Information paper Nº 29

SEMINAR ON THE DEVELOPMENT OF THE CHEMICAL INDUSTRIES IN LATIN AMERICA*

Caracas, Venezuela, 7 to 12 December 1964

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FERTILIZER DEVELOPMENT FOR SOUTH AMERICA

(Background document submitted by the United States Representative to the Second Meeting of CIAP October 26-31, 1964)

Note: This document (OE/Ser.H/XII) was presented to the Second Session of CIAP by the representative of the United States. In view of the importance of the subject, it is submitted as an information document to the present Seminar.

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The population of Latin America (excluding Cuba) is rising rapidly, at a rate of 2.5 per cent per year. In 1963 it reached 215 million persons. Food consumption continues to be lower than acceptable nutritional standards established by the Food and Agriculture Organization. Because of serious inequalities in food consumption within each country the less well-off people of the region are known to suffer from deficient diets. 1/ Since 1961 this human problem has been compounded by a failure of agricultural production to keep pace with population with the result that food availability is falling. USDA has published the indices of agricultural production in Latin America given below on a per capita basis: 2/

Year	Agricultural Production Index
1959-60	107
1960-61	104
1961-62	104
1962-63	101

Mexican food production which has risen more than 50 per cent since 1954 under impetus of technology and irrigation, paused in its growth in 1963 due to drought and a resultant shortage of irrigation water. Problems of falling production of some basic foods in Brazil, Colombia, and Chile during 1962 required increased imports, further emphasizing the delicacy of the food balance.

Another problem in Latin America is the failure to open up sufficient amounts of new farm land from the frontier areas. The amount of crop land available per person has fallen from .55 acres before World War I to .43 acres in 1963. This land pressure makes intensive production more necessary as is the case in the United States. In Latin America however the technological improvement has scarcely made itself felt on the food crops.

A recent publication "Man, Land, and Food" by Lester R. Brown 3/ translates the population problem into a food problem. Grain production is a simplified indicator of the food output of particular importance in the underdeveloped countries. Latin America is the region of the world which has experienced the greatest reduction in per capita output of grain since 1934-38 having declined from 254 kilograms per capita to 214 kilograms. This has occurred in spite of the expansion in planted area in Latin America

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1/ USDA, The world food budget 1962-66, Economic Research Service, Foreign Agriculture Economic Report No. 4 (1961) p.31.

2/ USDA, The 1963 world agricultural situation, Econ.Res.Serv. (1963) p. 25.

3/ Brown, Lester R. Man, land and food. USDA, Economic Research Service, Foreign Economic Report No. 11 (1963) p. 26.

by 30 per cent during the same period. Mr. Brown points out that there are two ways to increase food output: (1) expanding the cultivated area, and (2) using existing land more intensively.

Agricultural technology, developed in the temperate regions has not yet been fully applied in the tropical regions. There is, for that reason, a need to push rapidly forward with the development and adaptation of a tropical technology.

A recent review of fertilizer data from trials and demonstrations in the underdeveloped regions, 4/ predominantly based upon the Freedom from Hunger Campaign of FAO, has shown that it is clear that deficiency of plant nutrients in the soil are presently limiting crop yields in most irrigated and rain-fed areas. The evidence shows high probability that an increase of 50 per cent in yields of grain can be obtained over extensive areas where water is not the limiting factor. The FAO experimental results in the Middle East, West Africa and Northern Latin America which used the best available local varieties of food crops, indicate that fertilizer can give an immediate benefit without special plant breeding work at first. It is quite apparent, however, that a plateau of yield may then be reached, which will require improvement of the plant material by breeding in order to secure additional general benefits from the use of fertilizers.

These findings are especially pertinent in South America in view of the foregoing observation of agricultural stagnation in that Continent. It is incumbent upon the leadership of the Alliance for Progress to consider ways of applying the technologies of modern fertilizer production and use on behalf of the solution of problems of food supply and economic health of Latin America.

There is a close relationship between the total national consumption and the average yield of crops. Parker, 5/ has presented a crop-value index response curve for a series of about 41 countries. The curve shows a progressive increase of crop index from 100 to 450 as the total fertilizer nutrient use rises from 0 to 450 kilograms per hectare.

Fertilizer Raw Materials Production

The raw materials for fertilizers are unequally distributed in South America. The most important raw material resources for fertilizer are:

4/ MIT Summer Study of Agricultural Productivity. Special Group IV. Supplying the farmers' requisites for production, mimeo (1964).

5/ Parker, F.W. Fertilizers and Economic Development. Fertilizer Workshop. FAO (1962) p.12.

