	>10,000	Total
Private				
Number of distributors	27	133	29	189
Annual volume–tons	13.6	385.6	729.3	1,128.5
"Cooperative"				
Number of distributors	4	8	1	13
Annual volume–tons	2.1	29.9	16.1	48.1
Government				
Number of distributors			3	3
Annual volume–tons			202.3	202.3
Total				
Number of distributors	31	141	33	205
Annual volume–tons	15.7	415.5	947.7	1,378.9

sales. The remaining dealers, those distributing over 10,000 tons annually, sold 69% of the total product.

From all indications every state in Mexico, with the exception of the Territory of Quintana Roo, has at least one accredited distributor. A number of the states with little agricultural importance have only one distributor, while other better farming areas have 10 or more. The State of Jalisco, for example, had 14 accredited "comisionistas" and 2 credit organizations distributing fertilizers in 1970-71.

Similarly, some distributors have no subdistributors or agents as a part of their retail distribution system; other distributors may have as many as 40 or 50. In total it appears that fertilizer distribution points cover the major fertilizer use areas and are, at least, available in the lower consumption regions.

Except for anhydrous ammonia, almost all of the fertilizer marketed in Mexico is bagged material. Bags are either 40-kg or 50-kg size. Polypropylene bags appeared to be the most common type of bag used. However, fertilizer materials arriving at the distributors from production points are frequently in bulk form, especially ammonium sulfate, single superphosphate, and triple superphosphate. The distributors bag the material prior to movement to the farmers. Moreover, it would appear that most farmers pick up their purchases at the distributors' place of business, although some dealers provide delivery to the farms.

Fertilizer storage does not seem to be a general problem, although in certain instances very little or no storage exists. Storage capacity for fertilizers totaled 4.6 million tons with Government facilities accounting for 82%. Approximately 70% of this storage is located at either intermediate or terminal points in the distribution system. Much of the storage capacity is used for bagged material.

Transportation of fertilizers from production points to the distributors was divided: 74% by rail and 26% by truck during 1970. Certain commodities, such as triple superphosphate, produced by FFM were shipped almost entirely by rail. In other areas, where plants producing a variety of fertilizers were located near heavy use areas, a major portion is shipped by truck. Anhydrous ammonia is shipped by rail, pipeline and rail, or ocean vessel and rail.

Credit

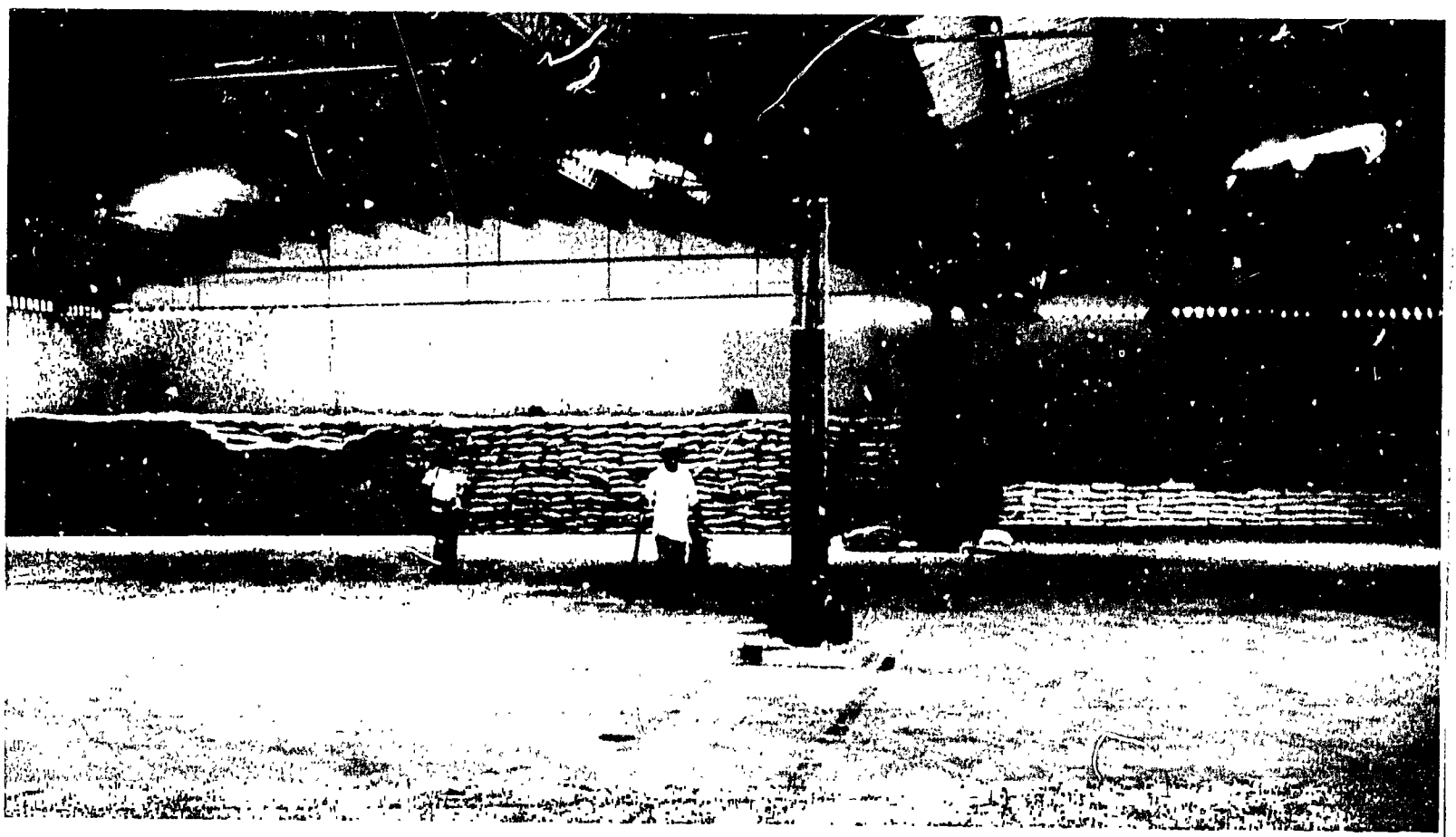
Guanomex provides credit to both accredited distributors and direct clients. It also provides credit to farmers for fertilizer purchases indirectly through their accredited distributors. The current credit policy generally required the distributors to pay 40% of the value of the fertilizer purchase during the month of the sale. The remaining 60% is due within 180 days. It is understood that there may be some exceptions to this general policy in certain regions of the country.

During 1970 Guanomex had extended 6 months' credit totaling US$68.9 million to 400 dealers and clients. The average size of loan was US$172,000 and the interest rate was 9%. Collateral is required and the loan must be repaid in cash. An estimated 99% of the loans are repaid within one year.

Although data are not available on the total quantity of credit extended to farmers by Guanomex dealers, it may be assumed that a large portion of the credit extended to the distributors by Guanomex is in turn extended to farmers. The terms on farmer credit appear to be similar to that extended to the dealers by Guanomex, although several instances of a 12% rate were found in the dealer survey covered later in this report. In most cases, credit was

Typical distributor of Guanomex fertilizer.

New storage centers have adequate capacity for storing fertilizer.



extended for 180 days; yet a few dealers extended credit until harvest, ranging from 240 to 360 days.

Government banks are an additional source of credit for farmer purchases of fertilizer. An estimated US$23.6 million was extended for this purpose during 1970. The terms are similar to Guanomex credit, except that the rate charged is 10%, no collateral is required, and repayment may be in cash or kind. Repayment performance is estimated to be 94% at the end of the first year with the balance repaid by the end of the second year.

Private banks, agricultural credit unions, and other sources of credit are also used for fertilizer purchases as well as other farm inputs. Volume of credit extended and terms of loans are not available. Interest rates on these loans appear to be in the vicinity of 12%.

Fertilizer Prices

The overall objective of Guanomex in pricing fertilizers is to equalize price throughout the country. This would involve absorbing or pooling transportation costs so that regions distant from production points are not penalized through higher fertilizer prices. While this objective has not been achieved, Guanomex feels that it has made substantial progress in equalizing the prices of ammonium nitrate, urea, and diammonium phosphate.

