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Report No. 300a-ME

**APPRAISAL OF THE
PANUCO FIRST-STAGE PROJECT**

MEXICO

February 4, 1974

Latin America and Caribbean Regional Office

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Currency Equivalents

Currency Unit = Mexican Peso (Mex\$) 1 Mex\$ = US\$ 0.08
US\$1 = Mex\$ 12.5 Mex\$ 1 million = US\$ 80,000

Measures

mm = millimeter (1 mm = 0.039 inch)
m = meter (1 m 3.28 feet)
km = kilometer (1 km = 0.62 miles)
ha = hectare (1 ha = 10,000 m² = 2.47 acres)
km² = square kilometer (1 km² = 247.1 acres = 100 ha = 0.386 square miles)
m³ = cubic meter (1 m³ = 1.31 cubic yards = 264.2 US gallons)
Mm³ = million m³ (1 Mm³ = 811 acre feet)
kg = kilogram (1 kg = 2.2 lb)
ton = 1,000 kg = 2,205 lb

Abbreviations

SRH = Secretaria de Recursos Hidraulicos (Ministry of Water Resources)
PSC = Comision de Estudios del Rio Panuco (SRH Commission dealing with the Panuco Basin)
DAAC = Departamento de Asuntos Agrarios y Colonizacion (Department of Agrarian Affairs and Colonization)
FONDO = Fondo de Garantia y Fomento para la Agricultura, Ganaderia y Avicultura (Fund in Central Bank to provide agricultural credit)
SAG = Secretaria de Agricultura y Ganaderia (Ministry of Agriculture and Livestock)
PLAMEPA = Plan de Mejoramiento Parcelario (SRH group providing intensive extension service)
CONASUPO = Compania Nacional de Subsistencias Populares (Government organization guaranteeing prices and purchases of subsistence crops)
BANEJIDAL = Banco Nacional de Credito Ejidal (official Bank granting credit to ejidatarios only)
BANCO AGRICOLA = Banco Nacional de Credito Agricola, S.A. (official Bank granting credit to small private holders and colonists)
BANAGRO = Banco Nacional Agropecuario, S.A.
IDB = Interamerican Development Bank
USAID = United States Agency for International Development

Fiscal Year - January 1 - December 31

MEXICO

PANUCO FIRST-STAGE PROJECT

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PANUCO FIRST-STAGE PROJECT

SUMMARY AND CONCLUSIONS

- i. This report appraises a project for the construction of irrigation systems to serve 137,000 ha in three separate areas of the Panuco Basin in the States of Tamaulipas, San Luis Potosí, and Veracruz.
- ii. Of Mexico's population of 54 million, about 21 million live in rural areas. Increase of rural population is estimated to be close to 2% p.a., and in view of the limited land resources -- 16.4 million ha including 4.2 million under irrigation, were cultivated in 1972 out of a potential of 35 million ha -- the Government is faced with problems regarding agricultural production and distribution of wealth. Government policies place emphasis on irrigation as the most effective means of both increasing agricultural production to meet the growing local demands, and to serve as a means to distribute wealth more equitably through the application of agrarian reform. The creation of three new irrigation districts envisaged under the project would allow the redistribution of all privately owned farms larger than 20 ha per holding to form new communal farms.
- iii. The three project areas are Las Animas, Pujal Coy and Chicayan. The development plans for each differ only in the means of providing the irrigation water supply. In the case of Las Animas, a diversion dam would be constructed to divert water from the Guayalejo River into an offstream storage reservoir. Pujal Coy would have no major water storage facility and water would be pumped from the uncontrolled flows of the Tampoan River. Chicayan would involve construction of a storage reservoir across the Chicayan River. All three areas would have an irrigation water distribution system, a drainage system, and a road network. Lands requiring it would be cleared and all lands would be leveled. An intensive agricultural extension program is included.
- iv. The total cost of the proposed project is US\$208.4 million, inclusive of interest on the Bank loan during the construction period. The proposed Bank loan of US\$77 million would cover the estimated foreign exchange component of US\$75.2 million (including the estimated interest of US\$11.0 million on the Bank loan during the construction period but excluding the foreign exchange components of the costs of steel, cement and small equipment (US\$4 million)), plus US\$1.8 million as one-half the cost of the extension program. The remaining costs of the project would be met through Government budgetary allocations. Major civil works contracts, and equipment purchases financed under the loan, would be let under international bidding procedures in accordance with Bank guidelines. Some land clearing, the land leveling and certain small civil works contracts aggregating not over Mex\$ 30 million would be done through standard Government procedures.

Disbursements under the loan would be made as 38% of payments to contractors on contracts let under international bidding procedures and 38% of payments to contractors for land clearing, leveling and small contracts. Disbursements for equipment purchased under international bidding would be 100% of foreign expenditure. Disbursement for the costs of the extension program would be 50% of actual cost, and, for 100% of interest and other charges on the Bank loan.

v. The Ministry of Water Resources (Secretaria de Recursos Hidraulicos) (SRH) would have responsibility for constructing, operating, and maintaining the project, and for providing the agricultural extension service. The Ministry of Agriculture would assist in the technical aspects of the extension service, while the Department of Agrarian Affairs would be responsible for redistribution of lands, selection of new ejidatarios, ^{1/} and organizing new ejidos for the project. Normal banking channels would provide the credit requirements. The private sector, assisted by Government, would provide additional marketing and supply facilities.

vi. The annual value of net production in the project area would increase from Mex\$101 million (US\$8.1 million) to Mex\$763 million (US\$61.0 million) as measured in average 1971/72 farm-gate financial prices. To achieve this production, approximately 17,000 man-years of employment would be required, compared to 2,000 man-years at present. Approximately 5,300 individuals over and above those now on the project area would be given the opportunity to become ejidatarios. The average net income of an individual ejidatario would increase from about Mex\$17,000 to Mex\$68,000, about 83% of the project benefits would accrue to ejidatarios. The economic rate of return of the three projects, when evaluated individually, is 19% for Las Animas, 20% for Pujal Coy, and 22% for Chicayan, showing that each area justifies its development.

vii. With satisfactory assurances having been obtained at negotiations, the project is suitable for a Bank loan of US\$77 million, for a term of 25 years, with a grace period of five years. The borrower would be Nacional Financiera, S.A., the Government agency empowered to contract for external financing. The United Mexican States would guarantee the loan and carry the exchange risk.

^{1/} Ejidatarios are members of ejidos (communal farms).

MEXICO

PANUCO FIRST-STAGE PROJECT

I. INTRODUCTION

1.01 The Government of Mexico has requested a Bank loan of US\$77 million to help finance the construction of the first-stage of the Panuco irrigation system, which is designed to serve about 137,000 ha within the Panuco River Basin. The loan would be made to Nacional Financiera with the United Mexican States as Guarantor. Four previous Bank loans, totalling US\$71.5 ^{1/}, million have been made for irrigation projects, as well as four loans, totalling US\$275.0 million for agricultural credit. Progress on these projects has been generally satisfactory, although cost over-runs due to particular local circumstances have occurred on the last two irrigation projects. An overall performance evaluation is given in Annex 1.

1.02 Three separate and distinct areas are proposed for development under the Panuco First-Stage Project. Each was chosen as having the most merit for early development, based on the suitability of lands, the availability of water and sufficient basic data on which to plan development. They are an initial stage of an envisaged large regional development effort of the Government. The project was prepared by the Secretaria de Recursos Hidraulicos (SRH) and its subsidiary local organization, the Comision de Estudios de la Cuenca del Rio Panuco (Panuco Study Commission, PSC).

1.03 This report is based on the studies prepared by SRH and PSC, and on the findings of an appraisal mission in May 1973, composed of J.C. Douglass, R. R. Rossi, A. Amir and M. Miller (Bank staff).

II. BACKGROUND

General

2.01 Since 1960, Mexico's overall economic performance has been impressive, with GDP growing at an average annual rate of 7% and inflation being limited to about 3.5% annually. Despite this, Mexico is faced with the triple problems of a rapidly increasing population, uneven distribution of wealth, and relatively limited agricultural resources in relation to its size. The total population is just over 54 million, of which 21 million (41%) live in the rural areas. With an annual rate of increase of 3.4%, the population is likely to be 100 million by 1990. Income distribution

1/ Loan 275-ME in January 1961 for US\$15 million; Loan 336-ME in April 1963 for US\$12.5 million; Loan 450-ME in May 1966 for US\$19 million; and Loan 527-ME in January 1968 for US\$25 million.

is highly skewed, with the top 10% of the population in 1969 commanding 51% of the disposable income and the bottom 20% only 4%. There is also a marked disparity between urban and rural incomes, for, whereas the average per capita GNP for the country as a whole was US\$670 in 1971, in the rural areas it was less than US\$200. Nor is the pattern of land use very favorable. Out of a total area of nearly 200 million ha, only 35 million ha is potential crop land, of which about 16 million are presently cultivated including 4 million under irrigation. It is estimated that about 12 million ha is suitable for irrigation. The Mexican Government has given agricultural development in general, and irrigation development in particular, priority, particularly, as such development is a suitable vehicle for extending agrarian reform.

Agricultural Sector

2.02 Although agriculture's direct contribution to GDP dropped from 25% in 1950 to 11% in 1972, it still plays a major role in the Mexican economy. Approximately 39% of the labor force obtains its main income from agriculture and, in 1972, the sector contributed about 50% of export earnings. The target now is to sustain this export level while, at the same time, producing enough food to meet the demand of a rapidly growing domestic market.

2.03 From 1961 through 1965, agricultural production increased at an average rate of 4.7% per year, but from 1966 onwards, it dropped to about 2%. For major staple foods, the poor performance is considered to be largely the result of unfavorable climatic conditions and no permanent shortages are forecasted. For livestock products, fats and oils, and fruits and vegetables, however, production has continuously failed to keep pace with demand. This situation is reflected in the market prices at farmgate, which exceed Government guaranteed prices for most products, and in consumer prices, which since 1966 have increased faster than prices in general. Government has recognized the seriousness of the situation and lists the achievement of production increases among its main objectives for the agricultural sector. The main constraints on agricultural development are the limited cultivable area, a shortage of water and lack of access to technical assistance, long-term credit, and farm inputs for a large number of producers.

Government Policy for Agriculture

2.04 Production Objective. Mexico is facing two major problems. The first is to keep pace with the growth of demand for agricultural products and the second is to correct maldistribution of income. Since the majority of the population is located in the northern part of the country where rainfall is low, Government has emphasized irrigation as a means of increasing production. Irrigated areas have tripled since 1950 and in 1970 covered 4.2 million ha, producing 40% of the total agricultural production value and 60% of the total crop output. However, if population continues to grow at its present rate and productivity trends do not improve rapidly, Mexico will

face a severe food shortage before the end of the century. Simultaneously, there is a potential water scarcity that could lead to regional water shortages in the late 1970's. ^{1/} Although increased attention is being given to settlement and rural development projects, sustained efforts to improve land productivity through efficient use of irrigation will be necessary if Mexico is to achieve its agricultural production goals.

2.05 Distribution Objective. The second big problem facing Mexican agriculture is maldistribution of income (para 2.01). The average net annual family income in Mexico is estimated at US\$2,280, but the average net annual family income in rural areas is only about US\$860. However, about 40% of the rural families have net annual family incomes of less than US\$560. These discrepancies arise mainly from the land tenure system.

2.06 The agricultural population can be subdivided into three groups: landless peasants, ejidatarios, and private landowners. The landless peasants provide most of the seasonal farm labor. Widespread unemployment among the landless has caused massive migration towards the cities. Ejidatarios are members of ejidos, which are groups of farmers. The land remains the property of the ejido and is worked by the ejidatarios individually or collectively. Although the ejidos were institutionalized after the Mexican Revolution and their rights and obligations defined by successive agrarian laws since 1917, their lot has improved very little over the years. Private landowners generally have better access to resources than the ejidatarios, but they often still lack critical inputs such as water, capital, and technical expertise. While private farmers with sufficient land have usually obtained satisfactory incomes, the majority of those with less than 20 ha have not been much better off than the ejidatarios.

2.07 In recognition of the situation, the President of the Republic has pledged to improve the lot of the poorer farmers and the Government has passed two major laws to this effect: the new Federal Agrarian Reform Law and the Federal Water Law. The new Agrarian Reform Law is development oriented. It recognizes the legal status of the ejidos, which makes it possible for ejidatarios to obtain credit; gives power to the Departamento de Asuntos Agrarios y Colonizacion (DAAC) to carry out land reform; determines the maximum and minimum sizes of farms to be held privately; fixes a ceiling on taxes to be paid by ejidatarios; and provides for redistribution of funds from production taxes paid by private farmers. Finally, it encourages ejidos to diversify into small-scale industries. The Federal Water Law regulates the distribution of water and land in Irrigation Districts in a more equitable way. Under this law, the Government can set up new Irrigation Districts and expropriate, with compensation, all land and irrigation facilities in an area. The law also stipulates the

^{1/} IBRD is executive agency for a UNDP-financed a National Water Plan Study.

procedure for fixing water charges, requiring that the social and economic situation of individual farmers in each district be taken into consideration. Both laws provide a good basis for development efforts aimed at helping the poor Mexican farmers.

Agricultural Supporting Services

2.08 Secretaria de Recursos Hidraulicos (SRH). In 1947, SRH was established as a Federal Ministry, directly responsible to the President of the Republic, with powers to control and expand exploitation of the country's water resources. Due to Government's emphasis on irrigation, SRH grew rapidly and has now become the main agricultural organization in the country. By 1971/72, it had developed 3.0 million ha under irrigation, or 70% of the country's total irrigated area, the remaining 1.2 million ha being privately developed. Plans are now almost complete which call for new irrigation schemes to be constructed over 800,000 ha and old districts to be rehabilitated over 450,000 ha by 1976.

2.09 SRH has, at headquarters level, four main subsecretaries concerned with planning, construction, operation, and administration, but most of its regional activities are undertaken directly by SRH-managed Irrigation Districts. In five major river basins, however, including that of the Panuco River, SRH commissions have been established. In the case of Panuco, the Commission has a dual function and is responsible for studies for future development of the Panuco Basin and for managing irrigation development for SRH including construction and operation of the proposed project.

2.10 The Federal Water Law (para 2.07) requires that each Irrigation District have a Management Committee (Comite Directivo) to advise and coordinate operations in the District. This committee is made up of representatives of SRH, the Ministry of Agriculture and Livestock, DAAC, the credit institutions and private banks, the National Insurance Agency for Agriculture and Livestock, Nacional Financiera (if it so requests), and farmers. One of its important duties is to set the cropping pattern. Private farmers and ejidos submit their individual proposals, which the Committee then combines and adjusts to the overall water, technical, credit, and market conditions.

2.11 Research and Extension. While little has been done on rainfed crops, research on irrigated crops has achieved considerable success. Agricultural extension services have been extremely poor. Several Government agencies provide extension services, but, except for some irrigation districts, they have been spread too thin (approximately 1 office to 1,600 farmers) to have any measurable impact. To compensate for this deficiency, private banks and farm-input suppliers provide their own technical assistance to clients, but their activities have naturally been concentrated on the most creditworthy farmers, leaving the others without adequate help. In irrigated areas, SRH

has set up an organization called Plan de Mejoramiento Parcelario (PLAMEPA) to direct efforts aimed at improving water use on farms that fall below the average efficiency of a particular district. This constitutes an intensive extension effort. Results have been satisfactory, particularly with ejidatarios. PLAMEPA's assistance is often a condition for obtaining credit from the private banks (see para 5.05). The Inter-American Development Bank (IDB) recently granted a US\$23 million loan to help finance the first phase of a US\$47 million project aimed at extending PLAMEPA's activities over about 1 million ha of ongoing irrigation projects, also financed with IDB assistance.

2.12 Agricultural Credit. Farm credit is provided by both official and private institutions. The Government's Banco Nacional de Credito Ejidal S.A. de C.V. (Banco Ejidal) lends to ejidatarios, the Banco Nacional de Credito Agricola, S.A. (Banco Agricola) concentrates on lending to small-scale farmers, and the Banco Nacional Agropecuario (BANAGRO) lends to any farmer who has technical assistance. About 70% of agricultural lending is by these official institutions and is in the form of short-term credit. Medium and long-term credit from Government has become significant only in the last few years through the Fondo de Garantia y Fomento para la Agricultura, Ganaderia y Avicultura (FONDO) managed by the Bank of Mexico and has been mostly financed by IBRD, IDB and USAID loans. Until 1972, less than 5% of the most needy farmers had received credit, but Government has since announced its intention to guarantee at least 60% of the amount of the long-term loans made by private financial institutions to groups of ejidatarios or other small farmers. Also, in Bank loan 910-ME, US\$25 million has been reserved for lending to low income producers.

III. THE PROJECT AREA

3.01 The project would cover three separate and distinct areas, which combined, would total 137,000 ha. All lie in the coastal plains of the Panuco River Basin (see map 10,554). Las Animas is the farthest north of the three and includes 48,000 ha lying on both banks of the Guayalejo River, downstream of the city of Mante in Tamaulipas state. Pujal Coy encompasses 72,000 ha lying south of Las Animas and is situated between the left bank of the Panuco River and right bank of the Guayalejo River. The area lies in the states of Tamaulipas, San Luis Potosi and Veracruz. Chicayan is the farthest south and contains 17,000 ha lying along both banks of the Chicayan River south of the city of Panuco in Veracruz state.

3.02 Project lands lie between 5 m and 60 m above sea level and slope towards the sea at a gradient of between 0 and 12 m per km. All three areas are generally flat, with good internal drainage, although they are subject to seasonal flooding. The soils are mainly alluvial clays and

clay loams of fine texture, which, while inherently fertile, require skillful management when irrigated. In general, the soils are well suited to a wide range of crops. The current cropping intensity is of the order of 57% with equal areas devoted to rainfed crops and pastures for beef cattle production. Only about 5,900 ha are irrigated mainly for vegetables and sugar cane. Annex 2 gives details on soils and topography.

Climate

3.03 The climate is tropical with a distinct rainy season from June to October. About once in 10 years, major hurricane storms strike the area, usually in September or October. Although the mean annual rainfall is about 700 mm at Las Animas and about 950 at Pujal Coy and Chicayan, the pattern is too erratic to support reasonably intensive agriculture. Annex 3 provides monthly rainfall records at the city of Panuco between 1943 and 1971, which illustrates the wide variations in rainfall which can be experienced at one station. Temperatures range from a monthly average of 28°C in June to 18.5° in January. Extremes vary from 42°C in June to 10°C in January. There are no frosts.

Population

3.04 The estimated population in the project and adjacent areas, was about 200,000 inhabitants in 1970, 35% of whom were classified as rural. The rate of population growth is high (4.6% - 5.3% according to different municipalities), due to both natural increase and considerable immigration into the area in search of work. The population is relatively young, about 65% being under 24 years of age. In 1970, 24% of the population within the Las Animas area had originated in other parts of the country. More than half of the labor force is employed in agriculture. Considerable seasonal unemployment exists within the region.

