REPORT
ON
ECONOMIC DEVELOPMENT SURVEY IN QATAR

presented to

HIS HIGHNESS

SHEIKH KHALIFA BIN HAMAD AL-THANI

GOVERNMENT OF QATAR

APRIL 1970

JAPANESE SURVEY TEAM FOR ECONOMIC DEVELOPMENT IN QATAR

DISPATCHED UNDER THE AUSPICES OF

THE OVERSEAS TECHNICAL COOPERATION AGENCY, JAPAN

April 15, 1970

His Highness
Sheikh Khalifa Bin Hamad al-Thani

SUBJECT: Economic Development Survey in Qatar

Your Highness,

It is with great pleasure to present to you our Report of Economic Development Survey in Qatar. Thanks to your assistance and cooperation, we could carry out our survey efficiently according to the established schedule.

We believe that the survey of this nature is very meaningful and timely at this stage of the development of Qatar. The effective formulation of development strategy is only possible by grasping the overall development prospect of the country. We earnestly hope that the findings of our survey will be very useful for the formulation and implementation of projects for the acceleration of economic and social development of Qatar. We also hope that this survey will be an impetus for further economic and technical cooperation between Qatar and Japan.

We would like to express our thanks to the officials of your government and other institutions concerned for their invaluable cooperation and assistance extended to our survey mission.

We shall be very happy to answer any questions which may arise from reading our report.

With best wishes,

Yours sincerely,

Shigetoro Tabi

for Kenro Nakamura
Chief
Japanese Survey Team
for Economic Development in Qatar.

PREFACE

At the request of the government of Qatar, a survey team was dispatched under the auspices of the OVERSEAS TECHNICAL COOPERATION AGENCY, a government agency of Japan, for the overall study of the economic development of Qatar. The survey team consisted of four members; a civil engineer, a petrochemical engineer, an agronomist and an economist. The survey team arrived in Qatar on January 15th, 1970, and carried out survey works including data collection and field observation for two weeks.

After the oral presentation of the interim report to the government of Qatar, the team left Doha, the capital of Qatar on January 29th. On the way back to Japan, the team made brief visits to the neighboring states including Abu Dhabi, Dubai, Bahrain and Kuwait for the observation of petroleum and petrochemical facilities and the marketing survey of Arabian Gulf area.

The survey team analyzed the informations and data collected and prepared the final report in Japan. This report is written for the government officials of Qatar. Thus, only the essentials of our findings are presented in this report. Efforts are made to avoid the mere presentation of general informations on Qatar.

The main objective of this survey was to indentify economic development projects which are worthy of studies or further investigations from standpoint of technical feasibility. We attempted to analyze the totality of development problem which Qatar faces and look at all the important sectors without preconception or prejudice. Owing to the lack of time and other factors, the scope of our survey is limited and does not go beyond the nature of preliminary survey or reconnaissance. The survey of this kind which presents only an overally view should be followed by the feasibility studies of respective projects suggested in this report.

The organization of our survey team was as follows;

Chief — Kenro Nakamura, civil engineer
Chief of Civil Engineering Department
Nippon Koei Co., Ltd.

Goro Nishikawa, agronomist, Professor
Faculty of Agriculture
Tokyo University of Education

Shigeatsu Taki, chemical engineer
Planning Department
Japan Gasoline Co., Ltd.

Kunio Waki, economist
Engineering Consulting Firms Association
Japan

The survey was conducted according to the following schedule:

January	13 (Tue.)	Departure from Tokyo
	14 (Wed.)	Arrival in Kuwait. Courtesy call to the Embassy of Japan in Kuwait.
	15 (Thu.)	Arrival in Qatar. Discussion concerning the survey schedule at the Government House.
	16 (Fri.)	Rest (Trip to Umm Said area)
	17 (Sat.)	Visit to gardens in the North
	18 (Sun.)	Visits to the distillation plant, wells and reservoirs in the Doha area and Northern well fields. Visit to ranches.
	19 (Mon.)	Discussion on the general economy and petroleum affairs at the Government House. Visit to Qatar National Fishery Co., Ltd.
	20 (Tue.)	Visits to Engineering Services Department and Electricity Department.
	21 (Wed.)	Visits to the Umm Said industrial area, the cement factory in Umm Bab and the Dukhan oil field.
	22 (Thu.)	Visits to the Port Authority, the Customs Department, the jetty and warehouses.
	23 (Fri.)	Rest
	24 (Sat.)	Discussion on petroleum affairs at the Government House. Visits to the Water Department, Qatar Chamber of Commerce, and Labor Department. Visits to the Water Department, Qatar Chamber of Commerce, and Labor Department.
	25 (Sun.)	Audience with His Excellency Sheikh Khalifa bin Hamad al Thani, the Deputy Ruler. Discussion with Director of Financial Affairs.

	Visit to the Custom Department for data collection. Trip to the South.
26 (Mon.)	Discussions on educational development with Director, Ministry of Education, and on petroleum affairs at the Government House.
27 (Tue.)	Visits to the off-shore oil facilities, Halul Island, and the head office of Shell Qatar.
28 (Wed.)	Oral presentation of interim report at the Government House.
29 (Sat.)	Departure from Doha, Qatar.

ACKNOWLEDGEMENT

We are deeply grateful to His Highness Sheikh Ahmad Bin Ali al-Thani, the Ruler, and His Excellency Skeihk Khalifa bin Hamad al-Thani, the Deputy Ruler, for having invited us to visit Qatar. We would like to thank heartily Sayed Ali Jaideh, Deputy Director of Petroleum Affairs, Sayed Husni Abukhalil, Director of Financial Affairs, Sayed Michel Farah, Director of Agriculture Department and Mr. George Webster, Director of Engineering Services Department. Throughout our survey in Qatar, they kindly helped our team in arranging visits and collecting necessary informations and data. Frequent discussions with them proved to be most meaningful.

We are also deeply indebted to other government officials and businessmen of Qatar. We appreciate their warm reception and cooperation. It is impossible to name them all, but they will long be remembered by individual members of the survey team.

In spite of the short period of time available in Qatar, our team could conduct a survey covering a vast area of Qatar in an effective manner. Without the kind assistanve extended to us by the people of Qatar, the efficient execution of survey works was impossible.

April 1970

Tokyo, Japan

Kenro Nakamura
Chief
Japanese Survey Team
for Economic Development
in Qatar.

CONTENTS

SUMMARY AND RECOMMENDATION

The Government of Qatar intends to have diversified industries other than the oil production developed in the country.

The mission has tried to find industrial projects with respect to such intention, and, under the given circumstances, found that the following industries may prove to be feasible or worthy for further detailed investigation.

(i) Petrochemical industry

a. LPG production

Extraction of LPG from the surplus associated natural gas in Dukhan field, which is currently being flared, about 260,000 tons per annum, and export thereof were proposed.

b. PVC plastics, and related chlorine and caustic soda production

Manufacturing of PVC plastics and caustic soda, 10,000 tons and 7,600 tons per annum respectively, using natural gas and salt, and fabrication of PVC commodities were proposed.

c. Oil refinery expansion

Establishment of a refinery of 10,000 BSD was proposed.

(ii) Salt field development

The quality of salt on the Qatari coast was found to be of good quality and development of salt field was suggested. However, no quantitative suggestion was made in this report.

(iii) Aluminium refining

Referring to the example in Bahrain, an aluminium refining, 100,000 tons per annum, developing electric power by a part of natural gas which is to be sent from Dukhan oil field to Umm Said for the fertilizer production was suggested.

(iv) Marine freight

Depending on the availability of fund, owing of dry cargo freighter or LPG carrier was suggested.

(v) Agriculture, horticulture, poultry and dairy

Research and experiment for the improvement of agriculture in the depression farms in northern peninsula, future investigation of utilization of ground water around Qarn Abu Wayil, the Government's initiation on the poultry and dairy farms on experimental basis with foreign experts and later shifting to commercial base run were suggested.

By nature of the mission, our study of these industries remained to be of general one, and this report does not contain any concrete proposal for the actual implementation.

It is therefore, recommended that the Government take further steps to formulate the concrete plans of implementation of respective industries, perhaps entrusting such works with qualified consultants or advisory institutions.

CHAPTER I INTRODUCTION

The state of Qatar occupies a peninsula on the western shore of the Arabian Gulf. Most of the land is a desert. Except for oil, natural gas, line-stone, some underground water and sea resources, the availability of natural resources is quite limited. Before the start of oil production in 1949, pearling, finishing and grazing are major productive activities. At present, petroleum is the najor source of the income of Qatar.

The population of Qatar has been steadily increasing since the discovery of oil in 1939, and is now estimated to be about 85,000. There has been an influx of immigrants into Qatar, and non-Qataris account for a very large percentage of the total population. The population is concentrated in Doha, the capital of Qatar.

The modern economic history of Qatar can be classified into four periods. The first period is the pre-oil period when most people were engaged in fishing, pearling, grazing and trading. The growth of the economy in this period is thought to be quite limited, while the development of cultured pearl in Japan depressed the export of pearls from Qatar.

The second period is the oil development period roughly from 1940 to 1959, during which there have been a steady growth of oil production and a steady increase of population.

The third period is the infrastructural development period under the rule of Shaikh Ahmad bin Ali al-Thani. This period is roughly from 1960 to 1968 when conscious efforts were made for the infrastructural development. Large investments were made in the areas of road, electric power, port, water supply, school, hospital and telecommunication.