/(1) Natural

(1) Natural and artificial hydrocarbon gas for ammonia fertilizers.

(2) Phosphate rock for phosphate fertilizers.

(3) Potassium salts for potash fertilizers.

In addition there is a major need for sulphuric acid to manufacture ammonium sulphate and superphosphate.

Sources of Hydrogen for Ammonia

Natural Gas

The South American countries known to have important reserves of natural gas are Venezuela, Brazil, Colombia, Peru, Ecuador, Chile, Bolivia and Argentina. These eight countries are highly important locations for the manufacture of nitrogen fertilizers and will require careful further study to determine their potentials for domestic consumption and also for the supply of neighbouring markets.

Refinery Gas

There are petroleum refineries in several of the major countries which produce waste hydrocarbon gases suitable for the separation of hydrogen used to manufacture ammonia. Such refinery based projects are already underway in Aruba, Colombia, Peru, Argentina, Brazil and Venezuela. There is an important potential for this kind of ammonia production in Brazil to supplement proven natural gas reserves. The Southern end of Brazil is most dependent upon hydrogen from petroleum and upon nitrogen imports because of the fact that the natural gas is limited to the Northeast.

Other sources of hydrogen

In Cuzco, Peru, a nitrogen plant is under construction based upon hydrogen obtained from hydrolysis of water by electric current. This is presumably a temporary solution while electricity is produced in excess. Later it might be possible to develop other supplementary sources of hydrogen, for example, natural gas from the Peruvian or Bolivian gas fields.

In Europe there are important amounts of ammonia manufactured using producer gas from coal in which the hydrogen is derived from steam.

For plants in countries where petroleum is the only hydrocarbon resource there is a process for generating hydrocarbon gas from "bunker sea oil" as is done in Puerto Rico.

For India where the greatest petroleum use is for kerosene, there is a great surplus of naptha gasoline. This portion is usable in gasified form as a source of hydrogen for ammonia plants.

/Table 1

Table 1 presents recent developments in South American nitrogen production as compiled in the FAO review for 1962. 6/

Table 1

DEVELOPMENTS IN NITROGEN PRODUCTION IN SOUTH AMERICA

Country	Location	Kind of fertilizer and capacity	Start-up date
Argentina			
Fabric. Militares	Buenos Aires	Ammon. Sulf. 40 T/day	1961
Somisa	Buenos Aires	Ammon. Sulf. 21 T/day	1960
Brazil			
Cia. Paulista	Bahia	Ammonia 200 T/day	-
" "	Cubatao	Ammonia 33,000 T/yr.	1959
" "	"	Calc. Nitrate 100,000 T/yr	1959
" "	"	Ammon. Nitr. 10,500 T/yr	1959
Colombia			
Am. del Canbe	Cartagena	Ammonia Nitrogen 92,500 T/yr	-
IPC	"	Ammonia 98,400 T/yr	-
Abonio Col	"	Urea 77,000 T/yr	-
		Compound fert. 119,800 T/yr	
Peru			
	Choco	Calc. nitrate 190 T/day	-
Venezuela			
Petroquímica	Moron	Ammonia 100 T/day	1963
Petroquímica	Moron	Ammonia 150,000 T/yr	1966

6/ Food and Agriculture Organization of the United Nations, Fertilizer, an annual review of world production, consumption and trade. Rome, 1963, p.51.

/Production on

Production on the Continent of South America is supplemented by two large nitrogen plants on offshore islands, one of which is the largest in the world.

On Aruba the Antilles Chemical Co.,associated with ESSO International has one ammonia plant of 100,000 T/yr. capacity "on stream" and another of similar capacity under construction. Both are based upon refinery gas. The finished products will include urea and compound fertilizers.

The new plant of Trinidad, operated by Grace Chemical Co.,is designed to produce 600 tons per day of ammonia based upon natural gas as the source of hydrogen.

Phosphate Rock Supply

The South American production of rock phosphate in 1962 was limited to three countries: Brazil, Peru, and Chile. The reserves in Brazil and Peru are important and appear to assure an adequate supply of phosphate on both coasts of the Continent for the immediately foreseeable future.

	Reserves of phosphate rock	P_2O_5 (percentage)
Brazil	Pernambuco (Olinda) 30,000-100,000 T	22
	Minas Gerais (Araxa) 100,000 T	30
	São Paulo 15,000-30,000 T	20
Chile	Atacama 1,000 T	28-34
	Coquimbo 2,000 T	10
Peru	Sechura several million T.	Ca.20

In addition to the domestic rock production some of the requirements are met by imports of rock phosphate from the U.S. and North Africa.

