

Fertilizer Project

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CERRO DE PASCO CORPORATION

40 WALL STREET, NEW YORK 5, N. Y.

MEMORANDUM

No. 24-52

May 8, 1952

To: The Directors
From: R. P. Koenig
Subject: Fertilizer Program

CONFIDENTIAL

During the last few months the management has been studying the possibilities of additional profits from the manufacture of sulphuric acid for the use in the production of ammonium sulphate and superphosphate in Peru.

On March 31, 1952, Alfredo Ferreyos (formerly Ambassador from Peru to the United States), Enrique Dibós (a director of Compañía Administradora del Guano), Rollin Thorne and Guido Sacerdote - all directors of Fertilizantes Sintéticos, S. A. (FERTISA) - called on me in Lima to determine whether there was any mutuality of interest in their desire to enter the chemical fertilizer business in Peru and the interest of Cerro de Pasco in finding an outlet for additional sulphuric acid. I informed them, subject to, among many other considerations, the approval of the Board of Directors, that such a possibility existed. Attached hereto is an appendix which covers the information available to date on this subject. A brief summary follows:

The fertilizer demands in Peru are presently partially satisfied by guano. This source is inadequate and unreliable. Nitrogenous fertilizer demands, in excess of the guano supply, are now only partially satisfied by the importation of small quantities of Chilean salitre and ammonium sulphate. It is provisionally estimated by various private and governmental agencies in Peru that 100,000 tons of ammonium sulphate could be consumed if producing facilities for this fertilizer were erected in Peru.

Preliminary estimates indicate that facilities to produce 100,000 tons per year of ammonium sulphate will require a total of \$10,000,000 to increase the sulphuric acid plant capacity of Oroya by 225 metric tons per day, erect an ammonia plant having a full capacity of 75 metric tons of ammonia per day and an ammonium sulphate plant capable of producing 300 metric tons of ammonium sulphate per day. This program is referred to as Project 1 in the appendix. Preliminary figures are also given, under Project 2, for facilities to produce 100 metric tons of ammonium sulphate per day. This program would involve an investment about \$5,000,000 in plants.

A third program, Project 3, is also presented, costing \$3,000,000, to produce 40 metric tons of ammonium sulphate per day, but the prospects of this plant being economical have yet to be proven.

The presently most attractive of the various alternatives is that the Corporation would produce sulphuric acid for sale to FERTISA and that FERTISA would produce and sell the ammonia and ammonium sulphate. Based on a selling price of sulphuric acid by the Corporation to FERTISA of \$20 per metric ton, Project 1 indicates an annual profit to us after depreciation but before income taxes of \$1,000,000 on an investment of \$2,000,000 in the acid plant. For this project, FERTISA might have an annual profit after depreciation but before income taxes of \$1,850,000 on its investment of \$10,000,000 consisting of \$8,000,000 for plants and \$2,000,000 for necessary working capital. Both of these profits are contingent on the sale of 100,000 metric tons of ammonium sulphate. The above figures are given to illustrate the potential profits in this business and are subject to confirmation, or change, by more detailed study.

It is recommended that steps should be taken to arrange for a market survey and an economic evaluation of the various projects listed in the attached memorandum. It is estimated that these two studies would cost about \$65,000.

The following program is suggested for further investigation:

1. After deciding whether this Corporation wishes to have partners, determine whether the present stockholders of FERTISA are acceptable partners and whether FERTISA has suitable articles of incorporation and by-laws for the activities contemplated.
2. If the answer to 1 above is affirmative, accept the offer made by Rollin Thorne to this Corporation, dated April 18, 1952, to permit this Corporation to acquire up to 40% of the common stock of FERTISA for paid-in capital, subject to
 - (a) the present stockholders of FERTISA subscribing to 60% of the common stock of FERTISA for paid-in capital;
 - (b) both interests agreeing to provide FERTISA with a total of \$100,000 in U. S. dollars to finance the cost of the market survey and economic evaluation; and
 - (c) the Board of Directors of this Corporation deciding that (i) the findings of the market survey and economic evaluation, as and when available, (ii) the political environment and (iii) other valid business reasons, justify the investment of further capital in engineering, plant facilities and working capital.

About six months will be required to complete the market survey of experience now available and economic evaluation.

Enclosure

Robert P. Koenig

To Messrs. D. H. Allen
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A P P E N D I X T O
M E M O R A N D U M

No. 24-52

During the past few months, the management has been studying the economic, and other factors, pertaining to the production of substantial quantities of sulphuric acid for use in the manufacture of chemical fertilizers in Peru. This memorandum outlines these factors as they relate to possible action which may be taken by the Corporation.

The waste gases discharged from the smelter stacks at Oroya contain large quantities of sulphur dioxide. Part of this gas is now being cleaned, converted into sulphuric acid and sold at the rate of about 40 short tons per day. Substantially larger tonnages of sulphuric acid can be produced if an attractive market should be developed for the utilization of such production. The most promising possibilities for substantial additional consumption of sulphuric acid are in the manufacture of fertilizers requiring sulphuric acid as a raw material, such as ammonium sulphate and superphosphate.