Present Land Use

3.05 Out of a total of 137,000 ha, approximately 59,000 ha are still undeveloped, 35,200 ha are under rainfed farm crops, and 37,100 ha are in improved pastures. Only about 5,900 ha are currently irrigated, mostly by means of small pumping schemes. Some 4,800 ha of the irrigated land are devoted to vegetables and the balance to sugarcane, fruit trees and improved pastures. Corn, sorghum, safflower and beef-cattle are the most important activities under rainfed conditions. In the past, cotton was important, but has since declined due to the incidence of pests and diseases and the fact that harvesting often coincided with wet weather.

Transportation, Processing, and Marketing

3.06 The towns within the project area are connected by a secondary road network to Tampico, which is, in turn, linked by rail and road to

Mexico City and Monterrey. Highways also link Tampico to San Luis Potosi and Guadalajara, as well as to Matamoros (Brownsville, U.S.). Marine and air transportation is available at Tampico. The project area needs additional internal roads and the improvement of the few that do exist, both to provide a basic network suitable for distributing farm inputs and for transporting produce to other parts of Mexico or for export.

3.07 There are numerous cotton ginneries, sugar mills and grain storage facilities, and, to a lesser extent, meat, fruit, and vegetable packing plants, located in or adjacent to the project area. There are also transportation companies providing non-refrigerated trucking services. The existing facilities are generally adequate for present production and have some surplus capacity. However, increased production due to the project would require some enlargement, which is expected to be provided primarily by the private sector.

3.08 Government annually fixes guaranteed prices for key commodities such as maize, sorghum, safflower, soya, and beans and acts as residual buyer through the Compania Nacional de Subsistencias Populares (CONASUPO). Cattle are usually sold "on the hoof" to packing plants in Mexico City and Monterrey. Sugarcane and cotton are the only crops processed in the region, with soybean and safflower being sold to processing mills in the larger cities outside the region. Most of the tomatoes and mangoes are selected for export, graded, and packed in the region and trucked directly to the border for export by the farmers and/or the packing plant operators, using their own vehicles or trucks, which are readily available on a contract basis.

3.09 The storage and processing of produce is reasonably adapted to the present stage of development. For certain commodities like cotton and sugar, there is, in fact, over-capacity due to decline in area devoted to these crops over the last few years. With expansion of agricultural production due to the project, there is potential for further development of processing industries in the region, principally livestock, soybeans, fruits, and vegetables, thereby creating additional employment.

Land Tenure and Farm Size

3.10 In the project area, approximately 105,700 ha are privately owned or held by colonos (individuals who were settled on federal lands under a colonization scheme sponsored by the Government). In general, the colonos have discharged their repayment obligation to the Government and now have title, making them for practical purposes, small private land owners. The balance of the 137,000 ha area, or 31,300 ha, belongs to ejidos. The average size of the present private or colonos holding is 66 ha, while for the ejidatario, it is about 17 ha. Annex 4 gives further details of the ejido system of farming, an analysis of holding sizes of the private farmers and ejidos, and the changes that would be induced by the project.

3.11 Under the Federal Water Law of 1971, the maximum size holding allowed to a private individual in new irrigation districts is 20 ha and the minimum allotment to an ejidatario is 10 ha. While some irrigation is currently practiced on the project lands by pumping from the rivers, no permanent irrigated land rights have been established. Acquisition of such rights was specifically prohibited by Government decree, pending preparation of a plan for development of the Panuco Basin. Thus, all project lands are subject to the provisions of the Federal Water Law and all present private and colonos holdings would be expropriated under the project. Compensation would be provided and lands reallocated in 20-ha irrigated units to existing private holders and colonos. New owners would, however, be obliged to pay the appraised value of the new irrigated holding. Present ejidal land would not be expropriated, but the ejidos would be reorganized on the basis of 15 ha per ejidatario. This size was chosen by the Government in order to establish full time farms and raise the income of the ejidatario to a reasonable level. Lands acquired from the private owners and colonos and not reallocated to them, would be used to form new ejidos. The following tabulation compares the projected land holding pattern with that now in effect.

	<u>Present Situation</u>			<u>With Project</u>		
	<u>No.</u>	<u>Ha.</u>	<u>Ave. Size</u> <u>Ha.</u>	<u>No.</u>	<u>Ha.</u>	<u>Ave. Size</u> <u>Ha.</u>
Private owners	755	72,997	97	685 /1	12,953	19
Colonos	839	32,687	39	839	16,780	20
Ejidatarios	<u>1,873</u>	<u>31,361</u>	<u>17</u>	<u>7,153</u>	<u>107,312</u>	<u>15</u>
TOTAL	<u>3,467</u>	<u>137,045</u>		<u>8,677</u>	<u>137,045</u>	

/1 Assumes that some present private owners, with small holdings, would elect to receive cash compensation in lieu of an equal size irrigated holding.

The project would provide an opportunity to establish about 5,300 new ejidatarios, which in effect more than doubles the numbers of families with direct access to lands.

IV. THE PROJECT

Description

4.01 The proposed project would develop intensive irrigated agriculture on 137,000 ha in three distinct areas in the Panuco River Basin: Las Animas in the State of Tamaulipas; Pujal Coy in the States of Tamaulipas, San Luis Potosi and Veracruz; and Chicayan in the State of Veracruz.

The project would be in line with Government's overall policy to increase production and provide for more equitable income distribution. Increased production would be obtained through a more dependable water supply, improved technology, a better supply of farm inputs generally, and improved marketing facilities. A more equitable income distribution would be obtained by settling a larger number of farmers on small farms capable of providing acceptable levels of income, which would conform to the general philosophy of the Agrarian Reform Law. Project works are detailed in Annex 5 and are summarized below.

(a) Water Supply Features

- (i) Las Animas. A diversion dam would be constructed across the Guayalejo River to divert water into a feeder canal ending in a storage reservoir to be built across Las Animas Arroyo. The reservoir would have a capacity of 600 Mm³ to supply the main canals for the irrigation system.
 - (ii) Pujal Coy. A diversion dam would be constructed across the Tampaon River to divert water into a feeder canal supplying a pumping plant. The plant would have two sets of pumps to discharge water into two small regulating reservoirs located at different elevations. The main canal serving lands to the north would be supplied from the higher regulating reservoir, while the main canal serving lands along the Tampaon and Panuco Rivers would be supplied from the lower regulating reservoir. A second pumping plant would be constructed at station 40 km on the higher canal to serve other higher project lands.
 - (iii) Chicayan. A storage reservoir with a capacity of 570 Mm³ would be constructed across the Chicayan River to regulate the flows of that stream and provide the necessary water supply to the main irrigation canals at each end of the dam.
- (b) Irrigation Distribution System. Each area would have its own irrigation distribution system, consisting of main canals, laterals, and sublaterals, to supply water to blocks of about 60 ha each. Devices would be installed for measuring deliveries of irrigation water. Preliminary plans call for the system to be lined with concrete, but, further study for final designs will probably show that much of the lining could be eliminated.
- (c) Drainage System. Each area would have a complete drainage system to remove surplus rain and irrigation water. This system would consist of open main and secondary drains to discharge water into the natural stream channels. Total length of drains would be about 1,600 km.

- (d) Roads. A total of about 1,800 km of roads would be constructed along canals and drains to facilitate operation and maintenance and for use by farmers. This system would be supplemented by other connecting roads to provide a complete network. Access roads to the storage reservoirs of Las Animas and Chicayan are under construction and will provide the main access to these operations.
- (e) Auxiliary Works. Houses would be constructed for ditchriders, and headquarters and suboffices would be built in each area. A telephone network, linking key operating points, would also be installed at each site.
- (f) Land Preparation. Lands still in native vegetation would be cleared and all project lands leveled.

In addition to the above civil works, the project would provide equipment and materials to be used for operation and maintenance purposes. It would also finance an intensive agricultural extension program in the initial 4-year period to insure proper use of water. All project activities are expected to be completed by June 30, 1980. A construction schedule is given in Annex 6. SRH would have overall responsibility for project implementation.

Water Supply, Requirements, and Utilization

4.02 Each of the three areas would derive its water supply from separate tributaries of the Panuco River. Analyses of water available at project diversion points have been based on stream flow records covering the period 1955 through 1972 at Las Animas and Pujal Coy projects. The gauging station at Chicayan was not installed until 1969, but flows for the period 1944 through June 1969 have been inferred by using another stream flow record in an adjacent basin over the period of concurrent record as a basis. Requirements for irrigation water have been estimated, using the cropping pattern for each area, the Blaney-Criddle consumptive use formula, and rainfall data. The main irrigation season would be from December to June. Conveyance efficiency to the farm has been generally taken as 70% and the farm application efficiency as 70% giving an overall efficiency of about 50%. A study of the adequacy of the available water, as regulated by the project facilities, to meet the water requirements indicates that on each sub-project, there would be occasional periods of up to three months when shortages in supply could be experienced. These would generally occur at the end of the dry season in May and June. However, in view of the infrequency of such occurrences, it is concluded that the water supply for each project would be adequate to meet crop requirements (see Annex 7).

4.03 While the facilities proposed are expected to give an adequate water supply for project purposes, there are many opportunities for further irrigation developments in the Panuco Basin, both above and below

the three sites now proposed. These would, however, require construction of new storage reservoirs if they were not to deplete water supplies to the proposed project. The Government has given an assurance that it would not permit depletion of flows of the Guayalejo, Tampaon or Chicayan Rivers that would adversely affect the project without specific concurrence of the Bank.

Status of Engineering

4.04 Preliminary designs adequate for estimating project costs have been made for all project features. In addition, final designs and tender documents have been prepared for all features on which construction would be initiated in 1973 (para 4.13). Certain contracts have already been negotiated for access roads and construction camps.

Cost Estimates

4.05 Project cost estimates are detailed by individual areas in Annex 8 and summarized below. The total foreign exchange costs are estimated at US\$64.2 million, including US\$4 million foreign exchange components of the costs of material and small equipment which the Government would furnish directly to contractors (see para 4.10) and of negotiated contracts other than for land clearing and leveling (para 4.13). After deducting these items, the remaining foreign exchange costs would be US\$60.2 million which is considered in establishing the amount of the Bank loan.

	---Mex\$ Millions---			---US\$ Millions---			% Foreign Exchange
	<u>Local</u>	<u>Foreign</u>	<u>Total</u>	<u>Local</u>	<u>Foreign</u> ^{/1}	<u>Total</u>	
<u>Civil Works</u>							
Let under international competitive bidding including small contracts	847	541	1,388	67.8	43.3	111.1	39
Land clearing & leveling	154	65	219	12.3	5.2	17.5	30
Negotiated contracts (Access Road and Camp)	24	-	24	1.9	(0.5)	1.9	0
<u>Equipment & Materials</u>							
Furnished by SRH (not ICB)	113	-	113	9.0	(2.3)	9.0	0
Operation and Maintenance (Not ICB)	29	-	29	2.3	(1.2)	2.3	0
Purchased by SRH (ICB)	-	71	71	-	5.7	5.7	100
Engineering & Administration	178	-	178	14.2	-	14.2	0
Rights of Way	36	-	36	2.9	-	2.9	0
Contingencies 10% physical	120.5	62.5	18.3	9.6	5.0	14.6	35
10% price	120.5	62.5	18.3	9.7	5.0	14.7	35
Extension services	44	-	44	3.5	-	3.5	0
Total	1,666	802	2,468	133.2	64.2	197.4	33
Interest on loan during construction	-	138	138	-	11.0	11.0	
	<u>1,666</u>	<u>940</u>	<u>2,606</u>	<u>133.2</u>	<u>75.2</u>	<u>208.4</u>	

^{/1} Amounts in brackets, totaling US\$4 million, indicate the estimated foreign exchange components for items not financed by the proposed loan; they are not included in the column total.

Total project costs (in millions of US\$) are divided between sub-projects as follows:

Las Animas	75.7
Pujal Coy	93.2
Chicayan	28.5
Total	<u>197.4</u>

4.06 Quantities of work items were estimated on the basis of the preliminary designs. Unit costs for work items were based on information provided by the construction division of SRH, which maintains a current

list of unit prices for all categories of work by geographical area. Contingencies of 10% have been added for physical aspects on civil works and equipment and material purchases, and 10% for escalation of prices. Escalation of construction costs has been about 3 to 4% per year according to SRH data and, since most of the construction work would be started in 1973 and 1974, the allowance is considered adequate. Some contracts have already been awarded for amounts below the estimates given in para 4.05, and some at higher prices. The estimates are considered adequate, particularly since much of the concrete lining of canals included in the estimates should prove to be unnecessary (para 4.01). The foreign exchange component of civil works has been estimated on basis of depreciation of heavy equipment considered appropriate during the period of construction.

Financing

4.07 The proposed Bank loan of US\$77 million would finance the foreign exchange component of the project except for the US\$4 million referred to in paragraph 4.05. The loan would also cover US\$11 million interest on the Bank loan during construction plus half the cost of the extension program (US\$1.8 million). The balance would be financed under Government budget to SRH. The loan would be made for 25 years with five years' grace, at the current Bank rate of interest, to Nacional Financiera, S.A., Government agency in charge of handling foreign loans and credits. The United Mexican States would be the guarantor and would carry the foreign exchange risk. Following a request by Government at negotiations the closing date has been extended to December 31, 1980 to allow adequate time to complete the agriculture extension (PLAMEPA) program, since this can only be fully effective after water is available. The grace period has not been extended since the PLAMEPA program is only a small portion of the project costs and the flow of project benefits should still permit the repayment pattern that was originally envisaged. An appropriate share of contracts let under approved procedures prior to the date of loan signing (para 4.13) would be financed up to a maximum of US\$3.0 million of loan funds.

Procurement

4.08 Contracts for the principal features of construction work would be awarded on the basis of international competitive bidding in accordance with the Bank guidelines for procurement. Mexico has a well developed and competent contracting industry, capable of doing all types of civil works at competitive prices, and only rarely is a bid submitted from a non-Mexican firm. However, in order to make practicable the participation of international contractors, civil works would be grouped into contracts having a minimum value of Mex\$20 million (US\$1.6 million) insofar as possible. Assurances to this effect were given by Government during negotiations.

4.09 On previous Bank loans for irrigation projects, up to 20% of the total value of civil works contracts could be done by force account, local bidding or on a negotiated contract basis and still be eligible for financing under the Bank loan. This provision covered the performance of small

jobs and SRH has used it, principally, to accomplish much of the land clearing and leveling. Local groups of farmers have been organized into partnerships to contract land leveling on small tracts up to 100 ha in size, using their own farm machinery. The work provides income to the farmers pending completion of the irrigation facilities, but, more importantly, it trains them in proper leveling procedures and prepares them to maintain their fields in proper condition. SRH has provided engineering services and supervision of such contracts. Since there is proven merit in this procedure, the Government would award contracts for such activity under its standard procedures. Also, to expedite the construction of civil works under ICB, small jobs which because of timing or nature of the work cannot be included in the major contracts, would be done under ordinary Government procedures up to a maximum value of each contract of one million pesos provided the aggregate amount of these contracts does not exceed 30 million pesos.

4.10 The normal practice for SRH is to let contracts under local bidding procedures for supply, in bulk, of common building materials such as cement and reinforcing steel. It then furnishes such items to civil works contractors and the cost of such items is not included in the bids submitted by the contractors. However, other items readily available in Mexico, such as fabricated gates, and structural steel shapes, are included in the civil works contracts on a furnish and install basis and are included in the contractor's bids and paid for as a part of the civil works contracts. Special equipment not available in Mexico such as large size electric motors and pumps, certain types of valves and gate hoists are procured by SRH under international bidding procedures and paid for under separate supply contracts. Equipment for operation and maintenance purposes such as tractors, trucks, draglines, etc., are available in Mexico and are purchased under local bidding procedures. Annex 9 gives further details on equipment and materials to be purchased by SRH under local bidding, and that which would be purchased under international bids. The items to be financed under the loan would be payments to civil works contractors and the CIF value of equipment purchased under international bidding.

Expenditure Schedules

4.11 Annex 10 gives schedules of annual expenditures for project implementation.

Disbursements

4.12 Loan categories, amounts, and the basis for disbursement are as follows:

<u>Category</u>	<u>Item</u>		<u>Total Cost</u>	<u>Loan Amount</u>	<u>Basis for Disbursement</u>
			--US\$ Million--		
I	Civil works				
	Let under ICB	108.7)	128.6	48.5	38% of payments to contractors
	Small contracts under local bidding	2.4)			
	Clearing & leveling	17.5)			
II	Equipment purchased under ICB		5.7	5.7	100% CIF
III	Extension services		3.5	1.8	50% of total costs as certified by SRH
IV	Interest during construction		11.0	11.0	100% of actual costs
V	Unallocated			<u>10.0</u>	
				<u>77.0</u>	

Of the expenditures for equipment, only that purchased under international bidding procedures would be eligible for disbursement. The expenditures for the four-year period terminating June 30, 1980 of the extension program would also be eligible for disbursement. In the event of higher costs in the first four categories, funds would be shifted from the unallocated category to increase the amounts as appropriate. Any funds remaining at the close of disbursement would be cancelled. An estimated schedule of disbursements is given in Annex 11. Because of overlap of closing date with the grace period (para 4.07) disbursements would continue after the expiration of the grace period.

Advance Contracting

4.13 The Government has recognized the urgency of initiating construction work on this project. Consequently, in 1972, SRH negotiated contracts for access roads to the Las Animas storage reservoir and the Paso de Piedras dam site on the Chicayan. SRH, in 1973, negotiated contracts for building construction camps at Las Aztecas on Las Animas, at Ebano on Pujal Coy, and at the dam site of Chicayan. Costs incurred under these negotiated contracts are not recommended for disbursement. SRH has, however, followed acceptable international bidding procedures in seeking bids for civil works for Las Animas and Pujal Coy. Annex 12 shows the details of such contracts that have been awarded during calendar year 1973. Payments to contractors during

1973 are scheduled at Mex\$80.6 million, but due to slippage, it is probable that the full amount will not be earned. At the recommended disbursement percentage of 38%, disbursement for contracts let before loan signing would be about US\$2.5 million, and it was agreed that up to US\$3.0 million are eligible for disbursement under the Bank loan.

Accounts and Auditing

4.14 SRH would maintain separate project accounts to reflect the financial situation of the project. Accounts are subject to internal and external audit by the Secretaria de la Presidencia, Direccion de Inversiones, and the Secretaria del Patrimonio Nacional, Direccion de Contratos y Presupuestos. Such audits are not conducted on a regular schedule. The Government gave an assurance that they would promptly make available to the Bank such accounts as audited under its laws and furnish such other pertinent information as the Bank may reasonably request.