The fourth period starts from 1969, and now the Government intends to go into development of industries in more diversified fields than the oil production. The completion of Umm Bap cement plant and launching in fertilizer and flour mill projects in Umm Said symbolize the start of this period.

It is our opinion that the infrastructure, in Qatar has already been well developed and therefore, except for the gradual and regular expansion thereof, there remains little need of major infrastructural construction for the introduction of the industries. In addition to that the advantageous factors for the introduction of industries may be the availability of oil resources and the zeal for the industrialization on the part of the Government as reflected on such policies as tax concessions and non-limitation in remittance etc.

Of course we have to consider such advers factors as smallness of domestic and hinter area market, competition from the surrounding states, limitation of land available for cultivation, salinity problems in farm land, hard climatic conditions in summer, lack of industrial background to be required to support new industries.

We looked into these conditions carefully and as the result reached a conclusion that the following projects might prove to be feasible under the given circumstances.

(i) Petrochemical industries.
(ii) Salt field development.
(iii) Aluminium refinery.
(iv) Marine freight.
(v) Agriculture, horticulture, poultry and dairy.

Our studies of these projects are provided in the following chapters.

Table No. 23, 24, 25 and 26 as included in appendix are showing the statistics of the import to Qatar in 1969. Although there is seen a demand for various commodities in various degrees of quantity, we still observe that such quantity is not large enough to endorse the introduction of manufacturing of such commodities. If there are some cottage industries which nevertheless prove to be profitable, we consider that they may be left to the enterprising mind and resources to the local enterpreneurs. Therefore, the cottage industries of such category were not dealt with in the present report.

CHAPTER II PETROCHEMICAL INDUSTRY

2.1. GENERAL DISCUSSIONS

2.1.1. Planning for Petrochemical Industry

In Qatar, crude oil and its associated natural gas are the most precious natural resources. At present, the annual production of crude oil is 9.4 million long tons (1969) at the Dukhan oil field, west of Qatar Peninsula and 7.4 million long tons (1969) in the offshore field centering around Halul Island at the east. This Dukhan crude oil is of good quality, being light (42.1°API) and containing less sulfur (1.05 % by weight) than the crude oils produced in the Arabian Gulf area. Qarari offshore crude is slightly of lower quality than the Dukhan product.

The natural resources of hydrocarbons in Qatar are fairly favorable ones but when compared with the Arabian Gulf area as a whole, the area would not be termed rich. When planning petrochemical industries based on such natural resources, the following points must be taken into consideration.

1) In order to plan effective utilization of the natural resources of hydrocarbons, composite utilization of all hydrocarbon components from natural gas fraction to heavy crude oil residue fraction should be considered.

2) In the early stages of industrialization, those industries which produce items of relatively high added value by a comparatively simple process from components of hydrocarbon should be selected.

3) At the same time that the selected industries are being developed, related industries are to be cultivated in order to diversify the industrial power in Qatar.

2.1.2. Industrialization Policy of the Government of Qatar and Situation of Petrochemical Industrialization in Arabian Gulf Countries

The Government of Qatar has already well recognized the points regarding the industrialization for composite utilization of hydrocarbons described above and continues its efforts toward industrialization based on these premises.

The large scale export-oriented fertilizer complex the construction of which

was begun by the Qatar Fertilizer Company (QAFCO) in the Umm Said industrial zone in 1969 was the first attempt in the petrochemical industrialization program of the Government of Qatar. This project for constructing a complex was designed as a model in scale, manufacturing process, product market planning, capital planning, etc., and it can be said to be a most appropriate and attractive beginning for the plan for composite utilization of hydrocarbons in Qatar.

In the Arabian Gulf countries, projects for composite utilization of hydrocarbons are being continually implemented under the same considerations as in Qatar (refer to Table 1). Qatar has clearly confirmed its position as an industrial country in the Gulf area by the establishment of this fertilizer complex.

Table 1

Petrochemical Projects in Arabian Gulf Countries

Company	Plant Site	Projects		Probable Completion	Raw Material	Market	Future Expansion
Qatar			Mt/d				
Qatar Fertilizer Co. (QAFCO)	Umm Said	Ammonia Urea	900 1,000	1972	Natural Gas	Export (Norsk Hydro Co.)	
Saudi Arabia			Mt/d				
Saudi Arabian Fertilizers Co. (SAFCO)	Damman	Ammonia Urea Sulfur	600 1,100 50	1969	Natural Gas	Export (International) Ore & Fertilizers Co.)	Fertilizers, PVC MVC, Methanol, Ethylene, Propylene, Carbon-black, Elastomer, Synthetic Rubber, Ester, Plastics
Kuwait			Mt/d				
Kuwait Chemical Fertilizer Co. (KCFC)	Shuaiba	Ammonia Urea Ammonium sulphate Sulphuric acid	400 550 450 400	Complete	Natural Gas	Arabian Countries, Iran, Mainlan China, India	Fertilizers, Acetylene, Chlorine, Caustic soda, PVC
Petrochemical Industries Co. (PIC)	Shuaiba	Ammonia Urea	1,600 1,400	Mid 1970	Natural Gas	Turkey, Mainland China, India, South America, Europe	
Mediterranean Fertilizer Industries	Shuaiba	Liquid ammonia	800			Export to Turkey	

Iraq			Mt/d				
Basrah Fertilizer Co.	Basrah	Ammonia Urea Ammonium sulfate	200 160 40	1971	Natural Gas	Domestic	Fertilizer Plastics, Synthetic Fiber, Synthetic rubber
Iran			t/y				
Iran Fertilizer Co.	Shiraz	Urea Ammonium nitrate NPK Compound fertilizer (20-20-0)	55,000 10,000 15,000	Complete	Natural Gas	Domestic	Fertilizers, Methanol, Melamin, Ethylene, Isoprene, Ethyleneglycol, Ethanolamine, Plastics (PVC, PE)
Pazargad Chemical Co.	Abadan	Caustic soda Hydrochloric acid	5,000 4,500	Complete	Salt	Domestic	Synthetic Rubber, Aromatics, Phthalic Anhydride, Caprolactam
Abadan Petro-chemical Co.	Abadan	PVC DDT Caustic soda	20,000 10,000 24,000	1969		Domestic	Dodecylbenzene, Carbonblack, Tetraethyl Lead, Carbon disulfide
Kharg Chemical Co.	Kharg Island	Sulphur LPG	200,000 240,000	1969	Natural Gas	Export	
Shahpur Chemical Co.	Shahpur	Sulphur Ammonia Urea Phosphoric acid Sulfuric acid Ammonium-phosphate Triple superphosphate	480,000 340,000 164,000 143,000 420,000 100,000 141,000	1969	Natural Gas	Export (Sulfur, Ammonia)	

2.1.3. Possibility of Future Petrochemical Diversification

From the viewpoint of composite, effective utilization of natural resources of hydrocarbons and utilization of the regional pattern of the Arabian Gulf area, the following three industries are to be considered as future industrialization projects. (refer to Fig. 1)

1) Liquefied petroleum gas (LPG) production

2) Polyvinyl chloride (PVC) plastics, and related chlorine and caustic soda production by salt electrolysis

3) Oil refinery expansion

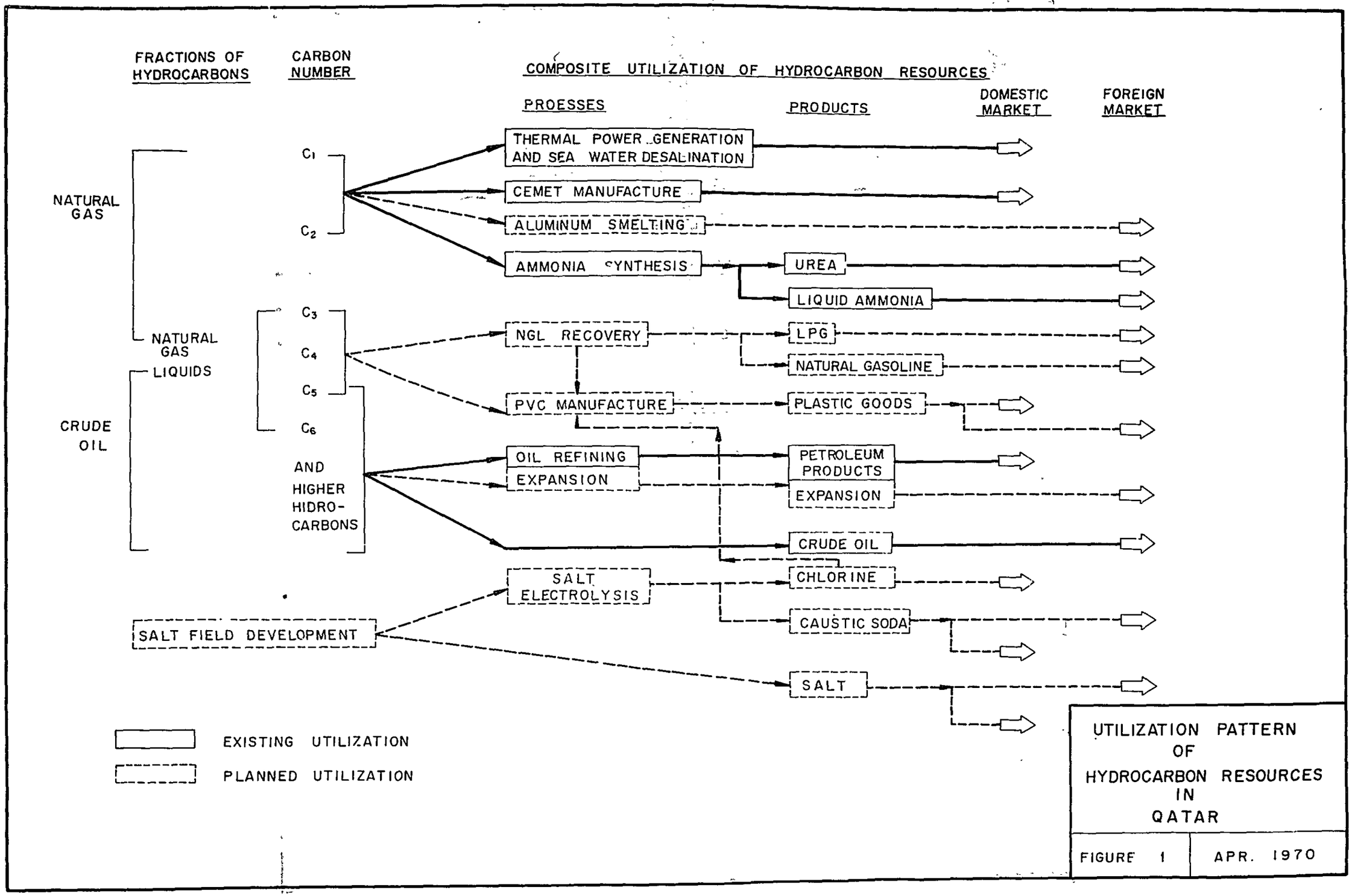
LPG production and PVC production aim at the effective utilization of natural gas liquids (the propane, butanes, pentanes and hexanes of hydrocarbons).