The following aspects of this problem are hereinafter set forth for the information of the Board of Directors together with a proposed fertilizer program:

- I POSITION OF AGRICULTURE IN THE FOREIGN TRADE OF PERU
- II PERUVIAN FOOD SUPPLY
- III PRESENT USE OF FERTILIZERS IN PERU
- IV SOIL DEFICIENCIES
- V MARKETS AND PRICES
- VI PRODUCTION FACILITIES
- VII POSITION OF CERRO DE PASCO IN MARKETING FERTILIZERS
- VIII FERTILIZER CORPORATION
- IX FERTILIZER PROGRAM
- X ADVANTAGES AND DISADVANTAGES

I - POSITION OF AGRICULTURE IN THE FOREIGN TRADE OF PERUAgricultural Areas.

The principal exports of agricultural products from Peru are cotton and sugar. Generally speaking, sugar is grown in the coastal area north of Callao and cotton is grown south of Callao, except for the Department of Piura. Servicio Cooperativo Interamericano de Produccion de Alimentos (SCIPA - an agency sponsored by the United States Government) has made a detailed study of the principal crops grown in the various agricultural areas of Peru.

Agricultural Exports.

The Peruvian Government publishes statistics (Anuario del Comercio Exterior) which show the distribution of exports. The following tabulation summarizes these exports for the calendar year 1950. The sum of the value of the exports of food products (Class I) and of industrial agricultural products (Class VI) exceeds the value of mineral products (Class III) by about 50%. The exports of agricultural products generate an important part of the foreign exchange available to Peru.

1950 - EXPORTS BY CLASSIFICATIONS

<u>SECTION</u>	<u>DESCRIPTION</u>	<u>THOUSANDS</u>	
		<u>T.M.</u>	<u>SOLES</u>
I	Edibles	327	552,453
II	Greases and waxes	---	73
III	Mineral products		
	Metallic	278	714,237
	Non-metallic	2	644
	Fuel and oil	1,089	388,587
IV	Forest products	12	24,087
V	Animal products	9	137,977
VI	Industrial agricultural products	75	1,021,323
VII	Manufactured products	9	32,291
VIII	Not otherwise classified	1	6,041
IX	Government species	---	3,677
X	Re-exports	1	5,372
	Totals	1,803	2,886,762

Agricultural Imports.

Wheat has to be imported to satisfy the Peruvian food requirements. During 1950, these wheat imports totaled 243,000 metric tons and had a value of S/ 307,936,000 (\$20,000,000). Miscellaneous foodstuffs are imported at the rate of about 60,000 metric tons per annum.

II - PERUVIAN FOOD SUPPLYPopulation.

The population of Peru has increased from approximately 6,200,000

in 1940 to 8,500,000 in 1950 - an increase of 2,300,000 persons, or 37%. During the same period the population of the Department of Lima increased about 50%.

Adequacy of Food Supply.

If the population of Peru continues to increase at the above rate and if industrialization further increases the percentage of the population dependent on others for food, either more food must be produced in Peru or exports must be increased to generate the exchange required to purchase some of the necessary food abroad.

III - PRESENT USE OF FERTILIZERS IN PERU

Guano.

Guano from the islands off the Peruvian coast constitutes the major source of fertilizer in Peru. The income account of Compania Administradora del Guano for the calendar year 1950 shows sales of 220,028 metric tons of guano rico containing 2,858,161 units of nitrogen (1), or 13% nitrogen. Ninety-two percent (92%) of this tonnage was sold at a price of S/ 20.00 (\$1.33) per metric ton unit of nitrogen. The same statement also shows the sale of 1,314 metric tons of guano pobre at S/ 214. (\$14.25) per metric ton. Guano pobre contains about fourteen percent (14%) phosphoric acid and less than two percent (2%) nitrogen. These figures result in a selling price for guano pobre of about \$1.00 per metric ton unit of phosphoric acid.

The population of sea birds on the guano islands is inadequate to produce sufficient guano for the Peruvian agricultural demands. Guano is allocated. The sea birds are also subject to diseases and have insufficient food when the Humbolt current shifts which causes wide fluctuations in bird population. Guano is an inadequate and unreliable source of supply for the future fertilizer requirements of Peru.

Compania Administradora del Guano has a monopoly on the exploitation and distribution of guano. It also has a monopoly on the imports of fertilizers, on a duty-free basis. Senor Enrique Dibós D., a director of this company, informed me that he believed that the manufacture and sale of chemical fertilizers, produced in Peru, would be outside the control of this monopoly.

Chilean Nitrate.

The inadequate guano production is now supplemented, in part, by imports of Chilean salitre (sodium nitrate). This fertilizer accelerates a tardy growth but is not as desirable for the alkaline soil conditions of the coastal areas of Peru as ammonium sulphate. During recent years, Peruvian imports of Chilean salitre have been as follows:

(1) A unit of nitrogen (or phosphoric acid) is the content of these chemicals in percent and, in the case of a metric ton, is equal to 22 pounds.