Potash Supply

The only countries producing potash in South America are Chile and Peru. The Chilean reserves of potash are a part of the nitrate salt deposits and are believed to total 1 million tons of K_2O. The Peruvian potash reserves are not yet completely proven.[2] They are made up of (1) potash-bearing bird guano of which the annual production of K_2O varies between 2,000 and 5,000 tons and (2) potash brines obtainable by pumping from deep wells in the Sechura desert near Piura of which the production potential is still not known.

Sulphuric Acid Supply

There are no known major deposits of sulphur in South America. The sulphur requirements of the maritime regions have however been

/readily met

readily met by imports of sulphur from the U.S., Mexico, and Europe. In Trinidad sulphur is obtained from the natural gas (sour gas) as a by-product.

Sulphuric acid is manufactured from SO_2 of smelter gases in the countries of Chile, Peru, Bolivia, Colombia and Argentina.

A recent installation in Chile is under construction by ENAMI at El Salado with capacity of 20 tons per day of sulphuric acid.

The principal uses of sulphuric acid are in the secondary manufacture of superphosphate, ammonium sulfate and wet process phosphoric acid. Countries which are now producing phosphoric acid include Brazil, Chile, Uruguay, Argentina and Venezuela.

Fertilizer Production, Consumption, and Trade

The fertilizer production consumption and trade for six years ending in 1961/62 are presented in Table 2. 7/ These data show a substantial increase in the fertilizer use and trade during the years recorded. Probably the most critical lack is sufficient supplies of phosphate fertilizer, which reached a new peak of consumption of 203,000 T in 1961/62. It is probable that increased use of phosphate fertilizer as well as increased adoption of ground limestone for soil application will result in improvement in the response obtained from other fertilizers, especially nitrogen. A complete programme of balanced fertilizer development will necessarily take into account the known heavy requirements of South American soils for phosphate and lime.

How to Increase Agricultural Productivity

Fertilizers will make a major contribution if all other possible limiting production factors are provided for. These include supplemental water, liming, high-yielding varieties of crops, pest control and mechanical aids to modern farming.

These inputs can be made available at a faster than normal rate by systematic assistance to the farmers who adopt the recommended methods. One of the best kinds of subsidy is the provision of essential inputs at moderate prices. This tends to create a mass market by bringing the cost of required materials within reach of all consumers. Such programmes have the advantage that they reward the innovater and, by omission, penalize the non-adopter.

Another factor favouring productivity is adequate farm roads and highways. The governments which build roads to promising new

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7/ Op.cit., page 47.

/Table 2

Table 2

SOUTH AMERICA: PRODUCTION, CONSUMPTION AND TRADE
1956/57 - 1961/62

Item	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62
			(1,000 metric tons)			
PRODUCTION						
Nitrogen (N)	226	300	298	259	215	260
Phosphoric acid (P_2O_5)	76	97	106	97	86	101 a/
Potash (K_2O)	16	15	15	16	13	15
CONSUMPTION						
Nitrogen (N)	121	139	156	140	210	171
Phosphoric acid (P_2O_5)	135	138	159	141	170	203
Potash (K_2O)	71	93	100	99	160	121
EXPORTS						
Nitrogen (N)	170	231	230	199	101	194
Phosphoric acid (P_2O_5)	10	20 a/	37	32	...	-
Potash (K_2O)	5	5	5	15	4	11
IMPORTS						
Nitrogen (N)	65	70	89	89	106	96
Phosphoric acid (P_2O_5)	70	72	91	77	88	119
Potash (K_2O)	60	83	90	98	149	112
EXPORTS minus IMPORTS						
Nitrogen (N)	105	161	141	110	- 5	98
Phosphoric acid (P_2O_5)	- 60	- 52 a/	- 54	- 45	...	-119
Potash (K_2O)	- 55	- 78	- 85	- 83	-145	-101

a/ Unofficial figure.

/land resources

land resources are effectively promoting efficient agricultural production. Improvement of existing farm to market roads can also be extremely important.

Less universally applauded are price differentials which promote production of specific export crops or needed food production. In practice this incentive may lead to a form of permanent sectoral subsidy which goes beyond original intentions. There is no doubt about the efficacy of price supports, however, in providing production incentives.

The Role of Government in Fertilizer Projects

The timidity of many local and foreign investors to enter the fertilizer industry in underdeveloped countries is well-known. There is a public interest in fertilizer use which takes some of the flexibility out of the business in these commodities. Governments must, therefore, clearly state their position in behalf of free enterprise in order to attract the needed private investments.