Methane which is found in the greatest quantity among the components of natural gas, is used not only as the major material in the fertilizer complex but also as the fuel for the thermal power station and cement factory; however, the utilization of natural gas liquids interspersed between methane and the components of crude oil has not yet begun.

LPG is a commodity with a promising export market and PVC is a plastic with a very wide range of application and excellent processability as the first plastic with which Qatar is to embrace the plastics industry. Production of soda and chlorine by a salt electrolysis plant can also be considered in relation to production of PVC.

There is a 600 barrels/day small topping plant operated by the National Oil Distribution Company (NODCO) in Umm Said.

Expansion of the plant is already under study by NODCO, then this report attempted investment cost estimation on the basis of 10,000 BSD. There is a relatively high potential demand for petroleum products in the Trucial states as a whole and oil refining is a promising industry, but further and detailed investigation is considered necessary for the new establishment of a refining with existing distributors in mind.



UTILIZATION PATTERN
OF
HYDROCARBON RESOURCES
IN
QATAR

FIGURE 1 | APR. 1970

2.2. LPG PRODUCTION

2.2.1. General

As stated above, in Dukhan field, if LPG is extracted from the surplus associated natural gas, of which is currently being flared, about 260,000 tons of LPG per year can be produced. The natural gas produced in the Halul offshore field is not considered in this text, because an expensive investment cost of production facilities is expected. (refer to Tables 2, 3, 4 and 5)

260,000 tons of LPG satisfies the minimum economic scale. In this case, the construction cost for an LPG extraction plant is about 68 million QDR and the operation cost of the LPG is about 57 QDR/ton. Therefore it is considered that LPG production will become a sufficiently profitable enterprise.

Table 2

Natural Gas Production

Dukhan Field (July 1968 - June 1969)

Production Station	Gas Production in MMSCF (14.7 psia 60°F)	
	High Pressure Separator Gas 650/550 psia	Low Pressure Separator Gas 140, 40, 10/6, psia and atmospheric
Khatiyah	20,835	7,259
Fahahil	21,077	6,772
Jaleha	17,522	5,531
Total	59,434	19,562
Average Daily rate	162.8	53.6

(Source: Government of Qatar)

Table 3

Recoverable Natural Gas Liquids Calculations

Fraction	Associated Natural Gas MMSCF/Year				Rate Recovery %	Recovered Natural Gas Liquid Tons/Year
	Khatiyah Station	Fahahil Station	Jaleha Station	Total		
Propane	1,130	1,000	830	2,960	98	161,000
Butanes	470	490	450	1,410	99	102,000
						263,000
Pentanes and Heavier	190	220	220	630	99	63,000
						326,000

Table 4

Typical Low Pressure Separator Gas Analysis

Separator: Fahahil Station/3rd Stage

Collected at: 87 psig and 118°F

Components	MOL%
Nitrogen	0.02
Carbon dioxide	6.92
Hydrogen sulfide	1.26
Methane	38.71
Ethane	25.59
Propane	16.05
iso-Butane	2.26
n-Butane	5.57
iso-Pentane	1.21
n-Pentane	1.47
Hexanes	0.68
Heptanes plus	0.26
Total	100.00

(Source: Government of Qatar)

Table 5

Typical High Pressure Separator Gas Analysis

Separator: Khatiyah South Station

Collected at: 650 psig and 150°V

Components	MOL%
Nitrogen	Trace
Carbon dioxide	4.60
Hydrogen Sulfide	1.42
Methane	73.59
Ethane	11.95
Propane	4.81
iso-Butane	0.67
n-Butane	1.51
iso-Pentane	0.41
n-Pentane	0.51
Hexanes	0.32
Heptanes plus	0.21
Total	100.00

(Source: Government of Qatar)

2.2.2. Export Market of LPG

Recently household and industrial demands for LPG are greatly increasing in Japan. The available supply of LPG is that produced in domestic refineries and imported LPG. The increase of imported LPG is fairly great and an annual growth of about 200,000 tons is expected (refer to Table 6).

LPG imported into Japan comes mainly from the Middle East, especially Kuwait and Saudi Arabia, and its imports amount to 1,700,000 tons a year (1969) (refer to Table 7).

This means that the greatest market for LPG produced in the Middle East is Japan, so it is considered to be desirable to proceed an LPG export project with the cooperation of Japanese importers.

Table 6

LPG Demand and Supply in Japan

(Unit: 1,000 ton)

	Year / Classified Use	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Demand	Household use	1,118	1,434	1,641	1,800	2,106	2,443	2,740	2,976	3,192	3,380	3,566
	Town gas making	44	39	40	72	101	155	126	154	221	318	455
	Industrial use	182	255	324	481	645	747	872	1,002	1,132	1,262	1,392
	Automobile use	155	374	635	828	1,007	1,201	1,371	1,476	1,582	1,693	1,792
	Raw material for chemical industries	86	64	54	158	194	203	347	512	522	522	522
	Export	-	-	3	9	20	27	34	35	36	12	13
	Total	1,585	2,166	2,697	3,348	4,073	4,776	5,580	6,155	6,685	7,187	7,740
Supply	Domestic production	1,360	1,714	2,244	2,472	2,742	3,025	3,512	3,835	4,169	4,633	5,112
	Import	227	429	582	915	1,345	1,815	2,088	2,351	2,544	2,578	2,661
	Total	1,587	2,143	2,826	3,387	4,087	4,840	5,600	6,186	6,713	7,211	7,773

(Source: LP-GAS Annual Report, Facts & Figures-Japan Vol. 5, 1969)

Table 7

LP-Gas Import Tankers in Japan (1969)

Port of export	Tankers	Dead weight tonnage	Loading capacity t		Annual carrying capacity t/y
KUWAIT Mena al Ahmadi	Bridgestone Maru	25,600	LPG	16,500	132,000
	No. 2 Bridgestone Maru	29,500	LPG	21,000	168,000
	No. 3 Bridgestone Maru	33,800	LPG	27,500	220,000
	No. 5 Bridgestone Maru	44,700	LPG	40,700	325,000
	Shiroyama Maru	35,000	LPG	26,500	212,000
	Kazutama Maru	39,000	LPG	29,500	236,000
SAUDI ARABIA Ras Tanula	Nisseki Maru	22,400	LPG Crude Oil	5,300 14,500	42,400
	Goshu Maru	48,000	LPG Crude Oil	6,500 38,000	52,000
	Toyosu Maru	22,000	LPG Crude Oil	7,500 14,000	60,000
	No. 10 Yuyo Maru	54,000	LPG Crude Oil	26,000 23,000	208,000
IRAN Bandar Mah Shahr					600,000
Kharg Island	Under Construction	40,000 x 6			240,000
CANADA Port Moody	Yamahide Maru	29,100	LPG	21,500	237,000
AUSTRALIA Long Island Point					500,000

(Source: Bridgestone Liquefied Gas Co.)