IMPORTS OF CHILEAN SALITRE

<u>YEAR</u>	<u>M. T.</u>	<u>SOLES</u>
1936	7,000	790,000
1937	10,000	1,294,000
1938	8,000	1,027,000
1939	13,000	1,833,000
1940	7,000	831,000
1941	7,000	1,183,000
1942	31,000	5,505,000
1943	40,000	10,496,000
1944	25,000	6,654,000
1945	28,000	7,643,000
1946	37,000	10,832,000
1947	29,000	7,605,000
1948	33,000	13,999,000
1949	10,000	11,772,000
1950	8,000	7,563,000

Payment is made for these Peruvian imports of Chilean salitre in United States dollars.

Other Fertilizers.

Until 1948, the statistics for fertilizer imports were totaled for Chilean salitre and "other countries". Imports under the second category were negligible. In 1948, the fertilizer imports were reclassified and imports of ammonium sulphate, potassium nitrate, urea and other nitrogenous fertilizers were reported as one group (Partida 1067). Ammonium sulphate constituted most of this group and for recent years the imports under this heading have been -

IMPORTS OF AMMONIUM SULPHATE

<u>YEAR</u>	<u>METRIC TONS</u>
1948	3,200
1949	2,200
1950	6,000
1951	18,000

IV - SOIL DEFICIENCIESDeficient Elements.

Peru can be divided into three distinct agricultural areas - coastal, sierra and montaña. The coastal and sierra areas have been utilized for centuries and are deficient in many elements, according to agricultural standards in the United States, but the major deficiencies are nitrogen in the coastal areas and phosphorus in the sierra. For the purpose of this memorandum, the undeveloped montaña area has been eliminated. In the sierra, crop rotation has improved the nitrogen availability. Guano pobre (14% phosphoric acid) has been used effectively, to the extent available, on experimental agricultural plots in the sierra and has demonstrated increased crop yields.

In the cotton and sugar areas on the coast, the soils are deficient in nitrogen and the value of the crops makes it economical to apply guano rico (13% nitrogen), also to the extent available, and to supplement guano rico with Chilean salitre or imported ammonium sulphate.

Field Tests.

In the United States, work controlled by the Department of Agriculture, state sponsored agricultural field tests and many private records show precisely the increased crop yields which can be obtained by specific fertilizer applications to particular crops under their soil conditions. Then, knowing the value of the increased crop yields and the cost of the fertilizer applications, the economic justification of the fertilizer applications are readily determined. Such information exists in Peru to a limited extent for guano, but, except for data on the utilization of ammonium sulphate by the large producers of cotton and sugar, information does not exist on the economic justification of superphosphate and ammonium sulphate applications. Before most farmers will spend appreciable funds on fertilizer applications, they must accept authentic information showing that increased crop yields will be obtained by the use of fertilizers under their particular soil and rain conditions and that these increased yields will more than pay for the cost of the fertilizers. This information would include -

- (a) a comparison of crop yields from fertilized plots with adjacent non-fertilized plots, each having the same soil conditions and growing the same crop.
- (b) value of the increased crop yield,
- (c) cost of the fertilizer application, and
- (d) possible cumulative effects of fertilizer applications.

Interest of SCIPA in Fertilizer Program.

There are some agricultural experimental stations in Peru where SCIPA has been cooperating with the Peruvian Government to develop techniques which will improve Peruvian agriculture. No work, however, has been done by this group on the application of superphosphate or ammonium sulphate - the two fertilizers which must eventually satisfy a large part of the fertilizer demand in excess of the maximum possible production of guano. Mr. John R. Neale, head of SCIPA in Peru, is familiar with the interest of this Corporation in the possible production of additional sulphuric acid for fertilizer manufacture and is prepared to initiate work in the agricultural experimental stations to obtain the data necessary to educate possible users in the economic justification of superphosphate and ammonium sulphate applications.

V - MARKETS AND PRICES

Ammonium Sulphate Market.

During 1950, the nitrogenous fertilizer demands of Peru were par-

tially satisfied by 220,028 metric tons of guano rico containing 13% nitrogen, 6,000 metric tons of imported ammonium sulphate containing 20% nitrogen and 8,000 metric tons of Chilean salitre containing 16% nitrogen - a total nitrogen content of 31,000 metric tons which is equivalent to 155,000 metric tons of ammonium sulphate. It has been estimated, by Mr. John R. Neale and other recognized agricultural authorities, that Peruvian agriculture might consume a total of 100,000 metric tons per annum of ammonium sulphate as compared with 18,000 in 1951. Such estimate, or modifications thereof, should be supported by the interpretation of the results of comparative field tests on various crops to which could be applied the value of the increased crop yield and the cost of the fertilizer application.

Nitrogen Prices in 1950.

Guano rico (13% nitrogen) sold at seaports for S/ 20.00 (\$1.33) per metric ton unit of nitrogen. Chilean salitre (16% nitrogen) sold at seaports for \$68.00 per metric ton or \$4.25 per metric ton unit of nitrogen. The cost to the farmers of the imported ammonium sulphate is unknown. The foregoing price differential between guano rico and Chilean salitre clearly illustrates the Peruvian Government's pricing policy. Under such a price structure, there would be no imports of nitrogenous fertilizers if the supply of guano rico had been adequate in supply to meet the demands. On the other hand, the farmers who paid \$68.00 per metric ton for Chilean salitre expected sufficient increase in crop value to more than pay for the cost of the Chilean salitre.