Among the most valuable and acceptable forms of governmental assistance to the fertilizer industry are:

(1) Agricultural promotion, research and services to farmers,
(2) Feasibility studies for new plants,
(3) Infrastructure investments,
(4) Loans to industry including public investments,
(5) Temporary assistance in facilitating importation of trial shipments during the periods of contruction of fertilizer manufacturing facilities,
(6) Institutional assistance in the location of raw materials resources, sites and marketing arrangements.

Technical Questions Requiring Preinvestment Study

A. Ammonia Production

(1) Raw materials supplies and locations (gas, water, electricity).
(2) Alternative secondary raw materials (sulphuric acid, phosphoric acid),
(3) Feasibility of direct soil application of anhydrous ammonia and aqua ammonia,
(4) Markets and sufficient transport,

- (a) Domestic supply lines
- (b) Export facility

(5) Acceptability of political climate,
(6) Responsiveness of regional soils and crops,
(7) Selection of major crops for intensification,

- (a) Export crops
- (b) Domestic cash crops

/(8) Feasibility

(8) Feasibility of storage, distribution and sales networks,
(9) Economies of scale versus economies of dispersion,
(10) Opportunities for exportation and for exchange or barter,
(11) Use of flexible "package-type" plants versus large permanent installations,
(12) Provision for subsidiary plants based upon ammonia as a raw material (nitric acid, sulphuric acid, urea, mixed fertilizers, ammonium nitrate, etc.),
(13) Arrangements of acceptable capitalization, management agreement and profit structures (private management and ownership preferred).

B. Phosphate Production

(1) Raw materials supplies and locations,
(2) Problems of enrichment of ores,
(3) Transport for low-priced rock,
(4) Markets and costs of production and delivery,
(5) Processing to obtain solubility and high analysis, (acids, thermal treatment, electric furnace, blast furnace),
(6) Storage near the point of sale,
(7) Manufacturing and blending of compound fertilizer.

C. Potash Production

(1) Search for raw materials.

D. Sulphuric Acid Production

(1) Search for raw materials (sulphur, pyrites, gypsum, smelter gas),
(2) Location relative to ammonia and phosphate potentials.

E. Fertilizer Production and Use

(1) Feasibility of direct use of basic ingredients,
(2) Involvement of promoters, sales force, and marketers to stimulate wide use,
(3) Diagnostic services to the grower,
(4) A foresighted distribution policy and network,
(5) Storage near point of sale,
(6) The ammonia station and distribution set up.

Developmental Questions

Ammonia Question

The natural gas deposits of the continent are so well distributed as to facilitate the preparation of a continental programme of fertilizer development of unprecedented scale and impact. The provision of ten small but well located plants of 60 T/day of ammonia capacity should be weighed against a single giant plant like the one in Trinidad which produces 600 T/day. The study of the problem will require unusual evaluation efforts:

/(1) What

(1) What are the investment economies?
(2) What are the recurring production economies?
(3) What are the freight and marketing economies?
(4) What stimuli can 10 modern but small chemical factories give to their respective recipient countries and their economies?
(5) What is the agricultural significance of cheap anhydrous ammonia for direct application?
(6) Can ammonia tank cars be used on the bank-haul to transport phosphoric acid or superphosphoric acid?
(7) What are the implications of a sharply reduced cost of agricultural production for grain, fruit, vegetables, fibres, export crops, meat, wool, milk and plantation crops?
(8) Can the needed complementary inputs of phosphate, potash, sulphuric acid, lime, improved seed, pesticides and farm machinery be provided if production doubles in a decade?
(9) Is there sufficient awareness of the institutional and regulatory requirements of a fertilizer revolution in agriculture?
(10) Is there capital for the already tardy construction of a continental road system? For farm-to-market roads?
(11) Which countries are ready for a production boom, and willing to face the problems and benefits?

Phosphate Question

The development of adequate phosphate supplies depends upon geologic exploration to locate a better continental supply. Modern Alluvial analysis techniques can be used to spot new phosphate anomalies and follow them to their sources.

Development of three major phosphate mines in Brazil and of the huge Sechura deposit in Northwestern Peru and matters of agricultural and hemispheric priority. The application of modern flotation procedures using seawater, if possible, can make economical concentration of the open pit phosphates of Sechura a practical reality. Hopefully these developments would interest American industry and thereby avoid the necessity of massive public investment for the purpose. Among the larger U. S. companies in the hydraulic phosphate mining field are:

(1) International Minerals and Chemical Corp.
(2) Cyanamid Corp.
(3) Tennessee Corp.