V. ORGANIZATION AND MANAGEMENT

Administration

5.01 The project would be administered by SRH through its normal organization channels, with the Tampico office having direct responsibility for project construction and operation and maintenance (Chart 7434 shows the organization of the Mexico City headquarters of SRH, while Chart 8110 illustrates the organization of the Tampico office). The Gerencia General del Rio Panuco (office of the General Manager for Rio Panuco) at Tampico handles all SRH activities in the lower Panuco Basin and the Comision de Estudios del Rio Panuco (Panuco Study Commission) prepares plans for development of the entire Basin. The same staff serves both entities. It reports to the General Manager on administrative matters, but looks to SRH headquarters on technical matters. DAAC in cooperation with SRH would be responsible for land redistribution and the application of the agrarian reform and water laws to project lands. DAAC would be involved in the expropriation of the private lands, the layout of new farmplots and the compensation of private farmers. It would also be responsible for reorganization of the ejidos. DAAC has started preliminary reallocation work and it is expected that all such activities would be completed by the time water is available.

Operation and Maintenance

5.02 Three Irrigation Districts would be established to embrace each of the project areas, and each would have its own Management Committee (Comite Directivo, para 2.10) to foster agricultural development. These committees would decide on the cropping pattern and related use of water, formulate and foster credit plans, promote farmers' organizations, and periodically consider and recommend the water charges to be levied. Physical operation and maintenance of the project's systems would be handled by

the Panuco Study Commission responsible for such activities. Annex 13 gives details of operation and maintenance costs at full development and shows the following:

	<u>Las Animas</u>	<u>Pujal Coy</u>	<u>Chicayan</u>
<u>Annual operation and maintenance costs</u>			
Total (Mex\$ millions)	15.3	37.3	5.3
Per ha (Mex\$)	318	518	311
US\$ equivalent per ha	25.40	41.40	24.90

The higher per hectare cost of Pujal Coy is attributed to the cost of pumping.

Agricultural Services

5.03 Training. Mexico has many schools and institutions devoted to agricultural education and training. These are considered adequate and no special additional training component is included in the project (see Annex 14 for description of facilities).

5.04 Extension. SRH, assisted by SAG, would provide an intensive agricultural extension service during a four-year period to ensure good irrigation practices. During negotiations, an assurance was obtained that such a service would be provided and continued after this initial period. The estimated cost of the initial program is MEX\$44.0 million (US\$3.5 million). Details are in Annex 14.

5.05 Credit. Annex 14 describes the various banking institutions that provide agricultural credit. BANAGRO is the official bank which is expected to handle most of the credit needs of project farmers. Current rates of interest for short-term credit are 10.8% p.a., and from 7.6% to 12.0% for long-term credit. Under the USAID - and IDB - supported projects for low income producers, the long-term interest rate is now 7.6%, but it originally started in 1963 at 5.5% and has increased steadily ever since. Under the IBRD-supported projects, the interest rate to low income producers is 7.6%, but varies from 10 to 12% on loans to commercial farmers. At full development, the annual credit required for crop production would be on the order of Mex\$900 million. Long term credit of about Mex\$200 million would be required to establish fruit trees and livestock farms. During negotiations, the Government gave an assurance that it would make its best effort to make available, promptly as needed, medium and long-term agricultural credit on reasonable terms to farmers in the project area.

Water and Development Charges

5.06 The new Federal Water Law of 1971 requires SRH, with the advice of DAAC and the Management Committee of each District to carry out socio-economic studies to determine appropriate charges for the services rendered

in each irrigation district. Water rates must take into account the recoverable portion of the capital costs of the project, and the annual recurrent costs of administration, operation and maintenance. Charges may be varied on the basis of the quantity of water used, the area irrigated and the crops grown. The law requires that water rates be reviewed periodically on the basis of data from socio-economic studies. Irrigation service may be suspended for failure to pay water rates, or compulsory proceedings may be instituted through the Federal Treasury to collect outstanding charges. For the project, SRH proposes to establish a dual-type water charge, one component to consist of a per ha charge, and a second component to be related to volume of water used and crop grown. The total charge would be sufficient to pay operation and maintenance costs, and as much of the capital investment as appears reasonable; such judgment being on the basis of socioeconomic studies. During negotiations, assurances were given that the Government would (a) charge and collect water charges on the basis of the ability of water users to pay and the need to maintain an incentive for them to make best use of the land and water available to them, as necessary to cover all the operation and maintenance costs of the project and as much as practicable of the investment; (b) carry out the initial socio-economic study by June 30, 1979, or such later date as may be agreed with the Bank, to determine the ability of water users to pay; (c) periodically review such study with a view to revise charges, if appropriate; and (d) promptly give the Bank an opportunity to comment on conclusions and recommendations of the socioeconomic studies after each is completed. In determining the investment cost to be repaid, the objective should be to recover the investment cost in as short a time as possible (see paras 6.06-6.08 for discussion of farmers' income, capacity to repay water charges, and possible return on investment).

VI. PRODUCTION, MARKETS, PRICES & FARMERS' INCOME

Production

6.01 The project would substantially increase the cropping intensity in all three areas. At present only one crop is grown per year and, bearing in mind the amount of land in native vegetation, results in a cropping intensity of 57%. With the project, some 50,000 ha would be in perennial crops such as sugarcane, fruit trees and pastures. If these are treated as single crops, the cropping intensity under project conditions would be 129%. The entire area would be under crop for four months of the year (December through March) and even in April, the period of minimum use, at least 78,000 ha would be in crops. Soybeans, cotton, safflower and sorghum would occupy the largest areas, while vegetables would make a major contribution to increased returns. Cotton would be reinstated since with irrigation, the planting season would be shifted to allow for growing and harvesting to coincide with dry weather, thus improving the effectiveness of disease and insect control and enabling the crop to be picked under dry conditions. The cropping pattern with and without the project is summarized in para 6.03 below.

6.02 Yields would increase as a result of irrigation and the availability of better technical assistance. Annex 15 provides further details, which are summarized in para 6.03. The present yields reflect current experience in the area, whereas projected yields are based on what has been accomplished under similar irrigated conditions elsewhere in Mexico, and are about 75% of experimental results in an area immediately adjacent to the project. They are considered realistic and fully attainable. The effect of dry years and possible water shortages are reflected in the yield estimates.

6.03 Overall production in the project area would increase about 900,000 tons. Annex 16 details the production costs by crop, while Annex 17 shows the net value of production with and without the project and the increment attributed to the project. This shows a net annual production value with the project at full development of Mex\$763 million, a value without the project of Mex\$101 million, and an incremental net value of Mex\$662 million. Production data is summarized below.

Crops	Without Project			With Project			Net Incremental Production	
	Area (ha)	Yield (Tons/ha)	Production ('000 Ton)	Crop-ped Area (ha)	Yield (Tons/ha)	Production ('000 Ton)	Production ('000 Ton)	Production Value (US\$'000)
Soybeans	1,200	0.9	1.08	30,000	2.5	75	73.92	6.78
Vegetables	4,800	11.0	52.80	8,000	18.0	144	91.20	5.84
Beans/Pulses	2,000	1.0	2.00	4,000	1.5	6	4.00	0.19
Rice	-	0	-	6,000	5.0	30	30.00	2.02
Corn	11,000	1.1	12.10	4,000	3.0	12	(0.10)	0.19
Cotton	2,000	1.5	3.00	25,000	2.5	62	59.50	5.69
Safflower	8,000	0.7	5.60	20,000	2.0	40	34.40	3.16
Sorghum	11,000	1.8	19.80	30,000	5.0	150	130.20	4.60
Sugarcane	400	60.0	24.00	3,000	100.0	300	276.00	1.11
Fruit trees	700	8.0	5.60	8,000	20.0	160	154.40	19.22
Pastures	37,100	0.3	9.09	39,000	1.5	57	48.24	4.16
Native Veg.	58,845	-	-	-	-	-	-	-
TOTAL	137,045		135.07	177,000		1036	901.76	52.96

Cropping Intensity (%)

57

129

Markets and Marketing

6.04 Market opportunities have been carefully considered in determining the proposed cropping pattern. When fully operational, the project would produce significant quantities of sorghum, rice, soybeans, safflower, fruits and cotton (Annex 18) together with relatively small quantities of corn, vegetables, beans, sugarcane and beef. Fruits, sugar and a small portion of the vegetable productions will be exported and are expected to find ready markets in the U.S. Most of the production, however, from the project will go to the domestic market as import substitutes. Annex 19 further discusses market aspects.

6.05 The increase in output would require a corresponding expansion and improvement of the Panuco region transport, packing and processing facilities as well as related managerial capabilities. No provision has been made for improving such facilities under the project, because it is difficult to determine what type and capacity would be required seven to eight years from now and because it is expected that the private sector will, of its own initiative, provide these services, as it has done in other parts of Mexico. However, the processing and marketing facilities for sugar and cotton are considered adequate. The Government gave an assurance that it would continue to make its best efforts to promote, through existing organizations or otherwise, the establishment of agro-industries in or close to the project area.

Farmers' Income

6.06 The project envisages two different types of farmer, the private farmer and the ejidatario, collectively growing a wide range of crops. After project implementation, the average private farmer would have 20 ha, while the average ejidatario would have 15 ha, in both cases the farm units being fully irrigated. Although the size of unit would be fairly uniform, individual cropping patterns could and would be very varied depending on individual preferences, technical skills, and capital resources. Not every farmer would grow every crop. The majority would probably grow only a few of those listed in para 6.03. There would, therefore, be many variations in cropping between farms. Sample budgets have been prepared which illustrate some of the many possibilities. These are detailed in Annex 20 and are summarized below. It should be emphasized that the sample budgets should be viewed as average possibilities rather than specified circumstances which will apply in every case.

<u>Farm Type</u>	<u>Area</u>		<u>Net Value of Production</u>		
	<u>Without</u>	<u>With</u>	<u>Without</u>	<u>With</u>	<u>Increment</u>
	<u>Project</u>	<u>Project</u>	<u>Project</u>	<u>Project</u>	
	<u>Ha</u>	<u>Ha</u>	-----	<u>Mex\$</u>	-----
<u>General Crops</u>					
Private	97	20	85,700	90,200	4,500
Private (Colono)	39	20	36,700	90,200	53,500
Ejidatario	17	15	16,700	68,500	51,800
<u>Exclusive Livestock</u>					
Private	97	20	19,900	30,600	10,700
Ejidatario	17	15	3,500	22,900	19,400

The above net income reflects the return per farm family that can be used for the family living and to pay water charges.

6.07 Water Charges. The assurances outlined in paragraph 5.06 would require that water users pay all operation and maintenance costs, estimated on the average at Mex\$422/ha for the three project areas (see Annex 13), and as much as practicable of the investment cost with due regard to ability of the water users to pay. Mexican law allows water charges to be varied on the basis of area, volume of water, or crops, but requires that the same basis be applied to all users. SRH intends to link the investment cost recovery to volume of water used and the specific crops grown. Higher rates will be levied for higher value crops than for lower value crops. However, the actual charges will only be determined after completion of a detailed socio-economic study - prescribed by the Federal Water Law.

6.08 Repayment of Investment. The degree of recovery of the project's investment costs can only be estimated with accuracy once the socio-economic studies have been completed. It depends on (a) the farmer's net income after meeting all crop production costs, taxes and project operation and maintenance charges less (b) the amount he needs to cover his family living costs and have a reasonable incentive to continue irrigated farming. Items under (a) can be calculated but those under (b) are matters of judgement. The Mexican authorities have suggested that a sum equivalent to twice the regional minimum salary (Mex\$18,750) would be an appropriate subsistence income. Looking at the result from the point of view of equity, twice the regional minimum salary represents the approximate cut-off point for the lowest 40% of personal incomes in Mexico. Moreover, it should be noted that both private farmers and the ejidatarios in the Panuco project have similar farm sizes and in both cases enjoy full irrigation, thus being provided with similar conditions. Twice the regional minimum should also provide adequate incentives for irrigated farming by both groups. Deducting this from projected net farm income yields residual income for water charges which would produce for the Government recovery of project investment costs at an interest rate of

6.5% over 50 years or 9.5% over 50 years if taxes on incremental production were included. However, during negotiations, the Government representatives indicated that present Governmental thinking is to recover only the investment cost without interest. On this assumption investment costs could be recovered in about 10 years. However, it should be realised that such a level assumes that the farmer would be contributing about 65% of his net income at full production (net of all operating costs and operation and maintenance charges). It is unlikely that such a contribution could be levied and a more realistic amount would be nearer half this figure.

VII. BENEFITS AND JUSTIFICATION

7.01 At full development, about 12 years after completion of project works, the annual net value of production from the project, valued in economic terms (expressed in 1973 prices) would be Mex\$1,087 million (US\$87.0 million), compared to Mex\$157 million (US\$12.5 million) under future conditions without the project. The useful life of the project facilities would be almost indefinite, but, for the analysis of economic benefits, it has been assumed at 40 years. Over this period, the economic rates of return would be 19% for Las Animas, 20% for Pujal Coy, and 22% for Chicayan. To measure the project's sensitivity to deviations, several alternatives have been considered: (a) construction period extended by one year, investment costs increased by 20%, and incremental benefit delayed by one year; (b) benefits decreased by 25%; (c) farm labor costs fully valued at the official wage rate, instead of being shadow priced; and (d) combined (a) and (b) tests. None of these alternatives, except (d), which is very unlikely, would result in an internal rate of return of less than 12%, which is considered as the opportunity costs of capital. Annex 21 gives further details on the project economic evaluation.

7.02 It can be argued that with the relatively high rainfall in the project area, and by clearing the lands not now cultivated, a higher level of production could be achieved from the project area without the need for irrigation facilities. About 59,000 ha (43%) of the project lands are still undeveloped and it would be possible to clear such lands and achieve comparable returns as those obtained from the presently cultivated land. It is questionable, however, whether such development would, in fact, take place in the absence of the project, largely because of the pattern of land ownership. From a national point of view, given the scarcity of land and the population pressure, government has to exploit all available resources. From the project point of view, it is doubtful whether development can be based on a 15 ha rainfed farm with the erratic rainfall distribution. In addition, without the proposed project, no land distribution would be feasible, since the Federal Water Law can only be applied to irrigation and drainage projects.

7.03 About 8,700 farmers would benefit from the project, 7,150 of which would be ejidatarios, 850 colonos, and the rest private owners. The number of private owners would be slightly smaller, and the number of colonos would remain the same as under pre-project conditions, while about 5,300 new individuals would become ejidatarios (see paras 3.11, 6.06, and 6.07).

7.04 The project would require about 17,000 man-years of employment annually; the existing demand is of the order of 2,000 man-years. ^{1/} The annual net of tax income of the average ejidatario farm would increase from about Mex\$17,000 to Mex\$68,000 at full development, while the expected corresponding increase for the average private farm would be from Mex\$86,000 to Mex\$90,000.

7.05 Since most of the project products are either for export or for use as import substitutes, for which deficiencies are expected in the future, the project would make a valuable contribution to Mexico's balance of payments. It would also provide increased employment and serve the social needs of the country.

7.06 Additional employment and value added which would result from crop marketing and processing and other related activities, as well as secondary benefits due to the acceleration of the general economic activity in the region as a result of the project construction and operation, were not quantified, and consequently have not been included in the economic analysis.

7.07 There are no known water-borne diseases such as bilharzia in the project areas. Increased use of fertilizers and pesticides as part of the farming operation could result in some increase of residual quantities of such chemicals in downstream flows. However, it is not believed these would exceed acceptable limits.

VIII. AGREEMENTS REACHED AND RECOMMENDATION

8.01 During loan negotiations, assurances were obtained that Government would:

- (a) not permit the depletion of water flows in the Guayalejo, Tampaon or Chicayan Rivers, that would adversely affect the project, without specific concurrence of the Bank (para 4.03);

^{1/} Only direct employment in field activities is considered and 250 working days per one man-year is assumed.

- (b) prepare tender documents for civil works in groups having as far as practicable a minimum value of Mex\$20 million (para 4.08);
- (c) maintain separate project accounts, and promptly submit to the Bank reports as audited according to Mexican laws (para 4.14);
- (d) provide an intensive agricultural extension service for the four-year implementation period and continue at an adequate level thereafter (para 5.04);
- (e) make best effort to make available adequate credit resources to meet the needs of farmers engaged in the project (para 5.05);
- (f) levy charges for water services sufficient to pay operation and maintenance costs plus as much as was practicable of investment costs. Such charges would be determined following socio-economic surveys made periodically, the first of which would be undertaken by June 30, 1979. The Bank would be given a reasonable opportunity to comment on conclusions and recommendations of the studies (para 5.06);
- (g) make its best efforts to promote the location of agro-industries in the Panuco Basin (para 6.05).

8.02 Contracts let under international competitive bidding procedures prior to signing of the loan would be eligible for financing under the loan up to a maximum of US\$3.0 million (para 4.13).

8.03 The proposed project constitutes a suitable basis for a Bank loan of US\$77 million.

MEXICO

PANUCO FIRST-STAGE PROJECT

Bank Loans for the Agricultural Sector in Mexico

1. Since 1961, the Bank has helped finance eight loans in the agricultural sector in Mexico -- four for irrigation and four for livestock and agricultural credit. Pertinent facts concerning the implementation of these projects are discussed below and a statement of each is given in Table 1.

Loan 275-ME of Jan. 1961 - First Irrigation Rehabilitation Project

2. Rehabilitation work under this project was completed in 1966 in the four districts over a total irrigated area of about 690,000 ha, or an area about 20% larger than anticipated. Project costs remained within the US\$110/ha estimates. On-farm development was affected initially by the lack of credit, which the Government had agreed to provide, but, at the end of the development period, private bankers and commercial food and marketing agencies supplied much of the needed financial support and technical assistance, especially to vegetable growers. Water charges are being collected substantially in accordance with the loan agreement. Agricultural development has been considerable, surpassing appraisal expectations, and agrobusiness in particular has been making spectacular progress.

Loan 336-ME of April 1963 - Second Irrigation Rehabilitation Project

3. Rehabilitation works on 350,000 ha were completed in 1970, and costs remained in line with the appraisal estimates of US\$110/ha. The principal problems encountered were: (a) leakage from unlined canals; (b) high watertable in one district; (c) inadequacy of technical assistance to ejidatarios, and (d) radical changes in the cropping patterns. As complete lining of the canals would be too costly, determined efforts are being made to reduce water needs by modifying the cropping pattern and increasing the on-farm water efficiency. SRH will construct additional drains to reclaim land affected by high salinity where the watertable is too high. Although research and extension services have been satisfactorily increased since project completion, credit to ejidatarios has remained inadequate because of lack of education and farming experience and cumbersome administrative procedures. As a result, on-farm improvements and farm machinery services remain inadequate. Cotton has been largely replaced in the cropping patterns by cereals, fodder crops, and pasture as a result of technical problems, shifting marketing conditions, and Government support prices. In spite of all this, the project is expected to yield the expected benefits. The total irrigated area exceeds the appraisal estimate, and yields and farm income are considerably higher than those prevailing when the project started. Water charges of Mex\$ 100 to 120/ha (US\$8.00 - 9.60) are being collected but no contribution to capital recovery charges is yet being made. The Government is reviewing the situation (see para. 4).