At the present time, the price of ammonium sulphate in the United States is about \$55.00 per metric ton. Adding \$10.00 for ocean freight and insurance, we obtain a price of \$65.00 per metric ton for ammonium sulphate CIF Peruvian seaport, or \$3.25 per metric ton unit of nitrogen.

Future Nitrogen Prices.

A future selling price for ammonium sulphate produced in Peru would have to be less than the cost of ammonium sulphate imported duty-free. This difference might be 10% of the sum of the prices of ammonium sulphate FAS U. S. shipping port and of ocean freight, or the price FAS U. S. shipping port plus one-half of the ocean freight. There is but slight difference in final price, and for this preliminary study, we can use \$60.00 per metric ton for the estimated future selling price of ammonium sulphate produced in Peru, or \$3.00 per metric ton unit of nitrogen. The important point is the differential between this price and the price of \$1.33 per metric ton unit of nitrogen in the form of guano rico in 1950. Compania Administradora del Guano will be approached to determine their pricing policy for guano rico, if an ammonium sulphate plant should be erected in Peru to supply the nitrogenous fertilizer demands in excess of the supply of guano rico.

Superphosphate Market.

The market for superphosphate will have to be developed. The use of guano pobre (14% phosphoric acid) has shown some remarkable results in the soils of the sierra. We are now contemplating field demonstration tests, both on our ganaderas and in the Peruvian agricultural experimental stations, under the general direction of SCIPA, to obtain data on the increased crop yields which might result from the application of imported superphosphate. Although superphosphate is secondary to ammonium sulphate, it is part of our fertilizer program

Superphosphate Prices.

In 1950, Compania Administradora del Peru sold guano pobre (14% phosphoric acid) at a price of about \$1.00 per metric ton unit of phosphoric acid. There are no comparable prices for imported superphosphate. The following preliminary estimate shows that superphosphate (20% phosphoric acid) manufactured in Peru would have to sell at about \$40.00 per metric ton to show a profit, or about \$2.00 per metric ton unit of phosphoric acid:

COST OF IMPORTED PHOSPHATE ROCK

Phosphate rock (75% tricalcium phosphate) FAS Tampa	\$ 8.40
Loading charge	0.35
Trimming (if necessary)	0.06
Ocean freight	10.00
Insurance	0.30
Total CIF Callao - long ton	<u>\$19.11</u>

MANUFACTURE OF SUPERPHOSPHATE
NEAR OROYA

	<u>Metric Ton</u>
0.56 MT of phosphate rock at \$19.11 long ton CIF Callao	\$10.50
Charge CIF Callao to FOB Oroya at \$11.00 MT	<u>6.15</u>
Cost of 0.56 MT of phosphate rock FOB Oroya	\$16.65
0.35 MT of 100% sulphuric acid at \$20. MT (includes profit)	<u>7.00</u>
Cost of raw materials	\$23.65
Manufacturing cost	4.00
Bags	<u>3.00</u>
Total direct cost	\$30.65
Plant overhead - 10% of direct cost	<u>3.06</u>
Total plant cost per MT of superphosphate	\$33.71
Administration, selling expenses, capital charges and profit	<u>6.29</u>
Estimated selling price of superphosphate FOB Oroya	\$40.00

Marketing Problems.

In addition to the price problems, the marketing of fertilizers manufactured in Peru will involve all of the fertilizer marketing problems in other countries. Farmer educational programs, financed by the Peruvian Government, should work in parallel with the production of fertilizers. Credit facilities available to farmers will be required in many cases to finance the fertilizer consumption from the time of delivery to the farmer until the crop is harvested. (The fertilizer producer should receive payment at the time of delivery of the shipping documents for the fertilizer). There may be price competition between guano rico and ammonium sulphate. Since it is expected that the supply of guano rico will continue to be inadequate, allocations, in some form, will have to be continued in order that each buyer may obtain a fair portion of the guano rico. Fertilizer prices are questions in which every Peruvian will have a direct or indirect interest and the Peruvian Government will be active in all aspects of the marketing of manufactured fertilizers as is the case today in the activities of the Guano company.

VI - PRODUCTION FACILITIES

Ammonium Sulphate Plant Location.

Ammonium sulphate would be produced from synthetic ammonia and sulphuric acid. Synthetic ammonia is produced from hydrogen and nitrogen. Hydrogen is produced from coke, from natural gas, from oil refinery gases, or by the electrolysis of water. Since there are no natural or oil refinery gases now available, the hydrogen will have to be produced from coke or by the electrolysis of water. Coke for the manufacture of ammonia would be produced from coal originating in the sierra or near Chimbote, or imported. If the first market to be satisfied is the coastal area, the nearer the ammonium sulphate is produced to such market, the lower will be the transportation charges on the product.

Ammonium Sulphate Plant Costs.