Potash Question

The search for potash should begin at once. The thick saline beds of the upper Amazon basin seem a logical place to begin geological and drilling activities. There are also possibilities to be explored in the brine solutions which curiously are underlying the Sechura phosphate formations mentioned earlier. These brines were discovered in oil-dry well holes of the Sechura oil explorations.

Evidently potassium is the element most dependent upon continued imports from overseas.

/Sulphur Question

Sulphur Question

A constant alert should be maintained by oil companies and other drillers for promising sulphur bearing formations. Meanwhile full benefit should be derived from the widely occurring sulphide ore smelters or potential smelters which could render service to agriculture by supplying raw SO_2 gas for manufacture of sulphuric acid. The acid is not only needed to react with phosphate and thereby produce a readily soluble fertilizer product but has an important value in its own right as a unique fertilizer. I.R.I. researchers and others throughout South America have found repeatedly that sulphur deficiency is one of the first problems to be manifested by crops when nitrogen and phosphate are supplied.

Brazilian Opportunities

The Brazilian opportunities for fertilizer development are numerous.

(1) Phosphate mining and processing,
(2) Lime grinding on a continental scale,
(3) Nitrogen production in Bahia will open the new era of cacao resurgence, cattle ranching and the opening of a western frontier reaching northward to Belem on the Amazon.

Argentine Opportunity

The presence of rich gas-fields for nitrogen fixation make it a virtual certainty that Argentina will regain in large measure its standing as a great food-exporting nation.

Venezuelan Opportunity

The natural gas riches of Venezuela make this country the richest of all potential nitrogen exporters in the Hemisphere. The use of abundant gas resources will not diminish the country's wealth of petroleum. This would be a promising place for another giant continental ammonia plant with minimum per-ton cost of production, were it not for the presence already on the island of Trinidad of a large plant ready to supply the local area with moderately priced ammonia.

Bolivian Opportunity

The existence of gas wells at Santa Cruz in a strategic central area of the continent give Bolivia a unique status for ammonia production.

From Santa Cruz, itself an agricultural region, there are roads and railroads reaching to the Atlantic, the Pacific and the River Plate. This gas field is well situated for export as well as to supply the present miniscule nitrogen requirements of Bolivian agriculture.

/This opportunity

This opportunity is especially attractive to the U.S. government in that it presents the most likely escape of Bolivia from its historic reliance upon minerals and ores for export earnings. Secondly, the use of a rapidly increasing proportion of the nitrogen fertilizer at home cannot fail to stimulate vitally needed production of tropical fruits and animal products for export.

Questions which need to be answered are;

(1) Can the sulphuric acid capacity of Potosi smelters be increased sufficiently for ammonium sulphate production of the national requirements?
(2) Can the Coramba railroad sustain a steady daily schedule of ammonia tank car deliveries to and from Brazil?
(3) Is it possible to obtain financing to complete the missing bridges on the direct rail link from Santa Cruz to Argentina?
(4) Will the government of Bolivia tolerate a strong proportion of private ownership and management in a new ammonia and fertilizer industry?
(5) Will Brazil accept Bolivia ammonia for cash?
(6) Is there a possibility of partial barter of phosphoric acid from São Paulo for a part of the ammonia from Santa Cruz?
(7) Will the U.S. fertilizer loan to Brazil permit that country to purchase important ammonia requirements from a third country rather than the U.S.?
(8) Can the Ammo-Pak plant offered by Girdler Corporation be delivered and assembled in less than six months?

Ecuadorean Opportunity

The gas reserves of Ecuador make this agricultural nation a natural site for a moderate sized ammonia plant. Fortunately Ecuador is in a position to expand its exports of bananas, cacao, rice and other food products of which it is already a significant factor on world markets. The questions to be asked in Ecuador are:

(1) Can the country absorb a substantial part of the production of a "small" Ammo-Pak plant of 60 T/day capacity?
(2) What is the condition of the world banana market?
(3) Can financing be provided for a 3 million dollar fertilizer investment in ammonia, sulphuric acid and ammonium sulphate facilities?
(4) Which products should be given maximum technological stimulus?
(5) Do the tropical and the high altitude agricultural research stations know how to use maximum efficient dosages of nitrogen?
(6) Are there varieties of rice, wheat, barley, corn and cash crops which respond well to heavy fertilization while retaining high crop quality and avoiding losses due to lodging?
(7) What are the pasture requirements for beef cattle, dairy and sheep?

/(8) Are

(8) Are there deficits in production of oil seeds, cotton, jute or other products on which nitrogen use would produce a welcome surplus of production?
(9) Can the small farmer and settler use fertilizer to accomplish a more rapid adaptation and successful establishment?
(10) Will the farms of 10 hectares size proposed under agrarian reform in the highlands be enabled to prosper through intensive fertilization?