Loan 450-ME of May 1966 - Rehabilitation and Expansion of the Region Lagunera and San Juan del Rio Irrigation Districts

4. Most project construction works on about 95,000 ha were completed ahead of time except for land leveling in Lagunera, but costs were about 30% higher than the appraisal estimate of US\$688/ha largely because of foundation problems encountered at Las Tortola Dam, changes in plan on San Juan del Rio and higher unit costs of land leveling. The main problems were lack of extension services and water shortage, the former being acute in Lagunera where the farmers themselves were the main obstacle to land leveling. With more technical assistance, however, such work could be terminated before the scheduled time. In San Juan, overall water efficiency is only 50%, with considerable quantities of water being lost from the reservoirs through seepage. Additional technical assistance would be required to increase water efficiency above the current 70% if the area is to be fully irrigated. Unlike the situation in the other projects, credit distribution--particularly for short-term--has been adequate and has increased significantly in the project areas, even for ejidatarios. Cotton or high value crops such as vines have replaced cereals in the cropping pattern and farm incomes have increased significantly and exceed appraisal estimates by 30%. Operating and maintenance charges are inadequate and deficits amount to about 35% of the running costs. No capital recovery charge is being collected. The project should be completed by the end of 1973 and Government is planning to modify and introduce higher water rates to allow partial recovery of investment costs. The Government's position concerning levels of charges for this and other projects is expected at time of negotiations.

Loan 527-ME of Jan. 1968 - Rio Colorado Project

5. Estimated costs of this project, which became effective in 1969, have risen by 30%, largely because of modifications and enlargements of the development plan. Although construction and land leveling will probably be completed before the closing date, extension activities will need to be expanded considerably to ensure successful project implementation. Overall water efficiency is currently only about 30% (50% in canals and 65% on farms), and since salinity affects a large portion of the project area, total reclamation will take more time than anticipated. Adequate credit funds appear to be available, but small farmers and ejidatarios have difficulties in obtaining short-term credit due to troublesome administrative procedures. The cropping pattern has changed significantly, with cotton being replaced by wheat, vegetables, and fodder crops. Current water charges pending completion of the project cover only 75% of operating and maintenance costs. These would be reviewed after the project is complete.

Loans 430-ME, 610-ME, 747-ME, and 910-ME Livestock and Agricultural Credit Projects

6. The above four loans, for a total of US\$275 million, were signed in October 1965, June 1969, June 1971 and June 1973, respectively. They support projects under which loans for agricultural and livestock producers and for agro-industries are made through private and public banks. These loans are

eligible for rediscounting through the Fondo. The first three Projects have been very successful in providing credit and technical services for commercial farmers and for agro-industries. The Fourth Project, supported by Loan 910-ME for US\$110 million, signed in June 1973, includes an amount of US\$25 million for a credit program to ejidatarios and individual small farmers.

7. In addition to the above Bank loans, SRH has received 26 loans since 1961 from the Interamerican Development Bank, totaling in excess of US\$358 million for irrigation development.

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PANUCO FIRST-STAGE PROJECT

Statement of Bank Loans in Agriculture
(as of 1972)

<u>Number</u>	<u>Year</u>	<u>Borrower</u>	<u>Purpose</u>	Loan (less Cancellations) ----- US\$M -----
<u>1. Fully Disbursed</u>				
275-ME	1961	Nacional Financiera, S.A.	Irrigation	15.00
336-ME	1964	Nacional Financiera, S.A.	Irrigation	11.35
430-ME	1965	Nacional Financiera, S.A.	Agricultural Credit	25.00
610-ME	1969	Nacional Financiera, S.A.	Agricultural Credit	65.00
<u>2. Still Being Disbursed</u>				
450-ME	1966	Nacional Financiera, S.A.	Irrigation	19.00
527-ME	1968	Nacional Financiera, S.A.	Irrigation	25.00
747-ME	1971	Nacional Financiera, S.A.	Agricultural Credit	75.00
110-ME	1973	Nacional Financiera, S.A.	Agricultural Credit	110.00

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MEXICOPANUCO FIRST-STAGE PROJECTSoils and Topography

1. The soils of the project area are predominantly heavy alluvial of fine texture and located on a flat coastal plain of the Panuco River Basin. They occur along the terraces and flood plains of the main tributaries of the Panuco River, such as the Guayalejo (Las Animas), Coy, Choy, Tampaon and Mactezuma (Pujal Coy); and Chicayan (Chicayan). Soils are generally deep with good internal drainage. Their parent materials are limestone, sandstone, and schist, and the general level of salinity is low. Most of the year, the water table remains deep, except in small areas inundated during periods of exceptional heavy rains or when hurricane conditions are present.

2. The main deficiency of project soils is linked to their fine and heavy texture. This point has important bearing on managing this type of soil under irrigation conditions. In general, soils are fertile and well adapted to cultivation of a wide range of crops. Current cropping intensity is of the order of 57%, with equal areas devoted to rainfed annual crops and dry farming pastures for beef; there are at present only about 6,000 ha of irrigated crops such as vegetables, sugarcane, and fruit trees.

3. Following the system of the U.S. Bureau of Reclamation, lands have been classified as follows:

<u>Land Classes</u>	<u>Las Animas</u>	<u>Pujal Coy</u>	<u>Chicayan</u>	<u>Total Net Irrigable</u>	<u>Percentage (%)</u>
	-----(ha)-----				
I	30,317	15,858	4,859	51,034	37
II	16,282	52,559	9,609	78,450	57
III	<u>1,434</u>	<u>3,595</u>	<u>2,532</u>	<u>7,561</u>	<u>6</u>
Total net irrigable	48,033	72,012	17,000	137,045	100
Percentage	35	53	12	100	

4. Project lands lie between 5 m and 60 m above sea level, having a general gradient between 0 and 12 m per km to the sea. Predominant relief is uniformly flat, occasionally interrupted by small areas of undulating land or by small isolated hills. Some ponding occurs during the wet season, but because the project soils have good internal drainage, they dry out in a relatively short time. Generally, the area is high enough that there is no tidal effect or salt water intrusion.

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PANUCO FIRST-STAGE PROJECT

Precipitation Pattern

Table 1 shows the monthly rainfall pattern for the meteorological station at the Town of Panuco as being typical of the area. It illustrates the variations in the rainfall and shows the normal dry season extending from November through May and the normally wet season June through October. The year 1955 is not necessarily typical but it does show the vagaries of the rainfall pattern. The total rainfall figure for that year is one of the highest, but 439 mm fell in July and 958 mm in September, thus 1,397 mm of the total of 1,544 mm fell in only two months. The September record fall was followed by 8 mm in October.

PANUCO FIRST-STAGE PROJECT

Precipitation Pattern at Station Panuco, Veracruz
(in mm)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1943	71.0	0	16.0	45.5	12.5	95.0	77.8	45.6	52.5	6.5	31.0	53.5	506.9
1944	11.5	5.5	0	41.0	21.8	136.7	57.6	214.0	382.0	58.5	41.0	50.4	1020.0
1945	24.5	- 0	0	0	2.5	40.8	-1.0	-1.0	-1.0	-1.0	-1.0	37.6	-1.0
1946	38.5	27.0	1.5	38.0	38.0	131.5	42.0	119.5	184.0	158.5	46.5	17.0	842.0
1947	26.0	15.0	7.0	12.5	41.6	35.0	25.0	397.0	234.0	148.5	107.0	40.0	1088.6
1948	44.5	8.0	4.5	0	91.5	128.0	304.0	34.0	97.0	81.0	14.0	16.0	822.5
1949	52.0	39.0	0	4.0	33.0	54.0	22.0	76.0	105.5	16.5	4.0	96.0	502.0
1950	14.0	6.5	36.0	29.0	68.0	107.5	48.0	34.0	60.5	133.7	3.0	4.0	544.2
1951	14.7	0	0	0	16.0	320.0	56.0	226.0	197.0	171.0	39.0	18.0	1057.7
1952	7.0	0	0	68.0	8.0	329.5	283.5	400.0	313.5	14.5	243.5	0	1667.5
1953	0	10.0	2.5	92.0	1.0	39.5	151.5	32.0	87.0	52.5	6.0	5.0	479.0
1954	0	15.0	1.0	37.0	0	89.5	283.5	94.5	293.5	354.0	8.0	6.5	1182.5
1955	7.5	4.0	2.0	6.0	4.0	6.5	439.0	84.0	957.5	8.0	26.0	0	1544.5
1956	0	0	3.0	56.5	46.0	160.0	132.5	50.5	379.5	35.0	36.5	20.5	920.0
1957	20.0	62.5	10.0	65.5	90.5	28.0	105.0	46.5	68.0	46.5	8.0	15.5	566.0
1958	50.0	21.0	5.0	0	66.0	350.0	382.5	33.5	167.0	404.5	35.5	29.5	1544.5
1959	43.5	75.0	0	45.0	2.0	216.0	52.0	39.5	6.0	178.0	54.0	0	711.0
1960	0	2.0	0	1.0	47.5	26.5	169.5	106.5	121.0	93.0	43.0	12.5	622.5
1961	66.0	7.5	5.0	0	48.5	144.0	202.0	45.5	83.5	61.0	33.5	15.0	711.5
1962	3.5	0	4.0	82.5	34.0	310.0	52.0	16.0	232.0	41.0	65.0	39.0	879.0
1963	9.0	9.0	3.0	0	90.0	126.0	69.0	82.0	82.0	24.0	0	96.0	590.0
1964	21.0	14.0	3.0	24.0	187.5	69.0	18.0	19.0	152.5	5.0	59.0	14.0	586.0
1965	37.0	13.0	0	10.0	4.5	155.0	110.0	135.0	243.0	62.5	13.0	27.0	810.0
1966	50.5	48.0	9.0	32.0	108.0	313.0	36.5	73.0	66.0	753.5	12.0	21.0	1522.5
1967	35.0	15.5	50.0	3.0	41.6	66.5	14.5	224.0	633.0	58.0	90.0	16.5	1247.6
1968	52.5	20.5	45.0	46.0	25.0	162.0	80.5	169.5	85.5	85.5	45.0	80.0	897.0
1969	40.0	13.5	16.0	44.0	10.5	133.0	389.0	275.0	275.0	37.5	41.0	8.0	1282.5
1970	17.0	53.0	0	0	26.0	415.0	190.0	119.0	279.0	49.5	7.5	17.0	1173.0
1971	15.5	3.0	0	0	55.0	257.0	54.5	117.5	151.5	136.5	32.5	25.0	848.0

NOTE: Minus one indicates absence of Data

AVERAGE	26.6	16.8	7.7	27.0	42.1	153.3	137.4	118.2	213.9	116.9	40.9	26.9	934.6
MAXIMUM	71.0	75.0	50.0	92.0	187.5	415.0	439.0	400.0	957.5	753.5	243.5	96.0	1667.5
MINIMUM	0	0	0	0	0	6.5	14.5	16.0	6.0	5.0	0	0	479.0

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PANUCO FIRST-STAGE PROJECT

The Ejidal System, Water Law, and Land Tenure

General

1. There are three classes of land holders in the project area: private small holders, colonos and ejidos. The colonos were settled under a program, now discontinued, for colonization of federal lands. The individual colono obtains title to his allotment of land after he has made full payment to the Government under the colonization agreement. In general, the colonos living in the project area have discharged their repayment obligation and now have title. They are, therefore, the same as private small holders. Ejidos are made up of individuals known as ejidatarios who have specific rights as members of the ejido. Two recent laws, the Agrarian Reform Law 1/ and the Federal Water Law 2/, define lands which may be expropriated by the Government for Agrarian Reform purposes or to establish new irrigation districts and the rights of the private holders to retain lands. Both laws are operable in the project area.

The Ejido System and the Agrarian Reform Law

2. The ejido system was officially established as a tenure system by the Agrarian Reform Law of 1915, under whose provisions existing rural communities were confirmed in their ownership rights and ejidos were created and endowed with land, water, and all the natural resources within a demarcated area. The ejido, as the community, is the legal proprietor of the land, but it cannot transfer, rent, or mortgage it. Land can be withdrawn from an ejido only for reason of public use, in which case compensation must be paid (para 4). The ejido may operate as a communal farm, with the members being similar to shareholders in a corporation, or it can elect to parcel out its land to its members on a pro rata share. In this case, the individual ejidatario manages his own holding as though it were his own, although he has use of the land only and cannot mortgage, sell, or rent it. He may pass on his rights to one designated successor, such as his spouse, child, or some one financially dependent on him, who must then accept the financial obligation of supporting the dependents of the original member. An ejidatario loses his right (a) if he or his family does not work the land allotted personally for two consecutive years or if he does not perform his required service to the communal farm; (b) if he has acquired his rights by succession and does not financially support the dependents of the deceased; (c) if he uses ejidal land for unlawful purposes; (d) if he has interest in other ejidal land; or (e) if he is convicted of growing narcotic plants. If an ejidatario unit becomes vacant, it is reallocated by the ejido to an eligible individual.

3. Membership in an ejido is entirely free and no one can be forced to join. Any group of individuals can petition the Government to form a new ejido, provided the prospective members can meet the eligibility requirements for ejidatarios. These call for the candidate to:

- (a) be Mexican by birth, over 16 years old or of any age if he or she has a dependent family;
- (b) have resided in the population center filing the request for at least six months;
- (c) agree to work the land personally;
- (d) not own in his own name any land equal to or greater than 10 ha of irrigated land or 20 ha of dry land;
- (e) not own capital in industry or commerce exceeding Mex\$ 10,000 or agricultural capital exceeding Mex\$ 20,000; and
- (f) not have been convicted for planting marijuana or narcotics.

After a petition is filed, DAAC must review all lands within a prescribed distance of the petitioning population center to see if land can be made available. Private lands may not be expropriated for purposes of forming ejidos if the individual holding does not exceed the following limits:

- (a) 100 ha of irrigated or first class watered land;
- (b) 150 ha utilized for cotton if irrigation takes place through flooding or pumping;
- (c) 300 ha in plantation crops such as sugarcane; and
- (d) an area sufficient to maintain 500 head of cattle or the equivalent in other livestock.

Land that exceed these limits and certain federal lands can be taken, with compensation, but private owners are entitled to retain buildings, or improvements such as wells.

4. DAAC is responsible for managing ejido affairs at the Government level and for applying the Agrarian Reform Law. This law specifies operational procedures for the ejidos and most importantly grants legal status to it so that it is eligible for credit. Among other things, the law has the following provisions:

- (a) ejidatarios shall pay a property tax but it cannot exceed 5% of the value of marketed production; the tax liability is binding on the ejido and all its members;
- (b) each ejidatario is entitled to a houselot without charge not exceeding 2,500 m² in size. He is obliged to occupy the lot and build on it, with DAAC supplying suitable plans and technical assistance;
- (c) ejidos may be subdivided in specific cases where technical studies indicate that subdivision is appropriate;
- (d) ejidal property can be expropriated for public purposes. SRH is specifically mentioned as having that right when lands are needed for hydraulic works. However, the indemnity paid must be set aside to acquire equivalent lands where the agrarian group can be reestablished;
- (e) two or more ejidatarios can agree to work their parcels jointly;
- (f) ejidos are entitled to preference in all government activities such as technical assistance, provision of credit, and purchase of produce; and
- (g) ejidos using water belonging to an irrigation district must pay the usual water charges for that district.

The Federal Water Law

5. This law complements the Agrarian Reform Law and sets the procedures which are applicable in developing the nation's water resources, specifically invoking the Agrarian Reform Law in cases involving ejidal or community properties. The law also does the following:

- (a) Establishes priorities for use of water as:
 - (i) domestic purpose;
 - (ii) urban public services;
 - (iii) cattle watering;
 - (iv) irrigation;
 - a. ejidal and communal lands;
 - b. privately owned lands;
 - (v) industrial purposes;
 - a. electric generation for public use;
 - b. other uses;

- (vi) aquatic culture;
 - (vii) electric generation for private use;
 - (viii) soil leaching; and
 - (ix) other uses;
- (b) Establishes procedures for setting up new irrigation districts and requires that all land within the boundaries be expropriated. It further requires DAAC to define the rights of ownership by ejidos within the district;
 - (c) States that when the irrigation district is declared for expropriation, landholders must prove their rights of ownership for compensation, which may be in cash or in kind. In the latter case, the payment may comprise not more than 20 ha of irrigated land with any balance paid in cash or credited to the persons concerned for payment of water charges;
 - (d) Requires DAAC to propose new holding sizes for ejidatarios if ejido lands are included in an irrigation district;
 - (e) Allows for the Federal Government to declare the size of irrigation unit to be assigned to small private landowners or to colonos. The area may never exceed 20 ha (the Agrarian Reform Law provision of a minimum allotment per ejidatario of 10 ha of irrigated land is mentioned, (para 3d);
 - (f) Entitles each user to his pro rata share in times of water shortage; and
 - (g) Allows double cropping without implying any permanent right to such use when there is surplus water.

Land Tenure

6. At about the time the Comision de Estudios del Rio Panuco was established in 1959, the Government prohibited the granting of any further permanent rights to private individuals to use waters of the Panuco Basin. Although several private pumps have been installed since then to pump water from tributaries of the Panuco, no one enjoys permanent rights nor can individual owners claim that their lands are irrigated in the sense that it would exempt their holdings from expropriation under the Agrarian Reform Law. There is no existing Irrigation District covering any portion of the project lands. Thus, as the Government establishes the three new Irrigation Districts, one for each area, all private and colonos lands would be expropriated for district purposes, with compensation either in cash or in land. Reallotment

of lands would be made to present private owners and to colonos who choose that methods of compensation for their present holding. The reallocation would not exceed the size of the present holding or 20 ha, whichever is smaller and the allottee would be required to pay the appraised value of the land. In most cases, the value of the irrigated allotment would exceed the value of the non irrigated present holding and the allottee would be required to pay the difference. The new allotment does not necessarily have to include any of the land previously held by the individual except that cognizance must be given to established permanent crops such as orchards and to improvements.

7. Private owners of land in the reservoir basins of the Las Animas and Chicayan Projects could elect to be paid in cash for the value of their present holding, or, if they prefer, they could choose to be compensated by an allotment of land in the service area of the project in the same sense as a private owner now living in the proposed service area. Ejidal property lying in the reservoirs could be expropriated by SRH if necessary. However, there is only one ejido involved and that in the basin of the Las Animas Reservoir. It has elected to voluntarily sell its lands to SRH and be re-located in the irrigated area.