Three different capacities are being considered for ammonium sulphate plants. These capacities and preliminary construction cost estimates are shown in the following tabulation:

POSSIBLE PLANTS UNDER CONSIDERATION

<u>PROJECT</u>	<u>PLANT CAPACITIES</u> <u>METRIC TONS PER DAY</u>		
	<u>1</u>	<u>2</u>	<u>3</u>
Ammonia plant	75	25	10
Sulphuric acid plant	225	75	30
Ammonium sulphate plant	300	100	40

C O N S T R U C T I O N C O S T

U. S. Dollars

<u>PROJECT</u>	<u>1</u>	<u>2</u>	<u>3</u>
By Cerro de Pasco Corporation			
Sulphuric acid plant	\$ 2,000,000	\$1,000,000	\$ 500,000
By fertilizer corporation			
Ammonia plant	5,500,000	3,000,000	2,000,000
Ammonium sulphate plant	1,000,000	500,000	250,000
Plant and community services	1,500,000	500,000	250,000
Total	\$ 8,000,000	\$4,000,000	\$2,500,000
 <u>GRAND TOTALS</u>	 <u>\$10,000,000</u>	 <u>\$5,000,000</u>	 <u>\$3,000,000</u>

Ammonium Sulphate Producing Costs.

Any statements made about producing costs, before information is available as to the plant location, cost of the coke, sulphuric acid and power, must be taken as an indication of magnitude only.

In the first instance, the cost of producing ammonium sulphate in Peru must be less than the cost of imported ammonium sulphate. Next, the cost of producing ammonium sulphate in Peru must be less than the costs resulting from the purchase of anhydrous ammonia in the United States, transporting this ammonia to the Callao area and acidifying with sulphuric acid produced at Oroya.

The following tabulation shows a preliminary estimate of the producing costs of ammonium sulphate in each of the three projects under consideration:

AMMONIUM SULPHATE
PRODUCING COST PER METRIC TON

U. S. Dollars

<u>PROJECT</u>	<u>1</u>	<u>2</u>	<u>3</u>
Ammonia	20.00	25.00	30.00
Sulphuric acid, includes profit	15.00	15.00	15.00
Total raw materials	35.00	40.00	45.00
Manufacturing costs	1.50	4.00	8.00
Plant costs, unbagged	36.50	44.00	53.00
Bags	3.00	3.00	3.00
Plant costs, bagged	39.50	47.00	56.00
Overhead	1.00	3.00	7.00
*Depreciation	1.00	1.50	2.00
Total costs	41.50	51.50	65.00
Profit before income taxes	18.50	8.50	5.00
Selling price	60.00	60.00	60.00

*Sulphate plant only. Depreciation on ammonia and sulphuric acid plants included in the cost of these items.

As stated above, these figures must be taken as an indication of magnitude only. Although there is a profitable Chemical Construction Corporation ammonia plant in India, producing 10 tons per day from electrolytic hydrogen in a high price market for ammonium sulphate, it appears as if Project 3 looks rather hopeless under the Peruvian conditions.

Preliminary Estimate of Return on Investment in Ammonium Sulphate.

Although the construction and producing cost figures, herein given, are of a preliminary nature, for purposes of illustration, the following tabulation shows the return on the investment estimated for each ammonium sulphate project, on the assumption that the agreed to selling price for sulphuric acid is \$20.00 per metric ton:

ESTIMATED RETURN ON INVESTMENT

<u>PROJECT</u>	<u>1</u>	<u>2</u>	<u>3</u>
Ammonium sulphate, t/d	300	100	40
Investment by Cerro de Pasco Corporation			
Plant	\$ 2,000,000	\$1,000,000	\$ 500,000
Working capital	None	None	None
Operating profit	\$ 1,000,000	\$ 300,000	\$ 100,000
Net profit after 40% income tax	\$ 600,000	\$ 180,000	\$ 60,000
Return	30.%	18.%	12.%
Investment by fertilizer corporation			
Plants	\$ 8,000,000	\$4,000,000	\$2,500,000
Working capital	2,000,000	600,000	250,000
Total capital	\$10,000,000	\$4,600,000	\$2,750,000
Operating profit	\$ 1,850,000	\$ 300,000	\$ 65,000
Net profit after 40% income tax	\$ 1,110,000	\$ 180,000	\$ 65,000
Return	11.1%	3.9%	2.3%

Superphosphate Plant Location for Sierra Market.

Since there is no phosphate rock in Peru, superphosphate would have to be produced by the treatment of imported phosphate rock with sulphuric acid. If the first superphosphate market to be satisfied should be in the sierra area, this phosphate rock could be hauled to the vicinity of Oroya, treated with sulphuric acid produced at Oroya from waste smelter gases, and marketed in the sierra area. Under these circumstances, the freight costs on the superphosphate to be consumed in the sierra would be a minimum.

Superphosphate Plant Costs.

A small commercial superphosphate plant having a capacity of 50 metric tons of superphosphate per eight hour shift, or 15,000 metric tons per annum, would cost about \$400,000. This plant would consume 20 short tons of 100% sulphuric acid per day.

Superphosphate Plant Location for Coastal Market.

If a market should develop on the coast, or in the export market in competition with United States and Canadian procedures, another small superphosphate plant could be considered at a seaport location. In this case, there would be the problem of a supply of sulphuric acid. This problem would be solved

- (a) by the production of sulphuric acid at Oroya from waste smelter gases and the transportation of the acid, in railroad tank cars, to a superphosphate plant located near Callao;
- (b) by the burning of pyrite in a sulphuric acid plant adjoining the superphosphate plant; or

- (c) by the production of sulphuric acid at a sea-coast smelter (yet to be built) from waste smelter gases and the treatment of phosphate rock in an adjoining superphosphate plant.