Peru Opportunity

The above questions concerning Bolivia and Ecuador have their counterparts in Peru, which is equally well endowed with gas and is uniquely rich in phosphate resources in the entire Continent. It is already apparent that a skilled investigative team is required to evaluate, judge and recommend concerning the relevant fields of plant location, financing, agriculture, marketing and general policy. Peru, no less than the previously listed countries, needs such studies. The most important project in Peru is the development of the Sechura deposits.

Institutional Preparation

The rural development teams in each country mission, along with the U.S.D.A., U.S.D.I., and Land Grant College contract teams of agricultural scientists will play a needed role in the adjustments and technical developments which must precede and accompany the establishment of fertilizer industries in South America.

The need for supplementary inputs of improved seed, lime, soil testing, experimental plots, demonstration farms, research and extension work and agricultural education will be increased and the efforts made more meaningful by such investments in a more productive agricultural industry.

Sources of Survey Personnel

In addition to the U.S.D.A. there is one agency of the U.S. Government with special qualifications to assist A.I.D. in a fertilizer development plan of large proportions. This is the Tennessee Valley Authority. Their experience in nitrogen and phosphate industrial development and in the agricultural field is unsurpassed.

Other sources of competence are the U.S. producers and certain consulting firms specializing in fertilizer market studies and chemical construction projects. These include:

A.D. Little
Chemicol
Chemical Construction
M. W. Kellogg

The manufacturers of package type ammonia plants are, of course, able to assist in surveys once their product has been given a favourable decision.

/SUPPLEMENTARY DATA

SUPPLEMENTARY DATA

Natural Gas Information:

- Argentina
- Bolivia
- Brazil
- Chile
- Costa Rica
- Dominican Republic
- Ecuador
- Guatemala
- Mexico
- Peru
- Venezuela
- Others

/NATURAL GAS

NATURAL GAS INFORMATION SHEET

Argentina

1.	Gas present	Yes - source Shell
2.	Current Annual Production	5,947 million cu. meters
3.	Estimated possible annual production	By 1971 9,600 million cu. meters
4.	Proved Reserves	224,031 million cu. meters
5.	Location of Gas fields and operational control	Chubut Prov. YPF & PA Oil Co. Santa Cruz Prov. YPF Tierra del Fuego - YPF Neuquen Prov. YPF & ESSO Rio Negro Prov. YPF Salta Prov. YPF Mendoza Prov. YPF & Cities Service
6.	Pipelines installed planned and possible	A. Installed: 1. Campo Duran (Salta) BA 1,767 Kms. 2. Canadon Seco (Santa Cruz) BA 1,705 Kms. 3. Plaza Huincul (Rio Negro) General Conesa - 460 Kms. B. Under Construction: Santa Cruz, B.A. 1,780 Kms. C. Possible: 1. Catriel (Rio Negro) Olavarria 700 Kms. 2. Catriel - Mendoza - 560 Kms.
7.	Current Disposition of Gas	A. Sold to Public 2,465 mil. cu. mtrs. B. Consumption by Oilfields Refineries and Pipelines 901 mil. cu. mtrs. C. Losses and oilwell injections 2,581 mil.cu.mtrs.
8.	A. Current Explorative Efforts B. Possibilities	As indicated
9.	Current Vol. Prod. of Chem. Fertilizer/ Ingred. from Natural Gas	NONE
10.	Planned Production of same	Petrosur (Ammonia, urea, sulphuric acid, ammonium sulphate, superphosphate, compound fertilizers) scheduled completion 1967.

/Bolivia

Bolivia

1.	Gas present	Yes, Source EMBASSY and USAID
2.	Current Annual Production	NONE
3.	Estimated Possible Annual Production	CONFIDENTIAL
4.	Approved Reserves	CONFIDENTIAL
5.	Location of Gas Fields and Operational Control	Camiri Region - Dept. of Santa Cruz Discovered by GULF - Ownership under discussion
6.	Pipelines installed planned and possible	None - Planning to connect with City of Santa Cruz
7.	Current Disposition of Gas	Capped
8. A.	Current Explorative efforts	A. None
B.	Possibilities	B. Optimistic - Petrochemical GOB has contracted M.W. Kellog make feasibility study
9.	Current Vol. Prod. of Chem. Fertilizer/Ingred. from Natural Gas	NONE
10.	Planned Production of same	UNKNOWN