Fertilizer pricing policy is the responsibility of Guanomex. While this is obviously true for fertilizer costs to accredited distributors and direct clients, there is evidence that farmer prices are not completely within the control of Guanomex. Exceptions appear in the cases of agricultural associations, credit unions, etc., who stated that their prices to farmers were set either by their own board of directors or that prices were regulated by the General Law of Credit Institutions and Auxiliary Organizations. Whether or not these exceptions are valid remains to be verified.

Price data obtained from Guanomex distributors indicated that substantial variations existed in 1970 fertilizer costs to the distributors and prices charged farmers. Although Guanomex is attempting to equalize fertilizer prices, a large portion of the price deviation is obviously due to varying transport costs. In other cases, variations may be due to delivery charges, different type packaging, etc. A more detailed discussion of this matter is made in a latter section of the report.

Seasonal Movement of Fertilizers

The movement of fertilizers through the marketing channel is illustrated in figure 7. Approximately 52% of the fertilizer moves between March and July. With the exception of June, which is the peak month, the movement curve is fairly uniform throughout the year. By contrast, the application curve has several sharp peaks which correspond with local cropping conditions. Nearly 60% of the fertilizer is applied between March and July, with June and July accounting for almost one-third of the total. The fall peak (October, November, December) in the application curve is the result primarily of the intensive fertilizer use in irrigated regions of the northern zone. This is also the major liquid-using area of Mexico.

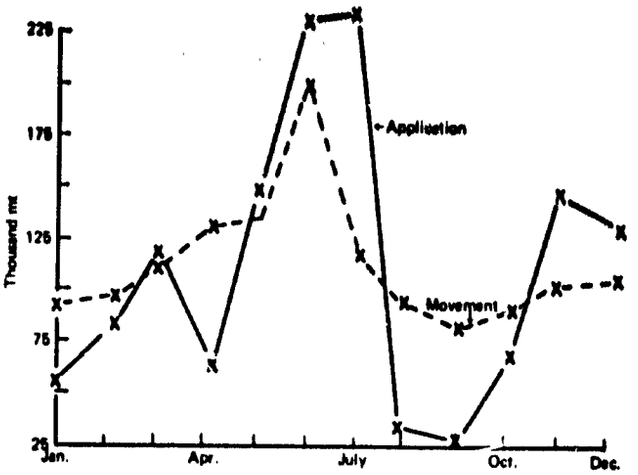


Figure 7. Estimated seasonal movement and application of fertilizers in Mexico, 1970

Guanomex distributors are required to maintain detailed records on fertilizer inventories by product and by location. The distributors also submit an inventory report to the central office every 30 days. In addition, the sales managers are responsible for continuing assessment of market trends and developments. Such feedback from the field to Guanomex has made it possible to program fertilizer shipments well in advance of application. Storage needs and utilization have been adjusted to coincide with movement.

Services and Promotion

Guanomex provides extensive assistance to its distributors, which in turn extend a variety of services to farmers. These services are usually free of charge.

Within Guanomex there are several divisions which are service oriented. The agronomy division conducts analytical studies of soils and crop response throughout the country. Demonstration farms have been established and staffed in different regions. Soil analysis is available to the farmer either through Guanomex or a distributor.

Technical assistance is provided to distributors and farmers on the latest developments and findings in soil fertility and fertilizer use. Extensive use is made of promotional campaigns, exhibitions, leaflets, etc., all on a national scale.

Guanomex's market research department conducts market studies and compiles statistics on a state, regional, and national basis. This research is used to assess market trends, establish logistics requirements, and evaluate the marketing program.

There is close cooperation among Guanomex and the colleges, credit institutions, research foundations, and international research centers (CIMMYT). Guanomex has assisted with special programs to help low income farmers. An example has been the "Puebla project" where Guanomex furnished fertilizer and expertise in cooperation with CIMMYT and the national school of agriculture at Chapingo.

There are several experiment station farms throughout Mexico. All types of soils and crops are studied and general fertilizer recommendations are published. Farmers can obtain recommendations from Guanomex's distributors, extension agents, etc.

FERTILIZER MARKETING AT THE DISTRIBUTOR LEVEL

Introduction

Since Mexico is a large country and its agriculture and climate are quite diverse, several major agricultural regions were selected for study of fertilizer marketing at the distributor level. The major regions were the Pacific coastal lowlands and the Central Plateau. Information was also obtained from a limited number of distributors in the Northern Plateau, the Gulf Coast region, and the Chiapas Highlands.

In total, questionnaires were obtained from 20 distributors, 10 of which were visited personally by the study team (figure 8). Thirteen of the firms were classed as wholesaler-retailers (i.e., sold goods to retail outlets and directly to farmers), six firms were solely retail distributors,

