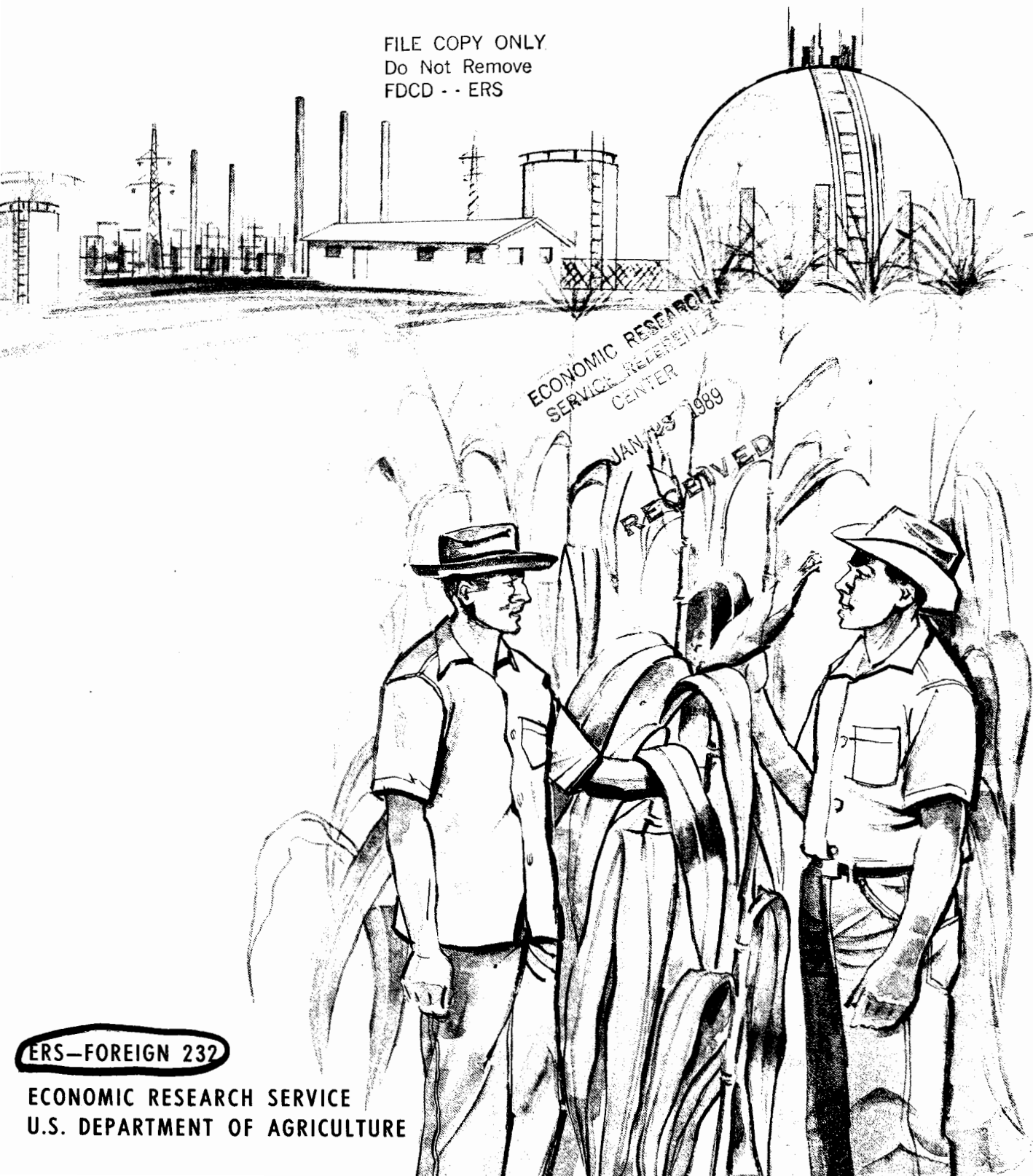


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# REGIONAL INTEGRATION OF THE CHEMICAL FERTILIZER INDUSTRY IN LATIN AMERICA

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ECONOMIC RESEARCH SERVICE  
U.S. DEPARTMENT OF AGRICULTURE

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## SUMMARY AND CONCLUSIONS

Sectoral integration--integration of a key industry such as fertilizer production--could lead the way toward regional economic integration in Latin America, and to the benefits that would be derived from an expanded market, economies of scale, specialization, and optimum location for industry.

The fertilizer industry was singled out as a feasible starting point for sectoral integration for the following reasons:

1. There is an urgent need to increase agricultural productivity in Latin America. For this purpose, large and cheap supplies of fertilizers are required.
2. There is a large and rapidly expanding demand for fertilizer products throughout Latin America--a demand that is being stimulated by active promotional policies of the governments.
3. The raw material inputs for this industry are in plentiful supply within Latin America, but their distribution is such that the costs of fertilizer production would be lower under conditions of free trade and unhindered factor allocation.
4. Although there still are many institutional barriers, vested interests have not yet become as serious an obstacle in this industry as in most other basic industries.
5. The Inter-American Development Bank and other regional agencies have focused attention on the fertilizer industry and have demonstrated their willingness to help finance regional investment projects in this sector.

Actual progress has been very slight. Although there have been tariff concessions made for trade in fertilizer materials and finished products, little has been accomplished in coordinating investments. The IDB has not been a very strong influence, except to the extent that it has contributed to the literature of supply-and-demand and feasibility studies, which would provide good background material for planning of regional investments.

In the absence of regional coordination, the fertilizer industry is beginning to follow the autarkic direction taken by the other basic and consumer industries in Latin America and vested interests are growing. The opportunity for sectoral integration may be lost if action is not taken soon.

What, then, are the possibilities that significant progress can be expected within the next few years? To a large extent, the answer depends upon certain infrastructure improvements--above all, upon transportation and finance. As the obstacles posed by gaps and rigidities in these areas are eliminated, the chances for success will be enhanced. LAFTA is making notable progress both in

improving the regional transportation networks and in developing a financial, credit, and investment structure which will facilitate regional integration.

However, despite all the factors which seem to weigh in favor of such a development, it does not appear very likely that a thorough regional integration of the fertilizer industry will take place within the next few years. A certain amount of trade liberalization may be expected, as well as increasing cooperation in investment planning and coordination; this could result in one or more pioneer regionally-integrated fertilizer plants being established for the entire Latin American market. There seems to be little possibility of total integration of the industry throughout the continent as the determination to take definite action to accomplish this does not seem strong enough on the part of those concerned.

REGIONAL INTEGRATION OF THE CHEMICAL FERTILIZER  
INDUSTRY IN LATIN AMERICA

by Virginia Johannsen Willard  
Economic Assistant 1/

INTRODUCTION

Regional integration involves elimination of trade barriers and coordination of investment and has long been recognized by Latin Americans as a means of benefiting from an expanded market, economies of scale, specialization, and optimum location considerations. This is an evaluation of the fertilizer industry as a sector of the economy of Latin America which might offer a promising route to regional economic integration.

Sectoral integration--that is, placing emphasis on integration of a single sector (such as the fertilizer industry) makes it possible to concentrate on a limited objective and gradually expand the area of economic cooperation.

As interest increases in achieving regional economic integration in Latin America, increased consideration is being given to the sectoral approach and to the fertilizer industry as a possible starting point for full integration. Integrating this sector could contribute simultaneously to the improvement of agriculture, to industrialization of the continent, and, finally, to the development of patterns of regional cooperation which could lead to more comprehensive economic integration.

In view of this, the following questions concerning the integration of the fertilizer industry in Latin America are considered:

(1) What is the status of the industry in terms of raw material supplies, existing and projected productive capacity, economic demand, agricultural requirements, and other relevant considerations?

(2) What direction is the development of the industry taking? Is the trend toward autarkic industrial development or toward regional and continental cooperation?

(3) What are the advantages offered and the problems posed by sectoral integration?

(4) What are the forces (political, economic, institutional, etc.) encouraging or discouraging regional integration?

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(5) If there are possibilities of sectoral integration, what progress can be expected in the next few years?

(6) What will be the influence of integration of this industry on general integration efforts?

To get answers to these and other questions, use was made of the available information on supply and demand, investment, and trade. The greatest possible use was made of relevant studies and research of other agencies and institutions.

#### THE BACKGROUND OF ECONOMIC INTEGRATION IN LATIN AMERICA

The desirability of regional economic integration was expressed in the Charter of Punta del Este (Title I, Paragraph II), and again at Punta del Este, in April 1967, when the presidents of the various republics of Latin America resolved to create a Latin American Common Market to begin in 1970, and to be "substantially in operation" by 1985. 2/

Economic integration of Latin America is not a new concept. The idea was first expressed in the 1950's, largely through the efforts of the United Nations Economic Commission for Latin America (ECLA). The first meaningful steps toward economic integration were taken with the creation of the Central American Common Market (CACM) in 1960 and the Latin American Free Trade Association (LAFTA) in 1961. These were only first steps. Although the CACM has gone far toward achieving a common market, it affects only a very small part of Latin America.3/ LAFTA, on the other hand, embraces a much larger area--almost the entire South American continent, 4/ but the concessions granted by members have generally followed the line of least resistance and have yet to alter intraregional trade in any very significant degree despite impressive percentage increases. Between 1961 and 1965, there was more than a 200-percent increase in intra-CACM trade and more than a 100-percent increase in intra-LAFTA trade. However, it must be kept in mind that the trade of both areas was at a very low level prior to the trade liberalization programs established under these two trade systems. 5/ Intra-Latin American trade as a percentage of Latin America's total trade with the world (exports and imports) grew from less than 8 percent in 1961 to approximately 11.5 percent in 1965, but this is still a very small proportion of the total (fig. 1).

The success of the European Common Market has unquestionably contributed greatly to Latin American interest in integration. It has also served to point up the inadequacy of the integration efforts made so far in Latin America.

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2/ Declaration of the Presidents of America. Punta del Este. Apr. 14, 1967.