2.2.3. Outline of LPG Production Plant (refer to Fig. 2)

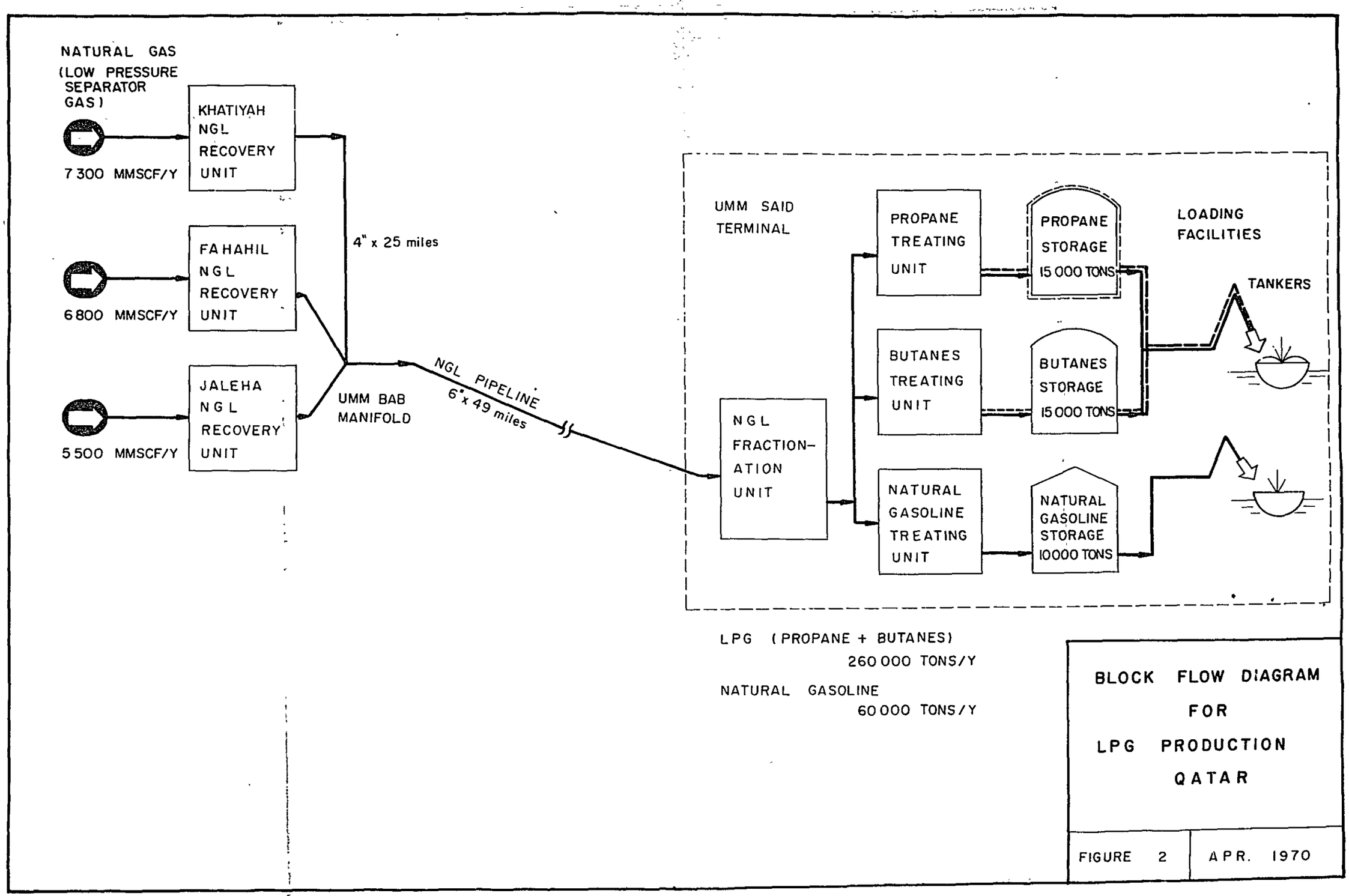
Three natural gas liquids (NGL) extraction units are to be constructed at each separation station of Katiyah, Fahahil and Jaleha in the Dukhan oil field. In the extraction unit, the low-pressure separator gas, after being separated from the high-pressure separator gas with methane as the major component, is treated to recover the natural gas liquids.

The propane refrigeration system is adopted for the recovering system, and propane fraction is recovered at as high a rate as 98% and butanes fraction and pentanes and heavier fraction at 99%.

The recovered natural gas is pumped to the Umm-Said Terminal through pipeline, 6" x 49 miles.

At the Umm-Said Terminal, an NGL processing unit and storage loading facilities are constructed. The NGL transferred from Dukhan is first sent to the fractionation unit where it is separated into propane, butanes and natural gasoline. After that, each fraction is sent to a treating unit to remove the sulfur and be dried and refined.

The propane and butanes are liquefied and stored in refrigerating tanks. The capacity of the refrigerating tanks for propane and butane is 15,000 tons each. The natural gasoline is stored in an ordinary storage tank. The loading capacity of the loading facilities is 1,500 tons per hour.



BLOCK FLOW DIAGRAM FOR LPG PRODUCTION QATAR

FIGURE 2 | APR. 1970

2.2.4. Investment Cost Estimation

Estimated investment cost required for establishing the proposed NGL recovery units, processing units, storage and loading facilities is as shown in Table 8.

Table 8

Investment Cost Estimations

Units and facilities		Investment cost QDR
NGL Recovery units (Khatiyah, Fehahil and Jeleha stations)		25,600,000
NGL Pipelines	4" x 25 miles 6" x 49 miles	13,800,000
Umm Said Terminal		28,600,000
	NGL Fractionation unit NGL Treating unit	
	Storage tanks (15,000 tons for propane 15,000 tons for butanes and 10,000 tons for natural gasoline)	
	Loading facilities (1,500 tons/hour)	
	Utility facilities	
		68,000,000

2.2.5. Operation Cost of LPG Production

The following Table 9 shows the operation cost of LPG production.

Table 9

Annual Operation Cost Calculations

Basis : 1) Total investment cost: 68,000,000 QDR

2) 330 Stream days/year

Item	Annual cost QDR
Direct operating cost	
Utilities and other expenses	920,000

Item			Annual cost QDR
Labour and supervision (50 men)			370,000
			1,290,000
Fixed cost			
Amortization	10%	investment/year	6,800,000
Interest	6%	"	4,080,000
Tax and insurance	1%	"	680,000
Maintenance	3%	"	2,040,000
			13,600,000
Annual operation cost			14,890,000
Operation cost of LPG (propane + butanes)			56.6 QDR/ton of LPG

2.2.6. Profitability Evaluation

The estimated profitability is as shown in Table 10.

Operation cost of the plant is 56.6 QDR per ton of LPG which is reasonable, but the most important problem for this project is at what price level the low-pressure separator gas (NGL) is bought from the natural gas manufacturers. In the following calculation, the purchase price of NGL is assumed to be 18 QDR per ton whereupon the obtained profit is 8.4 million QDR a year. The pay-out time of the project is 4.5 years. This value is about reasonable for a project of this kind.

Table 10

Profitability Evaluation

Basis:	1) LPG FOB price	80.0 QDR/ton
	2) Natural gasoline FOB price	66.0 "
	3) Raw NGL cost	6.0 "

Table 10 - continued -

1) Annual sales value

	Sales amount	FOB price	Sales value
	tons/yr	QDR/ton	QDR
LPG	263,000	80.0	21,040,000
Natural gasoline	63,000	66.0	4,158,000
	326,000		25,198,000

2) Profitability

	QDR
Annual sales value	25,198,000
Annual raw NGL cost	1,956,000
Annual operating cost	14,890,000
Profit (in case of no taxation)	8,352,000

$$\text{Pay-out time (years)} = \frac{\text{Total investment cost}}{\text{Profit + Amortization cost}} = 4.5$$

2.3. PVC PLASTICS, ANE RELATED CHLORINE AND CAUSTIC SODA PRODUCTION

2.3.1. General

The PVC plastics manufacture from natural gas liquid and chlorine obtained from salt electrolysis is suitable as the first step toward an entry into the plastics industry. PVC has many uses such as rigid PVC pipes (water pipes), corrugated board, pipes for mine and industry, shoes, floor material, bags for fertilizer, etc., and a fair market can be found even within the Arabian Gulf countries.

2.3.2 Prerequisite Conditions for PVC Manufacture

It is the most important problem for the plastics industry to cultivate plastics processors who process PVC resin up to the end products. The logical steps to be taken in the development of this industry is to cultivate widely domestic processors at first to permit them to become accustomed to the process with imported PVC resin (or PVC compounds), and finally to process the domestic produced material of which manufacture is considered in this text.