Preliminary Estimate of Return on Investment in Superphosphate.

The profits from the manufacture and sale of superphosphate will be small. Its attractiveness is an additional outlet for sulphuric acid. No estimate of the possible return on the investment can be made until figures are available as to the market.

VII - THE POSITION OF CERRO DE PASCO IN MARKETING FERTILIZERS

The basic policy of this Corporation should be to encourage the manufacture in Peru of ammonium sulphate (and possibly superphosphate) as an outlet for sulphuric acid produced from waste smelter gases. Within this framework, one of the following general positions can be taken:

- A. Produce and market these fertilizers;
- B. Produce these fertilizers for sale to a fertilizer corporation for marketing;
- C. Produce sulphuric acid and ammonia for sale to a fertilizer corporation for the production and marketing of these fertilizers; or
- D. Produce only sulphuric acid for sale to the fertilizer corporation.

Because of the marketing problems stated on page 7, it would seem preferable to eliminate position A above. The production of fertilizers for sale to another corporation for marketing, B above, would eliminate our direct contact with the buyers and agricultural credit agencies, but it would have the disadvantage of placing the full plant investment on Cerro de Pasco Corporation and of permitting any pressure on market prices to be pushed through the selling commission of a marketing corporation onto the transfer price from Cerro de Pasco Corporation to the marketing corporation; this possibility is eliminated. The sale of sulphuric acid and ammonia to another corporation for the production and marketing of superphosphate and ammonium sulphate, C above, would give Cerro de Pasco Corporation control of the costs of raw material to the fertilizer corporation but would place on this Corporation the costs of the expensive facilities necessary to produce anhydrous ammonia; this possibility is also eliminated. The simplest step is for us to produce sulphuric acid, D above, and place all other activities in the fertilizer corporation. This position is recommended pending further developments.

VIII - FERTILIZER CORPORATION

On the assumption that Cerro de Pasco Corporation will produce the necessary acid for sale to a fertilizer corporation, we can outline some of the points to be taken into consideration.

Fertilizantes Sintéticos S. A. (FERTISA)

A few years ago, this corporation was formed in Peru by certain Peruvians for the purpose of worming into the producing and marketing of ammonium sulphate which might have been manufactured at Chimbote, if the Corporación del Santa had erected a zinc refinery. The present net assets of FERTISA are unknown, but Sr. Alfredo Ferreyros (formerly Ambassador from Peru to the United States), Enrique Dibós (a director of Compañia Administradora del Guano), Rollin Thorne and Guido Sacerdote - all directors of FERTISA, called on me in Lima on March 31, 1952 to determine whether there was any possibility of a mutuality of interest between FERTISA and Cerro de Pasco Corporation in the fertilizer business. I informed these visitors that such a possibility existed, subject to approval by the Board of Directors.

Compañia Administradora del Guano.

The production of guano pobre (14% phosphoric acid) is negligible - 1,314 metric tons in 1950. Efforts might be made by FERTISA to purchase all production of guano pobre and mix it with superphosphate to produce GUANO ENRICADO (18% phosphoric acid). If this step could be accomplished, the price differential between the present selling price of guano pobre of \$1.00 per metric ton unit of phosphoric acid and the estimated selling price of \$2.00 per metric ton unit of phosphoric acid for superphosphate produced in Peru would be eliminated. The mixture would then be sold at a 10% discount from imported superphosphate.

The larger tonnage of guano rico - 220,028 metric tons sold in 1950 - makes a similar arrangement for this product more difficult but it should be attempted or the fertilizer corporation must be prepared to deal with a situation which involves trying to sell ammonium sulphate (20% nitrogen) at \$3.00 per metric ton unit of nitrogen in a market partially satisfied by guano rico (13% nitrogen) selling at about \$1.33 per metric ton unit of nitrogen.

Arrangements with Peruvian Government.

Agreements should be made with the Peruvian Government, prior to significant capital subscriptions, which cover, among others, the following points:

- (a) Importation of plant facilities duty-free;
- (b) Importation of phosphate rock and fertilizer bags duty-free;
- (c) Income tax liabilities; and
- (d) Convertibility of exchange for purchase of raw materials, operating supplies, interest and amortization on indebtedness and dividends.

Stockholders of FERTISA.

Present thought is for Peruvian nationals to hold 60% and Cerro de Pasco Corporation to hold 40% of the common stock representing paid-in

capital. Consideration should be given to our holding 49%, present stockholders of FERTISA holding 49% and 2% in escrow, or in friendly hands, which we could vote as long as there is any debt outstanding. No preferred or common stock is to be outstanding unless issued for paid-in capital. Representation on the Board of Directors would be proportional. Arrangements should be made for subscription to a part of the Peruvian capital by holders of small lots.

Bank Loans.

After the fertilizer program has become crystalized, a study should be made to determine the extent to which a part of the necessary capital might be financed by bank loans or otherwise. The Export-Import Bank has looked with favor on similar projects in other countries.