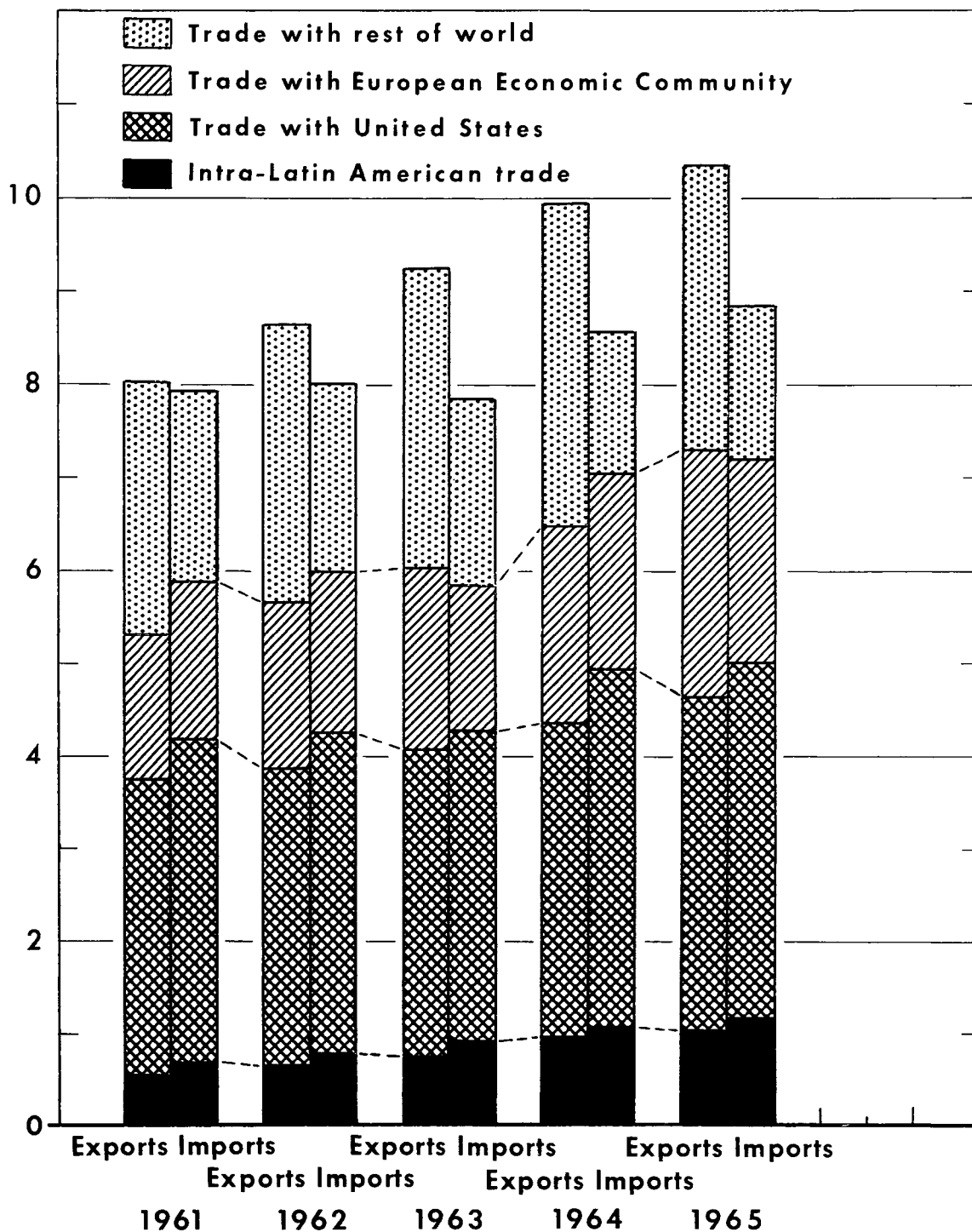
3/ The members of CACM are Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua. The combined area of these countries is only 2 percent of the area of Latin America and the total GNP is little more than 5 percent of the total product of Latin America.

4/ LAFTA includes Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru, Uruguay, and Venezuela.

5/ It is not the purpose of this paper to review the general progress of these two trade systems. For general works on CACM and LAFTA, see the bibliography.

# LATIN AMERICAN TRADE 1961-65

\$ BIL.



SOURCE: INTERNATIONAL MONETARY FUND DIRECTION OF TRADE.

Figure 1

The director of the Institute for Latin American Integration (INTAL) recently expressed the view that:

The world preponderance of the United States and the Soviet Union, and their economic and military might, stems from the fact that both nations represent large common markets which are organized economically, scientifically, and technologically into continental federations.

The Western Europe of 'The Six' is an analogous attempt to organize a continental federation through a Common Market. Europeans realize that nation states of the traditional type will inevitably play a subordinate role to continental federations. This is equally true for the developing world. 6/

Thus, regional integration is seen as a way to survive in a world of giants. Whether economic survival or political survival is the first consideration depends upon the point of view of the speaker, but many Latin American economists and politicians believe that a thorough continental integration offers the best solution to their problems of economic, social, and political development.

However, as these leaders recognize, it is not enough to recognize the need; the means must also be found. As Felipe Herrera recently pointed out, it is necessary to "clarify our concept of integration ... define the methods for achieving it and ... be honest enough to recognize the problems and risks inherent in this process." 7/

A gradualistic, functional approach appears to many economists and politicians to be the most practicable and realistic means of working toward economic integration of Latin America. It is believed that Latin America will get further in its efforts to achieve integration by taking small steps upon firm ground than by taking a great leap into uncharted territory. This "building block" theory of integration, whereby regional integration is advanced one sector at a time rather than by simultaneous integration of all sectors, is commonly known as the sectoral approach.

#### THE SECTORAL APPROACH TO INTEGRATION

It was the post-war search for an effective way to unite Europe that gave rise to the sectoral theory of integration. The Stikker Plan submitted to the Organization for European Economic Cooperation (OEEC) in 1950 proposed a functional, sectoral process of integrating various lines of industry by reducing

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6/ Gustavo Lagos. Political, Legal and Institutional Aspects of Latin American Economic Integration. Speech delivered to the Colloquium on the Economic Integration of Latin America, Georgetown University, Washington, D.C., June 23, 1966.

7/ Economic and Political Bases for a Latin American Common Market. Opening speech at the Colloquium on Economic Integration of Latin America, June 22, 1966.



tariffs and removing quantitative import restrictions (28, pp. 436-444). 8/ It was an even bolder project, the Schumann Plan, that was finally implemented in 1951 with the creation of the European Coal and Steel Community, and that laid the foundations for the adoption, 6 years later, of the Treaty of Rome. Thus, the economic integration of Europe was set into motion by the regional integration of one key sector. The success of the European experience has understandably encouraged the Latin Americans, and, although the situations are very different, the approach is an interesting possibility for the Latin Americans to consider seriously.

One reason for the appeal of sectoral integration is that governments are usually more willing to make limited commitments whose implications are reasonably clear than to plunge into integration of all sectors at once. This was true in Europe, and it is true in Latin America, as experience to date clearly shows. When LAFTA was formed, the contracting parties did not make provisions for across-the-board tariff reductions or commit themselves to a timetable of successive reductions. Instead, each concession that was granted and every item put on the Common List was negotiated separately and painstakingly. At first, an impressively large number of concessions were granted. (Most of these concessions, however, were for items in which trade was small or nonexistent). Since then, it has become much more difficult to add items to the Common List because the only items left for consideration are those from the most highly protected areas--areas where vested interests are the strongest. Many Latin Americans believe that there is little future in continuing in this manner and that they must find a new and more effective approach to integration. To many, this appears to be the sectoral approach. 9/

Even Bela Balassa, an economist who objects to the sectoral approach on theoretical grounds, concedes that "integration in one sector [may be] beneficial if political obstacles hinder integration in all areas" (9, p. 15). Such obstacles are present in Latin America as they were in Europe.

Politically, a European common market was not acceptable in 1950, but limited integration in even such a politically and economically sensitive area as coal and steel was feasible.

The interest in sectoral integration is based on the conviction that a limited commitment is more feasible than a total commitment. Those who support this approach believe that the Latin American nations should choose a key industry with products for which there is a growing demand, and one in which

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8/ Underscored figures in parentheses refer to items in the bibliography, page 38.

9/ The question of whether sectoral agreements are consistent with General Agreement on Tariffs and Trade (GATT) does not seem to be troublesome. This question came up in connection with the United States-Canadian Auto Parts Agreement of 1965, which was criticized by some as a violation of GATT. But in this case, a sectoral agreement was qualified not under Article XXIV as a "free trade area," which requires free trade in "a substantial part of the trade of such territory," but under Article XXV, which permits waivers on the basis of "exceptional circumstances." (See 44 and 48, Nov. 8, pp. 191-194 and Nov. 15, pp. 793-796.)

vested interests have not had time to develop. They believe, furthermore, that this industry should be wholly integrated--that is, not only must all barriers to trade in the products of the industry be eliminated but investment and production in the industry must be coordinated.

Among the alleged advantages of approaching integration in this manner are the many second-phase effects. Integration of one key industry, according to this argument, sets off a chain reaction of regional integration of subsidiary and feeder industries. At the same time, it creates a demand for the infrastructure improvements which are vital to the success of the integrated industry. Thus, integration ideally proceeds sector by sector, clearing the way of obstacles to the creation of an economically integrated community.

The most common theoretical criticism of the sectoral approach is that the reallocation effects of integrating only one sector would cause serious disruptions and imbalances. The critics argue that integration in just one sector leads to factor reallocation only in that sector because compensating adjustments in other sectors are impeded by persisting trade barriers. Therefore, they say, some of the participating countries would benefit while others would suffer welfare loss, balance of payments pressures, and unfavorable factor movements (9, pp. 16-17).

However, what may be theoretically the best policy will not necessarily be the most practical, and an "all or nothing" policy could easily result in nothing. In answer to the traditional argument that sectoral integration causes imbalances within the economies, Dr. Isaiah Frank has observed that "there is no way, short of literally establishing a complete political and economic union, of eliminating the kinds of imbalances that economists and theoreticians speak about... while the GATT customs-union principle calling for the removal of internal restrictions on substantially all trade is a sound goal toward which to strive, as a practical matter it may be attainable sooner on the basis of more rapid moves covering more limited fields." 10/

There would be imbalances caused by partial integration, but these could be confronted and alleviated. (The methods of accomplishing this task are considered later in this report.) Furthermore, the integration benefit of most interest to Latin Americans is not the reallocation of resources but rather the stimulus to development that would result from the increased scale and efficiency of production and marketing.

Herrera, Sanz, Mayobre, and Prebisch 11/ advocate the "programmed development" of a few large industries which offer "substantial economies of scale

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10/ Statement of Dr. Isaiah Frank before the Joint Economic Committee of the Congress of the United States, Hearings on Latin American Development and Western Hemisphere Trade, Sept. 8, 1965.

11/ Felipe Herrera, President of the Inter-American Development Bank; Carlos Sanz de Santamaria, Chairman of the Inter-American Committee for the Alliance for Progress; Jose Antonio Mayobre, Executive Secretary of the Economic Commission for Latin America; and Raul Prebisch, Secretary General of the United Nations Conference of Trade and Development.

through projection of the level of the regional market" (21, Annex I, p. 4). Products involved could include iron and steel; some nonferrous metals; motor vehicles, ships, and heavy industrial equipment; and some groups of heavy chemicals and petrochemicals, including fertilizers. These are import-substituting products--import substitution being very important as far as Latin America is concerned--and cover fields of great importance to the economic development of Latin America. The publication of the "Proposals for the Creation of the Latin American Common Market" in 1965 (34) stimulated interest in the sectoral approach to integration, and soon attention began to focus on fertilizer production as possibly the most likely sector with which to begin. In August 1965, President Johnson said:

I hope the American nations will consider the establishment of a program--patterned after the European Coal and Steel Community--for the production and trade, on a continental basis, of fertilizer, pesticides, and other products that are needed to increase agricultural production. My country stands willing to help in such a venture. 12/

and the following August he said:

Nineteen different fertilizer industries, 19 steel complexes, 19 isolated markets, and 19 different systems of tariffs would signify only stagnation, inefficiency, and waste. 13/

#### THE FERTILIZER INDUSTRY AS A LOGICAL STARTING POINT FOR SECTORAL INTEGRATION

There are several reasons for believing that sectoral integration could logically begin with the fertilizer industry. In the first place, it is an industry which to be efficient and economic requires larger investment and larger markets than can be found within most individual countries. Within a broad range of plant sizes both operating costs and required capital investment per ton of fertilizer produced decline as plant size increases. 14/ Second, there is no question that fertilizer production is a key sector in a continent with an urgent need to develop its agricultural production. Increased fertilizer production would contribute to the overall strengthening of the economic structure of the continent.