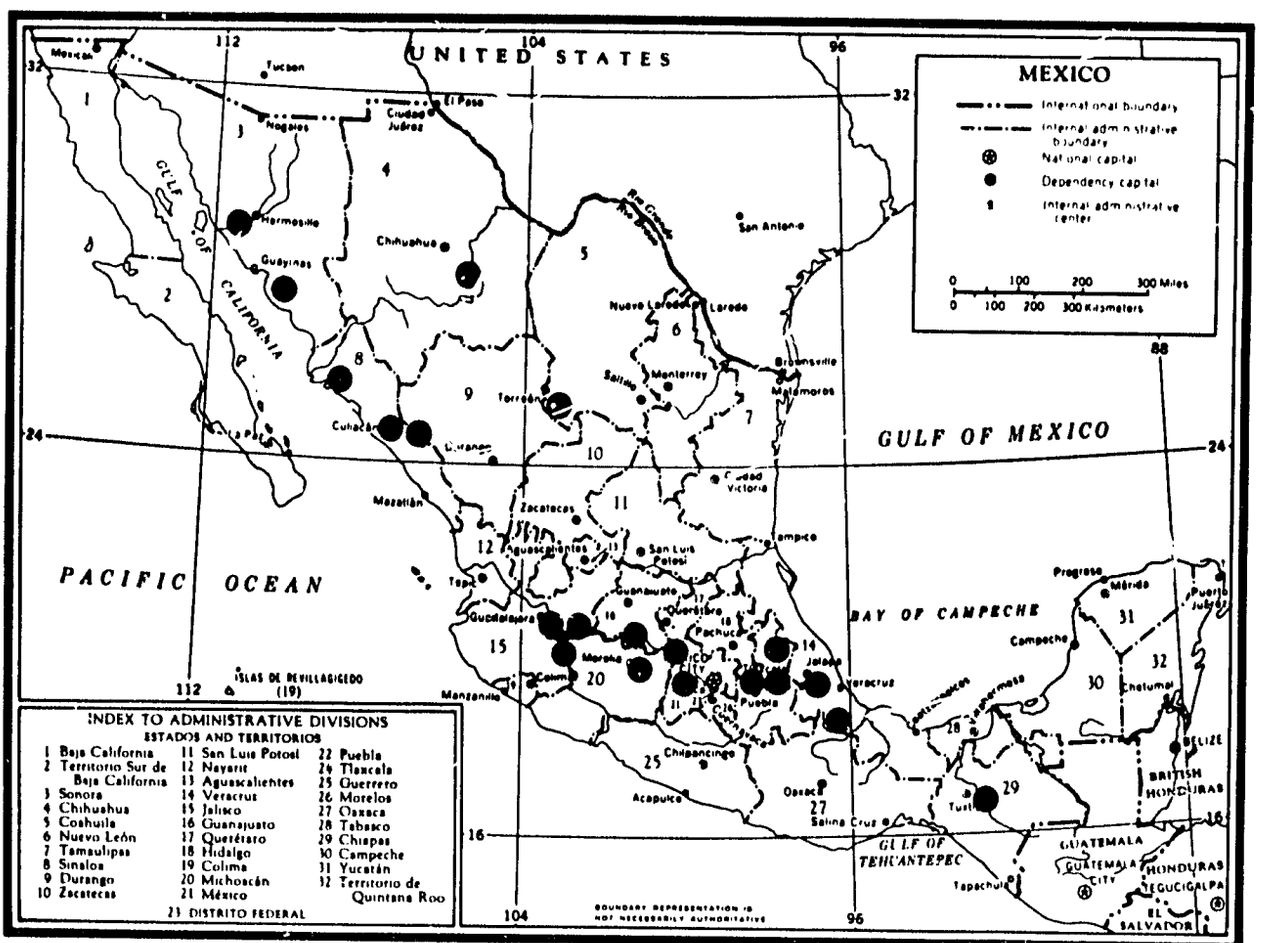
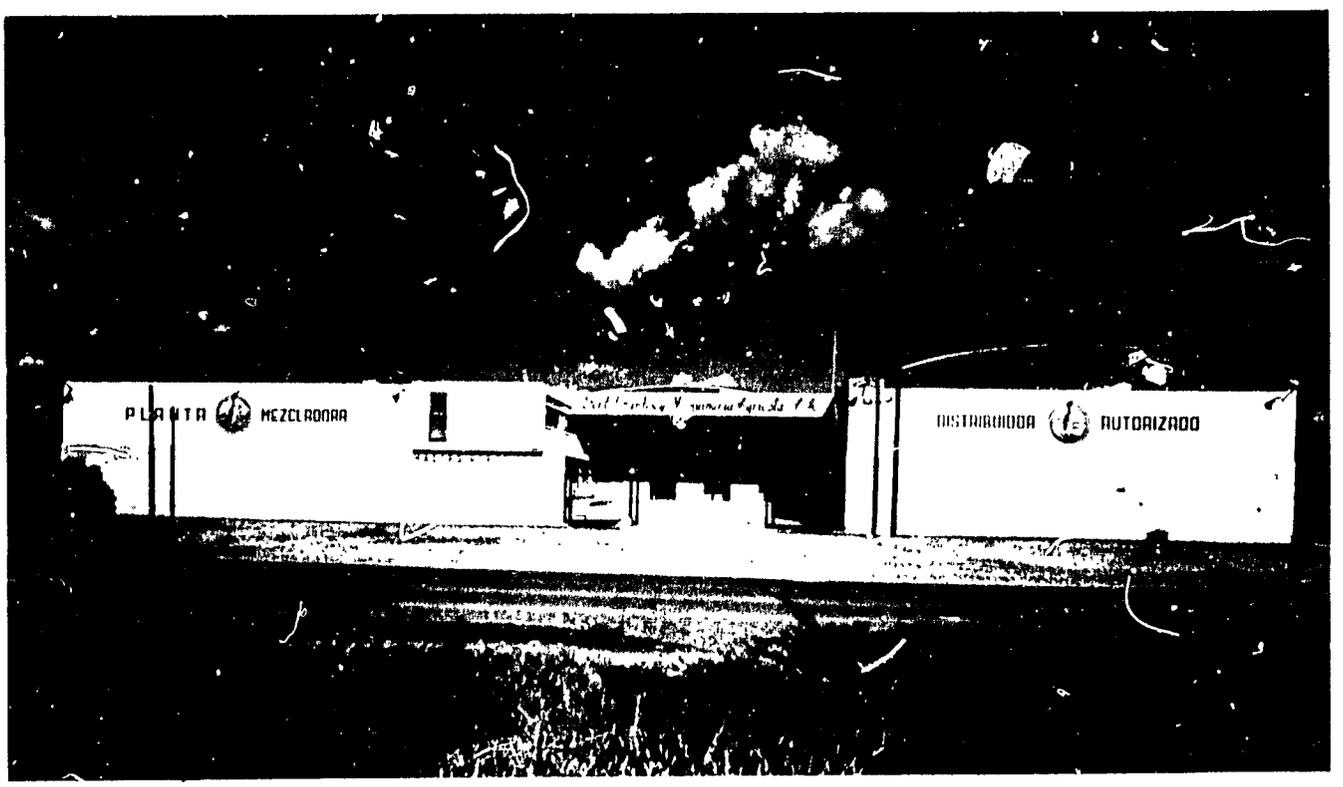


Figure 8. Location of distributors participating in fertilizer marketing study

Typical fertilizer dealer in central Mexico. Serving small farmers mainly.



A new modern fertilizer distribution facility in central Mexico. Serves large, irrigated farms.

and one firm was a wholesale outlet only. Ownership of the 20 firms was as follows: privately owned--14, farmer co-ops--3, and credit unions or associations--3.

The average distributor had been in the fertilizer business for slightly over 12 years; the range was from 5 to 25 years. Whereas 45% of the firms handled only fertilizer materials, the remainder handled a number of other agricultural inputs, including herbicides, insecticides, fungicides, seed, animal feed, farm machinery, petroleum products, tires, and veterinary products. One firm performed custom applications and leased farm equipment. All but one of the distributors operated a single fertilizer facility; several, however, had outlying storage facilities and retail outlets.

The surveyed firms claimed to serve nearly 74,000 farmers. This averages about 3,700 farmers per distributor. The number of farmers per distributor actually ranged from less than 100 to 15,000. Of the farms served, 26% were classed as general farms and 64% were grain farms. Cotton, sugarcane, coffee, and livestock were the only other types of farming listed, each accounting for 2-3% of all farms served by the 20 distributors.

As might be anticipated, nearly 55% of the farmer customers operated less than 10 ha of land; 22% farmed more than 10 but less than 50 ha; 17% had 50 to 100 ha; and 6%, more than 100 ha.

Size of Business and Fertilizer Sales

The average volume of sales from all sources was US$2.6 million per distributor in 1970. Sales ranged from US$0.4 million to US$7.6 million. Sales of fertilizer alone averaged US$1.9 million per firm, accounting for 74% of the total value of all sales (table 6).

The quantity of fertilizer material sold by the 20 distributors in 1970 totaled 524,980 tons. This volume of movement represents 38% of the fertilizer sold in Mexico during that period. The average was slightly over 26,000 tons per firm, indicating that the firms sampled were nearly four times larger than the typical distributor in Mexico in 1970. Sales ranged from about 4,000 to 70,000 tons. Five firms sold 10,000 tons or less and three firms handled 50,000 tons or more.

A vast majority (90%) of the fertilizer sold was bagged material. Liquid fertilizers accounted for 9% of the material sold, while bulk material made up less than 1%. Anhydrous ammonia for direct application totaled only 1,945 tons--0.4% of all sales. While this may appear to be an inconsistency, it should be recalled that Pemex makes most of the distribution of NH_3 in Mexico and the distributors sampled in this study were Guanomex dealers. It should also be added that three of the distributors did purchase NH_3, but it was used in the production of other materials rather than for sales as a direct application material.

An analysis of sales by size of fertilizer order revealed that slightly more than half of the orders were for less than 10 tons. The distribution of the remaining fertilizer orders was as follows: 10 to 49.9 tons, 30%; 50 to 99.9 tons, 11%; 100 to 999 tons, 6%; and orders of over 1,000 tons, 0.7%.

Sales of bagged fertilizer by type of fertilizer and region are presented in table 7. Of the distributors studied, ammonium sulfate was by far the most common fertilizer accounting for nearly 35% of all bagged material sold. Normal superphosphate was the second most common fertilizer material with about 17% of sales, followed by mixed fertilizers, 12%; ammonium nitrate, 10%; and urea, 9%. Triple superphosphate and diammonium phosphate each accounted for less than 5% of sales and potash fertilizers other than mixed fertilizer accounted for less than 1% in total.

The most common types of fertilizer sold in the North, in order of importance, were ammonium sulfate, urea, and diammonium sulfate. In the Northwest, urea, mixed fertilizers, and triple superphosphate were the most important. The materials used in these regions are directly related to the advanced agriculture (irrigation, intensive production, large farms) found in this area of Mexico. In the remaining three regions, sales of fertilizers tend to reflect the older,

Table 6. Volume of sales and fertilizer sales by regions, 20 distributors, 1970

Region	Number of distributors	Volume of sales per distributor		Total fertilizer sales					Sales per firm
		All sources	Fertilizer	Bagged	Bulk	Liquid	NH_3	Total	
		US$		tons					tons
North	2	2,860,000	640,000	12,143	–	–	–	12,143	6,072
Northwest	5	2,117,947	1,376,801	55,088	–	47,696	–	102,784	20,557
West	3	2,494,628	2,224,363	85,666	–	–	–	85,666	28,555
Central	7	3,297,902	2,908,014	266,682	4,510	–	1,945	273,137	39,020
South	3	1,434,659	977,348	51,250	–	–	–	51,250	17,083
Total, all firms	**20**	**2,559,144**	**1,890,192**	**470,829**	**4,510**	**47,696**	**1,945**	**524,980**	**26,249**
Percent	–	100.0	73.9	89.7	0.8	9.1	0.4	100.0	–

Liquid fertilizer dealer in northwest Mexico.