Brazil

1.	Gas present	Yes, source PETROBRAS
2.	Current Annual Production	503,768,646 cu. meters, 1963
3.	Estimated Possible Annual Production	500-600 Million Cu. Meters
4.	Proved Reserves	Est. 15 billion cu. meters
5.	Location of Gas Fields and Operational Control	Principally in state of Bahia controlled by PETROBRAS
6.	Pipelines installed planned and possible	1. From well locations to natural gasoline plant at Catu - approx. 20 kms. from Salvador
7.	Current Disposition of Gas	A. Small amount commercially for cement mfg. B. Balance - losses and oil well reinjection
8. A.	Current Explorative efforts	A. No information available
B.	Possibilities	B. Several other areas possible but unspecified

/9. Current

9.	Current Vol. Prod. of Chem. Fertilizer/Ingred. from Natural Gas	NONE
10.	Planned Production of same	Ammonia production and urea production to begin 2-3 years

Chile

1.	Gas Present	Yes. Source Embassy, USAID, ENAP
2.	Current Annual Production	5,155 million cu. meters 1963
3.	Estimated Possible Annual Production	6,500 million cu. meters 1964
4.	Proved Reserves	Not reported
5.	Location of Gas Fields and Operational Control	Magallanes - ENAP
6.	Pipelines installed planned and possible	Regional Collecting Networks - Magallanes
7.	Current Disposition of Gas	Liquid Gas Exports 85 thousand cu. mtrs. Domestic Liquid Gas 70 thousand cu.mtrs. Local Liquid Del. 60 thousand cu. mtrs. Reinjected 3,234 million cu. mtrs. Losses - Balance
8. A.	Current Explorative Efforts	A. Not reported
B.	Possibilities	B. Not reported
9.	Current Volume Prod. of Chemical Fertilizer/Ingred. from Natural Gas	None
10.	Planned Production of same	Feasibility Study will soon be made for possibility of fertilizer Plant - Magallanes Area

Costa Rica

1.	Gas Present	Yes - Source - Min. Industry Dept. Geology, Mines & Petroleum
2.	Current Annual Production	None
3.	Estimated Possible Annual Production	Unknown
4.	Proved Reserves	Unknown
5.	Location of Gas Fields and Operational Control	In both Atlantic and Pacific Coastlines. Punta Cahuita (So. of Limon on East Coast - 1 Million Cu.ft. Recent drillings revealed gas at various wells

/6. Pipelines

6.	Pipelines installed planned and possible	None
7.	Current Disposition of Gas	N.A.
8. A.	Current explorative efforts	A. N.A.
B.	Possibilities	B. Mostly south of Limon on East Coast and near Panama Border East Coast
9.	Current volume of Production Chemical Fertilizer/Ingred. from Natural Gas	None
10.	Planned Production of same	None

<u>Dominican Republic</u>

1.	Gas Present	Limited Source EMBASSY, Min. Ind. & Commerce, Mining Service, Local Ind.
2.	Current Annual Production	None
3.	Estimated Possible Annual Production	N.A.
4.	Proved Reserves	N.A.
5.	Location of Gas Fields and Operational Control	N.A.
6.	Pipelines installed planned and possible	N.A.
7.	Current Disposition of Gas	N.A.
8. A.	Current Explorative Efforts	A. Local interests have concessions Intend start drilling November 1964 Primary interest - Oil B. Unknown
9.	Current Vol. Prod. of Chemical Fertilizer/ Ingred. from Natural Gas	None
10.	Planned Production of same	Unknown

/Ecuador

Ecuador

1.	Gas present	Yes - Source CENDES - Dev. Ministry - Petroleum and Minerals Division
2.	Current Annual Production	6 billion cu. ft. current annual production, 1963 (170 million cu. mts.)
3.	Estimated Possible Annual Production	7 billion cu. ft. (1964) (198 million cu. meters)
4.	Proved reserves	Unknown
5.	Location of Gas Fields and Operational Control	Ancon and Cautivo-Santa Elena Peninsula - Guayas Province-Anglo Ecuadorean Oil-fields; El Cautivo S.A. and Carolina Oil Co.
6.	Pipelines installed planned and possible	None Pipeline to Guayaquil possible.
7.	Current disposition of Gas	90 per cent of gas produced directly used by Anglo-Ecuadorean who uses the gas-lift refining system. Remaining gas produced is bottled for domestic use.
8. A.	Current Explorative Efforts	A. None
B.	Possibilities	B. Much larger production could be expected from present area under exploitation and exploration in the Santa Elena Peninsula. Good possibilities of new oil findings in the Oriente where close to Colombian-Ecuadorean border. In the Colombia side large reserves have been proven by Texaco and others.
9.	Current Vol. Prod. of Chemical Fertilizer/ Ingred. from Natural Gas	No current production of chemical fertilizers.