In addition, supply and demand considerations justify a concerted effort in this field. There are unsatisfied needs for fertilizer now, and indications are that demand will expand rapidly in the next few years. At the same time, recent surveys indicate that Latin America has the resources to supply the great portion of its fertilizer requirements. However, if fertilizer is to be

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12/ Remarks at the Ceremony Commemorating the Fourth Anniversary of the Alliance for Progress, the White House, Aug. 17, 1965.

13/ Remarks at the Ceremony Commemorating the Fifth Anniversary of the Alliance for Progress, the Pan-American Health Organization, Aug. 17, 1966.

14/ For information concerning the cost of production relative to plant size see 29, 35, and 42.

made available to producers at reasonable prices, the industry must locate its plants so as to make the most efficient use of these resources.

Finally, the obstacles to integration are fewer in this sector than in most others since the fertilizer industry in Latin America is relatively new and there has not been much time for vested interests to develop. However, obstacles increase as action is delayed, and as each country proceeds with its own projects.

### Fertilizers and the Agricultural Problem

The interest in beginning sector-by-sector integration with the fertilizer industry coincides with a very deep concern over the state of agriculture in many of the countries.

Agriculture in the majority of the Latin American countries has developed very slowly at a time when there has been a rapid increase in population. This situation has given rise to a series of social and economic problems.

The slow improvement in agricultural production has been due in part to the system of land tenure prevailing in most of the countries. Where the system of tenant farming exists, it has the effect of lessening incentives to expand output, especially by employing new methods, because the tenant must bear all the costs and risks and then share his output with the landlord. Other factors which weigh upon tenant-farmer and owner-cultivator alike are preference for traditional methods and fear or ignorance of new techniques, unavailability of agricultural inputs such as fertilizers, and high prices of these inputs.

These factors working together have prevented agriculture from making the technical advances needed, especially in use of fertilizers. The problem is becoming increasingly serious each year, as food needs become more pressing and land becomes more scarce. Significantly, the modest production increases shown in the past were achieved largely through an expansion of the area under cultivation, while the yield per unit cultivated improved very little. During the period 1948-63, the area under cultivation increased 40 percent (2.7 percent annually), while average yields improved by only 13 percent (or 1 percent annually). The two factors together achieved only a 60-percent increase in agricultural production in the 16-year period--an average increase of 3.7 percent, which was little more than the growth in population (37). Furthermore, according to projections made by the Tennessee Valley Authority, Latin America must expand its productivity at a rate of 3.9 percent a year to meet the bare minimum of food requirements in 1975, without any improvement in the present nutritional level (30, p. 3).

In a report by the University of Michigan's Center for Research on Economic Development, it was estimated that, in the short run, agricultural production will have to rise by 5 percent a year to satisfy an overall growth rate of 2.5 percent in per capita income. According to the report, "This increase will be needed for the region as a whole to satisfy demand arising from increased population and rising incomes, as well as to contribute to meeting needed expansion of exports." (See 54, p. 100.) And looking to the longer run,

the report states that "output and productivity will have to rise very substantially to provide food and fiber for the estimated 600 million persons who will be living in the region by 2000 A.D." (See 54, p. ii.) As expansion of the cultivated area is becoming more difficult and costly, most of such an increase would have to come from more intensive use of land now under cultivation.

The application of fertilizers is not the only means of increasing productivity per unit of land, but it is one of the technical factors which contribute most to increasing average yields, and it constitutes one of the most important indicators by which to measure technological progress in agriculture. FAO studies of the 1950-63 period show that doubling the tonnage of fertilizer applied in Europe resulted in a 33-percent increase in production without expansion of the area under cultivation. Furthermore, the use of fertilizers is credited with accounting for more than 35 percent of the increase shown in the European gross agricultural product between 1960 and 1963 (37, p. 3).

An FAO report estimates that one-half of the increase in productivity per acre in the United States during 1946-55 can be attributed to an expanded use of fertilizers. In India, fertilizers were considered to be the most important source of increased volume of food grains during the second 5-year plan, and in northern Latin America, FAO Freedom from Hunger figures indicate that fertilizers were mainly responsible for average yield increases of 67 percent (50, p. XIII).

It cannot be expected that agriculture in the developing nations will necessarily respond to use of fertilizers in quite the same way as it has in Europe and the United States. As a rule, increases in crop production have been due to a combination of technological factors, the application of which has had to go along with an improved agrarian structure and relatively favorable economic conditions (46, p. 3). Yet the possibility of greatly increasing agricultural productivity in Latin America by greater application of fertilizers seems to be clear.

The relationship between fertilizer cost and the accompanying added returns from crops is, of course, critical, and high fertilizer prices are a serious deterrent to greater utilization of fertilizer in many areas of Latin America. Several FAO trials have shown that in some cases increased fertilizer use would be profitable even when fertilizer prices were considered high. A study of Brazilian coffee production showed that, at the average 1958 price and yield levels, an increase of 100 cruzeiros in chemical fertilizer use would produce about 25 more kilograms of coffee, giving a net profit margin of about 6.5 to 1 after the associated costs of labor had been taken into account (36, p. 87). FAO field trials in the early sixties in El Salvador showed that the average financial return from increased production of rice was five times the cost of fertilizer dressing, and for maize it was over three times the cost (46).

Although fertilizer use in many countries for many crops appears to be profitable, the per capita consumption of plant nutrients in Latin America continues to be very low (table 1). For the 1962-63 season, it was estimated to be less than one-fifth as high per capita as in Europe and only one-ninth as high as in the United States and Canada. 15/

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15/ Per capita consumption of nitrogen, phosphorus, and potassium: Latin America, 5.0 kilograms; Europe, 26.8 kilograms; United States and Canada, 45.0 kilograms (30, p. 6).

Table 1.--Consumption of fertilizers in 13 Latin American countries

Country	Nitrogen (N)				Phosphates (P <sub>2</sub> O <sub>5</sub> )			
	Average	Average	1963	1964	Average	Average	1963	1964
	1957-59	1960-62			1957-59	1960-62		
----- (Thousands of tons of plant nutrients) -----								
Argentina...	8.4	9.7	22.1	33.2	5.1	4.0	6.7	10.4
Brazil.....	38.2	57.4	62.1	50.8	128.7	123.4	153.4	135.1
Colombia....	9.3	13.7	22.5	41.0	37.8	42.5	45.3	29.8
Chile.....	11.6	17.8	27.3	32.7	36.7	50.3	77.1	73.2
Central								
America <u>1/</u>	<u>2/</u> 22.3	28.2	38.4	54.6	<u>2/</u> 7.1	10.1	13.3	20.3
Ecuador.....	2.8	3.0	3.2	<u>3/</u> 3.4	1.9	2.1	2.8	<u>3/</u> 5.1
Mexico.....	87.3	128.4	190.4	228.5	32.0	42.9	61.5	59.5
Peru.....	44.1	61.4	69.2	73.0	21.4	18.6	24.6	<u>3/</u> 22.0
Uruguay.....	2.2	4.6	7.3	10.5	8.0	17.2	15.6	19.7
Venezuela...	5.6	7.6	9.5	13.3	2.3	5.9	6.0	7.6
Total.....	231.8	331.8	452.0	541.0	281.0	317.0	406.3	<u>3/</u> 382.7
	Potash (K <sub>2</sub> O)				Total NPK			
	Average	Average	1963	1964	Average	Average	1963	1964
	1957-59	1960-62			1957-59	1960-62		
----- (Thousands of tons of plant nutrients) -----								
Argentina...	2.4	2.8	5.0	4.9	15.9	16.5	33.8	48.5
Brazil.....	60.9	81.7	91.8	69.6	227.8	262.5	307.3	255.5
Colombia....	13.9	17.5	24.6	24.0	61.0	73.7	92.4	94.8
Chile.....	7.1	9.9	12.0	14.2	55.4	78.0	116.4	120.1
Central								
America <u>1/</u>	<u>2/</u> 7.7	8.7	9.6	15.1	<u>2/</u> 37.1	47.0	61.3	90.0
Ecuador.....	1.4	1.7	2.7	<u>3/</u> 3.3	6.1	6.8	8.7	<u>3/</u> 11.8
Mexico.....	12.1	14.2	11.3	12.5	131.4	185.5	263.2	300.5
Peru.....	5.2	4.7	5.7	<u>3/</u> 4.9	70.7	84.7	99.5	<u>3/</u> 99.9
Uruguay.....	2.2	3.4	4.0	5.1	12.4	25.2	26.9	35.3
Venezuela...	3.7	7.6	8.3	11.1	11.6	21.1	23.8	32.0
Total.....	116.6	152.2	175.0	<u>3/</u> 164.7	629.4	801.0	1,033.3	<u>3/</u> 1,088.4

1/ El Salvador, Guatemala, Honduras, and Nicaragua.

2/ 1959.

3/ Estimates.

Source: El uso de Fertilizantes en America Latina (37).

The ECLA/FAO Joint Agricultural Division has estimated that the present level of fertilizer utilization is considerably less than the potential consumption (that is, less than the amount that could be used profitably). The underlying assumptions on input and product price relationships are not explicitly stated in the report. In fact, the potentials are represented as "technically recommended dosages," but presumably these were determined with at least implicit assumptions of prices within some likely or reasonable range.

Table 2 summarizes the ECLA/FAO estimates of the 1963 or 1964 consumption of fertilizers in eight Latin American countries, and potential consumption based on "technically recommended dosages." Based on the 1963-64 consumption figures, it would appear that the group as a whole consumed about one-seventh of the volume of fertilizers which should theoretically be applied for optimum yields, or 6 million tons less than the theoretical requirement. The principal countries contributing to the average of underconsumption were Brazil and Argentina, where the levels of fertilization were less than 10 percent and 3 percent, respectively, of the recommended levels. Even in Mexico, where consumption was highest, it was little more than one-quarter of the level recommended (37, p. 6).

### Fertilizer Prices

Practically all of the respondents to an Agency for International Development (AID) questionnaire on the use of fertilizers in Latin America indicated that one of the most important factors discouraging the use of fertilizers has been their high prices in relation to the price received by the farmer for his crops. Many factors combined to bring about these high prices, including high internal transport costs and poorly organized marketing and distribution, but the strongest factors are high tariff walls and trade restrictions. Integration of the industry would reduce these barriers within Latin America and, it is believed, reduce fertilizer prices.

Argentina provides an example of how fertilizer prices affect level of fertilizer use. Prior to 1963, fertilizer prices were among the highest in Latin America, both absolutely and in relation to crop prices. A 1963 AID study of the use of fertilizers in Argentina concluded that the principal factor limiting fertilizer use was the high price of fertilizers to the cultivator, which ranged from two to three times the world price (c.i.f. Buenos Aires). <sup>16/</sup> Major causes of the high price were tariff and customs fees, which in 1963 included import duties of 20 percent on fertilizer components and 40 percent on high-analysis concentrates, customs fees of 8 percent by value, and other importers' costs averaging 5 percent of value. Also, because of the low volume of sales, there was a high markup of 20 to 25 percent by the commercial handlers. In addition to all this, a federal sales tax of 13 percent levied in the commercial chain of distribution and ultimately added to the cost to the farmer brought the total to at least 150 percent of the world price.

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<sup>16/</sup> U.S. Dept. of State, AID, Airgram TOAID-767 (American Embassy, Buenos Aires: May 15, 1963).