8. Ejidal land lying in the proposed irrigated areas would not be subject to expropriation. The ejidos would, however, be reorganized as allowed by the law and the holding per ejidatario adjusted to meet the new allotment of 15 ha per ejidatario. Lands made available from the private and colonos holdings would be used only to enlarge present ejidos or to form new ones.

9. Table 1 shows the land tenure system as it exists at present in the proposed irrigated areas and as it is expected to be under the project. The table is based on the assumption that private owners in the reservoir areas would opt for cash compensation and will not seek an allotment of irrigated land. If any of the private owners do request compensation by an allotment of irrigated land, the number of private owners under the "with" project conditions would increase. The table also assumes that some of the private holders on the Pujal Coy project having very small holdings would elect cash compensation rather than seek to keep their less than 20-ha holdings under project conditions. The table is further based on the Government's recommendation of 20-ha allotments, the maximum allowed under the Federal Water Law, to private holders and a 15-ha allotment per ejidatario to ejidos. This size exceeds the minimum allowed by the law of 10 ha per ejidatario and has been recommended by the Government in order to establish the ejidatarios at a reasonable level of living.

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Land Tenure

	Present Situation			With Project		
	No.	Ha	Ave. Size Ha	No.	Ha	Ave Size Ha
<u>Las Animas</u>						
Private Owners	230	26,537	115	230	4,600	20.0
Colonos	36	3,572	99	36	720	20.0
Ejidatarios	<u>953</u>	<u>17,924</u>	<u>18.8</u>	<u>2,847</u>	<u>42,713</u>	<u>15.0</u>
	1,219	48,033	39.5	3,113	48,033	15.4
 <u>Pujal Coy</u>						
Private Owners	277	29,742	107	207	4,140	20.0
Colonos	803	29,115	36.3	803	16,060	20.0
Ejidatarios	<u>818</u>	<u>13,155</u>	<u>16.1</u>	<u>3,454</u>	<u>51,812</u>	<u>15.0</u>
	1,898	72,012	38.0	4,464	72,012	16.1
 <u>Chicayan</u>						
Private Owners	248	16,718	67.5	248	4,213	17.0
Ejidatarios	<u>102</u>	<u>282</u>	<u>2.8</u>	<u>852</u>	<u>12,787</u>	<u>15.0</u>
	350	17,000	48.5	1,100	17,000	15.4
 <u>Project</u>						
Private Owners	755	72,997	96.4	685	12,953	18.9
Colonos	839	32,687	39.0	839	16,780	20.0
Ejidatarios	<u>1,873</u>	<u>31,361</u>	<u>16.7</u>	<u>7,153</u>	<u>107,312</u>	<u>15.0</u>
	3,467	137,045	39.6	8,677	137,045	15.8

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PANUCO FIRST-STAGE PROJECT

Project Works

Existing Irrigation Facilities

1. There are a few small private pumps installed in each of the three project areas, but owners have only temporary rights to pump from the rivers. All such installations would be supplanted by project facilities and the equipment salvaged by the owner.

Las Animas

2. The basic water supply for Las Animas would be a direct gravity diversion of water from the Guayalejo River into a feeder canal, ending in the Las Animas storage reservoir. Main canals would head at each end of the storage reservoir dam to distribute water to the irrigation system on each side of the Guayalejo River.

3. Guayalejo Diversion Dam. This structure would be a concrete gravity type located across the Guayalejo River about 8 km northwest of the city of Mante. Radial gates would be installed to control water levels and when fully opened would be capable of passing floods of 3,500 m³ down the Guayalejo River. The feeder canal would be located on the right bank and discharges into the canal would be controlled by four radial gates. Sufficient drill holes have been sunk to explore foundation conditions and to prove the suitability of the site.

4. Feeder Canal. This canal would be 16.8 km long and excavated in earth its entire length. It would be concrete lined, with a capacity of 100 m³/sec.

5. Las Animas Storage Dam. This structure would be constructed across the normally dry arroyo of the same name. All the water to be stored would be delivered by feeder canal from the Guayalejo River. This site was chosen over an alternative site on the Guayalejo River as it would inundate less agricultural land and the ratio of land benefited to the land taken out of production due to reservoir construction would be much greater. The dam would be 7.8 km long, with a maximum height of about 28 m above foundation and have a zoned earth fill with a central impermeable zone. Two auxiliary dikes would be required to close low places on the periphery of the reservoir

and would be similar in design to the main dam. The spillway would be an overflow concrete crest 300 m long with a capacity of 500 m³/sec discharging into an arroyo leading back to the Guayalejo River. This spillway capacity, together with use of about 70 Mm³ of storage capacity, would control the maximum probable flood having a peak of 2,500 m³/sec. Operation of the reservoir would be restricted to ensure that 70 Mm³ of space is available from June to November. Irrigation outlets, with top seal radial gates, would be installed at each end of the dam to serve the two main canals. The reservoir would cover about 9,800 ha and have a total capacity of 600 Mm³, of which 62 Mm³ is dead storage and for sediment accumulation, leaving 538 Mm³ of usable storage. Sufficient drilling has been accomplished to explore the foundation conditions to prove the suitability of the site and to locate adequate materials for the embankment. An access road to the site from the paved highway Tampico-Mante has been constructed by SRH under a negotiated contract. Houses would be constructed at the dam for use of reservoir operators.

6. Ninety families live in the reservoir area, 87 being ejidatarios and three private owner families. Ownership is by 21 private owners and one ejido. The ejido has elected to voluntarily sell its land to SRH and be relocated in the irrigated area. Sixteen of the private owners have elected to receive compensation in cash and the balance have not made a decision as yet.

7. Irrigation and Drainage Facilities. Two main canals heading at each end of Las Animas dam would feed the irrigation distribution system. The right bank canal would be 53 km long and the one on the left bank, 126 km long. The right bank canal would have an initial capacity of 24 m³/sec and that on the left, 25 m³/sec. The left bank canal would have a siphon crossing the Guayalejo River to serve about 18,700 ha on the left bank of the Guayalejo. The main canals would have turnouts to secondary laterals, which, in turn, would feed the tertiary system. A turnout and measuring device would serve each 60-ha block. Estimates of cost have been based on concrete lining throughout, but, further soil tests would be made as part of final designs, and lining would be eliminated in those reaches not requiring it. A complete drainage system to remove excess surface water would be constructed. Open drains would have a minimum depth of 1.5 m, while larger drains would be at least 2 m deep.

8. Roads and Complementary Works. Roads would be constructed along all canals and drains for operation and maintenance purposes. This network would be supplemented with connections to form a logical road system. About 670 km of roads would be a part of the canal and drain system and 85 km would be constructed specifically to make connections. About 12 houses for ditch riders would be constructed and 183 km of telephone system installed to assist in the operation and maintenance of the project. A project headquarters located at Los Aztecas is under construction under a contract negotiated by SRH.

9. Land Preparation. About 22,700 ha would require clearing of the native brush. Approximately 7,000 of this is on the left bank and 15,700 on the right bank. All 48,000 ha in the project would be leveled.

Pujal Coy

10. The water supply for Pujal Coy would be by gravity diversion from the Tampaon River, effected by a diversion dam on that stream to direct water into a feeder canal ending at a pumping plant. The pumping plant would have two sets of pumps discharging into two small regulating reservoirs located at different elevations. The lower reservoir would feed the main canal serving lands adjacent to the Tampaon River, while the higher one would feed the main canal serving lands north towards Las Animas. One relift pump would be required to pump water from the north main canal into a lateral serving a higher area.

11. Diversion Dam San Jose del Limon. This diversion dam would be of a type used very successfully in Mexico and would consist essentially of an 85 m long overflow section constructed of compacted earth material protected by a heavy grouted rock fill. The upstream face would have a slope of about 3.33 to 1 up to the top of a concrete wall forming the crest of the dam. Downstream of the wall, there would be a vertical drop of 1 m to a long apron laid on a 9:1 slope back to stream bed. Concrete sills would be constructed at about 9 m intervals to control erosion in the apron. At the left of the dam, a sluiceway controlled by radial gates would be constructed to pass sediments downstream to the Tampaon River and avoid, as much as possible, diverting them into the feeder canal. The gate structure for the intake into the feeder canal would be located on the left abutment and the intake to the canal would be from the sluiceway structure.

12. Diversion Canal. This canal would be 4.43 km long and have a designed capacity of 60 m³/sec without sediment or 50 m³/sec with approximately 0.5 m of sediment deposited in the bottom of the canal. The canal would start in a fairly deep cut of about 14 m, gradually reducing to about 8 m where it crosses the Laguna San Jose del Limon, then increasing again to about 23 m at the pumping plant. Berms would be constructed on the slopes in the deep cuts to insure stability of the cut banks.

13. Pumping Plant. The main pumping plant would be constructed at the end of the feeder canal and would house the two sets of pumps feeding the regulating reservoirs. The exact number and characteristics of the pumps would be determined in the final design, but estimates are based on use of pump units with a hydraulic capacity of 6 m³/sec each. Seven pumps, plus one standby pump, would serve the higher reservoir and would be equipped with 3,500 hp electric motors. The other two units, equipped with 2,200 hp electric motors, would serve the lower reservoir. Electric power would be brought to the plant by a new line from an existing high tension line about 15 km north of the pumping plant. The Commission of Electricity and SRH would share the cost of constructing the line and installing the substation equipment.

14. Discharge Canals. Steel pipes would carry the pump discharge up to the elevation of the discharge canals to the high and low reservoir. These would be lined canals, having the following characteristics:

	<u>Low Canal</u>	<u>High Canal</u>
Length	800 m	170 m
Capacity	12 m ³ /sec	42 m ³ /sec

15. Regulating Reservoirs. The lower reservoir would be formed by a dike 710 m long and approximately 16 m high above foundation, containing 260,000 m³ of fill. The total capacity of the reservoir would be 2.0 Mm³, of which 1.85 Mm³ would be usable. The elevation of the normal water surface is about 25 m above sea level, giving a static pump lift of about 18 m from the water surface in the feeder canal. The upper reservoir would be formed by two dikes having a total length of 1650 m, with a maximum height above foundation of 18.5 m. The total capacity would be 6.5 Mm³, of which 5.5 Mm³ would be usable. The elevation of the normal water surface would be 37.5 m above sea level, giving a static pump lift of about 30.5 m from the water surface in the feeder canal.

16. Main Canals. The main canal serving the area along the Tapaon River would receive its water from the lower regulating reservoir and have a length of 83 km. The main canal serving the northern portion of the area would derive its water from the upper regulating reservoir and would have a total length of 99 km. At station km 40,000 of this canal there would be a pumping plant containing three units of 6.0 m³/sec capacity each, with a dynamic head of 28.0 m to serve the 60 km long main canal, Rebombeo Chapaco. All the main canals would be concrete lined unless later investigations showed that lining could be eliminated in certain reaches.

17. Irrigation and Drainage System. The main canals would supply water to the secondary and tertiary irrigation canals, which would then distribute it to approximately 60-ha blocks where turnouts and measuring devices would be installed. The estimates assume a wholly concrete-lined system, but further investigation may prove this to be unnecessary. The total length of the distribution canals would approximate 625 km. About 950 km of drains would be constructed to remove excess surface water. These would vary from 1.5 to 4.5 m in depth and would serve to return drain water to the rivers or natural water courses leading to the rivers.

18. Roads and Complementary Works. Roads for operation and maintenance purposes and for farmer use would be constructed along all of the larger canals and drains. This network would be supplemented by connecting roads to give a complete road network, all of which would be paved or surfaced to provide dependable all-weather use. Altogether there would be about 980 km of internal roads in the Pujal Coy area. Seventeen houses for ditchriders and three for the pumping plant personnel would be constructed and about 170 km of telephone system would be installed. Operating headquarters would be located at Ebano.

19. Land Preparation. The total area to be cleared is about 28,250 ha, of which 2,900 ha is medium, 11,800 ha light, and the balance merely in bush. All 72,000 ha of the area would be leveled. About 23,800 ha would require smoothing only, about 24,400 ha light leveling, and 23,800 considerable earth movement.

Chicayan

20. The basic water supply for Chicayan would be the flows of the Chicayan River, as regulated by Paso de Piedras dam and reservoir. Main canals would head at each end of the dam to irrigate the lands on both sides of the Chicayan River below the dam.

21. Paso de Piedras Dam and Reservoir. Only preliminary designs have been prepared and final designs could change details of the structure from those described. The dam would be 2.076 km long and have a maximum height above the present stream bed of 25 m. However, there will be considerable excavation for foundation of the dam and the maximum height above foundation may be of the order of 31 m. The preliminary design calls for the dam to be constructed primarily of readily available impermeable material, with a filter near the center of the dam. The filter would outlet near the downstream toe. Upstream and downstream slopes would be protected with riprap. About 1.8 Mm³ of fill material would be required. The spillway would be located in the dam at a point where the fill is very shallow and where the spillway structure could be founded on the original ground. Present plans call for a concrete ogee crest with ten 8 m by 8 m radial gates to control discharges. The ogee crest would lead to a stilling pool from which flows would return to the Chicayan River channel. The spillway capacity would be about 3,000 m³/sec, which, with use of the flood control space, would accommodate the maximum probable flood estimated to have a peak of 5,000 m³/sec. The two irrigation outlets would be located in natural ground near each end of the dam and would consist of an upstream gate structure with an emergency and service gate and a concrete pipe through the dam. The concrete pipe would be cast in place in a deep cut, and then the dam would be completed as a fill over the pipe. Dry season flows of the Chicayan River are very small and the schedule would call for construction during a two-year period. Preparatory work would be done in one dry season, with the main fill placed during the second season, thus avoiding any expensive means of handling floods during construction. The reservoir would inundate about 9,000 ha and have a total capacity of 570 Mm³ made up as follows:

Dead storage and sediment	120 Mm ³
Irrigation	340 Mm ³
Flood Control	110 Mm ³
Total	570 Mm ³

22. There are 160 families living in the reservoir area on 154 privately owned blocks. No ejidatarios are involved. So far, 30 owners have registered their ownership. Two have decided to take payment in cash and 28 have elected to receive payment in irrigated land on the project. It is not known now, what the others will do.

23. Access Road and Construction Camp. The dam site can be reached only by jeepable roads in the dry season. SRH, however, has started construction of a 25 km all-weather road running from the Tempoal-Tampico road to the site, and it will be the main connection between the project area and the Mexican highway network serving the balance of the country. To provide facilities for construction of the dam and to later serve as operating headquarters for the area, a permanent camp is being constructed nearby. Both the access road and camp are being built under contracts negotiated by SRH with local contractors.

24. Irrigation and Drainage System. The main canal serving the right bank would have an initial capacity of 9 m³/sec, a length of 52 km, and serve 8,057 ha. The left bank main canal would have an initial capacity of 10 m³/sec, a length of 50 km, and serve 8,943 ha. The irrigation distribution system would consist of secondary and tertiary laterals, totaling about 148 km in length. Turnouts and measuring devices would serve about 60-ha units each. Present plans call for the entire system to be lined with concrete but further study may indicate that some or all of the lining can be eliminated. Drainage of the area is relatively good, but the project would improve the natural water courses and supplement them with constructed drains to remove excess surface water. The total length of drains would be about 127 km and they would vary in depth from 1.5 m to 2.5 m.

25. Roads and Complementary Works. About 261 km of roads would be constructed along irrigation and drainage canals to serve operation and maintenance purposes and for farmer use, and 12 km connecting roads would be built to complete a logical network. Seven houses for ditchriders would be constructed, 65 km of telephone system would be installed, and sub-district offices would be built within the irrigated area at locations some distance from the headquarters at the dam site.

26. Land Preparation. Clearing would be required on 7,250 ha, 5,440 of which has medium cover and the balance just bush. All lands would be smoothed and leveled. About 8,500 ha would require light leveling, 5,100 ha medium, and 3,400 ha rather extensive work.

MEXICO
PANUCO FIRST-STAGE PROJECT

Construction Schedule

<u>Calendar Year</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>June 1980</u>
<u>Las Animas</u>								
Access Road	=====							
Construction Camp	=====							
Diversion Dam	=====							
Feeder Canal	=====							
Las Animas Reservoir		=====						
Main Canals	=====							
Irrigation System	=====							
Drainage System	=====							
Roads		=====						
Ditchrider Houses			=====					
Telephone System			=====					
District Offices			=====					
Land Clearing and Leveling		=====						
Equipment	=====							
Rights of Way	=====							
FLAMEPA (Extension)		=====						
<u>Pujal Coy</u>								
Diversion Dam	=====							
Feeder Canal	=====							
Pumping Plants		=====						
Regulating Reservoirs		=====						
Main Canals	=====							
Irrigation System	=====							
Drainage System	=====							
Roads		=====						
Offices	=====							
Ditchrider Houses	=====							
Telephone System		=====						
Land Clearing and Leveling		=====						
Equipment	=====							
Rights of Way	=====							
FLAMEPA (Extension)		=====						
<u>Chicayan</u>								
Paso de Piedra Dam	=====							
Main Canals	=====							
Irrigation System	=====							
Drainage System	=====							
Road System	=====							
Ditchrider Houses	=====							
District Offices	=====							
Telephone System	=====							
Land Clearing and Leveling		=====						
Access Road	=====							
Construction Camp	=====							
Equipment	=====							
Rights of Way	=====							
FLAMEPA (Extension)		=====						

MEXICO

PANUCO FIRST - STAGE PROJECT

Water Availability, Requirements, Utilization, and Quality

Las Animas

1. Water Availability. The basic water supply for Las Animas would be from the uncontrolled flows of the Guayalejo River. Available water would be diverted into a feeder canal leading to the Las Animas reservoir where it would be regulated to supply the canal systems.
2. Records of flows of the Guayalejo River are available at the Majiscatzin gage, about 5 km below the diversion site, from 1954 to the present. The flow at the gage has averaged about 2,300 Mm³ annually. All this water cannot be diverted as about 5 m³/sec is required for downstream uses primarily in the Tampico area and diversions are limited by the feeder canal capacity. Studies were made of divertable water with various canal capacities ranging from 50 to 150 m³/sec, and 100 m³/sec was chosen. Amounts divertable with that canal capacity vary from a low of 788 Mm³ in 1962 to about 1,600 Mm³ in 1972.
3. Water Requirements. These were computed by the modified Blaney-Criddle method, using factors found locally applicable. The net annual irrigation depth required is 0.71 m. Using 75% as conveyance efficiency and 70% farm irrigation efficiency, overall efficiency is about 50% of water diverted. Thus, the gross requirement is 1.37 m or 13,700 m³/ha. For the total area of 48,000 ha, water requirements are then 660 Mm³ per year.
4. Water Utilization. Studies were made of the operation of Las Animas Reservoir for the period August 1954 through 1972, using the water divertable from the Guayalejo River by a 100 m³/sec feeder canal as the supply and considering the evaporation losses of the reservoir and the irrigation requirements as demands. The useable capacity of the reservoir was taken as 538 Mm³, considering 62 Mm³ of the total 600 Mm³ capacity as being for dead storage and sediment accumulation. In only one of the years of study was the supply inadequate to meet the full irrigation requirements and the deficit would have amounted to about 100 Mm³, or 18% of that year's requirements. This shortage is considered tolerable and the water supply adequate.
5. Quality. Tests of the Guayalejo water shows that it has a total salt content varying between 700 and 820 ppm, with SAR about 0.8. This would class it as medium salinity water with low sodium hazard and make it suitable for irrigation use.