/10. Planned

10.	Planned Production of same	Plant now under construction to produce ammonium sulphate from imported ammonia and locally produced sulphuric acid. Capacity of future plant 200 T/day ammonium sulphate. Estimated starting date late 1965 or early 1966. No use for natural gas planned. Ownership of fertilizer plants - Juan H. Kruger and Chemoleum Corp.

Guatemala

1.	Gas Present	Limited Deposits Source-Min. Mines & Petrol.
2.	Current Annual Production	None
3.	Estimated Possible Annual Production	N.A.
4.	Proved Reserves	None
5.	Location of Gas Fields and Operational Control	N.A.
6.	Pipelines installed planned and possible	N.A.
7.	Current Disposition of Gas	N.A.
8. A.	Current Explorative Efforts	A. ESSO Intl. will undertake Pacific Offshore Exploration
B.	Possibilities	B. Unknown
9.	Current Vol. Prod. of Chemical Fertilizer/Ingred. from Natural Gas	None
10.	Planned Production of same	None

Mexico

1.	Gas Present	Yes - Source PEMEX
2.	Current Production	Producing 11,371,049,367 cu. meters 4,362,291,365 cu. meters used
3.	Estimated Possible Annual Production	Not available
4.	Proved reserves	401,500 billion cu.ft. (11,370 million cu. meters)

/5. Location

5.	Location of Gas Fields and Operational Control	N.E. District (No. Zone) No. District (No. Zone) So. District (No. Zone) Paza Rica, New Golden Lane, Veracruz, Istmo of Tehuantepec, Tabasco All owned and/or operated by PEMEX
6.	Pipelines installed planned and possible	A. Installed: 1. Ciudad PEMEX - Mexico City 2. Mexico City - Salamanca 3. Reynosa - Monterrey-Chihuahua B. Planned 1. Aguas Calientes-Guadalajara Tampico-Monterrey 2. Reynosa - Chihuahua-Nogales-Mexicali
7.	Current Disposition of Gas	Household fuel and industrial energy
8. A.	Current Explorative efforts	
B.	Possibilities	Not available
9.	Current Vol. Prod. of Chemical Fertilizer/Ingred. from Natural Gas	Not reported
10.	Planned Production of same	Not reported

Peru

1.	Gas Present	Yes - Source Embassy, USAID, US Bur. Mines
2.	Current Annual Production	45 billion cu.ft. (1,270 million cu.mts.)
3.	Estimated Possible Annual Production	Not reported
4.	Proved Reserves	750 billion cu.ft. (21,240 million cu. meters)
5.	Location of Gas Fields and Operational Control	Aguaitia, Lobitos, Talara (IPC)
6.	Pipelines Installed planned and possible	-
7.	Current Disposition of Gas	1. Well spudded 2. - 3. Talara gas sold in Lima
8. A.	Current Explorative Efforts	A. Aguaitia Cretaceous formation contains proven gas condensate section 353 ft. thick
B.	Possibilities	-

/9. Current

9.	Current Volume Production of Chemical Fertilizer/Ingred. from Natural Gas	-
10.	Planned Production of same	-

<u>Venezuela</u>

1.	Gas Present	Yes - Source Annual Report Min. Mines and Hydrocarbons
2.	Current Annual Production	37,465 million cu. meters
3.	Estimated Possible Annual Production	N.A.
4.	Proved Reserves	858,983 million cu. meters as of 12/63
5.	Location of Gas Fields and Operational Control	Associated Gas Western Venezuela (Maracaibo) Mostly private Cos. Non-associated gas Eastern Venezuela (Barcelona)
6.	Pipelines installed planned and possible	1,884 kms. of pipelines
7.	Current Disposition of Gas	Recycled - 16,268 million cu. mts. Used in Oil Ind. 3,361 million cu. mts. Sold (for energy) 2,240 million cu. mts. Converted to LPG & Nat. Gasoline 558 million cu. meters Flared 15,029 million cu. mts.
8. A. B.	Current Explorative Efforts Possibilities	N.A.
9.	Current Volume Prod. of Chemical Fertilizer/Ingred. from Natural Gas	None known
10.	Planned Production of same	Venezuela Dev. Plans include Petro-chemical Industry. However, presently no firm project.

<u>Jamaica</u>	<u>Colombia</u>	<u>El Salvador</u>
<u>Honduras</u>	<u>Panama</u>	<u>Nicaragua</u>
<u>British Guiana</u>	<u>Paraguay</u>	<u>Uruguay</u>

No data has been submitted by AID Missions for these countries.