Table 2.--Actual and potential consumption of fertilizers in selected Latin American countries

Country	Year	Actual consumption, 1963 or 1964				Potential consumption <u>1/</u>				Actual consumption as a percentage of potential consumption			
		N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	Total	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	Total	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	Total
-----Thousands of tons of plant nutrients													
Brazil	1963	62	153	92	307	1,004	1,207	1,009	3,220	6	13	9	10
Venezuela	1964	13	8	11	32	50	40	40	130	26	20	27	25
Colombia	1964	41	30	24	95	115	144	91	350	36	21	26	27
Argentina	1964	33	10	5	48	750	450	300	1,500	4	2	2	3
Mexico	1964	228	60	13	301	630	360	180	1,170	36	16	7	26
Peru	1963	69	25	6	100	192	115	90	397	36	22	7	25
Chile	1964	33	73	14	120	118	165	26	309	28	44	54	39
Ecuador	1963	3	3	3	9	79	96	53	228	4	3	5	4
Total <u>2/</u>		482	362	168	1,012	2,938	2,577	1,789	7,304	16	14	9	14

1/ Potential consumption was estimated on the basis of the area to which fertilizers could be applied at the present time.

2/ Although some of the actual consumption figures are for 1963 and some for 1964, they are added in this table in order to permit a comparison with total potential consumption figures for the eight countries.

Source: El Uso de Fertilizantes en America Latina (37).

Key: N = Nitrogen; P<sub>2</sub>O<sub>5</sub> = Phosphates; K<sub>2</sub>O = Potash.



Furthermore, costs of transportation from the port of entry are an added factor of major significance to many of the interior production areas. 17/

With the prices that prevailed in 1963, yield increases from fertilizer were generally considered not to be sufficient to pay the farmer for using fertilizer in Argentina. This was due primarily to the high cost of fertilizer, but also to the relatively low price received for agricultural products and the 5 percent federal tax on the gross sale of agricultural products.

In 1963, the Government of Argentina removed the 20- to 40-percent tariffs as well as the sales tax on fertilizers. The lower cost resulted in a doubling of the volume of fertilizers marketed in Argentina, a clear demonstration of the effect freer trade in fertilizers could have upon fertilizer use in Latin America.

Fertilizer prices in most Latin American countries are still quite high, although they vary considerably from country to country. In Brazil, Colombia, and Ecuador, in the early sixties, the prices of fertilizers to farmers were approximately twice those in Western Europe and the United States; in Argentina, the prices were 50 percent higher or more (table 3). Only in Mexico and Venezuela were prices similar to those in North Atlantic countries, due largely to the industrial capacity to produce fertilizers at reasonable cost.

Assuming that the lowering of fertilizer prices to the cultivator would increase consumption of fertilizers (as the case of Argentina suggests), then the prospect that integrating the fertilizer industry would lower costs and prices is a very persuasive argument for such integration. Before analyzing the effect of integration on lowering costs, let us look at the demand projections for fertilizers in Latin America.

#### Rapidly Growing Demand

It is very difficult to estimate accurately the future demand for fertilizers in Latin America, given the multiplicity of factors and policies which condition this demand and the elusiveness of the statistical material. Several projections are now available, however. 18/ It must be noted that the projections are not demand projections in the usual sense of free market demand which responds to price and income considerations. The definition of "demand" as used here and in the projections is based on subjective analyses of fertilizer needs and requirements in the countries under consideration. Furthermore, it is an "induced demand" that is being projected: that is, it postulates active policies of market intervention in an effort to (1) stimulate and influence consumer preferences by means of extension services and aggressive marketing of fertilizers, and (2) supplement individual purchasing power through subsidies, tax relief, and credit facilities.

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17/ U.S. Dept. of State, AID, Airgram TOAID-767 (American Embassy, Buenos Aires: May 15, 1963).

18/ The Demand for Urea, Ammonium Nitrate, Ammonium Sulphate, Ammonia, Formaldehyde, and Menthanol in the Latin American Free Trade Association (including Venezuela). Draft; the Brookings Institution, Feb. 1966.

Table 3.--Prices per ton paid by farmers for given fertilizers  
in selected countries

Country	Year	Ammonium sulphate	Nitrate	Simple super-phosphate	Potassium chloride
-----Dollars-----					
<u>Latin America:</u>					
Argentina	1964	90	98	---	102
Brazil	1965	104	122	59	107
Chile	1964	---	<u>1/47</u>	---	<u>2/56</u>
Colombia	1963	110	108	---	135
Ecuador	1963	121	---	---	127
El Salvador	1965	70	---	54	75
Honduras	1965	100	---	72	---
Mexico	1965	63	---	40	72
Nicaragua	1965	85	---	46	116
Guatemala	1965	90	---	61	67
Peru	1964	69	66	48	109
Venezuela	1965	52	---	39	81
<u>Other:</u>					
Belgium	1963	53	58	33	58
France	1963	62	71	43	50
West Germany	1963	52	48	40	42
United Kingdom	1963	<u>3/30</u>	<u>4/38</u>	<u>5/25</u>	63
United States	1963	57	62	42	59

1/ Subsidized at \$7.30 per ton.

2/ Subsidized at \$56.00 per ton.

3/ Subsidized at \$21.10 per ton.

4/ Subsidized at \$20.80 per ton.

5/ Subsidized at \$16.70 per ton.

Source: El Uso de Fertilizantes en America Latina (37).

The ECLA/FAO Joint Agricultural Division's projection reported in El Uso de Fertilizantes in Latin America (37) is summarized in table 4 below and shown in more detail in table 5.

Table 4.--Summary of estimated use of fertilizer in 1964, and demand projections for 1970 and 1975, 13 Latin American countries 1/

Year	N		P		K		Total NPK	
-----1,000 tons-----								
1964	541		390		165		1,096	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
1970	855	1,117	614	869	262	370	1,731	2,356
1975	1,175	1,730	818	1,490	339	699	2,332	3,919

1/ The 13 countries include Argentina, Brazil, Chile, El Salvador, Guatemala, Honduras, Nicaragua, Colombia, Ecuador, Mexico, Peru, Uruguay, and Venezuela.

Source: El Uso de Fertilizantes en America Latina (37).

The minimum estimates are based on a straight line extrapolation of the trends of demand registered in the last few years. This trend, as shown in table 2, represents considerable underconsumption. The maximum estimates are derived from a projection of additional output needed to meet the estimated requirements for increased domestic consumption and export of agricultural products. They postulate considerable increases in dosage per unit of land (though less than the technically recommended dosages shown in table 2), and a continued expansion of area under cultivation at the same rate as in the past. It is recognized in the report, however, that the best lands are already under cultivation, and that incorporation of new lands is becoming more and more costly because of their inaccessibility and because of the poor quality of their soils (37, p. 30).

Other studies anticipate a considerably greater need than the maximum ECLA/FAO projections. The Sulphur Institute says that 4.06 million metric tons of nutrients will be required by 1970 just to keep pace with population growth and make modest gains in nutrition levels (13, pp. 84-88). A preliminary study of sources of fertilizer minerals in South America prepared by the U.S. Geological Survey at the request of AID concludes that "at least five times the current consumption of fertilizers probably will be required by 1970. Some countries such as Bolivia and Ecuador, where fertilizers are scarcely used, will require much more than this." (See 19, p. 4.) Even the maximum estimates of ECLA/FAO are conservative and less than the technically recommended potential consumption of fertilizers, as can be seen by comparing tables 2 and 5.

Table 5.--Projections of demand for fertilizers for 1970 and 1975 in 13 Latin American countries

Country	1970						1975					
	Minimum			Maximum			Minimum			Maximum		
	N	P	K	N	P	K	N	P	K	N	P	K
	-----1,000 tons-----											
Argentina <u>1/</u>	67	35	13	67	35	13	117	66	22	117	66	22
Brazil	78	169	107	91	198	127	84	183	117	191	377	267
Chile <u>1/</u>	60	117	19	60	117	19	85	154	23	85	154	23
Central America <u>1/</u> <u>2/</u>	107	48	33	107	48	33	149	78	53	149	78	53
Colombia	46	72	37	97	125	60	58	96	51	152	179	89
Ecuador	4	3	3	12	10	9	5	4	3	28	25	22
Mexico	341	85	16	509	196	51	476	114	19	720	330	95
Peru	114	28	6	116	48	16	141	32	7	168	96	40
Uruguay	14	44	9	22	71	12	21	71	14	38	136	19
Venezuela	24	13	19	36	21	30	39	20	30	82	49	69
Total	855	614	262	1,117	869	370	1,175	818	339	1,730	1,490	699
Total (N, P, and K)	-----1,731----- -----2,356----- -----2,332----- -----3,919-----											

1/ Only one projection. 2/ Four countries: El Salvador, Guatemala, Honduras, and Nicaragua.

Source: El Uso de Fertilizantes en America Latina (37).

## Potential Supply

While there is disagreement over the exact size of future market demand for fertilizers, it is generally agreed that the need is very great and the potential demand is very large. What is not so well known is that Latin America could meet much of this need from its own mineral resources.

In the USGS report, "Sources of Fertilizer Minerals in South America," it is stated that, although the resources are unevenly distributed, "the continent as a whole has potential resources adequate not only to meet most of its current consumption--which is far below its need--but to support a much expanded use of mineral fertilizers." The prospects for discovery and increased production of phosphates, potash, and sulfur were found to be very encouraging, although these prospects were not expressed in quantitative terms. Nitrates were excluded from the study because they can be made synthetically.

The distribution of fertilizer minerals reported in the USGS study is shown on the map in figure 2. No entries are shown for the Guianas, Uruguay, and Paraguay, as the study was limited to existing geological surveys, and none had been made for these countries.

Prospects are especially bright for increased production of phosphates. The recently discovered deposits in the Sechura Desert of Peru may be among the richest in the world, and they are well situated for export of the ores to Pacific Coast regional markets. <sup>19/</sup> Phosphate deposits are also found in the Peruvian Andes and on the sea bottom off the coast of Peru. The guano deposits, the only present source of production in Peru, have little potential for expanded yields. Marine sedimentary deposits of phosphorous are being mined in Brazil and Venezuela and there are possibilities for further development. In addition, Brazil has large igneous deposits. Another important potential source of phosphates is basic slag, a byproduct of iron and steel production. This source of phosphates is presently being utilized to a certain extent in Colombia and Argentina, and the potential exists in the other countries, contingent upon the development of large iron and steel industries that make use of phosphorous-rich ores.

There are potash resources in South America but they are not so widely distributed as the phosphates. At present, potash is produced only in Chile where it is a byproduct of the nitrate industry. This production, as well as the development of saline brines, can be expanded considerably. There are sources of potash that may be commercially exploitable in Peru, Brazil, and possibly other parts of South America.

Finally, the USGS report indicates that potential sources of sulfur in South America are both large and widely distributed. Although Peru appears to have the greatest reserves--in the form of volcanic deposits, salt domes, extensive sulfide deposits, and smelter gases--Chile, Bolivia, Ecuador, Argentina,

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<sup>19/</sup> USGS estimates a reserve of 1.4 billion metric tons of phosphate rock (31 percent P<sub>2</sub>O<sub>5</sub>). Marketing possibilities along the Pacific Coast of South America are currently being studied at CIAP by Fred Heil, an AID fertilizer specialist.