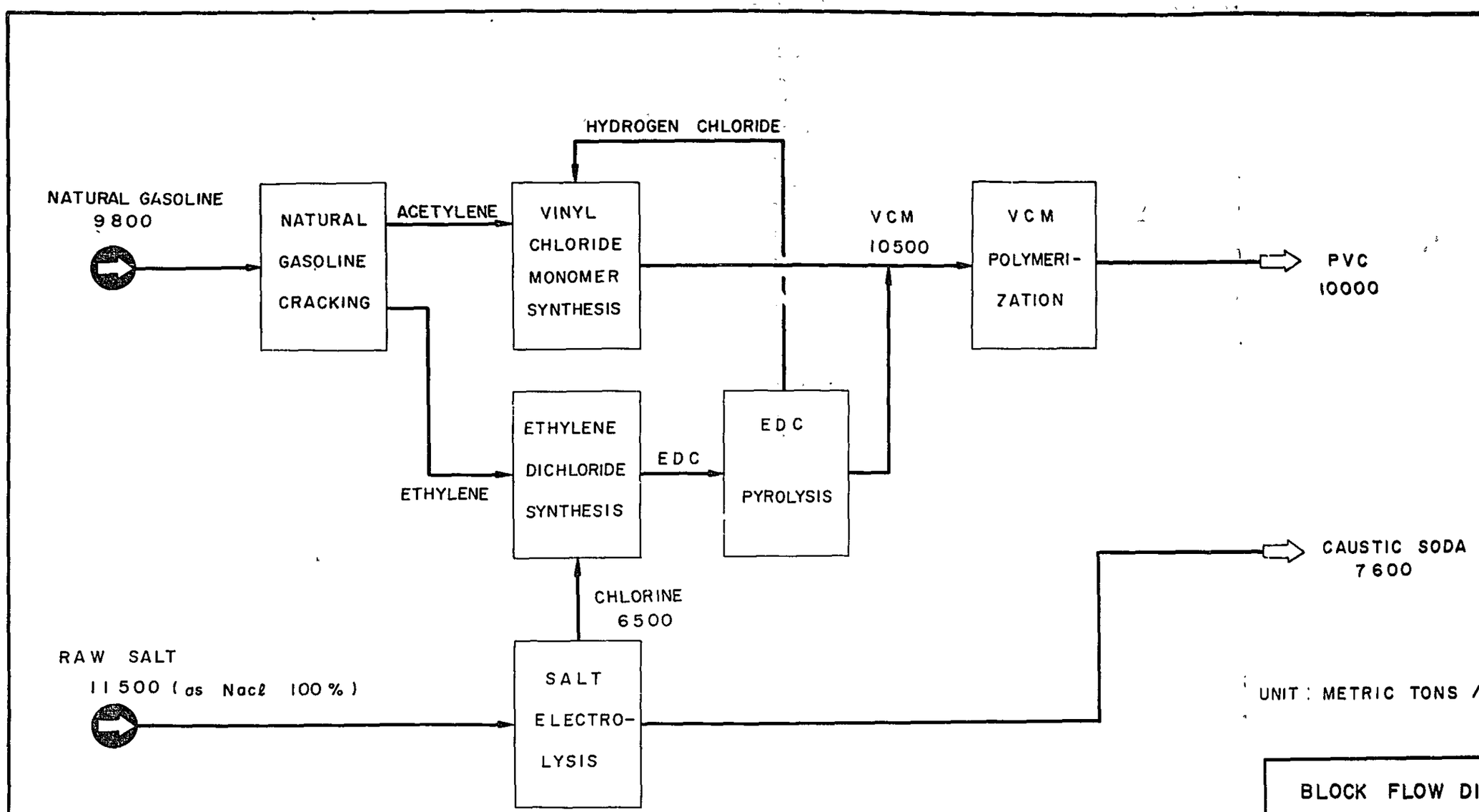
2.3.3. Outline of PVC Plant (refer to Fig. 3)

In this plant, PVC (polyvinyl chloride) is manufactured using natural gasoline recovered from natural gas. A salt electrolysis unit is installed at the same time to produce caustic soda and chlorine used for PVC.

Natural gasoline feedstock is sent to thermal cracking furnace to produce ethylene and acetylene. Thus produced acetylene is converted to vinyl chloride monomer by direct chlorination, and also ethylene is converted to VCM by oxy-chlorination and ethylene dichloride pyrolysis. Then VCM is polymerized to higher molecular polyvinyl chloride (PVC) by suspension polymerization process.

As to the plant site, Umm Said is desirable as raw natural gasoline and raw industrial salt easily available there, and the existing industrial facilities can be ustilized.

The PVC manufacturing plant needs about 150,000 square meters of land.



UNIT : METRIC TONS / YEAR

BLOCK FLOW DIAGRAM
FOR
POLYVINYL CHLORIDE (PVC)
PLANT
UMM SAID

FIGURE 3 | APR. 1970

2.3.4. Investment Cost Estimation

Investment cost required for establishing the proposed PVC manufacturing plant has been estimated as in Table 11.

Table 11

Investment cost estimation

Units	Investment cost QDR
VC Monomer unit)	
PVC Unit)	23,100,000
Electrolysis unit)	
Offsite facilities	13,600,000
Total	36,700,000

2.3.5. Production Cost

The following Table 12 shows the production cost of PVC.

Table 12

Production cost calculation

Basis: 1) Total investment cost 36,700,000 QDR

2) 330 stream days/year

Item		Annual cost QDR
Feed stocks		
Natural gasoline	9,800 tons/year (@66 QDR/ton)	646,000
Raw salt	11,500 tons/year (@47 QDR/ton)	540,500
		1,187,300
Direct operating cost		
Labor and supervision	(80 men)	720,000
Utilities and other expenses		2,710,000
		3,430,000

Fixed cost		
Amortization	10% investment/year	3,670,000
Interest	6% "	2,202,000
Tax and insurance	1% "	367,000
Maintenance	3% "	1,101,000
		7,340,000
By-product credit		
Caustic soda	7,600 tons/year (@700 QDT/ton)	5,320,000
	Total annual cost	6,637,300

Production cost of PVC PVC = 0.66 QDR/kg

2.3.6. Profitability Evaluation

Evaluating by the Pay-out time calculation, the pay out time is to be 3.5 years as shown in Table 13. These figures are fairly good values for this type of plant.

Table 13

Profitability Evaluation

Basis:	1) PVC production cost	0.66 QDR/kg
	2) PVC sales price	1.35 QDR/kg
Annual sales value PVC 10,000 tons/year (@1.30 QDR/ton)		13,500,000
Annual production cost		6,637,300
Profit (in case of no taxation)		6,862,700

Pay-out time (years) = 3.5

2.4. OIL REFINERY EXPANSION

2.4.1. General

Demand for petroleum products is increasing yearly with the development of industrialization and motorization in Qatar. Having taken notice of this point, NODCO has already begun the study of expansion program of its Umm-Said Topping plant.

Establishment of a refinery of 10,000 BSD is considered here on the assumption that the demand in 1975 will reach 10,000 BSD based on a rapid growth of demand for petroleum products in Qatar and the neighboring Trucial states.

Sales of petroleum products in Qatar and the Trucial states are handled by large oil distributors at present, so adequate research on the marketing methods will be necessary. As oil refining is a basic industry for a state, it will be valuable to consider it as a problem for the Trucial states as a whole, in that they are expected to develop greatly in the future.

2.4.2. Outline of the Refinery Expansion (refer to Fig. 4)

The refinery is designed to refine 10,000 BSD Qatar crude oil to produce petroleum products as shown below.

	Product	BSD
Crude oil 10,000 BSD	LPG	300
	Motor gasoline	
	Premium (97 RON)	1,200
	Regular (90 RON)	2,000
	Jet fuel	400
	Kefosene	600
	Gas oil	1,500
	Diesel oil	400
	Fuel oil	1,200
	Bunker oil	1,400
	Asphalt	600

Crude oil is transported from the Umm Said terminal. Products such as fuel oil, bunker oil and another products for export are shipped from the Umm

Said jetty, and products for mainly domestic use such as LPG, motor gasoline, jet fuel, gas oil are delivered directly by tanklorrys from the refinery.

As to the site of the refinery to be newly constructed, it is recommended at first to establish the refinery in Umm Said in direct relation with the industrial development plan of glowing Umm Said area. The 10,000 BSD refinery needs about 300,000 square meters of land.

In the production of asphalt, it is required to blend heavy asphaltic base source (such as Khafuji crude oil) and Dukhan crude oil.