Management Contract between Cerro de Pasco Corporation and FERTISA.

Cerro de Pasco Corporation would obtain a management contract to be effective for a period to be negotiated, but not less than the debt amortization period.

Sulphuric Acid Supply.

The price at which sulphuric acid is sold by Cerro de Pasco Corporation to FERTISA will have an important influence on the profits of FERTISA. A contract should be negotiated in which Cerro de Pasco Corporation agrees to supply all of FERTISA's sulphuric acid requirements. This contract should be based on the price of sulphur at Gulf of Mexico Ports plus operating costs, depreciation and profit subject to suitable escalator clauses and should be approved by the Board of Directors of FERTISA to avoid placing Cerro de Pasco Corporation in a position of dealing with itself.

Power.

If FERTISA should have plants near Cerro de Pasco's power supply, we could agree to supply the necessary power, as and when available, at going rates to outsiders under a long term contract with suitable escalator clauses and other provisions.

Ferrocarril Central Tariffs.

Since a fertilizer operation will create railroad traffic not contemplated at the time of preparation of the existing railroad tariffs, efforts should be made to obtain the lowest possible rates on ammonium sulphate from Oroya to Callao and on all other freight rates that would enter into this industry. Sufficient rolling stock would have to be procured.

IX - FERTILIZER PROGRAM

The following outline states a proposed fertilizer program for continuing the development of the possible position of this Corporation in the Peruvian fertilizer business and is set forth in some detail for discussion by the Board of Directors.

Ammonium Sulphate Market.

Determine where the 18,000 metric tons of imported ammonium sulphate were consumed in 1951 and the economic justification for its use.

Encourage ammonium sulphate field demonstration tests at the Peruvian agricultural experimental stations under the control of and at the expense of SCIPA.

Endeavor to obtain a written statement from Compania Administradora del Guano as to the extent to which it is expected that guano rico will satisfy the nitrogenous fertilizer demands of Peru for each of the next few years.

Endeavor to determine from Compania Administradora del Guano whether they would be prepared to increase the price of guano rico from \$1.33 per metric ton unit of nitrogen to \$3.00 if an ammonium sulphate plant should be built to supply the nitrogen demands in Peru in excess of the production of guano rico. Failing this, endeavor to determine a sensible possible marketing program for both natural and synthetic fertilizers.

After taking into consideration the foregoing, have a market survey made which will estimate the future annual consumption of guano rico, Chilean salitre and ammonium sulphate in the various agricultural areas of Peru. Such a market survey might be made by Abbink and Drumm, recognized consultants in overseas business investments, at a cost of about \$25,000.

Ammonium Sulphate Plants.

For an ammonium sulphate price of \$60 per metric ton f.o.b. Callao in bags, or its equivalent, and assuming an average annual rate of production of 75% of full capacity, prepare an economic evaluation for the following ammonium sulphate plants:

<u>Daily Capacity</u> <u>Metric Tons</u>	<u>Source of</u> <u>Hydrogen</u>	<u>Plant</u> <u>Location</u>
300	Coke	Oroya
300	Coke	Callao
300	Coke	Chimbote
100	Coke	Oroya
100	Coke	Callao
100	Coke	Chimbote
40	Electrolysis	Oroya

For such evaluation, the cost to the fertilizer corporation of the following items will have to be fixed.

From Cerro de Pasco at Oroya

- Sulphuric acid
- Coal
- Coke
- Power
- Plant services-water, steam, shops
- Community services

- From Ferrocarril Central-rates - Ammonia and ammonium sulphate downhill
- Phosphate rock uphill
 - Superphosphate downhill and east
 - Sulphuric acid downhill
 - Barren pyrite downhill
 - Coal downhill
 - Coke downhill

The economic evaluation of the different fertilizer plants could be made by Chemical Construction Corporation and would cost about \$40,000.

Superphosphate Market.

Conduct field demonstration tests on our farms and grazing lands using imported superphosphate to determine its economic justification. These tests will be made at our expense, under the general direction of SCIPA, and will be made in parallel with similar tests conducted at Peruvian experimental agricultural stations at the expense of SCIPA. The purpose of having the approval of SCIPA in the planning of our tests, in determining that these tests have been conducted as planned, and in assisting in the interpretation of the results, is to obtain the stamp of approval of the Peruvian Government on these tests for stimulating the use of superphosphate by others.

Superphosphate Prices.

After conclusive evidence that there is economic justification for the use of superphosphate in the sierra, endeavor to cause the Compañia Administradora del Guano to increase the price of guano pobre per unit of phosphoric acid to a point which would remove most of the price differential between guano pobre and imported superphosphate. Alternatively, establish the condition that all guano pobre must be sold to FERTISA for mixing with superphosphate to produce GUANO ENRICADO, thus eliminating guano pobre from the consumer market.

Superphosphate Plant.

As and when the use of imported superphosphate has shown increased crop yields which are more than adequate to cover the cost of the superphosphate, and agreement has been reached with the Compañia Administradora del Guano as to the marketing of guano pobre, consideration can be given to the construction of a superphosphate plant.