# PRINCIPAL KNOWN DEPOSITS AND PROSPECTS OF PHOSPHATE, POTASH, AND SULFUR IN SOUTH AMERICA

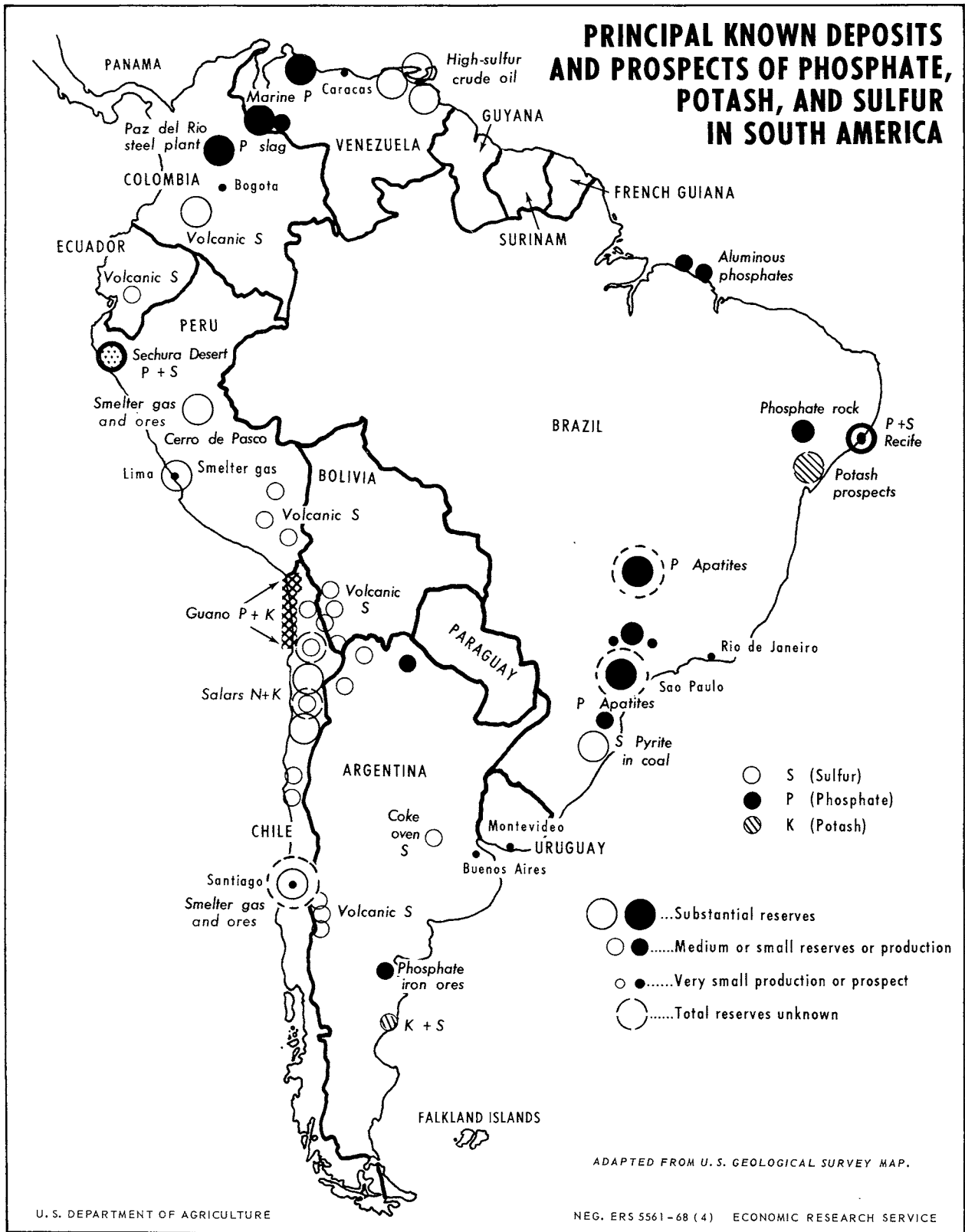


Figure 2

Venezuela, and Colombia all have substantial potential for production from volcanic deposits and smelter gases. 20/

The map of these mineral deposits portrays graphically one of the most persuasive arguments for regional integration of fertilizer production: the fact that, while South America has the minerals it needs to meet a very large part of even a rapidly growing demand for fertilizers, these mineral deposits are so scattered as to suggest that there is an inherent logic in the idea of integrating fertilizer production on a continental scale.

### Integration and Vested Interests

In Latin America, established industries such as coal and steel are usually surrounded by protective barriers. Investors (public and private) in such industries are granted concessions, such as long periods of tax relief, and usually are guaranteed a virtual internal monopoly as well as freedom from external competition. Once an industry has been established under such conditions, it is extremely difficult to withdraw the concessions and reduce protection, even though the intent to do so may have been stated from the very beginning. Rather than begin economic integration with such a sector, it would be far easier to begin with one which had not become so thoroughly surrounded by vested interests and protective barriers.

When regional integration of the fertilizer industry was first suggested in Proposals for the Creation of the Latin American Common Market (34), that industry still could qualify as one that had not yet built around itself a stubborn protective shell. The trend appears now, however, to be in the direction of autarkic rather than regional development. Therefore, it may soon become just as difficult to make progress in this sector as in others. If action is to be taken, it may have to be taken soon if any progress is to be made. A look at development since 1964 may give some indications of future developments.

### RECENT DEVELOPMENTS AFFECTING REGIONAL INTEGRATION OF THE FERTILIZER SECTOR

Three questions should be considered in determining the progress of sectoral integration of the fertilizer industry. First, what role do the inter-American regional institutions play in this process and what has been their contribution so far? Second, what has been the attitude and orientation of the various countries? And finally, what has been accomplished within the structure of the present trade systems, LAFTA and CACM?

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20/ The USGS map does not include Mexico because the survey was limited to South America. But since Mexico is a member of LAFTA and also is promoting cooperation with the CACM, it should be noted that Mexico has extensive sulfur deposits and typically exports about 1.5 million metric tons of sulfur a year. Most is exported to the United States, with only about 10 percent being sent to LAFTA partners.

## The Regional Institutions

In March 1964, an agreement was reached between FAO, ECLA, and the Inter-American Development Bank (IDB) recognizing the importance of fertilizers to the increase of agricultural production in Latin America and providing for a joint study of the factors which condition fertilizer consumption in the region. The ultimate purpose of the study was to recommend measures to overcome the obstacles lying in the way of increased use of this vital input.

Meanwhile, the status of CIAP (Inter-American Committee for the Alliance for Progress) as the institutional nucleus for these studies was established by the Inter-American Economic and Social Committee (IA-ECOSOC). At their Fourth Annual Meeting at the Ministerial Level, in Buenos Aires, the IA-ECOSOC recommended that:

...CIAP, in cooperation with the FAO and in consultation with the international financing agencies and private industry, formulate a general program and specific projects for promoting the use of fertilizers on a regional basis, with particular reference to the following aspects:

1. Organization of an active campaign demonstrating the use of fertilizers in the countries of the region.
2. Promotion of the establishment of a suitable commercial mechanism so that fertilizers will reach the farmers in sufficient quantities and at reasonable prices.
3. Installation of plants to produce fertilizers, of a multinational character insofar as possible, whose potential capacity will be in accordance with the prospects for demand within the immediate future.
4. That, once this program has been drawn up, CIAP request its adoption by the governments concerned, and cooperate with them in the search for financial and other means within the immediate future.

(See 26, pp. 55-56.)

As a first step, the Joint Agricultural Division of ECLA/FAO prepared a background study on the fertilizer industry in Latin America (33) which was presented in June 1965, at the first meeting of the "Working Group of CIAP on Fertilizers." The working group consisted of experts from CIAP, the IDB, ECLA, and LAFTA. It was then decided to execute a series of supply and demand studies. ECLA and FAO, with financing from the IDB, undertook these studies, and presented preliminary reports to the second meeting of the CIAP Working Group, held in May 1966 (35). Detailed studies have been completed and distributed on the fertilizer situation in Argentina, Colombia, and Chile (38, 39, and 40), and studies on Brazil, Mexico, Peru, and Venezuela are in the final stages of preparation.



In the area of statistics and data-collecting, CIAP and the collaborating regional institutions have made a great contribution. They have quantified the fertilizer problem despite the paucity of statistics in Latin America, and they have gone a long way toward providing background data for future policy deliberations. It remains, of course, for the governments and the private companies to implement the policy. The Inter-American Development Bank is in a position to have a significant role in providing financing.

The IDB, in its function as the bank for Latin American economic integration, financed these joint supply and demand studies, and has indicated that it "is willing to consider loans having the two-fold purpose of increasing the production capacity of the area to an adequate degree and of strengthening its competitive position for the purpose of regional integration." (See 21, app. B-3, p. 22.)

On August 2, 1966, the IDB announced the creation of a "Preinvestment Fund for Latin American Integration," a fund with the initial resources of \$15 million 21/ to be used "to prepare multinational projects designed to spur Latin America's economic integration and accelerate its development." In particular, the Preinvestment Fund is to be used for the execution of feasibility studies of regional or multinational projects, thereby promoting a regional approach to investment. 22/

The governments, private groups, and the IDB itself have been criticized as being slow to act. As one Mexican editor expressed it:

"Despite the apparently general conviction that complementary industries are the main-spring of both economic development and economic integration, the study groups set up under LAFTA to formulate the bases for future complements in several dynamic industries have come up against the indifference of governments, which neither designate nor send their technicians, and the IDB itself, which does not seem disposed to provide the modest financing required by these studies. This last is remarkably paradoxical in the light of the repeated statements by its directors that the IDB is resolved to be the bank of Latin American economic integration." (See 7, p. 3.)

### National Programs

Many of the Latin American countries are following a policy of developing their domestic fertilizer production to satisfy domestic demand to the greatest extent possible, substituting for imports and saving foreign exchange. This is

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21/ In addition to the initial allocation, the IDB is seeking contributions from member governments. The United States was the first contributor, assigning \$1.5 million of the Social Progress Trust Fund to the Preinvestment Fund.

22/ News Release NR-39/66, Aug. 1, 1966, pp. 1,2. Inter-American Bank Creates Preinvestment Fund to Spur Latin American Economic Integration.

apparent both from the objectives spelled out in national plans and from the rapid growth of investment and construction in the fertilizer sector.

In most countries, the expansion of fertilizer-producing capacity, especially of nitrogen-producing capacity, has been impressive. This expansion has consistently been on a national basis, with little thought of regional coordination. Each country is striving to build up its own domestic production.

In Peru, for example, chemical fertilizer production has more than doubled since 1960, as installed capacity has expanded and several new plants have begun operation. In 1960, there was only one domestic manufacturer of chemical fertilizers; by 1965, there were five. The total output of these five plants reached almost 100,000 metric tons of prepared fertilizers. 23/ Yet, while production has been growing, so has the domestic demand. In 1965, domestic output of chemical fertilizers supplied only about 40 percent of the total consumed, the rest being imported largely from Europe. However, the Sechura phosphate deposits are now being developed with Peruvian and U.S. capital, with production plans aimed at meeting domestic demand and exporting phosphates.

The Colombian fertilizer industry has also been growing very rapidly. The Government of Colombia has been actively promoting production and use of fertilizers and has participated in the installation of two ammonia plants which have a combined daily capacity of about 300 tons. 24/ Also producing ammonia is "Amoniaco del Caribe S.A." ("AMOCAR") which daily produces 300 tons of ammonia and 150 tons of nitric acid at its plant in Cartagena. 25/ The total installed capacity of these three plants (128,000 tons of nitrogen per year) (35, p. 93) exceeds current domestic economic demand for nitrogen. It even exceeds the ECLA/FAO estimates of future requirements. Yet investments are being made in even more installations. The Paz del Rio steel plant will begin production of ammonium sulfate in 1971, and it was announced in 1966 that a long-planned "Petroquímica del Atlántico" project had received financing from European banks and suppliers to set up a \$51 million ammonia and urea plant at Barranquilla. 26/

In early 1968, Colombia and Venezuela announced plans for a \$20 million two-nation plant to produce a variety of petrochemicals including fertilizers. This plant, "Monomeros de Colombia," will be located in Barranquilla. Colombian public agencies will own 45 percent; Venezuelan public agencies will hold 45 percent; and, the remaining 10 percent will be owned by the Dutch States Mines. It is scheduled to begin production in 1970 with a capacity of 135,000 tons of fertilizer compounds per annum. The output is to be marketed in Colombia and Venezuela and exported to other LAFTA countries (12, pp. 33, 34).