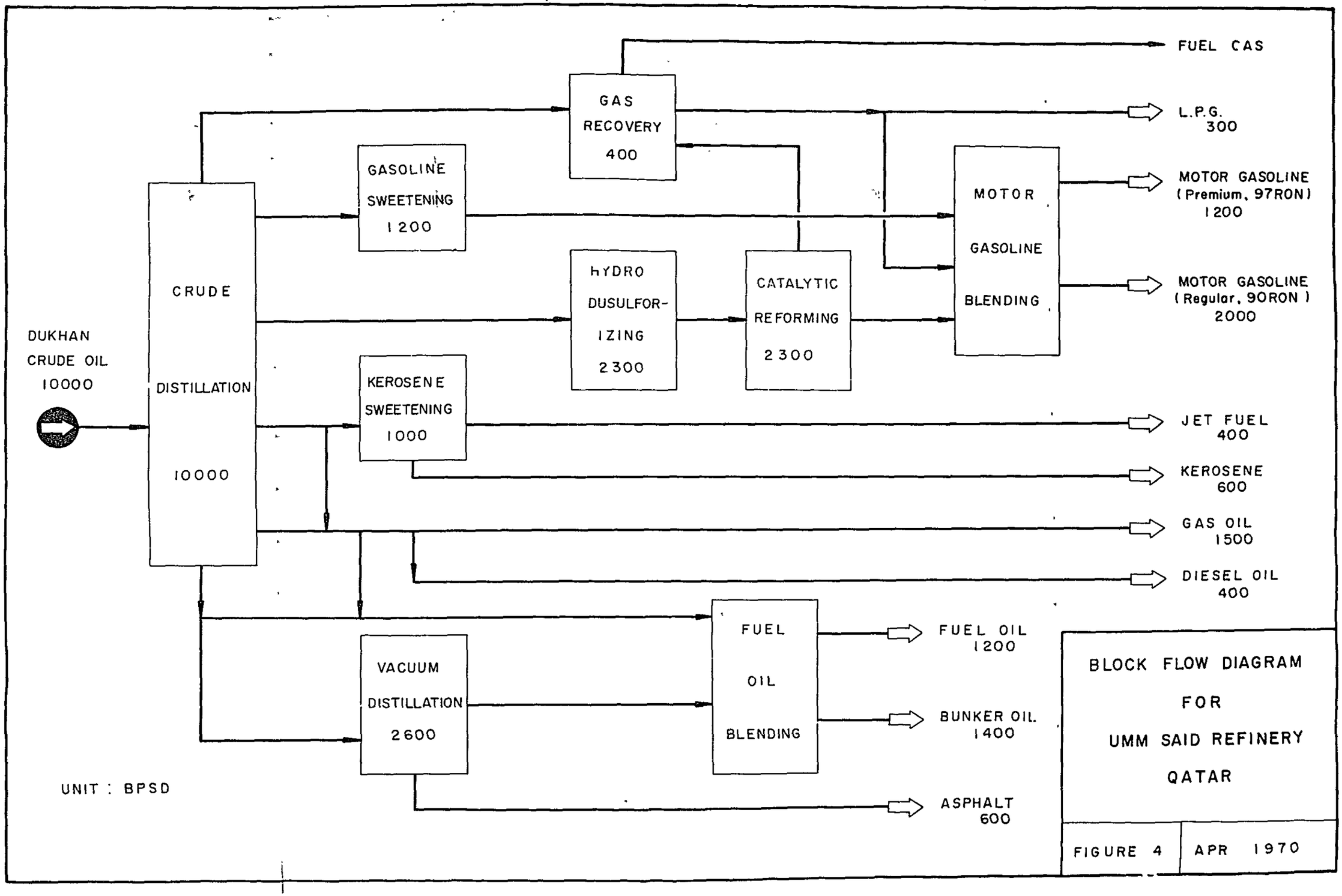

DUKHAN
CRUDE OIL
10000
CRUDE
DISTILLATION
10000
GAS
RECOVERY
400
GASOLINE
SWEETENING
1200
HYDRO
DUSULFOR-
IZING
2300
CATALYTIC
REFORMING
2300
KEROSENE
SWEETENING
1000
VACUUM
DISTILLATION
2600
MOTOR
GASOLINE
BLENDING
FUEL
OIL
BLENDING
FUEL GAS
L.P.G.
300
MOTOR GASOLINE
(Premium, 97RON)
1200
MOTOR GASOLINE
(Regular, 90RON)
2000
JET FUEL
400
KEROSENE
600
GAS OIL
1500
DIESEL OIL
400
FUEL OIL
1200
BUNKER OIL
1400
ASPHALT
600
UNIT : BPSD
BLOCK FLOW DIAGRAM
FOR
UMM SAID REFINERY
QATAR
FIGURE 4
APR 1970

Table 14

Properties of Dukhan crude oil

Gravity °API at 60°F		42.1
Specific gravity at 15/4°C		0.8135
ASTM distillation IBP	°C	32
5% vol. recovered at	°C	-
10% "	°C	92
20% "	°C	133
30% "	°C	170
40% "	°C	211
50% "	°C	263
Recovered at 300°C	%	59
Kinetic viscosity at 50°F	CS	4.59
Sulfur	%wt	1.06
Flash point	°F	66
Pour point (ASTM max.)	°F/°C	0/-18
Reid vapor pressure	lb	10.2

(Source: Government of Qatar)

2.4.3. Investment Cost Estimations

Investment cost required for establishing the proposed refinery have been estimated as in Table 15.

Table 15

Investment cost estimations

Unit	Investment cost QDR
Crude distillation and Vaccum distillation units	
Hydrodesulfurization and Catalystic reforing units	19,500,000
Gasoline sweetening unit	
Kerosene sweetening unit	
LPG recovery unit	

Ta Table 15 - continued -

Units	Investment cost QDR
Oil handling system	15,500,000
Offsite facilities	17,400,000
Total	52,400,000

2.4.4. Annual Operating Cost

The following Table 16 shows the annual operating cost of the refinery on the basis of 330 days operation.

Table 16

Annual operating cost calculation

Basis: 1) Total investment cost 52,400,000 QDR
2) 330 stream days/year

Item			Annual cost QDR
Direct operating cost			
Labor and supervision	(222 men)		1,332,000
Utilities and other expenses			1,513,000
			2,845,000
Fixed cost			
Amortization	10%	investment/year	5,240,000
Interest	6%	"	3,144,000
Tax and insurance	1%	"	524,000
Maintenance	3%	"	1,572,000
			10,480,000
Annual operating cost			13,325,000

2.4.5. Profitability Evaluation

Assuming the prices of individual products as

	QDR/imp. gallon
LPG	0.33
Premium motor gasoline (97 RON)	1.09
Regular motor gasoline (90 RON)	0.88
Kerosene	0.47
Jet fuel	0.47
Gas oil	0.60
Diesel oil	0.60
Fuel oil	0.15
Bunker oil	0.15
Asphalt	0.44

Sales values are put out as following Table 17.

Feedstock crede oil cost is estimated as 9.286 QDR (equivalent to US$ 1.95) per barrel.

Evaluating by pay-out time method, the pay-out time is to be 2.2 years on the new refinery. This figure seems fairly good value.

Table 17

Pay-out time calculation

Annual sales value	62,812,200
Annual crude oil cost	30,643,800
Annual operating cost	13,325,000
Profit	18,843,400

(increase of no taxiation)

Pay-out time (years) = 2.2

CHAPTER III SALT FIELD DEVELOPMENT

There is a vast accumulation of natural salt in the Umm Said area and an analysis of it indicates that it is of very good quality.

In Aden and Yemen, opposite side of Arabian Peninsula, there are many salt fields established in the early 1930's. At present, Japan imports raw salt of about 130,000 tons per year from these areas. Therefore, it would be of great value to study the development of the salt field in Qatar more thoroughly.

Table 18 shows an analysis of Umm Said salt, and Table 19 indicates salt imports in Japan by countries.

Table 18

Umm Said salt analysis

Component	wt.%
NaCl	99.35
Fe	(6ppm)
K	0.07
SO_4	0.061
Mg	0.01
Ca	0.03
Insoluble matter	0.00
Water	0.1

(Source: Research Laboratory, Japan Gasoline Co.)

Table 19

Salt imports in Japan by countries, 1968

Country of origin	Quality NaCl wt.%	Quantity Metric tons
USA	96.5-97.5	238,712
Mexico	96-97	1,986,245
India	94-95	435,308
Pakistan	93-95	85,057
Aden	93-94	55,794
Yemen	98-99	81,160
Ethiopia	96-97	141,067
Tunisia	96-97	31,759
Spain	96.5-97.5	14,179
Rumania	98-99	8,288
Venezuela	98-99	39,706
Chile	98-99	448,452
Indonesia	90-93	24,826
Thailand	88-89	11,493
Australia	94-97.5	322,403
Mainland China	93-94	1,026,551

(Source: Soda and Chlorine-Japan, 20, (No. 239) Dec. 1969)

CHAPTER IV ALUMINIUM REFINING

4.4. GENERAL

An aluminium refinery of a capacity of 90,000 tons per annum combined with a thermal plant of a capacity of 180,000 kilowatts are being constructed in Bahrain by a consortium under the name Aluminium Barhain (ALBA) consisting of the Government ($27\frac{1}{2}$ per cent), the British Metal Corporation (25 per cent), Aktiebolaget Elektrokopper of Sweden (25 per cent), the Western Metal Corporation ($12\frac{1}{2}$ per cent) and Guiness Mahon (10 per cent).

The aluminium consumption in the world is ever increasing. It is estimated that the total demand of about 10 million tons in 1968 will reach about 16 million tons a year by around 1976. The annual increase is estimated at one million tons a year.

In view of such prospect of demand growth and a live example in Bahrain, we consider that there should be a possibility of aluminium refinery project in Qatar as well, provided that an appropriate approach to the world aluminium concerns is to be made and that cheap electricity will became available utilizing a part of the natural gas to be sent from Dukhan oil field to the fertilizer plant at Umm Said. As in the case of ALBA, a refinery capacity of 90,000 - 100,000 tons may be recommended, and that also matches the available natural gas quantity. The project cost is roughly estimated as 350 - 400 million QDR for the refinery and 1.15 million QDR for the power plant.

As regards the energy cost, we have calculated as 0.75 dirham/kwh, excluding natural gas charge, vide next paragraph, and if we could assume that the gas is available at 0.13 dirham per normal cubic meter, the energy cost becomes 0.88 dirham/kwh which should be regarded quite attractive for the aluminium refining industry.

The pipe line from Dukhan oil field to Umm Said, 24 inch dia. x 60 miles, should have a spare capacity as explained in the following page.

Capacity under pressure 450 psi	150 MMSCF
" 300 "	100 "
Requirement for fertilizer plant	
Initial stage	45 MMSCF
After expansion	70 "
Spare capacity	
Uner pressure 450 psi	105 - 80 MMSCF
" 300 "	55 - 30 "
Requirement for 180,000 kw power generation	36 MMSCF

4.2. ENERGY COST CALCULATION

Installed capacity	30,000 kw x 8 = 240,000 kw
Assumed plant cost	480 QDR/kw
Annual fixed cost percentage	
Amortization (3.5%, 15 yrs)	8.68%
Operation and maintenance (excluding fuel charge)	1.65%
Insurance	0.3 %
Others	0.37%
	11.0 %
Annual fixed cost	52.7 QDR/kw
Annual operating hour 7,000 hr (P.F. 80%)	
Energy production cost	0.75 d/kwh.

CHAPTER V MARINE FREIGHT

It was made known to the mission that the Government of Qatar is interested in going in the marine freight business. Therefore, although none of the members of the mission was specialized in the business of that line, the mission has contacted with certain people from the marine freight business in Japan and obtained an information as follows.

When one wants to build freighters and go into the marine freight, there are two types of running business, the one being the ship owner who relays only on time-chartering-out and the other being the owner and operator who owns and operates freighters and runs the business by himself. In the case of Qatar who is to go into the business newly, it may be recommended that Qatar should better remain the ship owner.

It is said that there is plenty market for chartering-out of freighters in so far as Japan is concerned and that this market trend may continue.