Liquid fertilizer application in northwest Mexico.

Major bagged fertilizers marketed by Guanomex.

Table 7. Sales of bagged fertilizer by region and type of fertilizer, 20 distributors, 1970

Region	Type of fertilizer										
	Ammonium nitrate	Ammonium sulfate	Urea	TSP	SSP	DAP	KCl	Sulfate of potash	Mixed fertilizer[a]	Miscellaneous fertilizer[b]	Total[c]
	tons										
North	3,537	1,434	3,117			2,348	300				10,736
Northwest	2,350	1,143	22,509	5,469		2,413			21,512		55,396
West	11,809	27,687	4,804	3,829	8,249	1,753	100		21,951	2,063	82,245
Central	25,511	108,496	8,028	10,821	62,890	6,051	1,359	728	12,581	22,195	258,660
South	2,987	19,464	1,347	2,114	6,000	1,040	1,617	100	1,006	14,427	50,102
Total, all firms	46,194	158,224	39,805	22,233	77,139	13,605	3,376	828	57,050	38,683	457,139
Percent	10.1	34.6	8.7	4.9	16.9	3.0	0.7	0.2	12.5	8.4	100.0

[a]Major fertilizer grades include 12-24-24, 18-12-6, 18-12-12, 18-9-18, 17-17-17, 15-30-15, and 25-25-0
[b]Grades were not specified
[c]Total does not agree with totals presented in table 6 due to incomplete reporting by type of fertilizer

more traditional grades. For example, ammonium sulfate was the most common grade of bagged fertilizer sold in all three regions. However, in the West, mixed fertilizers are approaching ammonium sulfate as the most predominant fertilizer with ammonium nitrate a distant third. In the Central and South regions, normal superphosphate was the second most popular fertilizer followed by ammonium nitrate. Practically all of the potash fertilizers (not including that portion in mixed fertilizers) and a major share of the phosphate materials were sold in the West, Central, and South regions.

All of the liquid fertilizer sales occurred in the Northwest to further support the earlier statement. The only case of bulk fertilizer sales involved ammonium sulfate and occurred in the Central region.

While a vast majority of the fertilizer sales reported by the 20 distributors was in bagged material, a substantial portion of certain fertilizers is received in bulk at the distributor's location. Approximately two-thirds of the ammonium sulfate and three-fifths of the normal superphosphate were shipped to the distributors in bulk. These two fertilizers accounted for 89% of all bulk receipts. Moreover, 92% of the bulk shipments were made in the Central region and about 8% in the South. No bulk shipments were reported in the Northwest and less than 300 tons was shipped in the North and the West. The importance of bulk shipments in the Central region is undoubtedly a reflection of the type of materials sold (since they are readily transported in bulk) and location of production facilities.

Fertilizer Prices

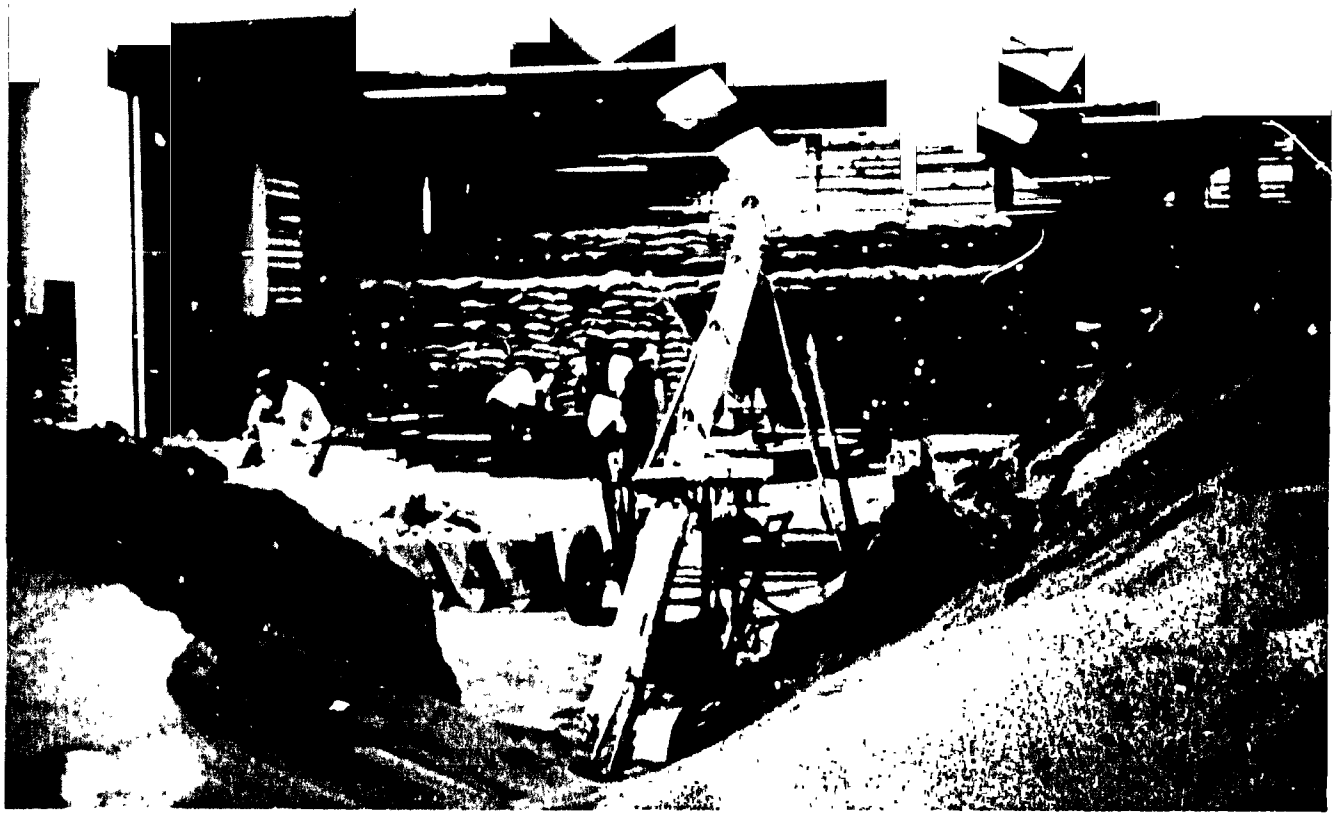
Price data obtained from the Guanomex distributors for the major solid grades of fertilizers are presented in table 8. Similar data on liquid fertilizers and anhydrous ammonia for direct application were too limited for analysis. The implied markup is based on the difference between the distributor's cost and the farmer's price and should not be interpreted as a profit rate. Costs of unloading railcars, shipment to distributor storage points, bagging (in the case of bulk shipment), and other overhead costs are included in the markup.

Table 8. Fertilizer prices and margins, 20 distributors, 1970[a]

Type of fertilizer	Distributor's cost	Farmer's price	Implied markup
	US$/ton		%
Ammonium sulfate	50.66	60.29	19.0
Ammonium nitrate	90.58	102.17	12.8
Urea	102.78	114.53	11.4
Single superphosphate	31.31	42.00	34.2
Triple superphosphate	84.33	100.79	19.5
Diammonium phosphate	133.00	144.46	8.6
Potassium chloride	57.69	69.17	19.9
Sulfate of potash	74.80	88.69	18.6
Mixed fertilizers[b]	102.63	120.24	17.2

[a]Both distributor's costs and farmer's prices were weighted by the quantity of fertilizer sold
[b]Major fertilizer grades include 12-24-24, 18-12-6, 18-12-12, 18-9-18, 17-17-17, 15-30-15, and 25-25-0

While Guanomex has a long-term objective of equalizing fertilizer prices throughout the country by absorbing or pooling transportation costs, there appears to be substantial variation in both distributor costs and farmer prices (tables A-8 and A-9). Looking at regional differences ammonium sulfate has the smallest variation in distributor costs and a modest variation in farmer's price. Mixed fertilizers have the least variation at the farmer level and a moderate difference at the distributor level. Of the major solid fertilizers sold, urea appears to have the most regional variation in prices. Obviously, a large portion of this variation must be attributed to transportation costs.