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23/ The five plants are Fertilizantes Sintéticos S.A. (Fertisa), Industrias Químicas Básicas S.A., Abonos Completos S.A., Rayon y Celanosa Peruana S.A., and Fabrica de Fertilizantes Nitrogenados de Cachimayo-Cuzco.

24/ The two plants are Industrias Colombianas de Fertilizantes (ICF) at Barrancabermeja, and Abonos Colombianos S.A. at Cartagena.

25/ Dept. of State Airgrams, American Embassy, Bogota: No. A-1609, Jan. 4, 1963; A-188, Sept. 22, 1964; A-146, Sept. 22, 1965; and A-173, Oct. 3, 1965.

26/ German, Belgian, Swiss, and Spanish capital, with Bavaria, S.A., subscribing to 25 percent of the capital (47, vol. CXXII, p. 25).

These are strong indications that by 1975 Colombia will have considerable excess fertilizer production capacity. Full utilization of capacity will require faster growth of demand than projected (table 5), or exportation to countries of Central America and LAFTA. These countries, however, are also trying to expand their production, reduce imports, and expand exports.

Venezuela is developing its resources as rapidly as possible to supply all of its own fertilizer needs. In 1963, Venezuela was importing about 70 percent of its fertilizer supplies. Since then, the rapid expansion has been largely the result of construction of the Instituto Venezolano de Petroquímica (IVP) complex at Moron, a vertically integrated industry which produces its own intermediate inputs such as sulfuric acid and ammonia, manufactures a variety of elaborated superphosphates and fertilizer mixtures, and has its own port and marketing facilities. Built in 1961, it entered into full production in 1964, exported 56,000 tons of fertilizers that year, and was operating profitably (according to IVP) by the end of 1965. In addition to the Moron complex, the Venezuelan Government is investing, through IVP, about \$2.2 million in the construction of petrochemical plants across the nation (18). 27/ Private companies are also making plans for expanding output of ammonia and other petrochemicals. With all of these projects in operation, Venezuela will be in a position by 1970 to meet its own demand for nitrogenous and phosphatic fertilizers and still have surpluses of 162,000 and 149,000 tons, respectively, available for export (35, pp. 131-133). But with all of Venezuela's neighbors following the same policy, the question is--available for export to whom?

Central America offers a potential market for ammonia but a small one. There was no ammonia produced in CACM in 1967. The Fertica complex (Fertilizantes de Centroamerica, S.A.), with plants located in El Salvador and Costa Rica, imports ammonia and produces complex fertilizers which are sold throughout CACM. However, in 1966, despite production by Fertica, Central America still imported almost one-half of its prepared fertilizers from Western Europe. If integration of the two trade systems, LAFTA and CACM, could be accomplished, the Western European imports could conceivably be replaced by imports from Latin American producers such as Venezuela.

Mexico is also pushing toward a self-sufficient and exporting status. Although Mexican consumption and production of fertilizers are already the highest in all of Latin America, Mexico is making a determined effort to expand production capacity to meet a rapidly growing domestic demand, and also to provide considerable quantities of fertilizer for export. Under law, the production of synthetic nitrogen is controlled by PEMEX, the State Petroleum Development Corporation, with private companies operating along with PEMEX in the production of nitrogenous and phosphatic fertilizers. Capacity of all Mexican plants producing fertilizers is now approximately 1.6 million tons (or 478,000 tons of nutrients) per year (35, pp. 97-107). Further expansion of capacity underway and planned is expected to bring total domestic production of nitrogen to 820,000 tons per year by 1975. Production of phosphatic fertilizers is being expanded to the extent that by 1970 there should be at least a 370,000-ton surplus (130,000 tons of P<sub>2</sub>O<sub>5</sub>) available for export (35, pp. 97-107).

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27/ Dept. of State Airgrams, American Embassy, Caracas: No. A-429, Jan. 12, 1965 and No. A-711, Mar. 17, 1966.

Chile is placing great emphasis on increasing fertilizer consumption. Many of the former restrictions to the importation of fertilizers have been removed, and in 1966, the Chilean Government received a \$3.6 million Alliance for Progress loan to finance the importation of triple superphosphates, but the emphasis in government policy is definitely upon domestic production for local consumption and for export. In May 1966, a new company was established to develop the petrochemicals industry in Chile. The Sociedad Petroquimica S.A. plans by 1972, to construct four installations which will specialize in petroleum and natural gas derivatives and will include nitrogenous fertilizers among its principal products. 28/ Also Corporacion de Fomento (CORFO) is considering the construction of a very large ammonia plant near Punta Arenas in southern Chile. Chilean producers hope to export to LAFTA countries, but if there is no regional coordination, Chile may find itself in direct competition with its fellow LAFTA members, especially those of the "Southern Cone"--Brazil and Argentina--which are also investing or planning to invest large public and private sums in the production of nitrogenous fertilizers.

Although Argentina at present produces and consumes very little chemical fertilizer, it has considerable potential, and measures to exploit this potential are beginning to be put into operation. In 1967, the only chemical fertilizer produced in Argentina was ammonium sulfate and the output of this compound was very low.

In 1963, plans began for a \$25 million Petrosur plant for the production from natural gas of ammonia, fertilizers, and other chemicals. The project was held in abeyance while studies were conducted to determine the potential market for its production until 1965 when the plant was approved by the Argentine Government. Production is scheduled to begin in 1968 with peak production to be reached in 1970. 29/ Foreign and Argentine investors have been demonstrating considerable interest in the Patagonia area, where abundant natural gases could provide the inputs for the production of ammonia. It is believed that such a plant could not only supply the nitrogen requirements of Argentine agriculture, but could provide up to 50 percent of the nitrogenous fertilizers needed in the whole continent of South America.

The output of an installation of this scale could well be marketed in Argentina's neighboring countries, especially in Brazil, which has an enormous potential market. But Brazil, like the rest of the Latin American nations, is interested in developing its domestic industry. During the last few years, the Brazilian Government has given priority to increasing agricultural productivity, with a major stress on production and utilization of fertilizers. Brazil's National Plan calls for development of the petrochemical industry to reduce dependence on imports and to save on foreign exchange. The result of this policy has been a decision to invest \$69 million in a naphtha-conversion complex, despite studies which show that alternative sources of ammonia in Venezuela or southern Argentina would have considerable raw material cost advantage because of the availability of low-cost natural gas. The scheduled daily production of nitrogenous fertilizers will be 600 tons. The complex was begun in June 1966, and should be ready to begin operations in January 1969 (49, pp. 27-28).

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28/ U.S. Dept. of State Airgram No. A-997, May 21, 1966.

29/ U.S. Dept. of State Airgram No. A-254, Sept. 30, 1967.

## THE OBSTACLES TO SECTORAL INTEGRATION IN THE FERTILIZER INDUSTRY

Clearly, Latin America has the capacity to meet most of its demand for fertilizers, at least for the immediate future. It is also clear that several countries, notably Venezuela, Colombia, and Mexico are developing considerable excess capacity which they hope to channel into exports to fellow LAFTA members. At the same time, however, these fellow members are aiming at self-sufficiency and do not want to import. So despite the efforts of the Inter-American Development Bank and of CIAP, ECLA, FAO, and other regional or international institutions, and despite the urging of many of the Hemisphere's statesmen, each country is going ahead with its national plans.

A thorough analysis of the economics of regional integration, especially in regard to costs and optimum location of regionally-integrated industries, requires a much deeper examination than is within the scope of this study. Also, many of the problems involved are essentially political and a sudden change of government can completely reverse a previous position. But it is still worthwhile to point out the main problem areas, and on this basis to assess the future of the sectoral approach for Latin America.

### Tariff Structures and Integration

Because of the important role that the tariff structure performs in the formation of an integrated fertilizer market, it is informative to examine the system which exists under LAFTA and the limitations which it presents to an increase in trade of fertilizer products.

In general, an examination of the tariff schedules of LAFTA members shows that there are many tariffs and other restrictions to the importation of fertilizers, of a type and magnitude which vary from one product to another and from one country to another. Representative examples of such tariffs and restrictions are those on ammonia, urea, ammonium sulfate, superphosphates, and potassium chloride, as shown on table 6 (4 and 37).

Ammonia imports are free from quantitative restrictions in Argentina, Brazil, Ecuador, Paraguay, Peru, and Uruguay. However, they are subject to high ad valorem tariffs ranging from 20 percent in Brazil to 150 percent in Argentina (and for countries outside LAFTA they are as high as 210 percent). Only in Uruguay is importation of ammonia practically free of restrictions. In Colombia and Mexico, an import license is required for ammonia, and in Chile its importation is prohibited entirely.

Urea imports also require a license in Colombia and Mexico. In Chile, while urea imports are permitted, a prior deposit of 10,000 percent is required, which represents a surcharge equivalent to a duty of 300 percent when interest is taken into account. In the other countries of the zone, urea can be imported in unlimited amounts, with relatively small duties.

Importation restrictions for ammonium sulfate are similar to those for ammonia, with the difference that the duties for it are lower in countries which permit its importation in unlimited amounts. Like ammonia, its importation is prohibited in Chile and subject to prior licensing in Colombia and Mexico.