We have recommended in Chapter II Petrochemical Industry, an exportation of LPG amounting 260,000 tons a year. Naturally, this project should require the operation of LPG tankers, in which Qatar may have an interest.

Though it is rather difficult to give the financial calculation in general term as there are various special conditions which affect on the cost figures, a most generalized example of the calculation in the case of 13,000 ton dry cargo freighter operating between the Arabaian gulf and Japan will be presented below.

Example

(i) Annual cost — 3,801,000 QDR

Capital cost . . . . . 2,501,000 QDR

Cost of freighter	13,000 tons @ abt. 17,000,000 QDR
Interest rate	6%
Repayment terms	10 years
Ship building period	2 years

Operating cost (owner's)	1,160,000 QDR
Crew salary	
Equipment and accessaries	
Lubricating oil	
Repairing cost	
Miscellaneous	
Company establishment	140,000 QDR
(ii) Time chaterage	4,900,000 QDR
7.5 $/ton/months	

CHAPTER VI AGRICULTURE, HORTICULTURE, POULTRY AND DAIRY

6.1. AGRICULTURAL DEVELOPMENT IN NORTHERN PENINSULA

Under the auspices of the Department of Agriculture, a remarkable agricultural development has been attained in northern peninsula of Qatar since 1960, cultivating the local depressions which provide fine soil deposit and soft ground water essential for the plant growing.

Except for the seedlings of fruit, forest and ornamental trees nursed in the Government experimental farm, the major crops are vegetables such as tomatoes, okra, eggplant, cabbages, cauliflowers and root vegetables. It is said that in so far as vegetables are concerned Qatar is now completely self supporting. Production of fruit such as melon, dates, guavas, pomegranates, figs, bananas and grapes, and wheat crops are being tried but they are still regarded as primary crops. It may even be necessary to weigh carefully whether they may become really economical production competitive against the imported fruit or grains.

Statistics on the farms in northern peninsula is given in Table No. 20, 21 and 22 attached hereto. As regards the room for further expansion in acreage, we may still have to wait the result of land survey which is said to be undertaken soon, but generally speaking if there is any such room it may not be of major scale. Therefore, we rather suggest the general improvement in the manner of cultivation and selection of crops based on the research and local need. An observation by our mission of the agricultural development in northern peninsula will be given in the next paragraph.

6.2. MISSION'S OBSERVATION

Although there still needs to be substantiated by various basic researches, Qatar seems to have more favourable condition for the agriculture than the other gulf countries.

Following are the observations:

1) Qatar has a comparatively long winter season in which the climate is mild and a few inches of rainfall is observed every year. This condition permits multi-cropping of products under suitable crop combination.

2) Soil in the depressions in northern peninsula is sticky clayish, deposited in sufficient depth, and suitable for agriculture.

3) The similar sort of soil is also found in the middle part of peninsula.

4) Soft water with brine in the range of 1,000 - 1,500 ppm is available in the depressions in northern peninsula, which is replenished by rain water every year.

5) In the areas near the area coast are acquifers of soft water lying over acquifers of brine water. The soft water can be utilized for the agriculture.

The abovementioned advantages make agriculture on vegetables, fruits and oil crops, cattle and poultry raising possible, but for the improvement production thereof the following measures will have to be considered.

1) As the compound and texture of the soil is not necessarily favourable, planting and ploughing in of such crops as lucern as recommended to supplement organic component.

2) In order to minimize the evaporation, such evapo-saving harvesting measures as mulching or grass and tree covering must be considered.

3) In order to avoid salinization of soil, studies on the irrigation and drainage system, crop rotation with deep leaching, cutting of capillary action by asphalt membrane or plastic film, or irrigation with resalinization consideration are necessary.

4) Shade trees are to be increased to protect the crops from strong sun ray. Acacis is one of the suitable shade trees, and if there becomes available sufficient shade, the summer cropping will become a possibility.

5) Stabilization of sand dunes or any dry ground are necessary in same degree as revegetation of farm land itself.

6) Water saving harvesting as well as the balancing of water use and availability should be given a reasonable consideration. A continued observation of ground

water level at each depressions are recommended.

7) Where hardpan underlines, irrigation and drainage system should be given a careful study, as such condition usually hamper the desired drainage.

8) It is reported in Kuwait that in case the vegetables are grown with distilled water, they can not vie with the imported ones unless the cost of water is less than 150 fils. It is said that the cost of mixed water of brakish and distilled, with salt content about 1,500 ppm, can be made as low as 90 fils.

Following points are also to be considered.

1) If large marketing can not be expected for vegetables, diversion to other easy - marketing crops, as fruits or oil crops (sunflower and safflower) should be considered. Oil crops will help improve the diet of the natives and also will be used in soap manufacturing. The grounds of the oil crops can be used as a feed in dairy and poultry farms. They are also good manures for improving the soil. The grounds of castor are not fit for the cattle feeding but good for poultry feeding if given mixed with others in small quantity.

2) Sorghum is a suitable crop for feeding, and the expansion of production is recommended.

3) It is recommended to expand the acrage of such fodder croppings as lucern etc.

4) Selection of seeds suitable to desert area may be necessary.

5) Introduction of freeze-storage may be worth study in order to keep the cost fluctuation minimum.

6) Establishment of agricultural school is recommended.

7) Establishment of experimental farm one each in northern middle and southern part of peninsula may worth consideration.

6.3. ARTESIAN WATER NEAR QARN ABU WAYIL

It is reported that over 70 square miles of Qatar in the vicinity of Qarn Abu Wayil is underlain by an artesian acquifer with a reservoir capacity of 547,000,000,000 U.S. gallons of potable water which under confined conditions will be replaced from the source rocks in Saudi Arabia.

The mission was intimated that a soil survey in the area is going to be undertaken by FAO for 27 months starting in August, 1970.

Depending on the result of this survey, and if it could be proved that the ground water can be extracted sufficiently and economically not only to sustain the growth of the selected crops but also to wash out the salt to be accumulated every few years, it may not necessarily be impossible to develop certain industrial crops or fodder in large scale either for domestic use or for exportation.

6.4. POULTRY AND DAIRY

The Department of Agriculture has a desire to see poultry and dairy farms developed in Qatar so that eggs, chicken meat and dairy products now being imported could be substituted by domestic products. In 1968, a poultry specialist Mr. Abdel Rahim Hashim from Ministry of Agriculture of Saudi Arabia, made a study on production of chicken meat and eggs in Qatar, as summary of his study being borrowed from his report and given below.

1) Qatar consumes annually 568 tons of frozen chickens and 6.5 million eggs valued at £192,683 and £68,499 respectively.

2) Based on performance data for places with approximately similar conditions, costs and volume are estimated for the commercial production of chickens and eggs in Doha. A two pound ready-to-cook bird costs 3.08 QDR and a dozen eggs can be produced at 2.36 QDR.

3) Home produced costs 0.41 QDR less than a two-pound imported frozen chicken. A dozen of eggs produced in Qatar costs 0.46 QDR more than the c.i.f. price, duty included for foreign eggs. At a retail price of 3 QDR per dozen eggs home

production yields a return on capital invested of 25%. The investment return index for broilers amounts to 60% if the present retail price of 2 QDR/lb is maintained.

4) Least profitable retail price egg producers may accept should it not fall below 2.5 QDR/dozen eggs. This may still allow 15% return on capital investment. To place the egg industry in a better competitive position either an import duty of 22% on foreign eggs has to be raised or a subsidy has to be injected at a certain level of the egg production channel. Broiler production enjoys a healthier position and no support measures are required.

5) If all chickens consumed in Qatar are produced locally, 18.6% of the foreign exchange spent annually on foreign supply is saved. This amounts to £35,061 sterling pounds. For eggs the figures are £3,740 sterling pounds equivalent to 4.3% of the total value of annual egg supplies.

6) It is difficult to expect improved production performance in the long run due to adverse effect of the climate; but productivity may be increased through economy in major item costs.

7) The success of the poultry industry is conditioned by the aviilability of full time expert advice and efficient healthe services. It is advisable that this should be undertaken by the government.

8) Both industries should be established gradually in phases so that by time training and experience can be achieved. Investors should be coordinated in some form of integration which would give them benefits of economy of scale.

9) Capital requirements for a three year plan to produce 75% of the market share of chickens is estimated at QDR 995,730. This covers both fixed and working costs for six different farms. Egg production programme extends for six years to attain a target of 72% of the annual consumption. This requires a total capital of QDR 1,136,148. Production beyond these limits has to be assessed later, subsequent to future market trends relative to imports.

The mission is of the opinion that the circumstances so far as is known appear to be premature to attract foreign investors or even local enterpreneurs to establish the poultry farms or dairy farms.

It is rather recommended that the Government should initiate the farms on experimental basis calling in the foreign experts, and once the operation of the farms is put on the established rail after two or three years, leave them to the operation by the local hand on commercial basis.