Fertilizer is shipped bulk to Guaymas for bagging.

Looking at fertilizer prices and margins for Mexico as a whole, based on the survey, shows that diammonium phosphate had the smallest markup 8.6%. On the other hand, single superphosphate had the greatest markup-34.2%. Other materials having relatively large markups included potassium chloride, triple superphosphate, ammonium sulfate, and sulfate of potash. Reasons for the rather wide variations in markups cannot be determined from the survey data; however the materials with the large markups are generally those that are transported in bulk to the distributors and hence must be bagged. Transportation costs are obviously a factor. Furthermore, pricing policies on certain materials may reflect Guanomex's desire to promote sales of these fertilizers by providing a larger profit margin for its distributors.

Seasonal Movement

The seasonal movement of fertilizers during 1970, based on sales of the 20 distributors, is presented in table A-7 and figure 9. Approximately 51% of the fertilizer was sold during the period May through August with June being the peak month. A second peak, although considerably smaller than the first, occurred in December-January. Presumably, the distribution of sales would be a fairly good indicator of application dates as sales would not precede application by any appreciable period of time.

Considerable variation exists in seasonal distribution by major fertilizers, although most fertilizers had a peak within the period of May through August. Specific exceptions to this included diammonium phosphate which peaked in December and potassium chloride which peaked in January. Urea may also be considered an exception as movement exhibited less monthly variation than found among other materials.

While the seasonal sales of the sampled distributors differ somewhat from the country as a whole, two distinct peaks exist throughout the year–one in midyear and one in the fall and winter months. All fertilizer materials, where data were sufficient to analyze seasonal sales, exhibited at least two peak sales periods while urea and triple superphosphate had three peak periods.

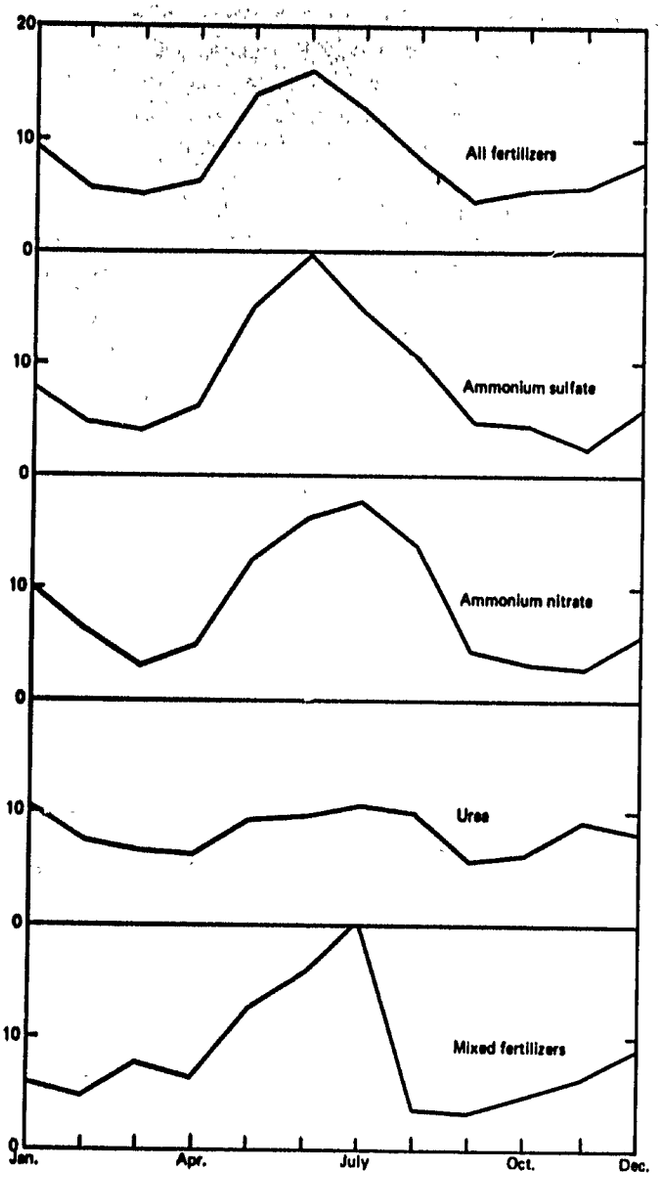


Figure 9. Seasonal movement of selected fertilizers, 20 distributors, 1970

Storage and Transport

Fertilizer storage capacity as reported by the 20 distributors included: 333,300 tons for granular materials, 830 tons for liquid fertilizers, and 100 tons for anhydrous ammonia (table 9). Storage for bagged and bulk materials ranged from 0 to 55,000 tons and averaged 16,665 tons per distributor. Approximately 71% of this capacity was considered bagged storage and 57% of the storage for granular material was owned by the distributor. Only one of the distributors had no storage of any kind. Storage capacity for liquids and anhydrous ammonia was rather insignificant, although it was probably sufficient to meet the current needs for these materials. However, as use increases additional storage will be required.

Most of the rented storage space was leased on an annual rental contract for an indefinite period. Some firms reported a flat rental fee regardless of quantity of fertilizer stored while others reported a rental based on tons stored per month. A couple of distributors leased storage for only that portion of the year that space was needed.

The most common mode of transportation used to move fertilizer from the surveyed distributors to farmers or subdistributors was trucks, accounting for about 84% of the total movement. Rail shipments occurred where distance exceeded 50 kilometers (km) and usually involved wholesale shipments to subdistributors.

Distribution of retail customers and the distance of fertilizer movement are presented in table 10. These data indicate that more than three-fifths of the total quantity of fertilizers was sold to farmers located more than 20 km from the distributors. Moreover, farmers located more than 10 km from the distributor purchased more fertilizer than those located nearer the sales outlet. Nearly 32% of the customers were located within 10 km of the dealer, but they purchased only 13% of the quantity sold.

Approximately 60% of the movement of wholesale fertilizer sales (i.e., sales to other distributors or subdistributors) was within a 50-km radius, and the entire movement was transported by truck. An additional 23% of these materials was shipped 100 km and 8% moved as far as 200 km. Ten percent of that wholesaled was transported over 200 km. Although rail shipments were used when distance exceeded 50 km, they were not significant until shipments exceeded 200 km.

Table 9. Fertilizer storage capacity, 20 distributors, 1970

Type of material	Ownership		Total
	Owned	Rented	
	metric tons		
Granular			
Bulk	41,000	54,000	95,000
Bagged	148,800	89,500	238,300
Total	189,800	143,500	333,300
Liquid	830	–	830
Anhydrous ammonia	100	–	100

Table 10. Retail fertilizer sales, 20 distributors, 1970

	Distance		
	<10 km	10-20 km	>20 km
	percent		
Customers	31.6	18.3	50.1
Fertilizer sales	13.1	24.4	62.5

It should not be interpreted from the above statements that the distributors commonly delivered fertilizer for such great distances. Less than half of the distributors provide a delivery service for fertilizer, and fewer deliver without a charge.

The cost for moving fertilizer by truck from the distributor's outlet to the farmer ranged from US$0.04 to US$0.08 per ton per km with a majority reporting the higher rate. Only very limited data were available on rail rates, but the average would appear to be approximately US$0.01 per ton per km.

Credit

Credit was provided for the purchase of fertilizer by 90% of the distributors. During 1970, 72% of the total quantity of fertilizer sold was on credit and the average term was 186 days. The number of days credit that was extended ranged from 30 to 360 days and a few cases of "credit extended until harvest" were reported. The modal term was 180 days.

Vouchers (letters of credit) were used by about half of the dealers as collateral, while promissory notes and real estate mortgages were occasionally used. A number of the dealers did not require any security. One dealer made a credit investigation before credit was granted.