Pujal Coy

6. Water Availability. Pujal Coy depends on pumping the unregulated flows of the Tampaon River. There is no stream gauging station at the diversion site. Flows available for diversion have been estimated from flows recorded at stations on two tributaries upstream, at Ballesimi and at Pujal. Approximately 70% of the flows at the diversion site originate in the Tampaon River, measured at the Pujal station and the balance from the Coy River, measured at Ballesimi. Average flows passing the diversion point are about 5,200 Mm^3 annually.

7. Water Requirements. Since there is no storage available, the water supply adequacy must be judged by the flows available in periods of low flow. The cropping pattern chosen for the area takes into account that the lowest flows occur in April-May, at the end of the dry season, and planting times have been adjusted so that the peak water use period does not fall in these months. The net irrigation requirement, determined by the modified Blaney Criddle method, using temperature and precipitation records at Panuco and Pujal, is about 0.72 m net and 1.38 m gross, or 13,800 m^3/ha . The gross requirement assumes 75% conveyance efficiency and 70% for farm efficiency. The total requirement for the 72,000 ha is about 990 Mm^3 .

8. Utilization. The adequacy of the water supply to meet irrigation requirements has been judged by comparing flows available by 10-day periods to meet the concurrent irrigation requirement. During the study period extending for 19 years from 1954 through 1972, only 36 of the 684 periods analyzed showed some deficiency, but none of these deficiencies exceeded 10% of the requirements for the month, or 1% of the annual. Thus, it is concluded that the water supply is adequate to meet project requirements.

9. Quality. Analysis of water at the diversion site shows total salt content varying from 600 to 1,200 ppm and SAR from 0.8 to 2.9. It is thus concluded that the water has a medium salinity but low sodium hazard and is quite suitable for irrigation use.

Chicayan

10. Water Availability. Chicayan would obtain its water supply from the Chicayan River as regulated by a storage reservoir to be constructed at the Paso de Piedras site. A gauging station was established upstream of the dam site and started operation on July 5, 1969, so that the direct record of flows available for use is very short. An estimate of flows at the dam site for the period 1944 to 1969 was made by establishing a relationship between flows at the dam site to flows recorded at a station on an adjacent stream with a longer period of record, and to rainfall. The rainfall and adjacent stream records were then used as the basis for estimating the flows at the dam site. These studies indicate an average annual flow at the dam site of 278 Mm^3 , a minimum of 78 Mm^3 , and a maximum of 700 Mm^3 .

11. Water Requirements. The water requirements were estimated using the Blaney-Criddle method, with temperature and precipitation data from stations at Panuco and Chicayan. The net irrigation requirement was estimated at 0.74 m. The conveyance efficiency was taken as 85% (appropriate for lined canals and the short distances involved) and farm irrigation efficiency as 70% to give an overall efficiency of 60% and a gross water requirement of 1.23 m, or 12,300 m³ per ha. For the 17,000-ha area, the annual water requirements are then 210 Mm³ per year.

12. Water Utilization. The total capacity of the Paso de Piedras reservoir would be 570 Mm³. To provide head to operate the irrigation canals and space for sediment, 110 Mm of the capacity would be dead storage, leaving 450 Mm³ useable. Studies of flood hazards at the reservoir and the incidence of hurricanes in the area further indicate that the total water in storage should not exceed 460 Mm³ from June through September and 525 Mm³ in October. The balance of the year, the full capacity of 570 Mm³ could be used, as the flood hazard would be minimal. A study was made of the operation of the reservoir and its ability to meet the irrigation requirements with the above limitations on usable storage space. For the 28-year period studied (1944 through 1971), there were three consecutive years when the full irrigation requirement could not be met. The annual shortages expressed as a percentage of the total annual requirement were 40%, 15%, and 10%. In each case, the shortage would occur in the last part of the dry period prior to the usual onset of the rains in June. These relatively few shortages are considered acceptable and it is concluded that the water supply is adequate.

13. Quality. Total dissolved salts range from 300 to 400 ppm on Chicayan River water and the SAR averages about 1.3. This classifies it as a slightly saline water with low sodium hazard and suitable for irrigation.

MEXICO

PANUCO FIRST STAGE PROJECT

Cost Estimates Las Animas

	--- Mex. \$ Millions ---			--- US \$ Millions ---			% Foreign Exchange
	Local	Foreign	Total	Local	Foreign	Total	
Civil Works Under ICB							
Diversión Dam	15.20	8.18	23.38	1.22	0.65	1.87	35
Feeder Canal	28.20	18.80	47.00	2.26	1.50	3.76	40
Storage Dam and Reservoir	112.42	74.94	187.36	8.99	6.00	14.99	40
Main Canals	104.27	69.51	173.78	8.34	5.56	13.90	40
Irrigation Distribution System	40.43	26.95	67.38	3.23	2.16	5.39	40
Drainage System	23.13	12.46	35.59	1.85	1.00	2.85	35
Roads	19.70	13.14	32.84	1.58	1.05	2.63	40
Ditchrider Houses	0.50	-	0.50	0.04	-	0.04	0
Telephone System	1.83	-	1.83	0.15	-	0.15	0
District Offices	1.50	-	1.50	0.12	-	0.12	0
Subtotal	<u>347.18</u>	<u>223.98</u>	<u>571.16</u>	<u>27.78</u>	<u>17.92</u>	<u>45.70</u>	<u>39</u>
Civil Works Under Local Bids							
Land Clearing	16.04	10.68	26.72	1.28	0.85	2.13	40
Land Leveling	39.65	13.22	52.87	3.17	1.06	4.23	25
Subtotal	<u>55.69</u>	<u>23.90</u>	<u>79.59</u>	<u>4.45</u>	<u>1.91</u>	<u>6.36</u>	<u>30</u>
Civil Works Under Negotiated Contracts							
Access Road to Reservoir	5.34	-	5.34	0.43	-	0.43	0
Construction Camp	5.00	-	5.00	0.40	-	0.40	0
Subtotal	<u>10.34</u>	<u>-</u>	<u>10.34</u>	<u>0.83</u>	<u>-</u>	<u>0.83</u>	<u>0</u>
Total Civil Works	<u>413.21</u>	<u>247.88</u>	<u>661.09</u>	<u>33.06</u>	<u>19.83</u>	<u>52.89</u>	<u>37</u>
Equipment and Materials							
Materials and Equipment Furnished by SRH	29.67	-	29.67	2.37	-	2.37	0
Operation and Maintenance Equipment	8.94	-	8.94	0.72	-	0.72	0
Equipment Purchased by SRH under ICB	0.14	2.73	2.87	0.01	0.22	0.23	95
Subtotal	<u>38.75</u>	<u>2.73</u>	<u>41.48</u>	<u>3.10</u>	<u>0.22</u>	<u>3.32</u>	<u>7</u>
Engineering and Administration	68.18	-	68.18	5.45	-	5.45	0
Rights of Way	17.56	-	17.56	1.40	-	1.40	0
Contingencies							
Physical, 10% on Civil Works and Equipment	45.19	25.07	70.26	3.62	2.00	5.62	36
Prices, 10% on Civil Works and Equipment	45.19	25.07	70.26	3.62	2.00	5.62	36
Subtotal	<u>90.38</u>	<u>50.14</u>	<u>140.52</u>	<u>7.24</u>	<u>4.00</u>	<u>11.24</u>	<u>36</u>
Project Total Exclusive of PLAMEPA	628.08	300.75	928.83	50.25	24.05	74.30	32
PLAMEPA	17.00	-	17.00	1.36	-	1.36	0
Project Total with PLAMEPA	<u>645.08</u>	<u>300.75</u>	<u>945.83</u>	<u>51.61</u>	<u>24.05</u>	<u>75.66</u>	<u>32</u>

August 17, 1973

MEXICO

PANUCO FIRST STAGE PROJECT

Cost Estimates Pujal Coy

	--- Mex. \$ Millions ---			--- US \$ Millions ---			% Foreign Exchange
	Local	Foreign	Total	Local	Foreign	Total	
Civil Works Under ICB							
Diversion Dam	3.30	2.38	5.68	0.26	0.19	0.45	42
Feeder Canal	8.36	5.58	13.94	0.67	0.45	1.12	40
Pumping Plant No. 1 ^{1/2}	15.24	6.53	21.77	1.22	0.52	1.74	30
Pumping Plant No. 2 ^{1/2}	6.80	2.92	9.72	0.54	0.23	0.77	30
Discharge Canals	0.30	0.20	0.50	0.02	0.02	0.04	40
Regulating Reservoirs	13.73	9.16	22.89	1.10	0.73	1.83	40
Main Canals	168.86	112.57	281.43	13.51	9.00	22.51	40
Irrigation Distribution System	95.30	63.53	158.83	7.62	5.08	12.70	40
Drainage Systems	45.91	24.72	70.63	3.67	1.98	5.65	35
Roads	19.60	13.06	32.66	1.57	1.04	2.61	40
Offices	1.50	0	1.50	0.12	-	0.12	0
Ditchrider Houses	1.20	0	1.20	0.10	-	0.10	0
Telephone System	1.70	0	1.70	0.14	-	0.14	0
Subtotal	<u>381.80</u>	<u>240.65</u>	<u>622.45</u>	<u>30.54</u>	<u>19.24</u>	<u>49.78</u>	<u>39</u>
Civil Works Under Local Bids							
Land Clearing	24.19	13.03	37.22	1.94	1.04	2.98	35
Land Leveling	52.78	17.60	70.38	4.22	1.41	5.63	25
Subtotal	<u>76.97</u>	<u>30.63</u>	<u>107.60</u>	<u>6.16</u>	<u>2.45</u>	<u>8.61</u>	
Total Civil Works	458.77	271.28	730.05	36.70	21.69	58.39	37
Equipment and Materials							
Construction Materials Furnished by SRH	62.90	-	62.90	5.03	-	5.03	0
Operation and Maintenance Equipment	16.49	-	16.49	1.32	-	1.32	0
Equipment Purchased by SRH under ICB	-	67.60	67.60	-	5.40	5.40	100
Subtotal	<u>79.39</u>	<u>67.60</u>	<u>146.99</u>	<u>6.35</u>	<u>5.40</u>	<u>11.75</u>	
Engineering and Administration	84.96	0	84.96	6.80	-	6.80	0
Rights of Way	8.83	0	8.83	0.71	-	0.71	0
Contingencies							
Physical, 10% Civil Works and Equipment	57.75	28.75	86.50	4.62	2.30	6.92	33
Prices, 10% Civil Works and Equipment	57.75	28.75	86.50	4.62	2.30	6.92	33
Subtotal	<u>115.50</u>	<u>57.50</u>	<u>173.00</u>	<u>9.24</u>	<u>4.60</u>	<u>13.84</u>	<u>33</u>
Project Total Exclusive of PLAMEPA	<u>747.45</u>	<u>396.38</u>	<u>1143.83</u>	<u>59.80</u>	<u>31.69</u>	<u>91.49</u>	<u>31</u>
PLAMEPA	19.50	-	19.50	1.56	-	1.56	0
Project Total With PLAMEPA	<u>766.95</u>	<u>396.38</u>	<u>1163.33</u>	<u>61.36</u>	<u>31.69</u>	<u>93.05</u>	<u>30</u>

^{1/} Civil Works, Installation of Pumping Equipment and SRH share of power line

MEXICO

PANUCO FIRST STAGE PROJECT

Cost Estimate Chicayan

	--- Mex. \$ Millions ---			--- US \$ Millions ---			% Foreign Exchange
	Local	Foreign	Total	Local	Foreign	Total	
Civil Works Under ICB							
Paso de las Piedras Dam	35.45	23.64	59.09	2.84	1.89	4.73	40
Main Canals	53.33	35.55	88.88	4.27	2.84	7.11	40
Irrigation Distribution System	16.07	10.71	26.78	1.29	0.86	2.15	40
Drainage System	9.14	4.92	14.06	0.73	0.39	1.12	35
Road System	2.33	1.56	3.89	0.19	0.12	0.31	40
Ditchrider Houses	0.29	-	0.29	0.02	-	0.02	0
District Offices	1.00	-	1.00	0.08	-	0.08	0
Telephone System	0.65	-	0.65	0.05	-	0.05	0
Subtotal	<u>118.26</u>	<u>76.38</u>	<u>194.64</u>	<u>9.47</u>	<u>6.10</u>	<u>15.57</u>	<u>40</u>
Civil Works Under Local Bids							
Land Clearing	10.66	5.74	16.40	0.85	0.46	1.31	35
Land Leveling	10.83	4.64	15.47	0.87	0.37	1.24	30
Subtotal	<u>21.49</u>	<u>10.38</u>	<u>31.87</u>	<u>1.72</u>	<u>0.83</u>	<u>2.55</u>	<u>22</u>
Civil Works Under Negotiated Contracts							
Access Road to Dam	8.75	-	8.75	0.70	-	0.70	0
Construction Camp	5.00	-	5.00	0.40	-	0.40	0
Subtotal	<u>13.75</u>	<u>-</u>	<u>13.75</u>	<u>1.10</u>	<u>-</u>	<u>1.10</u>	
Total Civil Works	153.50	86.76	240.26	12.29	6.93	19.22	36
Equipment and Materials							
Construction Materials Furnished by SRH ..	17.98	-	17.98	1.44	-	1.44	0
Operation and Maintenance Equipment	3.63	-	3.63	0.29	-	0.29	0
Equipment Purchased by SRH under ICB	0.02	0.38	0.40	-	0.03	0.03	95
Subtotal	<u>21.63</u>	<u>0.38</u>	<u>22.01</u>	<u>1.73</u>	<u>0.03</u>	<u>1.76</u>	<u>2</u>
Engineering and Administration	24.39	-	24.39	1.95	-	1.95	0
Rights of Way	9.59	-	9.59	0.77	-	0.77	0
Contingencies							
Physical, 10% Civil Works and Equipment ..	17.51	8.71	26.22	1.40	0.70	2.10	33
Prices, 10% Civil Works and Equipment	17.51	8.71	26.22	1.40	0.70	2.10	33
Subtotal	<u>35.02</u>	<u>17.42</u>	<u>52.44</u>	<u>2.80</u>	<u>1.40</u>	<u>4.20</u>	<u>33</u>
Project Total Exclusive of PLAMEPA	<u>244.13</u>	<u>104.56</u>	<u>348.69</u>	<u>19.54</u>	<u>8.36</u>	<u>27.90</u>	<u>30</u>
PLAMEPA	7.50	-	7.50	0.60	-	0.60	0
Project Total With PLAMEPA	<u>251.63</u>	<u>104.56</u>	<u>356.19</u>	<u>20.14</u>	<u>8.36</u>	<u>28.50</u>	<u>29</u>

August 17, 1973

MEXICOPANUCO FIRST-STAGE PROJECTEquipment and MaterialsGeneral

1. SRH traditionally purchases common building materials such as cement and reinforcing steel in bulk orders and furnishes them to the contractors for use on SRH work. Relatively small items such as structural steel shapes, culverts, and valves are included in the civil works contracts on a furnish and install basis. Large special equipment is purchased by SRH under separate bidding documents and furnished to the civil works contractor for installation. Equipment and materials available in Mexico cannot be imported by SRH. In general, only large size or special equipment is not available and thus may be imported.

Equipment and Materials for use in Project Furnished by SRH Under Local Bids

2. The following items would be purchased by SRH under local bidding procedures and furnished to the contractor for installation in the project. These items are not included in Bank financing:

	<u>Las Animas</u>	<u>Pujal Coy</u>	<u>Chicayan</u>	<u>Total</u>
	-----Mex\$ Millions-----			
Cement	23.7	52.8	15.6	92.1
Reinforcing Steel	6.0	10.1	2.4	18.5
Pumps and Accessories	-----	-----	-----	-----
	29.7	62.9	18.0	110.6

Operation and Maintenance Equipment

3. Certain equipment would be purchased to supplement that presently available to operate and maintain the project. Most of this equipment could be obtained in Mexico and would be purchased under local bidding procedures. It would be excluded from Bank financing.