STATISTICS ON FARMS IN QATAR

TABLE NO. 20

Year	No. of Farms	Fooder		Vegetables				Area Fruit Trees Dun.	No. of Lab.	Remarks
		Area Dun.	Prod. Tons.	Winter Dun.	Summer Dun.	Total Area Dun.	Total Prod Tons.			
1960	119	750	3520	510	344	854	1708	206	606	
1961	179	895	5817	1020	808	1908	4292	412	1212	
1962	241	1205	8435	1530	1032	2562	6385	618	1818	
1963	330	1650	12375	2040	1376	2416	9393	824	2424	
1964	370	1850	14800	2550	1720	4270	12810	1130	3030	
1965	404	2020	18180	3060	2060	5120	15360	1336	3636	
1966	433	2120	18880	3360	4560	7920	16110	1386	3751	
1967	461	2450	19870	4360	5138	9498	19344	1458	3891	
1968	470	2540	20270	4480	5338	9818	20284	1548	3921	

EXPERIMENTAL RESULTS ON WHEAT VARIETIES

TABLE NO. 21

Variety	Area	Sowing time	Seed Quantity	Harvest Season	Production	Production per Acre
Maxipak	112 m^2	11.12.68	2 Klg	7.4.69	28.5 Klg	1068 Klg
Agiba	96 m^2	21.12.68	2 Klg	11.4.69	24.5 Klg	1071.5 Klg
Floranc	104 m^2	21.12.68	2 Klg	9.4.69	21.5 Klg	867.3 Klg
Kinia colar	84 m^2	21.12.68	2 Klg	15.4.69	13.5 Klg	675 Klg

Note:-

1 - The Quantity of fertilizers which were put for each area of 32 m was 640 Grms.

2 - It is clear from the results shown that the varieties maxipak and Agiba are the best varieties to plant in Qatar because of their higher production than the two other varieties.

EXPERIMENTAL RESULTS ON BARLEY VARIETIES

TABLE NO. 22

Variety	Area	Sowing time	Seed Quantity	Harvest Season	Production	Production per Acre
Balady 216	3244 m^2	21. 12. 68	40 Klg	15. 4. 69	897 Klg	1161. 3 Klg
Manfalouty	3006 m^2	21. 12. 68	40 Klg	15. 4. 69	573 Klg	800. 5 Klg

Note:-

1 - Each acre planted with Barley was fertilised with 15 Klg of nitrate 21%.

2 - The results shows that the Balady Barley gives more production than the other Variety.

3 - The wheat and Barley Plants were not attached by any insects or diseases.

4 - The planted area was flooded when the plants were 10-15 Cm high for two days.

QATAR PETROLEUM COMPANY LTD.

GEOLOGICAL DEPARTMENT

QATAR

SCALE 1:250,000

TRACED FROM Q/00-0336 QATAR MAP 1:250,000
COMPILED BY R.V. BROWNE IN 1952 FROM:-

QATAR 1:50,000 BY HUNTING AEROSURVEYS LTD.
PHOTOGEOLOGICAL MAP OF QATAR 1:50,000
BY SEISMOGRAPH SERVICE LTD.

GEOLOGICAL MAP OF QATAR PENINSULA 1:100,000
BY WILLIAMSON & POMEYROL.

REVISION OF THE ABOVE AND ADDITIONAL INFORMATION
BY R.V. BROWNE.

Revised by T.B.H. Jonston

Hawar Island

Al Jamaliyah

Sinnah

Khatiyah D.Sta.

DUKHAN

DOHA

AL WAKRAH

UMM SAID

Salwah

Khor al Odaid

LEGEND

Roads Tarmac Premix
Roads metalled or oiled
" unmetalled
Tracks
Buildings or Houses
Ruins
Palm trees
Other "
Wells drilled by Q.P.C. for water
Native Water wells
Scarps
Depression with drainage line
Sand and/or Sabkhah
Isolated sand dunes
Boundary between Rock & Sand/Sabkhah
Triangulation points with height in metres.

Q/00 · 0648

A P P E N D I X

MAP OF QATAR

IMPORT STATISTICS

IMPORTS OF ALL GOODS INTO QATAR DURING 1969

TABLE NO. 23

Article	1st six months	2nd six months	Total Value CIF in QDRS
Food Stuff	24,175,044	28,999,759	53,174,803
Feeding Stuff	312,390	434,734	747,124
Alcoholi Beverage	185,566	197,031	382,597
Cigarittes & Tobacco	2,236,040	2,325,955	4,561,995
Medicines	1,428,679	2,403,917	3,832,596
Chemical Material	523,627	1,690,735	2,214,362
Perfames & Toilet Prepertion	1,735,476	1,727,935	3,463,411
Cloth	7,408,202	7,990,760	15,398,962
Carpets	754,865	1,047,549	1,802,414
Blankets	374,488	855,184	1,229,672
Clothing	9,683,275	3,683,961	13,377,236
Footware	1,049,930	1,298,151	2,348,081
Furniture	1,324,846	1,545,839	2,870,685
Suitcases & Handbags	252,825	288,422	541,247
Watches and Clocks	232,598	309,412	542,010
Cameras and Binoculars	297,270	195,259	492,529
Optical goods & Sunglasses	170,659	507,518	678,177
Radios and Televisions	1,108,913	1,241,285	2,350,198
Gramphones and Tape Record	580,042	499,495	1,079,537
Refrigerators	1,248,296	822,924	2,071,220
Air Conditionors	4,054,349	1,477,072	5,531,421
Washing Machines	263,429	458,496	721,925
Motor Cars	21,794,453	14,246,210	36,040,663
Tractors & Road Equipment	7,281,140	1,304,333	8,585,473
Electric Appliances	4,794,453	3,053,979	7,848,432
Sewing Machines	194,986	191,184	386,170
Typewriters & Calc. Machines	494,162	133,293	627,455
Paper & Paperboard	875,286	758,298	1,633,572
Motor Cycles & Bicycles	190,476	315,137	505,613
Building Material	9,736,693	7,418,114	17,154,807
Steel Pipes & Pipes fitt.	4,183,704	2,398,116	6,581,820
Lubricating Oil	838,446	1,845,314	2,683,760

Article	1st six months	2nd six months	Total Value CIF in QDRS
Asphalt and Bitumen	1,698,381	2,896,639	4,595,020
Rubber Manufactures	1,252,209	76,014	1,328,223
Plastic Material	439,129	554,685	993,814
Leather Manufacture	134,335	208,879	343,214
Manufacture of Metal	4,338,560	7,262,164	11,600,724
Gas Cooper and Ovens	256,742	222,282	479.024
Charcoal	142,558	425,049	567,607
Sanitary Ware	907,542	1,744,915	2,652,457
Wooden Manufacture	822,186	245,021	1,067,207
Medical Equipment	11,596	143,651	155,247
Stationery	172,418	535,843	708,261
Fertilizer Manufacture	94,670	80,220	173,890
Jute and Ropes	428,957	160,243	589,200
Toys	251,158	324,218	575,376
Miscelloneaus Goods	1,252,001	766,853	2,018,854
Live Animals	845,190	2,054,650	2,899,840
Gas Cylinders	137,748	111,476	249,224
TOTAL:-			232,457,655

IMPORTS OF EXEMPT GOODS DURING 1969 ACCORDING TO COUNTRY OF ORIGIN

TABLE NO. 24

Countries	1st six month	2nd six month	CIF Value in QDRs
United Kingdom	11,555,659	12,367,504	23,923,163
United states of America	1,769,754	622,279	2,392,033
France	1,384,969	1,867,685	3,252,654
West Germany	1,278,058	1,850,432	3,128,490
Lebanon	1,189,167	87,032	1,276,199
Japan	724,433	1,077,896	1,802,329
Iran	681,104	433,023	1,114,127
Holland	480,895	525,369	1,012,264
India	168,390	60,194	228,584
Sauth Africa	222,403	279,137	500,540
Kuwait	112,024	343,711	455,735
Denmark	108,355	151,638	259,993
Italy	100,945	64,806	165,751
Belgium	59,739	97,525	157,264
Pakistan	47,885	12,742	60,627
Switzerland	46,622	80,864	128,486
Norqag	21,417	-	21,417
Bahrain	7,918	5,382	13,300
Hungary	5,531	4,039	9,570
Kenya	5,496	-	5,496
Sweden	1,984	5,980	7,964
Poland	1,368	1,368	2,736
Muscat and Oman	1,159	-	1,150
Dubai	695	1,845	2,540
Finland	-	29,900	29,900
Austria	-	27,172	27,172
Singapore	-	8,694	8,694
Total			39,988,178

IMPORTS INTO QATAR DURING 1969 ACCORDING TO MONTHS:-

TABLE NO. 25

MONTH	CIF VALUE IN QDRS
January	18,356,951
February	18,842,566
March	20,187,970
April	21,281,081
May	21,818,709
June	19,546,685
July	22,545,517
August	21,247,366
September	20,954,347
October	19,267,834
November	22,507,481
December	21,878,373
TOTAL:-	248,434,880

GOVERNMENT OF QATAR

PORTS AUTHORITY DEPARTMENT

STATEMENT OF GENERAL CARGO IMPORTED TO QATAR

FROM 1953 TO 1969

TABLE NO. 26

Year	No. of Ships	Total Tonnage Imported	L/Stock	Cement Tonnage	No. of Vehicles
1953	-	80803	--	-	-
1954	-	83215	-	-	-
1955	-	97976	-	-	-
1956	-	115127	-	-	-
1957	-	115660	-	-	-
1958	-	183540	40062	-	-
1959	-	225817	16726	-	-
1960	314	250694	27543	-	-
1961	322	225797	32371	80000	849
1962	252	271140	43676	52472	1449
1963	247	199076	45438	47000	1352
1964	233	191072	46262	55000	1643
1965	265	276669	53852	84820	2045
1966	255	256985	39627	94381	1745
1967	278	263319	35484	67994	1848
1968	296	290723	27505	62044	2550
1969	282	288212	32642	43255	2928
G. Total:	2744	3415825	411189	586966	16409