The average interest rate charged was 10.5% with half of the dealers charging 9% per annum and the other half charging 12%. Repayment performance was extremely high, averaging 98.9% during 1970. The range was from 95% to 100% with most distributors reporting 99%. All dealers granted credit regardless of the volume of fertilizer purchased; however, only 19% provided credit for fertilizer services such as application. This is an obvious reflection of the fact that most of the distributors were not equipped to provide such services.

Guanomex provided credit to 17 of the 20 distributors for the purchase of their fertilizer supply. It is assumed that the remaining firms elected not to use this source of credit, or paid for the fertilizer within the so-called "grace" period. The typical term was 180 days and the interest rate was 9% per annum. Again, vouchers were used by most firms to secure the "loan." The dealers making use of this source of credit reported that 85% of the total quantity of fertilizer purchased was on credit.

Almost half of the firms also used other sources of credit to purchase fertilizer. The principal source reported was banks. In dollar volume, these sources appear to be small compared to the quantity of credit extended by Guanomex.

Services and Promotional Activities

Only three-fourths of the firms included in the study provided some form of fertilizer-related service. The most frequently performed services—soil testing, field days, and farmer meetings—were provided by more than half of the dealers. For the most part, no charge was made for these services, except an occasional charge for soil tests.

Delivery of fertilizer to the customer was provided by only 25% of the distributors on a regular basis, while a couple of additional distributors indicated that occasional deliveries were made for small quantities moving short distances. About half of the deliveries were made free-of-charge.

Fertilizer short courses were sponsored by 25% of the dealers. Other services performed by only one or two dealers included equipment rental, custom application, and plot demonstrations.

The most commonly used promotion technique was advertising (radio and newspaper), reported by 65% of the firms. Expenditure per firm for newspaper advertising was about US$560 and radio advertising, US$360 per year. Advertisements in trade journals were reported by three dealers at a relatively high cost, US$2,900 per firm, compared with other forms of advertising.

Another rather commonly used technique was distribution of fertilizer-related publications (leaflets and bulletins). Other lesser used items included special sales campaigns, small gifts, calendars, participation in fairs, etc. While these items were not often reported, the cost per distributor was frequently quite high. Therefore, the cost for all advertising and promotional activities averaged about US$3,700 per distributor reporting use of at least one of these techniques.

Investment

Total investment in facilities, equipment, and operating capital for 18 reporting distributors was US$8.8 million. Investment per firm averaged US$489,390 in 1970 and ranged from a low of US$46,000 to more than US$1.1 million. Two distributors had investments exceeding US$1.0 million, six firms had between US$0.5 to US$1.0 million, eight firms had between US$100,000 to US$500,000, and two had less than US$100,000.

Operating capital accounted for the largest investment item, 43%, and the second largest item was warehouses, making up nearly 34% of the total (table 11). Equipment investment accounted for an additional 19% with the remainder being in administrative facilities. Although detailed information was not available on "other equipment," it presumably includes application equipment, mixing and blending facilities, and bagging equipment. It may also include equipment used in a portion of business not related to fertilizer, since a number of the firms handled other products.

Table 11. Investment in fertilizer outlet, 18 distributors, 1970[a]

	Facilities		Equipment			Operating	
	Administrative	Warehouses	Transport	Handling	Other	capital	Total
Total investment (US$)	370,525	2,980,290	542,080	342,150	777,390	3,796,600	8,809,035
Average investment (US$)	20,585	165,570	30,115	19,010	43,190	210,920	489,390
Percent	4.2	33.8	6.2	3.9	8.8	43.1	100.0

[a]Investment data were not provided by two firms.

Operating Expenses

Costs associated with the operation of the distributorships are presented in table 12. Unfortunately, only 13 dealers provided data on this item, and in certain instances, data were incomplete or were not distributed by separate cost items. These limitations should be considered in analyzing the material presented in this section.

Based on the information supplied, administrative costs accounted for about 26% of the total operating cost in 1970. Other major items were distribution costs, making up nearly 23%, and taxes and insurance, adding another 21% of all costs. Costs associated with selling made up 14% of all costs. While this may appear to be low relative to other fertilizer marketing systems, it is undoubtedly a reflection of the structure of the Mexican system, i.e., government-regulated production and distribution.

Depreciation and interest each accounted for about 6% of the costs of operating the distributorships. Credit costs, on the other hand, accounted for only slightly more than 1% of all costs. While this item also appears to be quite low, it may be partially explained by the fact that the credit extended by the distributor is, in effect, Guanomex credit. Therefore, the costs to the distributors should not be large.

For the firms supplying information, the average selling cost per ton of fertilizer sold in 1970 was US$5.17. This figure represents between 6 and 7% of the total value of the fertilizer sales, based on prices to the farmer.[5]

Table 12. Operating expenses, 13 distributors, 1970

Cost item	Average cost per firm US$	%
Administration		
Management	20,085	11.9
Clerical	11,562	6.8
Accounting	10,853	6.4
Other	1,148	0.7
Total	43,648	25.9
Sales		
Personnel	12,102	7.2
Promotion-advertising	4,270	2.5
Other	7,274	4.3
Total[a]	23,646	14.0
Credit	1,958	1.2
Distribution		
Labor	11,190	6.6
Transportation-equipment	11,950	7.1
Handling-bagging	7,983	4.7
Warehouse rent	7,443	4.4
Total	38,566	22.8
Special services[b]	5,198	3.1
Taxes and insurance	36,103	21.4
Depreciation	10,178	6.0
Interest	9,486	5.6
Total, all cost items	168,783	100.0

[a]Includes sales commissions.

[b]Includes soil tests, application, delivery, etc.

Management and Labor

For the firms surveyed, managers devoted slightly over 80% of their time to the fertilizer end of the business. Five percent of their time was spent on farm chemicals (pesticides, herbicides, etc.); the remainder was spent on a wide variety of commodities including farm machinery, feed, seeds, petroleum products, and animal medicines.

The average distributor employed 43 full-time persons. Persons employed in sales averaged 8, while 15 performed office work, 14 were general laborers, and 6 were employed in miscellaneous activities (credit, managers of suboutlets, etc.).

The average firm also employed approximately 28 part-time employees with a vast majority (25) classified as general laborers. Part-time help was used most frequently during the months of April through June, the period of peak fertilizer sales.

About 70% of the distributors claimed that labor was not a problem from an efficiency standpoint. For the most part, those firms indicating that labor efficiency was a problem, no reason was cited. One distributor said that lack

[5]Using the average value of fertilizer sales for the 13 distributors reporting (US$2.3 million), operating expense per dollar of sales was slightly over US$0.07. Conversely, the average selling cost per ton of fertilizer (US$5.17) represents slightly more than 6% of the average selling price of a ton of fertilizer, all grades combined.

of training for specific jobs was the biggest problem. Apparently, plenty of labor is available although the supply may vary from time to time depending on the general economy of the region.

Pricing Policy

Generally, fertilizer pricing policy in Mexico is the responsibility of Guanomex. Exceptions to this statement concerned the materials produced by the distributors, such as liquid fertilizers, and where the distributorship was an agricultural association or a credit union. For the remaining dealers, prices for the products produced and marketed by Guanomex were set by that organization.

While prices in most cases are set by Guanomex, the basis for determining the difference between dealer cost and farmer price is not known. Most dealers indicated that the predetermined prices allowed a margin for handling, transportation, sales, administration, and profit. A few of the firms apparently operate strictly on a commission basis. Unfortunately, little information was obtained concerning official discounts for quantity purchases, off-season purchases, cash purchases, etc., by the dealers. Apparently, these techniques are not widely used.

The distributors reported that a reasonable profit rate (return on investment) should be about 16%. Replies concerning the profit rate ranged from 2 to 25%. The average profit rate achieved in 1970 by these firms was 9.25%–substantially lower than what was considered as a reasonable rate. Again, a wide range of profit rates existed–from 1.8 to 20.0%.

The average markup on bagged fertilizer varied from 4 to 18% and averaged 7.4% when weighted by tons of fertilizer sold. Similarly, the average markup on bulk fertilizer was 7.0%. Data for liquid fertilizers and anhydrous ammonia were too limited to establish an average markup.