	<u>Las Animas</u>	<u>Pujal Coy</u>	<u>Chicayan</u>	<u>Total</u>
	----- Mex\$ '000 -----			
Crawler Tractors	2.44	2.68	1.40	6.52
Drag Lines	4.18		0.88	5.06
Motor Graders	1.41	1.64	0.47	3.52
Vibrator Rollers	0.33	-	0.17	0.50
Small Tractor	0.58	-	0.58	1.16
Pickup with Equipment	-	0.87	0.13	1.00
Compressor	-	0.07	-	0.07
Welding Equipment	-	0.15	-	0.15
Excavator	-	6.54	-	6.54
Motor Scraper	-	1.47	-	1.47
Tractor Scraper	-	0.66	-	0.66
Agricultural Tractor	-	0.22	-	0.22
Slopemower	-	0.54	-	0.54
Miscellaneous	-	<u>1.65</u>	-	<u>1.65</u>
	8.94	16.49	3.63	29.06

Equipment Purchased by SRH Under International Bidding Procedure

4. The following equipment would be purchased by SRH for installation in the project. International bids would be sought and these items would be included in Bank financing:

	<u>Las Animas</u>	<u>Pujal Coy</u>	<u>Chicayan</u>	<u>Total</u>
	----- Mex\$ Million -----			
Gate Hoists	2.9	-	0.4	3.3
10 Electric Motors 2,500 hp	-	10.0	-	10.0
2 Electric Motors 1,250 hp	-	1.3	-	1.3
Butterfly and Check Valves	-	3.6	-	3.6
3 Electric Motors of 2,600 hp, with Valves	-	2.9	-	2.9
Pumps and Accessories	-	38.8	-	38.8
1 Dredge	-	<u>11.0</u>	-	<u>11.0</u>
	<u>2.9</u>	<u>67.6</u>	<u>0.4</u>	<u>70.9</u>

January 28, 1974

MEXICO

PANUCO FIRST STAGE PROJECT

Summary Expenditure Schedule
(US\$ Millions)

Calendar Year	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>Total</u>
Civil Works									
Under ICB	6.99	42.61	41.17	18.66	1.62	-	-	-	111.05
Under Local Bids	-	3.90	7.80	4.81	1.01	-	-	-	17.52
Under Negotiated Contracts	<u>1.55</u>	<u>0.38</u>	<u>-</u>	<u>-</u>	<u>-</u>	-	-	-	<u>1.93</u>
Total Civil Works	8.54	46.89	48.97	23.47	2.63	-	-	-	130.50
Equipment and Materials									
By SRH (not ICB)	0.70	2.97	3.80	1.36	-	-	-	-	11.94
Operation and Maintenance	-	0.45	1.14	0.74	-	-	-	-	2.33
By SRH (ICB)	-	1.53	1.83	2.32	-	-	-	-	1.68
Engineering and Administration	1.70	4.40	4.40	3.50	0.20	-	-	-	14.20
Rights of Way	1.42	1.22	0.24	-	-	-	-	-	2.88
Contingencies	0.75	5.00	11.90	11.19	0.44	-	-	-	29.28
Extension Services	<u>-</u>	<u>-</u>	<u>-</u>	<u>0.81</u>	<u>0.91</u>	<u>0.82</u>	<u>0.81</u>	<u>0.17</u>	<u>3.52</u>
Project Total (without Interest)	13.11	62.46	72.28	42.50	4.18	0.82	0.81	0.17	196.33

MEXICO

PANUCO FIRST-STAGE PROJECT

Expenditure Schedule-Las Animas

Calendar Year	1973	1974	1975	1976	1977	1978	1979	1980	Total
	----- US\$ Millions -----								
Civil Works Under ICB									
Diversion Dam	0.47	1.40	-	-	-	-	-	-	1.87
Feeder Canal	0.95	2.81	-	-	-	-	-	-	3.76
Storage Dam and Reservoir	0.90	10.00	4.09	-	-	-	-	-	14.99
Main Canals	0.68	4.40	6.55	2.27	-	-	-	-	13.90
Irrigation System	0.34	2.00	1.80	1.25	-	-	-	-	5.39
Drainage System	0.34	1.60	0.80	0.11	-	-	-	-	2.85
Roads	-	0.40	1.20	1.03	-	-	-	-	2.63
Ditchrider Houses	-	-	0.02	0.02	-	-	-	-	0.04
Telephone System	-	-	0.10	0.05	-	-	-	-	0.15
District Offices	-	-	0.06	0.06	-	-	-	-	0.12
Subtotal	3.68	22.61	14.62	4.79	-	-	-	-	45.70
Civil Works Under Local Bids									
Land Clearing	-	0.50	1.20	0.43	-	-	-	-	2.13
Land Leveling	-	0.80	2.50	0.93	-	-	-	-	4.23
Subtotal	-	1.30	3.70	1.36	-	-	-	-	6.36
Civil Works Under Negotiated Contracts									
Access Road to Reservoir	0.35	0.08	-	-	-	-	-	-	0.43
Construction Camp	0.35	0.05	-	-	-	-	-	-	0.40
Subtotal	0.70	0.13	-	-	-	-	-	-	0.83
Total Civil Works	4.38	24.04	18.32	6.15	-	-	-	-	52.89
Equipment and Materials									
Furnished by SRH (Not ICB)	0.20	1.10	0.90	0.17	-	-	-	-	2.37
Operation and Maintenance	-	-	0.40	0.32	-	-	-	-	0.72
Purchased by SRH (ICB)	-	0.23	-	-	-	-	-	-	0.23
Subtotal	0.20	1.33	1.30	0.49	-	-	-	-	3.32
Engineering and Administration	0.90	1.60	1.60	1.35	-	-	-	-	5.45
Rights of Way	0.80	0.60	-	-	-	-	-	-	1.40
Contingencies	0.75	2.00	5.00	3.49	-	-	-	-	11.24
Extension Services	-	-	-	0.22	0.36	0.36	0.36	0.06	1.36
Project Total	7.03	29.57	26.22	11.70	0.36	0.36	0.36	0.06	75.66

January 26, 1974

MEXICO

ANNEX 10
Page 3

PANUCO FIRST STAGE PROJECT

Expenditures Schedule-Pujal Coy

Calendar Year	1973	1974	1975	1976	1977	1978	1979	1980	Total
	-----US\$ Millions-----								
Civil Works Under ICB									
Diversion Dam	0.30	0.15	-	-	-	-	-	-	0.45
Feeder Canal	0.77	0.35	-	-	-	-	-	-	1.12
Pumping Plant No. 1	-	1.60	0.14	-	-	-	-	-	1.74
Pumping Plant No. 2	-	0.20	0.57	-	-	-	-	-	0.77
Discharge Canals	-	0.04	-	-	-	-	-	-	0.04
Regulating Reservoirs	-	1.40	0.43	-	-	-	-	-	1.83
Main Canals	1.30	6.00	10.30	4.00	0.91	-	-	-	22.51
Irrigation System	0.50	2.50	4.80	4.70	0.20	-	-	-	12.70
Drainage System	0.35	1.65	1.65	1.60	0.40	-	-	-	5.65
Roads	-	0.25	1.25	1.00	0.11	-	-	-	2.61
Offices	0.09	0.03	-	-	-	-	-	-	0.12
Ditchrider Houses	-	0.01	0.07	0.02	-	-	-	-	0.10
Telephone System	-	0.03	0.07	0.04	-	-	-	-	0.14
Subtotal	3.31	14.21	19.28	11.36	1.62	-	-	-	49.78
Civil Works Under Local Bids									
Land Clearing	-	0.60	1.00	1.00	0.38	-	-	-	2.98
Land Leveling	-	1.00	2.00	2.00	0.63	-	-	-	5.63
Subtotal	-	1.60	3.00	3.00	1.01	-	-	-	8.61
Total Civil Works	3.31	15.81	22.28	14.36	2.63	-	-	-	58.39
Equipment and Materials									
Construction Materials (not ICB)	0.46	1.22	2.20	1.14	-	-	-	-	8.13
Operation and Maintenance									
Equipment	-	0.30	0.60	0.42	-	-	-	-	1.32
Equipment (ICB)	-	1.30	1.80	2.32	-	-	-	-	1.42
Subtotal	0.46	2.82	4.60	2.99	-	-	-	-	10.87
Engineering and Administration	0.60	2.00	2.00	2.00	0.20	-	-	-	6.80
Rights of Way	0.22	0.25	0.24	-	-	-	-	-	0.71
Contingencies	-	2.00	4.40	7.00	0.44	-	-	-	13.84
Extension Services	-	-	-	0.40	0.36	0.36	0.35	0.09	1.56
Project Total	4.59	22.88	33.52	26.75	3.63	0.36	0.35	0.09	92.17

January 26, 1974

MEXICO

PANUCO FIRST STAGE PROJECT

Expenditure Schedule - Chicayan

	1973	1974	1975	1976	1977	1978	1979	1970	Total
	US\$ Millions								
Civil Works Under ICB									
Paso de las Piedras Dam	-	2.00	2.50	0.23	-	-	-	-	4.73
Main Canals	-	2.50	3.00	1.61	-	-	-	-	7.11
Irrigation System	-	0.50	1.10	0.55	-	-	-	-	2.15
Drainage System	-	0.60	0.40	0.12	-	-	-	-	1.12
Road System	-	0.10	0.21	-	-	-	-	-	0.31
Ditchrider Houses	-	0.01	0.01	-	-	-	-	-	0.02
District Offices	-	0.06	0.02	-	-	-	-	-	0.08
Telephone System	-	0.02	0.03	-	-	-	-	-	0.05
Subtotal	-	5.79	7.27	2.51	-	-	-	-	15.57
Civil Works Under Local Bids									
Land Clearing	-	0.50	0.60	0.21	-	-	-	-	1.31
Land Leveling	-	0.50	0.50	0.24	-	-	-	-	1.24
Subtotal	-	1.00	1.10	0.45	-	-	-	-	2.55
Civil Works Under Negotiated Contracts									
Access Road to Dam	0.65	0.05	-	-	-	-	-	-	0.70
Construction Camp	0.20	0.20	-	-	-	-	-	-	0.40
Subtotal	0.85	0.25	-	-	-	-	-	-	1.10
Total Civil Works	0.85	7.04	8.37	2.96	-	-	-	-	19.22
Equipment and Materials									
Furnished by SRH (Not ICB)	0.04	0.65	0.70	0.05	-	-	-	-	1.44
Operation and Maintenance	-	0.15	0.14	-	-	-	-	-	0.29
Purchased by SRH (ICB)	-	-	0.03	-	-	-	-	-	0.03
Subtotal	0.04	0.80	0.87	0.05	-	-	-	-	1.76
Engineering and Administration	0.20	0.80	0.80	0.15	-	-	-	-	1.95
Rights of Way	0.40	0.37	-	-	-	-	-	-	0.77
Contingencies	-	1.00	2.50	0.70	-	-	-	-	4.20
Extension Services	-	-	-	0.19	0.19	0.10	0.10	0.02	0.60
PROJECT TOTAL	1.49	10.01	12.54	4.05	0.19	0.10	0.10	0.02	28.50

January 26, 1974

MEXICOPANUCO FIRST STAGE PROJECTSchedule of Disbursements

<u>Fiscal Year and Semester</u>	<u>Cumulative Disbursement at end of Semester US\$ Million</u>
<u>1974</u>	
June 30, 1974	3.0
<u>1975</u>	
December 31, 1974	12.0
June 30, 1975	24.0
<u>1976</u>	
December 31, 1975	36.0
June 30, 1976	49.0
<u>1977</u>	
December 31, 1976	56.0
June 30, 1977	64.0
<u>1978</u>	
December 31, 1977	68.0
June 30, 1978	73.0
<u>1979</u>	
December 31, 1978	76.0
June 30, 1979	76.4
<u>1980</u>	
December 31, 1979	76.6
June 30, 1980	76.8
<u>1981</u>	
December 31, 1980	77.0
February 4, 1974	

MEXICO

PANUCO FIRST-STAGE PROJECTS

Advance Contracting

1. The Mexican Government has recognized the urgency of construction of the Panuco First-Stage Project and has initiated construction of some features on all three areas of the project. Some works such as access roads to dam sites and construction camps are being accomplished by contracts negotiated with individual contractors using standard unit prices established for the particular items of work for the geographical location involved. For example, the Mexican Department of Highways furnished the unit prices used in the negotiations for access roads. The work let under negotiated contracts is excluded from financing under the project.
2. Construction work on certain other features has been initiated under international competitive bidding procedures. The procedures followed for seeking international bids have been the same as used on the four previous Bank irrigation loans to Mexico. Bidding documents have been submitted to the Bank for comment. Recommendation for award of contracts and copies of contracts as awarded have been furnished to the Bank.
3. Table 1 shows the status of contracts let under international bidding procedures as of September 1, 1973. The anticipated contractor earnings as of January 1, 1974 are shown as reflecting a possible date of loan signing and also as a measure of the portion of the Bank loan which would be eligible for disbursement if the Bank agrees to finance work let prior to loan signing.

November 8, 1973

MEXICO

PANUCO FIRST-STAGE PROJECT

Contracts Let Under International Bidding Procedures in 1973

Contract No.	Work Item	Date		Contractor	Value of Contract, MEX\$ Million	Probable Earnings To Jan 1974
		Bids Opened 1973	Contract Date 1973			
<u>Contracts Let Under ICB</u>						
<u>Las Animas Unit</u>						
G1C-73-5	Feeder Canal-Diversion Dam to Las Animas Reservoir	February 20	March 13	Mexico, Compania Constructora, S.A.	32.293	11.0
G1C-73-6	Diversion Dam across Guayalejo River	April 10	April 30	Bufete Industrial Construcciones S.A.deC.V.	31.129	9.0
G1C-73-21	Right Bank Main Canal Km 0+000 to Km 30+100	July 24	August 7	Ingenieros Y Arquitectos S.A.	26.039	5.0
G1C-73-43	Storage Dam Las Animas	July 30	August 31	Construcciones Integrales, S.A.	123.729	4.0
G1C-73-56	Zone Irrigation Right Bank, 5,000 ha	September 11	September 25	Constructora Regional del Bravo, S.A.	26.432	4.0
G1C-73-57	Zone Irrigation Right Bank, 12,000 ha	September 11	1/	Ingenieros y Arquitectos, S.A.	70.705	10.0
1/	Main Canal Left Bank Km 0+000 to Km 22 and 6,000 ha of Irrigation	1/	1/	1/	1/	4.0
						Subtotal 47.0
<u>Pujal Coy Unit</u>						
G1C-73-17	Diversion Dam San Jose del Limon and Feeder Canal to Pumping Plant	March 20	1/	Constructora Regional del Bravo, S.A.	30.024	12.0
G1C-73-23	Main Canal Barrote Km 0+000 to Km 31+130	July 30	August 14	Caminos and Vias, S.A.	21.064	6.5
G1C-73-36	First Zone Irrigation 4200 ha	June 19	July 4	Constructora Regional del Bravo, S.A.	13.577	6.5
G1C-73-48	Main Canal Ebano	October 30	1/	1/	1/	4.5
	Dikes E and F (Regulating Reservoirs)	-	-	-	-	4.1
						Subtotal 33.6
<u>Chicayan Unit</u>						
	None					0
						Total 80.6
					Equiv. US\$Million	6.4

1/ Data not yet available

MEXICO

PANUCO FIRST-STAGE PROJECT

Operation and Maintenance

General

1. The only irrigation presently practiced on the project areas is done privately by pumping directly from the streams, but records are not available of costs incurred.

Operation and Maintenance Costs

2. Long experience in operating irrigation projects in Mexico has led SRH to relate general operating and maintenance costs to the amount of water delivered. A unit cost of Mex\$ 25 per 1,000 m³ has been adopted as average for a fully developed project involving storage dams and typical irrigation facilities. Any special costs such as those to cover pumping, as on Pujal Coy, is additional. Makeup of the 1,000m³ estimated cost is:

<u>Function</u>	<u>Percent</u>	<u>Amount Mex\$</u>
Operation	25	6.25
Engineering for Irrigation and Drainage	10	2.50
Maintenance	40	10.00
Administration	15	3.75
Other Costs	<u>10</u>	<u>2.50</u>
	100	25.00

3. Pujal Coy is the only area for which water would have to be pumped. SRH and the Electricity Commission would share the costs of building a transmission line to bring electric power to the plants. The rate for power at the plants is taken as Mex\$ 0.12 per kwhr. The costs of pumping are then estimated as follows:

	<u>Mex\$ Million</u>
Electric Energy 138 10 ⁶ kwhr	16.359
Lubricants	.464
Maintenance	1.560
Labor	<u>.458</u>
Total	18.841

4. The annual operation and maintenance costs for each area are then:

	<u>Las Animas</u>	<u>Pujal Coy</u>	<u>Chicayan</u>	<u>Total</u>
Water Diverted, Mm ³	<u>610</u>	<u>739</u>	<u>211</u>	<u>1,560</u>
O&M, Mex\$ Millions	15.25	18.47	5.28	39.00
Pumping Costs	<u>-</u>	<u>18.84</u>	<u>-</u>	<u>18.84</u>
Total, Mex\$ Millions	<u>15.25</u>	<u>37.31</u>	<u>5.28</u>	<u>57.84</u>
US\$ Millions	1.22	2.98	0.42	4.62
Project Area '000's ha	48	72	17	137
Mex\$ per ha	318	518	311	Ave. 422
US\$ per ha	25.44	41.44	24.88	Ave. 33.76

Organization

5. The typical organization pattern for operation and maintenance would call for one District Chief in each of the three areas to direct all such activities. The district would be divided into four or five units, each headed by a chief. The units would again be divided into four zones with a supervisor. The zones, in turn would be divided into about four sections, with a canaler (ditchrider) who would physically operate the turnouts in his section to deliver water to the individual users. Staff would have to be recruited and trained for these positions but many candidates would be available.

MEXICO

PANUCO FIRST-STAGE PROJECT

Agricultural Services

1. Mexican agricultural services providing education, training, research, extension and credit are reputed to be among the best in Latin America. They have had an important bearing on Mexico's relatively rapid agricultural development. They are, however, still insufficient to cope with the growing needs of the country, but offer a sound basis for expansion.

Education: Professional Level

2. At the university level, agricultural education has grown steadily for more than a century and Mexico now has 15 undergraduate schools. Five of the major schools show a combined enrollment of about 6,600 students, of whom about 1,150 will graduate this year (Ingeniero Agronomo degree). It is estimated that Mexico has about 9,000 agriculture graduates (Ingenieros Agronomos) now practicing their profession.

3. Three of the major agricultural schools have postgraduate courses. The National School of Agriculture, Chapingo near Mexico City, is part of the Ministry of Agriculture (SAG) and functions as a regional center for agricultural education, research and extension. It is supported by the Rockefeller and Ford Foundations, IDB, USAID, FAO/UNDP and Government. Chapingo is the biggest and oldest postgraduate school and has nine departments offering Masters and two offering Doctors degrees. The Graduate School has 230 students and, to date, 207 Masters degrees have been granted.

4. Mexico also has nine veterinary schools, with a total enrollment of about 4,200 undergraduate students, about 700 of whom graduate this year. The Mexican National University is the only one having postgraduate courses in Veterinary Medicine. There are about 3,000 veterinarians now practicing their profession, the majority of whom work in clinics and animal disease fields. Only a relatively small number are directly engaged in animal production.

Education: Sub-Professional Level

5. Currently seven technical agricultural and livestock schools financed jointly by SAG and State Governments have a student population of about 2,400 and a yearly output of about 700 sub-professionals. The role of the sub-professionals as technical assistants to enlarge the effectiveness of the professionals is being expanded, mainly by the Secretary of Hydraulic Resources (SRH), Fondo de Garantia para la Agricultura, Ganaderia and Avicultura (FONDO), the Banco Nacional Agropecuario System (BANAGRO) and other official and private banks.

6. About 159 secondary schools offer three-year courses in farming, animal husbandry, farm machinery and elements of rural management.

Training

7. The National School of Agriculture, Chapingo also has continuing special agricultural training courses. One special course of six-month duration is for technicians of the on-going Plan De Mejoramiento Parcelario - PLAMEPA -- of SRH. Another special training course is for technicians from the FONDO and public and private institutions associated with the Credit Program of FONDO. FONDO has established an office at Chapingo to coordinate activities of the various institutions engaged in agricultural and livestock activities and to promote application of research findings at farm level.

Research

8. Agricultural research is based on two main institutions: Instituto Nacional de Investigaciones Agricolas - INIA, and Instituto Nacional de Investigaciones Pecuarias - INIP. Administratively both belong to SAG -- INIA to the Under Secretary for Agriculture and INIP to the Under Secretary for Livestock. However, there is little coordination between them. Government and the Rockefeller Foundation have given significant support to agriculture research, especially since 1943. Under this support, some of the high yielding varieties of wheat and corn have been developed and produced in Mexico and are being exported to other countries as a part of the so-called "Green Revolution."

9. Other types of research are carried out by specialized institutions such as the Mexican Institute of Technological Research of Monterrey, which devotes particular attention to agro-industries; the Institute for Improvement of Sugar Production; the National Forestry Service; SRH on hydrologic research; the Mexican Coffee Institute; the Center for Agrarian Research; the Universities, mostly in connection with graduate studies; and the Latin American Association for Animal Production with headquarters in Mexico.