Table 6.--Import treatment of selected fertilizer products by LAFTA countries, 1966 1/

Product	Country	Duty treatment	Restriction	Customs duties and other import charges				
				Specific duty per 100 kg.	Ad valorem C.i.f.	Assessed value	Additional	Prior deposit
			Symbol	U.S. dollars or other	Percent			
Ammonia	Argentina	A	---	---	211.5	---	5.5	50
		B	---	---	151.5	---	5.5	---
	Brazil	A	---	---	26	---	---	---
	Colombia	A	PL	---	40	---	1.0	120
	Chile	A	IP	0\$1,61	---	---	32.5	?
	Ecuador	A	---	S/.20	25	---	---	15
		B	---	---	---	---	---	25
	Mexico	A	PL	\$0.15	---	10	3.0	---
		B	---	---	---	5	3.0	---
	Paraguay	A	---	---	57	---	15.0	---
Peru	A	---	S/o10.00	30	---	0.8	---	
Uruguay	A	---	---	\$0.006	---	---	4.0	---
Urea	Argentina	A	---	---	2/2.3	---	4.0	0
	Brazil	A	---	---	1.0	---	---	---
	Colombia	A	PL	---	1.0	---	1.0	1.0
	Chile	A	---	0\$0.01	---	---	---	10,000
	Ecuador	A	---	S/.0.20	15	---	---	15
		B	---	---	---	---	---	25
	Mexico	A	PL	\$0.01	---	2	3.0	---
	Paraguay	A	---	---	31	---	5.0	---
		B	---	US\$0.07	11	---	15.0	---
	Peru	A	---	---	20	---	0.8	---
Uruguay	A	---	---	\$0.006	---	---	4.0	---
	B	---	---	\$0.006	9.22	---	4.0	---

Continued--

Table 6.--Import treatment of selected fertilizer products by LAFTA countries, 1966 1/--Continued

Product	Country	Duty treatment	Restriction	Customs duties and other import charges					
				Specific duty per 100 kg.	Ad valorem C.i.f.	Assessed value	Additional	Prior deposit	
			Symbol	U.S. dollars or other	Percent				
Ammonium sulfate	Argentina	A	---	---	2/2.3	---	4.0	---	
	Brazil	A	---	---	1.0	---	---	---	
	Colombia	A	PL	---	1.0	---	1.0	1	
	Chile	A	IP	0\$0.16	?	---	32.5	?	
	Ecuador	A	---	S/o.20.00	15.0	---	---	15	
			B	---	---	---	---	25	
	Mexico	A	PL	\$0.05	---	---	3.0	---	
	Paraguay	A	---	---	31.0	3	5.0	---	
			B	---	US\$0.07	11.0	---	15.0	---
	Peru	A	---	---	---	20.0	---	0.8	---
	Uruguay	A	---	---	\$0.60	---	---	4.0	---
Super-phosphates	Argentina	A	---	---	2/0.3	---	4.0	50	
		B	---	---	0.3	---	5.5	---	
	Brazil	3/A	---	---	46.0	---	---	---	
		4/A	---	---	26.0	---	---	---	
	Colombia	A	PL	---	1.0	---	1.0	1	
		B	---	---	---	---	1.0	---	
	Chile	A	5/IP	0\$0.01	?	---	---	?	
	Ecuador	A	---	S/.0.20	15.0	---	---	15	
		B	---	0	---	---	---	25	
	Mexico	A	PL	\$0.01	---	2	3.0	---	
	Paraguay	A	---	---	31.0	---	5.0	0	
	B	---	---	\$0.07	11.0	---	15.0	0	
Peru	A	---	---	S/o50.00	30.0	---	0.8	---	
Uruguay	A	---	---	\$0.60	100.72	9.09	4.0	---	

Continued--

Table 6.--Import treatment of selected fertilizer products by LAFTA countries, 1966 1/--Continued

Product	Country	Duty treat- ment	Restriction	Customs duties and other import charges				
				Specific duty per 100 kg.	Ad valorem C.i.f.	Assessed value	Additional	Prior deposit
			Symbol	U.S. dollars or other	Percent			
Potassium chloride	Argentina	A	---	---	1/0.3	---	4.0	---
	Brazil	A	---	---	1.0	---	---	---
	Colombia	A	PL	---	1.0	---	1.0	1
		B	---	---	0.0	---	1.0	---
	Chile	A	---	(0\$0.11)	17.0	---	32.5	17
	Ecuador	A	---	(\$1.0.20)	15.0	---	---	15
		B	---	---	0.0	---	---	25
	Mexico	A	PL	---	---	3	3.0	---
	Paraguay	A	---	---	31.0	---	5.0	---
	Peru	A	---	---	20.0	---	0.8	---
	Uruguay	A	---	\$0.60	---	---	4.0	---

1/ In the columns, a dash indicates none; a question mark indicates information was not available.

2/ Reduced from 20-40 percent in 1963.

3/ Content equal to or less than 22 percent P<sub>2</sub>O<sub>5</sub>.

4/ Content greater than 22 percent.

5/ Prohibition lifted, 1966.

Source: LAFTA, Derechos Aduaneros (4).

Key to symbols:

A - most-favored-nation treatment.

B - concessions granted under LAFTA.

PL - prior license.

IP - importation prohibited.

\$ - pesos (Mexico: \$12.50 = US\$1.00); (Uruguay: \$75.50 = US\$1.00 in Nov. 1966).

0\$ - pesos oro (Chile: 0\$4.85 = US\$1.00).

S/o - soles (Peru: S/o 26.82 = US\$1.00).

S/. - sucres (Ecuador: S/. 18.18 = US\$1.00).

US\$ - U.S. dollars (Paraguay).



Imports of superphosphates from member countries are permitted in all of the countries, and only in Mexico are they subject to prior licensing. Surcharges and duties are generally low, except in Uruguay, where the tariff exceeds 100 percent of the c.i.f. value. The import status of potassium chloride is similar to that of the superphosphates. The duties are low, except in Chile.

Certain countries have eliminated customs duties on some fertilizer imports, but with serious qualifications. In 1963, Argentina removed the import surcharges and various taxes on fertilizer materials to stimulate national fertilizer consumption. However, this import freedom is to remain in effect only until "the output of existing or newly established domestic plants should, in the meantime, indicate that the country's requirements for any or all of these materials can be supplied locally at competitive prices." 30/

Likewise, Brazil recently lifted customs duties on certain fertilizers (phosphate rock), but requires the importer to show proof of purchase of 40,000 tons of fertilizer (in terms of P<sub>2</sub>O<sub>5</sub>) from domestic sources, to take advantage of the customs exemption. 31/

The structure of tariffs and the obstacles to the importation of fertilizers in the various countries reflect a philosophy aimed at protecting national industries. Nitrogenous fertilizers (ammonia, ammonium sulfate, etc.) are subject to the highest tariffs, and in Chile, their importation is prohibited. Clearly, in all countries, the fertilizers facing the highest barriers are those whose domestic production is the most highly developed.

According to the ECLA/FAO/IDB study on the use of fertilizers, this restrictive and protective system has very unfortunate economic effects.

Unfortunately...these surcharges and restrictions to trade in fertilizers weigh adversely on the price levels of these products, limiting the possibility of expanding their consumption. Furthermore, an exaggerated protection permits the substitution of inefficient, high-cost enterprises, which are in effect subsidized by the agricultural sector...If the consumption of fertilizers is to increase rapidly in Latin America in order to achieve the increase in agricultural productivity which is required in the next few years, it will be necessary to seriously revise the tariff structure and import regime for these inputs and raw materials. (Otherwise, the foreign exchange that is saved by not importing fertilizers will be spent, at a much higher loss of foreign exchange, in importing food-stuff). (See 37, p. 24.)

Where tariffs within LAFTA are generally low, they usually represent concessions made under the Treaty of Montevideo. Despite these concessions, intra-LAFTA trade in fertilizers has shown little increase over the pre-LAFTA period.

The trade figures of Colombia illustrate this lack of intra-LAFTA trade of fertilizers. In 1963, Colombia imported 144,000 metric tons of organic and

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30/ U.S. Dept. of State Airgram No. A-1241, Buenos Aires, May 28, 1964.

31/ U.S. Dept. of State, CERP Report A-294, Rio de Janeiro (Sept. 23, 1966. Airgram).

inorganic fertilizers. Only 2,350 metric tons, which were comprised mostly of raw materials (nitrates and potash from Chile) were of LAFTA origin (14). Argentina appears to be turning increasingly to sources outside Latin America for chemical fertilizers. (See tables 7 and 8.)

Even when tariff restrictions are removed altogether within a trade area, as for the CACM countries, the countries may continue trading with outside countries. The CACM countries still import one-half of their fertilizer requirements from Europe even though a 10-percent duty is applied to imports from outside the area.

The failure of intra-regional fertilizer trade and regional investment to increase in response to trade liberalization suggests that obstacles other than trade barriers are involved. While the importance of lowering trade barriers should not be understated, it must be recognized that the tariff structure is only one of the many limitations to regional integration of the fertilizer industry.

### Transportation

Cost of transportation can be an important factor in the fertilizer industry especially where there is a great weight difference between the raw material supplies and the finished product, such as that existing between phosphate rock and concentrated superphosphates. Transportation costs usually represent a substantial portion of the cost of raw materials to the producer, and subsequently, of the cost of the finished product to the consumer. Moreover, the distribution of the final product from a plant large enough to exploit the economies of scale associated with the manufacture of fertilizer requires a well developed transportation network.

Transportation within Latin American countries is not good. Most Latin American capitals have better transportation connections with the United States and Europe than with their Latin neighbors or with a large part of their own national territory. There is no all-weather highway between Chile and Argentina. Furthermore, these two countries are not yet joined by a standard-gauge railroad; at the Chilean-Argentine border, all goods must be transferred from a Chilean train of one gauge to an Argentine train of another. Such conditions discourage regional trade and regional investment. In all modes of transportation -- highway, railroad, river, maritime, and air -- the Latin American system is characterized by inefficiencies which need to be remedied if regional integration is to be achieved. In a report prepared by Development and Resources Corporation for the Inter-American Development Bank, transportation is one of the areas singled out as requiring great priority (16 and 11).

### Unseen Investment Barriers

There are few major explicit restrictions on investment in Latin America, but there are many unseen obstacles which stand in the way of "intraregionalizing" investment on the continent. Even with free trade and a complete and efficient transportation system in Latin America, investors would still be frustrated in their attempt to follow the economics of optimum location because of

Table 7.--Imports of organic and chemical fertilizers by four selected Latin American countries, 1961-64

Year and source	Argentina		Brazil		Colombia		Mexico	
	Tons	1,000 U.S. dol.	Tons	1,000 U.S. dol.	Tons	1,000 U.S. dol.	Tons	1,000 U.S. dol.
<u>Organic fertilizers</u>								
<u>1961</u>								
Latin America	0	0	0	0	421	54	0	0
United States	0	0	0	0	0	0	529	48
Rest of world	0	0	3	5	570	61	0	0
<u>1962</u>								
Latin America	0	0	0	0	180	25	0	0
United States	0	0	0	0	1	1	798	59
Rest of world	0	0	3	5	1	1/	0	0
<u>1963</u>								
Latin America	0	0	0	0	70	9	---	---
United States	0	0	0	0	1/	1/	1,116	10
Rest of world	0	0	2	4	1/	1/	108	23
<u>1964</u>								
Latin America	0	0	0	0	25	3	0	0
United States	0	0	0	0	0	0	2,412	47
Rest of world	0	0	0	0	0	0	13	3
<u>Chemical fertilizers</u>								
<u>1961</u>								
Latin America <u>2/</u>	16,604	970	58,294	3,351	1,656	126	8,235	427
United States	4,986	454	117,839	6,323	21,458	1,789	99,988	7,900
Rest of world	35,428	1,936	237,333	12,855	147,843	11,471	77,303	6,550
<u>1962</u>								
Latin America <u>2/</u>	14,011	789	44,766	2,615	927	72	9,230	474
United States	1,490	124	92,702	5,031	31,383	2,190	55,660	4,489
Rest of world	21,590	1,390	309,995	11,276	139,187	11,463	88,146	7,206
<u>1963</u>								
Latin America <u>2/</u>	9,517	513	51,700	2,999	2,287	155	10,419	654
United States	3,336	252	75,134	4,367	66,348	3,340	59,370	3,321
Rest of world	60,749	3,366	520,379	34,227	76,092	5,357	83,381	6,026
<u>1964</u>								
Latin America <u>2/</u>	8,308	424	32,501	1,949	951	67	22,961	1,469
United States	6,399	569	96,237	5,650	118,735	6,787	76,917	6,846
Rest of world	117,459	8,476	258,233	13,037	48,235	3,958	128,756	6,243

1/ Less than 0.5 but more than zero. 2/ Consists entirely of raw nitrates from Chile.

Source: ALALC, Serie Estadística No. 2 (5).