Fertilizer was the product most frequently mentioned as offering the greatest return on investment. Between 65 and 70% of the firms indicated that fertilizer was the most profitable item sold, while 15% felt that pesticides and herbicides offered the greatest profit. The remainder mentioned feed and machinery.

Dealer discounts were granted by less than half of the firms surveyed. The most popular discount was for volume purchases. The percentage discount averaged 2.25% and ranged from 1.0 to 5.0%. The second most common discount was for cash sales, averaging 2.5%. The only other discount was a seasonal discount reported by one firm. Of the dealers offering discounts, they were evenly divided as to which discount (cash or volume) was the most important.

Future Outlook

More than four-fifths of the distributors felt that the market for fertilizers would continue to grow. This optimism was reflected in the dealers' estimates of the growth rate over the next few years. Estimates of the anticipated growth ranged from 10 to 30% per year and averaged around 15%. The remaining firms felt the market was either stable or declining. These firms were all located in the North and Northwest regions. These areas already experience high fertilizer use, consequently future growth hinges largely on expansion of irrigation water.

Likewise, a large majority of the dealers felt that the trend toward higher analysis materials would continue. Many distributors anticipate greater use of mixed formula and liquid fertilizers, while some dealers expect to see subsoil and foliar applications come into use. A limited number felt that the existing market preferred low concentration materials, but with adequate incentives and promotion, higher analysis materials would be used.

Services associated with fertilizer sales is another area where considerable change is anticipated. Nearly two-thirds of the respondents to the survey felt that more technical assistance was needed and would be forthcoming. A number of the firms indicated that direct, onfarm contact was the most valuable service a dealer could perform. Also mentioned was the need for application services, particularly for the newer materials that farmers are not equipped to handle.

The future growth in educational services and promotion activities was not nearly so optimistic. Only about half of the dealers indicated a need for more of these services. Most frequently mentioned activities included plot demonstrations and farmer meetings. Apparently, many of the dealers feel that they are already performing these services adequately.

REFERENCES

1. *Economic Progress of Agriculture in Developing Nations 1950-68.* Economic Research Service, U.S. Department of Agriculture, Washington, D.C. May 1970.
2. Venezian, Eduardo, and William K. Gamble. *A Review of Mexican Agricultural Development 1950-1965.* Office of International Agricultural Development, New York State College of Agriculture, a Contract College of the State University, at Cornell University, Ithaca, New York.
3. *Socio-Economic Progress in Latin America,* Annual Report 1971. Inter-American Development Bank, Washington, D.C.
4. *Sources of Change in Mexican Agricultural Production, 1940-65,* Foreign Agricultural Economic Report, No. 73. Economic Research Service, U.S. Department of Agriculture, Washington, D.C.
5. "Marketing and Distribution of Fertilizers in Mexico." Unpublished draft report, Organisation for Economic Cooperation and Development, Paris, France.
6. (Monthly) Bulletin of Agricultural Statistics, Vol. 21. Food and Agriculture Organization of the United Nations, Rome, Italy. January 1972.
7. *Projection of Supply and Demand for Agricultural Products in Mexico to 1965, 1970, and 1975.* Banco de Mexico, Mexico, S.A. August 1966.
8. *Production Yearbook, 1971.* Food and Agriculture Organization of the United Nations, Rome, Italy.

APPENDIX

Table A-1. Annual fertilizer capacity by ownership, 1970

Ownership and product	Product	Nutrient
	thousand mt	
Guanomex		
Ammonium sulfate	480.0	98.4
Ammonium nitrate	178.0	59.6
Urea	205.0	94.3
Complex–N	81.8[a]	44.3
NH_3	(32.0)[b]	(26.4)[b]
Total N	944.8	296.6
Single superphosphate	295.0	59.0
Complex–P_2O_5	144.9[a]	78.4
Total P_2O_5	439.9	137.4
Complex–K_2O	26.3[a]	14.2
Pemex		
NH_3–total capacity	(594.0)[c]	(489.2)[c]
–for direct application	212.1	174.7
FFM		
Triple superphosphate	330.0	151.8
Other firms		
Ammonium sulfate	92.0	18.9
Total N	1,248.9	490.2
P_2O_5	769.9	289.2
K_2O	26.3	14.2
Grand Total	2,045.1	793.6

[a]Estimate based on nutrient content of complex fertilizers.
[b]This NH_3 capacity is used entirely for production of other nitrogenous fertilizers.
[c]This NH_3 capacity is used for both direct application and for production of other nitrogenous fertilizers.

Table A-2. Annual fertilizer capacity by type of fertilizer, 1950-71

Type of fertilizer	1950	1955	1960	1965	1966	1967	1968	1969	1970	1971
						thousand mt of product				
Ammonium sulfate	6.0	112.0	152.0	225.0	375.0	392.0	512.0	572.0	572.0	603.0
Ammonium nitrate			68.0	133.0	178.0	178.0	178.0	178.0	178.0	178.0
Urea				111.0	111.0	111.0	186.0	205.0	205.0	452.0
Single superphosphate	55.0	175.0	175.0	200.0	200.0	200.0	320.0	320.0	295.0	295.0
Triple superphosphate				50.0	50.0	50.0	50.0	50.0	330.0	330.0
Complex				108.0	178.0	178.0	178.0	178.0	253.0	253.0
NH_3[a]		22.0	22.0	186.0	186.0	186.0	318.0	648.0	616.0	616.0
						thousand mt of nutrient				
Ammonium sulfate	1.2	23.0	31.2	46.1	76.9	80.4	105.0	117.3	117.3	123.6
Ammonium nitrate			22.8	44.6	59.6	59.6	59.6	59.6	59.6	59.6
Urea				51.1	51.1	51.1	85.6	94.3	94.3	207.9
Single superphosphate	11.0	35.0	35.0	40.0	40.0	40.0	64.0	64.0	59.0	59.0
Triple superphosphate				23.0	23.0	23.0	23.0	23.0	151.8	151.8
Complex–N				18.9	31.2	31.2	31.2	31.2	44.3	44.3
–P_2O_5				27.0	44.5	44.5	44.5	44.5	78.4	78.4
–K_2O				8.6	14.2	14.2	14.2	14.2	14.2	14.2
NH_3[a]		18.1	18.1	153.2	153.2	153.2	261.9	533.6	515.5	515.5

[a]Represents total NH_3 production–data for direct application are not available.

Table A-3. Annual fertilizer production by type of fertilizer, 1950-70

Type of fertilizer	1950	1955	1960	1965	1966	1967	1968	1969	1970
					thousand mt of product				
Ammonium sulfate	2.6	70.2	147.2	205.5	229.9	241.2	346.8	399.7	388.0
Ammonium nitrate			54.3	94.3	146.8	162.7	164.2	160.0	151.9
Urea				96.2	104.1	96.4	118.4	161.5	158.5
Single superphosphate	15.5	74.7	93.2	145.2	170.6	176.4	206.4	237.1	174.9
Triple superphosphate				33.9	47.8	44.6	51.3	55.8	63.9
Complex				112.6	137.5	140.7	141.3	164.9	165.8
NH_3 (for direct application)	0.7	9.1	24.3	81.0	95.0	111.8	130.3	182.9	212.1
					thousand mt of nutrient				
Ammonium sulfate	0.5	14.4	30.2	42.1	47.1	49.4	71.1	81.9	79.5
Ammonium nitrate			18.2	31.6	49.2	54.5	55.0	53.6	50.9
Urea				44.3	47.9	44.3	54.4	74.3	72.9
Single superphosphate	3.1	14.9	18.6	29.0	34.1	35.3	41.3	47.4	35.0
Triple superphosphate				15.6	22.0	20.5	23.6	25.7	29.4
Complex–N				20.3	24.8	25.3	25.4	29.7	28.9
$-P_2O_5$				31.5	38.5	39.4	39.6	47.1	50.1
$-K_2O$				10.1	12.3	12.7	12.7	14.3	13.1
NH_3 (for direct application)	0.5	7.5	19.9	66.4	77.9	91.7	106.8	150.6	174.7