Fertilizantes Sintéticos, S. A. (FERTISA)

The first question under this heading is whether this Corporation wishes to have any partners in its fertilizer program. If the answer to this question should be in the affirmative, the Board of Directors should also decide whether the present stockholders of FERTISA are acceptable partners. If a favorable decision should be reached on these points, the articles of incorporation and by-laws of FERTISA will be examined to determine whether this corporate structure is adequate for the operations visualized. Information will also be obtained about its present financial status.

The cost of the market survey and economic evaluation of the various possible plant sites is estimated to be about \$65,000. If favorable answers are obtained for the foregoing questions, I recommend that Fertilizantes Sintéticos, S.A. be provided with \$100,000 to cover these costs and certain legal expenses which will be incurred. Subject to approval by the Board of Directors, Cerro de Pasco Corporation would subscribe its portion of this development fund under the condition that present stockholders would subscribe their portion - both in U. S. dollars.

After the completion of the market survey and the economic evaluation, a decision will be made as to whether this project is of further interest. If a favorable decision is reached, the engineering work on the approved plants could then be completed and the fertilizer corporation provided with the necessary capital. At such time, the magnitude of the funds required will be known and consideration can be given to bank loans.

X - ADVANTAGES AND DISADVANTAGES

The fertilizer program is attractive to this Corporation as a possible outlet for additional sulphuric acid produced from waste smelter gases. The sulphur in this acid would compete favorably with sulphuric acid made anywhere from brimstone or pyrite; it would also compete successfully with sulphuric acid made from waste smelter gases, and used in ammonium sulphate, at Trail B.C., and other places, because it would be produced nearer to the market for the ammonium sulphate. We would have our choice of copper roaster gases, lead sinter plant gases or Sterling process gases. The latter will probably be the most suitable because of its higher grade and purity. How profitable acid sales might be will depend on the detail engineering studies recommended and the selling price of the acid.

When the Sterling process zinc plant starts operations, the smoke problem will be aggravated. Each ton of sulphuric acid produced from waste smelter gases is a step toward reducing this ever present smoke problem.

The separation of this Corporation from the ultimate consumer by means of FERTISA, or other corporation, has eliminated most of the disadvantages.

The food and fertilizer problems in Peru are growing in magnitude. The political advantage to this Corporation in initiating a soundly conceived fertilizer program will further improve our public relations in Peru.

The recent importations of Chilean salitre and ammonium sulphate have required U.S. dollars or Sterling. Peruvian production of ammonium sulphate will eliminate this demand on foreign exchange. The reverse will take place. The more extensive use of ammonium sulphate on cotton and sugar will increase the exportable surplus of these agricultural products and generate additional U.S. dollars and Sterling for the purchase of industrial products.

CERRO DE PASCO CORPORATION • NEW YORK
INTER-DEPARTMENT MEMORANDUM

Date: December 8, 1952

To: J. D. Smith, Lima

From: W. C. Smith

Subject: Sulphuric Acid

The first stage of a study to justify the possible expansion of the Sulphuric Acid Plant at Oroya will require:

1. Data on annual basis since the acid plant began operation.
 - a. The amount of sulphuric acid sold.
 - b. The amount of sulphuric acid used by C. de P.
 - c. The average price of acid sold on Oroya basis.
2. Estimates of the amount of acid sales expected over the next ten years on annual basis. This is not to include acid for the production of fertilizers.
3. Estimates of the acid consumption by C. de P. annually over the same period.
4. A survey of the grades and amounts of acid which may be in demand, that is, 60°, 98%, and oleum.
5. An estimate of the future cost of transportation of acid from Oroya to Lima-Callao.

The above information can best be collected and prepared by the Lima and Oroya Staffs. We, therefore, ask for your cooperation.


W. C. Smith

WCS:JC

cc: JDS (4)
RPK (2)
AHE (4)
GR
MBL
LAddicks ✓
NY Central Files
" Circulating File

CERRO DE PASCO CORPORATION • NEW YORK
INTER-DEPARTMENT MEMORANDUM

A-40

Date: May 19, 1952

To: R. P. Koenig

From: L. Addicks

Subject: Hydrogen for Fertilizer Project.

1. I presume the fertilizer proposition at the outset visualizes only an enlarged sulphuric acid plant for tank car shipment out of Oroya. If, however, the proposed survey should contemplate the manufacture of ammonium sulphate at Oroya, I want to suggest an earnest weighing of hydrogen produced electrolytically as against reduction of gases by carbon. I have not at hand the quantitative data necessary to do this, but qualitatively it seems indicated.
2. Our coke or other carbon sources are expensive and will involve a complicated plant for purification. We have very cheap power and the process is simple - very slight gas-purification and merely burning sufficient hydrogen in the air to obtain the proper hydrogen-nitrogen mixture. The only problem is the purity of the electrolyte in the cells.
3. The waste oxygen gas probably has considerable value to us in enriching converter and blast furnace air as well as for minor uses. If the location is to be at Oroya, the balance sheet may be quite different from at a coastal point.


Lawrence Addicks

LA:JC

CERRO DE PASCO CORPORATION • NEW YORK
INTER-DEPARTMENT MEMORANDUM

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To: R. P. Koenig

From: L. Addicks

Ayo

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