Table 8.--Exports of organic and chemical fertilizers by four selected Latin American countries, 1961-64

Year and destination	Argentina		Brazil		Colombia		Mexico	
	Tons	1,000 U.S. dol.	Tons	1,000 U.S. dol.	Tons	1,000 U.S. dol.	Tons	1,000 U.S. dol.
<u>Organic fertilizers</u>								
<u>1961</u>								
Latin America	40	3	40	$\frac{1}{2}$	0	0	0	0
United States	0	0	7,750	136	0	0	150	5
Rest of world	413	22	2,412	82	20	$\frac{1}{2}$	0	0
<u>1962</u>								
Latin America	0	0	8	$\frac{1}{2}$	0	0	0	0
United States	0	0	3,136	59	0	0	264	25
Rest of world	353	18	317	40	0	0	0	0
<u>1963</u>								
Latin America	0	0	78	2	0	0	0	0
United States	0	0	0	0	0	0	21	1
Rest of world	502	21	1,371	66	0	0	0	0
<u>1964</u>								
Latin America	25	2	75	2	0	0	21	2
United States	0	0	0	0	0	0	1	$\frac{1}{2}$
Rest of world	205	11	4,093	123	0	0	36,033	3,278
<u>Chemical fertilizers</u>								
<u>1961</u>								
Latin America	0	0	6	$\frac{1}{2}$	0	0	5	1
United States	0	0	0	0	184	14	$\frac{1}{2}$	$\frac{1}{2}$
Rest of world	0	0	0	0	0	0	0	0
<u>1962</u>								
Latin America	0	0	5	$\frac{1}{2}$	173	4	$\frac{1}{2}$	$\frac{1}{2}$
United States	0	0	0	0	0	0	0	0
Rest of world	0	0	0	0	0	0	9,321	587
<u>1963</u>								
Latin America	0	0	$\frac{1}{2}$	$\frac{1}{2}$	0	0	0	0
United States	0	0	0	0	0	0	4,228	403
Rest of world	0	0	0	0	0	0	0	0
<u>1964</u>								
Latin America	50	4	25	5	0	0	202	16
United States	0	0	0	0	0	0	0	0
Rest of world	0	0	0	0	0	0	14,965	1,415

$\frac{1}{2}$  Less than 0.5 but more than zero.

Source: ALALC, Serie Estadística No. 2 (5).

lack of, or insufficient development of, financial cooperation and reciprocal credit arrangements. In addition, there is the problem of shortage of foreign exchange, particularly of hard currency, which all Latin American countries face. Regional integration requires complete multilateral convertibility of currencies and multilateral settlement of balances, so that scarce hard currencies need not be used for intraregional commerce and investment. LAFTA is making progress toward removing the foreign exchange barriers but much remains to be done.

Communication also has an important part in making known the possibilities for investment. As long as Latin American businessmen and investors did not look beyond their national horizons (unless it was to Europe and the United States), little could be accomplished in the way of intra-regional industries. Until recently, there was little interchange of information concerning investment possibilities between countries of Latin America. The various regional organizations are making a great contribution with their preinvestment and feasibility studies. Private organizations and businesses in Latin America have also become increasingly active in seeking out and promoting intra-regional trade and investment.

The prospects for future progress in regional integration of the fertilizer industry may be contingent more upon the interest and actions of private investors than upon decisions of the governments. It will be the private investors who will be the moving force behind such an integration plan. The economic advantages for free trade and a huge market have convinced them of the need for sectoral integration. They already have the support of the international organizations and the more progressive governments.

#### IS SECTORAL INTEGRATION ECONOMICALLY SOUND?

An analysis of integration must center around welfare gains and losses accruing to the participating countries. Although it has not been made explicit in any of the formal proposals for integration of the fertilizer sector, it is assumed that integration of the sector would follow the pattern of a customs union rather than that of a simple, free trade area; that is, it would involve a common external tariff for that sector. Ideally, this would result in a more efficient resource allocation, a shift to the lowest-cost source of supply, and the optimum location of production facilities within the area. However, when the theory of sectoral integration is applied to reality it is not so simple. The effect is conditioned by the relative costs of production outside the area and of partner producers under (a) free-trade conditions, (b) preintegration conditions of separate national policies, and (c) customs union conditions.

If, for example, sectoral integration resulted in the consumer paying less for a ton of regionally-produced fertilizer than for a ton produced in a domestic plant, there would be a gain in welfare. If, however, the price were higher than for fertilizer from outside the region under free trade, it could be said that there would be a welfare loss. Such loss, however, will not be considered here, as it is known that the world-wide free-trade assumption is of purely academic interest in the case of Latin America; the Latin American preference has been for very high protective tariff walls, and there is no indication that this would give way to world-wide free trade.

The choice for Latin America then, is limited to national development versus regional integration. It can be assumed (providing transportation costs can be sufficiently lowered) that integration of the industry would cause a welfare gain in that production would be lower-cost with integration than under the prevailing conditions of national development. Furthermore, there would be a gain in welfare and creation of trade as unused plant capacity would be released in response to the opportunities offered by broader markets and economies of scale.

This is all theoretically very interesting and basically sound. However, more information is needed concerning relative costs. A detailed quantitative study of relative costs is a very complicated and difficult undertaking under any circumstances, but particularly so when it concerns Latin America. Such an analysis is being prepared by the Brookings Institution. Martin Carnoy of Brookings, with economists from 10 Latin American research institutions, made a detailed analysis of relative costs and optimum plant location for the nitrogenous fertilizer industry in LAFTA. Carnoy found that under minimum-cost assumptions (with international freight rates lower than they are today) there is a very strong case for three integrated plants producing nitrogenous fertilizer components -- one in Mexico (producing for the Mexican market), one in Venezuela, and one in Southern Chile (Punta Arenas). Under maximum-cost assumptions, with freight rates essentially those which prevailed in 1965, the case for concentration of the industry is not so strong. Under minimum-cost assumptions, the production costs with each country producing its own ammonia and ammonium compounds would run about 15 percent higher than the costs of integrated production, but under maximum-cost conditions, the costs of producing nationally would be about the same as the optimum location figures, and maybe even slightly lower.

However, under both assumptions, the cost of importing all ammonia and fertilizer needs from the United States would run about 50 percent higher than would the cost of integrated production in Latin America, and, under the maximum assumption (prevailing transportation costs), the cost of importing these needs from the United States would be 77 percent higher. 32/

Brookings researchers plan to consider next the problem of welfare costs and "indifferent exchange rates" -- those rates of exchange at which a country would be indifferent as to whether the product was local or imported, or whether it was imported from one country rather than another.

Another question to be analyzed is whether, as suggested by Balassa and other critics of sectoral integration, the integration of only one industry will cause serious imbalances and will benefit some partners and harm others. It is not a problem to be ignored. As the Development and Resources Corporation report points out:

The integration of investment combined with freer trade will be beneficial to all countries to the extent that it makes goods generally cheaper. But on the other hand, some countries

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32/ Martin Carnoy, The Cost of Production and Transportation of Nitrogenous Fertilizers in the Latin American Free Trade Association, Preliminary Draft. The Brookings Institution, Washington. May 1966.

naturally fear the possibility that a change in the geographical location of capacity, particularly in the basic industries, may adversely affect their nations' economic development. The reasons for such fears may be more apparent than real, for overall benefits to each country are likely to outweigh considerably any particular detrimental effects. Nevertheless, at present we know very little about the relative strength of the beneficial effects, such as cost reduction, and the deleterious effects of capacity relocation. An appraisal of these effects is of critical importance in paving the way for future decision-making on investment policy and trade policy. (See 16, pp. 96, 97.)

The report then recommends that several studies be undertaken to provide a better basis for decision-making. (See appendix for these recommendations.)

A major problem would be the plight of existing plants unable to withstand competition on a regional basis. However, there are ways to mitigate or even prevent harmful effects to existing industries, and efforts to avoid such effects should accompany the integration process. Briefly, these measures are adjustment assistance and planned investment. Adjustment assistance could be used, simply, to assist firms in making the adjustment to increased competition. It could be used to modernize an inefficient plant, or, if the plant were at an absolute disadvantage, to phase it out, retrain the workers, and help establish another activity to take its place. Adjustment assistance would be more important in integration of an older industry than in a relatively new one, such as the fertilizer industry, although the latter is by no means free from uneconomic plants. While the field is still relatively uncrowded, investment could be planned to avoid uneconomic plant locations and unnecessary duplication of effort.

One further remark needs to be made about sectoral integration theory and its application to the fertilizer industry in Latin America. Integration of one sector is not meant to be an end in itself but rather a step toward further integration, which will spread from sector to sector. Therefore, many of the imbalances that might be caused by integration of one industry would be counterbalanced by the inclusion of a second key sector, and a third, and so on. Furthermore, the faster the economic growth of the region (and it is hoped that integration would speed up this growth), the less would be the disruptive effects from relocation of investment in any one industry.

## APPENDIX

### RECOMMENDATIONS FOR FUTURE STUDIES RELATING TRADE POLICY TO INVESTMENT POLICY 1/

Studies should be made relating trade policy to investment policy; certain other studies are also required to advance integration.

Tariff policies and agreements to facilitate trade will be effective only if there is also adequate investment in efficient facilities for producing and for transporting the goods to be traded. A number of studies have been made of economic and other aspects of integration in Latin America; yet much more investigation needs to be done to improve decision-making in the future. There are four particular areas where studies are needed and where the information acquired could be immensely useful in shaping future action programs. Each of them would ultimately lead to a number of substudies.

Studies in these categories are quite complex. They involve appraising a large number of variables. But they can begin to yield illuminating results as they are in process. They will, in fact, be carried out as a series of successive approximations, and would be continued only so long as significant additional contributions can thereby be acquired toward the solution of significant problems. Sampling methods and systems analysis techniques can be especially useful where they are appropriate. To the fullest possible extent consistent with progress in the investigations, wide participation in planning and executing them should be secured from integration and regional agencies, the countries, and the private sector involved. The studies we now recommend are as follows:

a. A quantitative study of the prospects for growth in intrahemispheric trade is needed. This should consider alternative estimates of costs of production, costs of transportation, likely levels of demand and import propensities, tariff levels, and the like. In short it should show the various likely outcomes for different configurations of conditions on cost and demand. It should not choose what is regarded as the single most likely (or desirable) case (which is apt to be biased). What is needed most urgently is a study of the alternatives and the likely sensitivity of trade to policy changes.

b. A quantitative study of the likely future location of capacity and investment in major industries is needed. This must take account of locations and costs of present capacity, levels of future demand, scale economies, etc. It should explore the likely outcomes under different assumptions as to policies in effect on trade and national development, and hence is related to study (a) above. A separate study might be made for each of a few major industries such as iron and steel, nonferrous metals, chemicals (including petrochemicals

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1/ Quoted from Multinational Investment Programs and Latin American Integration. (See 16, pp. 20-22.)



and fertilizer), pulp and paper, mechanical industries. Some work along these lines has been done by ECLA, LAFTA and ILAFA, but much more is needed.

c. A study is needed of the potential competitiveness in world markets of the products of major Latin American industries which will be appropriately related to study (b) above. It should identify and analyze the major obstacles to achieving a competitive level of costs, especially in such a basic industry as iron and steel, and recommend ways to overcome them. Another phase of the study of competitiveness will be to demonstrate the value of broader regional markets as expanding opportunities for Latin American entrepreneurs.

d. A study of the demand for and costs of transportation systems linking the countries is needed. This ultimately should be a systems study that compares and combines the various transportation modes. Such a study would provide a basis for much sounder decisions on transportation projects. Initially a smaller study might be made of economies from closer cooperation in operation of all Latin American civil international air lines.

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