Table A-4. Fertilizer imports by type of fertilizer, 1950-70

Type of fertilizer	1950	1955	1960	1965	1966	1967	1968	1969	1970
					thousand mt of nutrient				
Ammonium sulfate	3.1	9.3	1.5	14.6	11.6	14.4	22.8	8.1	
Ammonium nitrate	2.5	8.5	4.5	16.7	9.1	14.3	3.4	3.4	1.7
Urea		1.5	19.6	12.1	11.9	12.1	15.7	4.2	3.6
Complex–N			2.7	0.6		0.9	2.7	2.7	2.3
Calcium nitrate			[a]	0.4	[a]	[a]			
Sodium nitrate	1.3	1.5	1.6	2.1	2.3	2.4			
Other N fertilizers	0.5	9.6	30.0	1.0	0.9	0.7			
Total N solids	7.4	30.4	59.9	47.5	35.8	44.8	44.6	18.4	7.6
NH_3[b]	0.5	8.4	56.1	91.4	125.3	164.0	173.9	88.0	60.9
Triple superphosphate					[a]	6.5	9.0		
Complex–P_2O_5				1.5		2.2	4.2	6.9	6.0
Other P_2O_5 fertilizer	0.1	6.2	15.4	[a]	[a]				
Total P_2O_5	0.1	6.2	15.4	1.5	[a]	8.7	13.2	6.9	6.0
Rock phosphate[c]	3.3	11.9	21.3	50.2	73.9	107.5	105.6	135.7	96.8
Potassium chloride		3.3	5.5	18.9	24.5	22.9	22.6	20.5	18.2
Sulfate of potash			0.9	3.2		2.9	7.0	2.5	3.7
Other K_2O fertilizers			0.1	0.7	1.9	2.6	1.4	0.2	
Total K_2O		3.3	6.5	22.8	26.4	28.4	31.0	23.2	21.9

[a]Fifty tons or less.
[b]For direct use and for production of other fertilizers.
[c]Rock is considered to contain 32.5% P_2O_5.

Table A-5. Fertilizer exports by type of fertilizer, 1965-70

Type of fertilizer	1965	1966	1967	1968	1969	1970
			mt of nutrient			
Ammonium sulfate				153	123	
Ammonium nitrate		100	134			
Urea	1,497	2,594	322	3,288	9,456	7,839
Complex–N		351	322	759	972	1,731
Total N	1,497	3,045	778	4,200	10,551	9,570
Triple superphosphate					46	23
Complex–P_2O_5		595	736	1,710	1,766	2,537
Total P_2O_5		595	736	1,710	1,812	2,560
Complex–K_2O		923	89	354	419	176

Table A-6. Apparent fertilizer consumption, 1950-70

Type of fertilizer	1950	1955	1960	1965	1966	1967	1968	1969	1970
					thousand mt of nutrient				
Ammonium sulfate	3.7	23.7	31.7	56.7	58.7	63.9	93.8	89.9	79.5
Ammonium nitrate	2.5	8.5	22.7	48.3	58.2	68.7	58.4	57.0	52.6
Urea		1.5	19.6	54.9	57.2	56.1	66.8	69.1	68.7
Complex–N			2.7	20.8	24.4	25.9	27.4	31.4	29.5
Sodium nitrate	1.3	1.5	1.7	2.1	2.3	2.4			
NH_3 (for direct application)	0.5	7.5	19.9	66.4	77.9	91.7	106.8	150.6	174.7
Other N fertilizers	0.5	9.6	30.0	1.4	0.9	0.7			
Total N	8.5	52.3	128.3	250.6	279.6	309.4	353.2	398.0	405.0
Single superphosphate	3.1	15.0	18.6	29.0	34.1	35.3	41.3	47.4	35.0
Triple superphosphate				15.6	22.0	27.0	32.6	25.6	29.4
Complex–P_2O_5				33.0	37.9	40.9	42.1	52.3	53.5
Other P_2O_5 fertilizers	0.1	6.2	15.4	a	a				
Total P_2O_5	3.2	21.2	34.0	77.6	94.0	103.2	116.0	125.3	117.8
Potassium chloride		3.3	5.5	18.9	24.5	22.9	22.6	20.5	18.2
Sulfate of potash			0.9	3.2		2.9	7.0	2.5	3.7
Complex–K_2O			0.1		-0.9	-0.1	1.0	-0.4	-0.2
Other K_2O fertilizers				0.7	1.9	2.6		0.2	
Total K_2O		3.3	6.5	22.8	25.5	28.3	30.6	22.8	21.7
Total NPK	11.7	76.8	168.8	351.0	399.1	440.9	499.8	546.1	544.5

[a]Fifty tons or less.

Table A-7. Seasonal movement of fertilizers, 20 distributors, 1970

Type of fertilizer	Month											
	J	F	M	A	M	J	J	A	S	O	N	D
						percent						
Ammonium sulfate	8.1	4.9	4.0	6.2	15.0	19.7	14.6	10.3	4.6	4.4	2.3	5.9
Ammonium nitrate	10.0	6.2	3.1	4.8	12.3	16.1	17.8	13.9	4.4	3.0	2.7	5.7
Urea	10.7	7.7	6.6	6.3	9.4	9.5	10.6	10.1	5.8	6.0	9.1	8.2
Triple superphosphate	10.0	3.7	3.8	8.1	19.7	10.0	6.8	4.8	3.5	8.6	6.8	14.2
Diammonium phosphate	9.8	3.9	3.0	7.1	9.7	11.5	5.5	3.5	4.2	11.2	14.1	16.5
Potassium chloride	16.6	10.3	9.6	7.1	8.2	10.9	10.8	4.0	4.1	5.0	5.3	8.1
Mixed fertilizers	6.0	4.9	7.7	6.3	12.5	15.7	20.4	3.5	3.1	4.8	6.2	8.9
All fertilizers[a]	9.3	5.8	5.2	6.3	14.0	16.0	12.7	8.1	4.3	5.1	5.5	7.7

[a]Includes single superphosphate, sulfate of potash, anhydrous ammonia, liquid fertilizers, and miscellaneous grades which were not analyzed separately due to limited data on seasonal sales.

Table A-8. Fertilizer prices and margins, 20 distributors, 1970

Region	Distributor's cost	Farmer's price	Implied markup
	US$/ton		%
	Ammonium sulfate		
North	52.88[a]	57.60[a]	8.9
Northwest	50.30	56.09	17.5
West	52.40[b]	55.52[b]	6.0
Central	50.35	61.74	22.6
South	51.28[b]	57.60[b]	12.3
All regions	50.66	60.29	19.0
	Ammonium nitrate		
North	90.00[a]	100.00[a]	11.1
Northwest	90.00[a]	97.20[a]	8.0
West	97.76[a]	101.76[b]	4.1
Central	88.40[b]	103.47	17.0
South	95.27[b]	104.96[a]	10.2
All regions	90.58	102.17	12.8
	Urea		
North	117.60[a]	128.60[a]	8.8
Northwest	100.72	109.17	8.4
West	104.16[a]	110.56[b]	6.1
Central	112.81[b]	130.56	15.7
South	109.98[b]	116.36[b]	5.8
All regions	102.78	114.53	11.4
	Single superphosphate		
North	–	–	–
Northwest	–	–	–
West	NA	41.60[a]	–
Central	29.38	42.24	43.8
South	38.40[a]	41.20[a]	7.3
All regions	31.31	42.00	34.2
	Mixed fertilizers		
North	–	–	–
Northwest	98.46[b]	120.00	21.9
West	103.36[a]	120.37[b]	16.5
Central	104.27[b]	120.49	15.6
South	–	–	–
All regions	102.63	120.24	17.2

[a]One observation.
[b]Two observations.

Table A-9. Ranges in fertilizer costs and prices, 20 distributors, 1970

	Distributor's cost		Farmer's price	
	Low	High	Low	High
	US$/ton			
Ammonium sulfate	48.48	53.60	50.80	67.20
Ammonium nitrate	86.88	97.76	97.20	104.96
Urea	98.40	117.60	100.40	141.36
Single superphosphate	29.20	45.10	41.20	64.80
Triple superphosphate	80.80	98.40	96.00	108.00
Diammonium phosphate	130.00	135.04	140.56	148.56
Potassium chloride	45.12	67.20	64.80	70.40
Sulfate of potash	64.00	85.60	80.00	89.60
Mixed fertilizers	98.40	120.00	112.16	144.00

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