Extension

10. Agricultural extension services to meet the needs of about three million Mexican farmers are provided by:

- Government through SAG, SRH, and State Governments;
- Banking institutions; and
- Private organizations.

11. The Federal Service, the biggest of all, has some 1,900 officers, 80% of whom are graduates in either agriculture or veterinary science. The remaining 20% are sub-professionals. Taking into account this number of extension officers and the total number of farmers, a ratio of approximately

one officer to 1,600 farmers is obtained, which is inadequate to meet farmers' needs by any standard. Government is in the process of correcting this numeric deficiency and is also engaged in providing better facilities and incentives to their Federal and State Services. Both SAG and SRH concentrate in the irrigation areas while the rainfed cropping and ranching areas are relatively neglected.

Plan de Mejoramiento Parcelario (PLAMEPA)

12. SRH has long had a section concerned with irrigation and drainage problems in its usual irrigation district organization. These sections have been concerned with improving irrigation practices and making more efficient use of irrigation water in SRH districts. Over the years, this program evolved into PLAMEPA, which now works with individual farmers (private as well as colonos), ejidos, or ejidatarios to improve use of irrigation water. While irrigation practices are given emphasis in the program, a full line of extension services, including choice of seed variety, cultivation practices, and use of fertilizer and pesticides, is also provided. The project would include an intensive four-year PLAMEPA effort as a development cost. A program would be continued at a reduced rate after completion of the initial phase and be an annual cost to be borne by the Government. The timing of the intensive program would be from 1974 to approximately 1978. This would insure that all newly settled ejidatarios are given PLAMEPA assistance. The proposed investment schedule is presented in Table 1 and would result in a ratio of about one PLAMEPA employee to each 80 farmers.

Credit

13. Agricultural credit to meet the needs of a complex farming community composed of about three million farmers and producers in Mexico is provided by the official banks and private credit institutions.

14. Official banks are those organized or created by Government. To serve the agricultural sector, Mexico has three official banks:

- Banco Nacional de Credito Ejidal S.A. de C.V. (BANEJIDAL), which lends only to ejidatarios;
- Banco Nacional de Credito Agricola (BANAGRICOLA) which concentrates on lending to smallholders and colonistas (colonos); and
- Banco Nacional Agropecuario (BANAGRO), which lends to any technically assisted type of farmer.

In addition, the FONDO de Garantia y Fomento para la Agricultura, Ganaderia y Avicultura (FONDO) was established in 1955 as a trust fund in the Central Bank of Mexico (BANXICO), to carry out a program which provides financial

support and agricultural technical services to official and private banks active in agriculture. Financial support to the banking system is provided through a rediscounting mechanism. 1/

15. Private credit institutions dealing with agricultural credit are commercial banks and "Financieras." These have technical departments staffed by loan officers who normally coordinate with FONDO technicians in matters related to preparation and appraisal of farm development plans. Government has announced its intention to guarantee at least 60% of the amount of long term loans made by private financial institutions to ejedatarios and small farmers.

1/ More complete and extensive information concerning the credit system is given in the Appraisal Report of the Fourth Livestock and Agricultural Development Project 133a ME dated May 25, 1973.

MEXICO

PANUJO FIRST STAGE PROJECT

AGRICULTURAL EXTENSION SERVICES

Investment Schedule

ACTIVITIES	Las Animas				Total	Pujal Coy				Total	Chicayan				Panuco Grand Total	
	Year	Year	Year	Year		Year	Year	Year	Year		Year	Year	Year	Year		
	1	2	3	4		1	2	3	4		1	2	3	4		
	----- Mex\$'000 -----															
Topographic surveying	600	840	-	-	1,440	300	600	900	360	2,160	240	273	-	-	513	4,113
Preparation of farm plans	650	650	650	650	2,600	700	700	700	700	2,800	320	320	320	320	1,280	6,680
Soil and drainage studies	380	380	380	380	1,520	400	400	400	400	1,600	30	50	50	50	180	3,300
Laboratory tests	310	310	310	310	1,240	350	350	350	350	1,400	30	50	50	50	180	2,820
Field demonstrations	-	1,400	2,600	2,600	6,600	700	2,200	2,200	2,740	7,840	-	600	1,245	1,245	3,090	17,530
Artificial insemination	30	40	40	40	150	40	50	50	50	190	20	20	30	30	100	440
Agricultural and livestock trials	-	100	100	100	300	50	100	100	100	350	-	50	50	50	150	800
Miscellaneous	30	30	30	30	120	60	100	100	100	360	20	27	20	20	87	567
Subtotal	<u>2,000</u>	<u>3,750</u>	<u>4,110</u>	<u>4,110</u>	<u>13,970</u>	<u>2,600</u>	<u>4,500</u>	<u>4,800</u>	<u>4,800</u>	<u>16,700</u>	<u>660</u>	<u>1,390</u>	<u>1,765</u>	<u>1,765</u>	<u>5,580</u>	<u>36,250</u>
<u>Procurement, Constructions and Installations</u>																
Soils and water laboratory equipment	230	-	-	-	230	230	-	-	-	230	-	-	-	-	-	460
Laboratory and equipment for artificial insemination	-	-	-	-	-	500	-	-	-	500	-	-	-	-	-	500
Laboratory and equipment for animal production	-	-	-	-	-	500	-	-	-	500	-	-	-	-	-	500
Land leveling equipment	350	-	-	-	350	700	-	-	-	700	350	-	-	-	350	1,400
Agricultural and livestock equipment	700	-	-	-	700	1,050	-	-	-	1,050	350	-	-	-	350	2,100
Vehicles	126	90	-	-	216	168	120	-	-	288	84	-	-	-	84	588
Audio Visual aid equipment	105	-	-	-	105	105	-	-	-	105	-	-	-	-	-	210
Irrigation equipment	-	-	-	-	-	175	-	-	-	175	-	-	-	-	-	175
Office equipment and supplies	80	30	30	30	170	120	50	50	50	270	60	20	20	20	120	560
Training facilities	100	100	100	100	400	130	130	130	130	520	80	80	80	80	320	1,240
Miscellaneous	59	30	10	10	109	97	75	20	20	212	41	10	10	10	71	392
Subtotal	<u>1,750</u>	<u>250</u>	<u>140</u>	<u>140</u>	<u>2,280</u>	<u>3,775</u>	<u>375</u>	<u>200</u>	<u>200</u>	<u>4,550</u>	<u>965</u>	<u>110</u>	<u>110</u>	<u>110</u>	<u>1,295</u>	<u>8,125</u>
Total	<u>3,750</u>	<u>4,000</u>	<u>4,250</u>	<u>4,250</u>	<u>16,250</u>	<u>6,375</u>	<u>4,875</u>	<u>5,000</u>	<u>5,000</u>	<u>21,250</u>	<u>1,625</u>	<u>1,500</u>	<u>1,875</u>	<u>1,875</u>	<u>6,875</u>	<u>44,375</u>
<u>Personnel</u> ^{1/}																
	----- Numbers -----															
Senior extension officer	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3
Extension officers	3	5	9	9	9	4	6	10	10	10	3	3	3	3	3	22
Sub-professional extension officers	7	13	23	23	23	8	14	24	24	24	7	7	7	7	7	54
Surveyors	1	2	3	3	3	2	3	4	4	4	1	1	1	1	1	8
Research assistants	2	4	7	7	7	3	5	8	8	8	2	2	2	2	2	17
Secretaries	1	2	3	3	3	2	3	4	4	4	1	1	1	1	1	8
Workers	9	15	24	24	24	10	16	25	25	25	9	9	9	9	9	58
Total	<u>24</u>	<u>42</u>	<u>70</u>	<u>70</u>	<u>70</u>	<u>30</u>	<u>48</u>	<u>76</u>	<u>76</u>	<u>76</u>	<u>24</u>	<u>24</u>	<u>24</u>	<u>24</u>	<u>24</u>	<u>170</u>

February 4, 1974

ANNEX 14
Table 1

1/ Salaries included in activities

MEXICO

PANUCO FIRST STAGE PROJECT

Assumptions on Crops, Areas, Labor, Yields, Farmgate Prices and Cost of Production

Unit	Years					Years					
	0	1	2	3	4	0	1	2	3	4	
	Without Project	With Project				Without Project	With Project				
Soybeans											
Area	ha	1,200	10,000	19,500	30,000	30,000					
Labor requirements	man-days/ha	3	10	14	16	16					
Yields	tons/ha	0.9	1.5	2.0	2.5	2.5					
Rural price	Mex\$/ton	1,900	1,900	1,900	1,900	1,900					
Gross production value	Mex\$/ha	1,710	2,850	3,800	4,750	4,750					
Cost	Mex\$/ha	1,000	1,300	1,600	1,900	1,900					
Net value of production (NVP)	Mex\$/ha	710	1,550	2,200	2,850	2,850					
Incremental NVP	Mex\$/ha	-	840	1,490	2,140	2,140					
Vegetables and Melons											
Area	ha	4,800	6,000	7,000	8,000	8,000					
Labor requirements	man-days/ha	90	150	220	280	280					
Yields	tons/ha	11	13	15	18	18					
Rural price	Mex\$/ton	1,800	1,800	1,800	1,800	1,800					
Gross production value	Mex\$/ha	19,800	23,400	27,000	32,400	32,400					
Cost	Mex\$/ha	6,000	9,000	12,000	15,000	15,000					
Net value of production (NVP)	Mex\$/ha	13,800	14,400	15,000	17,400	17,400					
Incremental NVP	Mex\$/ha	-	600	1,200	3,600	3,600					
Beans and Pulses											
Area	ha	2,000	2,500	3,500	4,000	4,000					
Labor requirements	man-days/ha	3	10	14	16	16					
Yields	tons/ha	1.0	1.2	1.4	1.5	1.5					
Rural price	Mex\$/ton	1,800	1,800	1,800	1,800	1,800					
Gross production value	Mex\$/ha	1,800	2,160	2,520	2,700	2,700					
Cost	Mex\$/ha	860	1,200	1,500	1,600	1,600					
Net value of production (NVP)	Mex\$/ha	940	960	1,020	1,100	1,100					
Incremental NVP	Mex\$/ha	-	20	80	160	160					
Rice											
Area	ha	-	3,000	6,000	6,000	6,000					
Labor requirements	man-days/ha	-	20	22	23	23					
Yields	tons/ha	-	3.0	4.0	5.0	5.0					
Rural price	Mex\$/ton	1,400	1,400	1,400	1,400	1,400					
Gross production value	Mex\$/ha	-	4,200	5,600	7,000	7,000					
Cost	Mex\$/ha	-	2,400	2,600	2,800	2,800					
Net value of production (NVP)	Mex\$/ha	-	1,800	3,000	5,200	5,200					
Incremental NVP	Mex\$/ha	-	1,800	3,000	5,200	5,200					
Corn											
Area	ha	11,000	8,000	4,000	4,000	4,000					
Labor requirements	man-days/ha	10	20	22	22	22					
Yields	tons/ha	1	2	3	3	3					
Rural price	Mex\$/ton	900	900	900	900	900					
Gross production value	Mex\$/ha	900	1,800	2,700	2,700	2,700					
Cost	Mex\$/ha	850	1,200	1,700	1,700	1,700					
Net value of production (NVP)	Mex\$/ha	50	600	1,000	1,000	1,000					
Incremental (NVP)	Mex\$/ha	-	550	950	950	950					
Fruit Trees											
Area	ha	700	2,500	5,000	6,500	8,000					
Labor requirements	man-days/ha	90	100	110	120	130					
Yields, existing	tons/ha	8	12	16	20	20					
Yields, new	tons/ha	0	0	0	0	0					
Rural price	Mex\$/ton	2,000	2,000	2,000	2,000	2,000					
Gross production value	Mex\$/ha	16,000	24,000	32,000	40,000	40,000					
Cost	Mex\$/ha	5,000	7,000	8,000	9,000	9,000					
Net value of production (NVP)	Mex\$/ha	11,000	17,000	24,000	31,000	31,000					
Incremental (NVP)	Mex\$/ha	-	6,000	13,000	20,000	20,000					
Cotton											
Area	ha	2,000	9,000	17,000	25,000	25,000					
Labor requirements	man-days/ha	30	35	40	45	50					
Yields	tons/ha	1.5	2.0	2.5	2.5	2.5					
Rural price	Mex\$/ton	2,700	2,700	2,700	2,700	2,700					
Gross production value	Mex\$/ha	4,050	5,400	6,750	6,750	6,750					
Cost	Mex\$/ha	2,700	3,000	3,800	3,800	3,800					
Net value of production (NVP)	Mex\$/ha	1,350	2,400	2,950	2,950	2,950					
Incremental NVP	Mex\$/ha	-	1,050	1,600	1,600	1,600					
Safflower											
Area	ha	8,000	12,000	17,000	20,000	20,000					
Labor requirements	man-days/ha	3	14	15	15	15					
Yields	tons/ha	0.7	1.0	1.5	2.0	2.0					
Rural price	Mex\$/ton	1,800	1,800	1,800	1,800	1,800					
Gross production value	Mex\$/ha	1,260	1,800	2,700	3,600	3,600					
Cost	Mex\$/ha	700	1,000	1,200	1,400	1,400					
Net value of production (NVP)	Mex\$/ha	560	800	1,500	2,200	2,200					
Incremental NVP	Mex\$/ha	-	240	940	1,640	1,640					
Sorghum											
Area	ha	11,000	14,000	19,500	30,000	30,000					
Labor requirements	man-days/ha	6	17	18	19	19					
Yields	tons/ha	1.8	3.0	4.0	5.0	5.0					
Rural price	Mex\$/ton	750	750	750	750	750					
Gross production value	Mex\$/ha	1,350	2,250	3,000	3,750	3,750					
Cost	Mex\$/ha	720	1,200	1,400	1,600	1,600					
Net value of production (NVP)	Mex\$/ha	630	1,050	1,600	2,150	2,150					
Incremental NVP	Mex\$/ha	-	420	970	1,520	1,520					
Sugar Cane											
Area	ha	400	1,500	2,500	3,000	3,000					
Labor requirements	man-days/ha	30	35	40	45	45					
Yields	tons/ha	60	75	90	100	100					
Rural price	Mex\$/ton	80	80	80	80	80					
Gross production value	Mex\$/ha	4,800	6,000	7,200	8,000	8,000					
Cost	Mex\$/ha	2,200	2,600	2,800	3,000	3,000					
Net value of production (NVP)	Mex\$/ha	2,600	3,400	4,400	5,000	5,000					
Incremental NVP	Mex\$/ha	-	800	1,800	2,400	2,400					
Pasture, Beef/Fattening											
Area	ha	37,100	38,000	39,000	39,000	39,000					
Labor requirements	man-days/ha	1	2	3	3	3					
Yields	tons/ha	0.245	0.49	0.98	1.47	1.47					
Rural price	Mex\$/ton	9,000	9,000	9,000	9,000	9,000					
Gross production value	Mex\$/ha	2,205	4,410	8,820	13,230	13,230					
Cost	Mex\$/ha	2,000	4,000	8,000	11,700	11,700					
Net value of production (NVP)	Mex\$/ha	205	410	820	1,530	1,530					
Incremental (NVP)	Mex\$/ha	-	205	615	1,325	1,325					

September 18, 1973

MEXICO

PANUCO FIRST STAGE PROJECT

Detailed Production Costs
Without Project
(Mex\$ per ha)

	<u>Soybeans</u>	<u>Vegetables and Melons</u>	<u>Beans and Pulses</u>	<u>Rice</u>	<u>Corn</u>	<u>Cotton</u>	<u>Safflower</u>	<u>Sorghum</u>	<u>Sugar Cane</u>	<u>Fruit Trees</u>	<u>Pasture/ Beef</u>
<u>Operating Costs</u>											
<u>Without Project - Present Situation</u>											
Contract Cultivation	410	700	320	-	240	340	330	230	350	1,100	50
Seeds and Planting Materials	210	260	230	-	60	70	50	50	-	-	-
Pesticides and Weed Control	100	430	60	-	40	925	-	90	80	300	20
Fertilizers and Inoculants	25	700	-	-	-	-	-	-	190	60	-
Implements and Tools	20	140	20	-	20	35	10	10	60	80	10
Harvesting Supplies	40	250	40	-	50	40	40	40	80	340	-
Labor	90	2,700	90	-	300	900	90	180	900	2,700	30
Repairs and Maintenance	-	-	-	-	-	-	-	-	200	-	10
Animal Health	-	-	-	-	-	-	-	-	-	-	10
Mineral Salts	-	-	-	-	-	-	-	-	-	-	10
Livestock Purchase	-	-	-	-	-	-	-	-	-	-	1,800
Miscellaneous	105	820	100	-	140	390	180	120	340	420	60
Total	1,000	6,000	860	-	850	2,700	700	720	2,200	5,000	2,000

September 10, 1973

MEXICO

PANUCO FIRST STAGE PROJECT

Detailed Production Costs
Perennial Crops and Livestock with Project (Includes Investment Cost)

(Mex\$ per ha)

	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>	
<u>Sugarcane</u>					
Machinery	1,760	-	-	-	1,760
Planting material	660	-	-	-	660
Fertilizers	190	-	-	-	190
Insecticides	80	-	-	-	80
Other materials and tools	-	-	-	-	-
Labor	1,170	-	-	-	1,170
Miscellaneous	240	-	-	-	240
Total	<u>4,100</u>	-	-	-	<u>4,100</u>
<u>Fruit Trees</u>					
Machinery	1,430	1,120	1,120	1,120	4,790
Planting materials	3,500	-	-	-	3,500
Fertilizers	40	140	250	300	730
Insecticides	270	270	270	270	1,080
Other materials and tools	230	180	80	80	570
Labor	2,280	1,090	1,550	2,000	6,920
Miscellaneous	250	200	230	230	910
Total	<u>8,000</u>	<u>3,000</u>	<u>3,500</u>	<u>4,000</u>	<u>18,500</u>
<u>Livestock^{1/}</u>					
Pasture, beef fattening					
Pasture establishment	1,450	-	-	-	1,450
Fixed fences, Mex\$3,500/km	70	-	-	-	70
Electric portable fences Mex\$2,500/km	20	-	-	-	20
Corral and additional structures	70	-	-	-	70
Miscellaneous	90	-	-	-	90
Total	<u>1,700</u>	-	-	-	<u>1,700</u>

^{1/} Investment cost estimates based on a one-thousand hectares ejido cooperative ranch but figures refer to 1 ha.

MEXICO

PANUCO FIRST STAGE PROJECT

Detailed Production Costs
Annual Crops with Project
(Mex\$ per ha)

<u>Operating Costs</u>	<u>Soybeans</u>	<u>Vegetables and melons</u>	<u>Beans and Pulses</u>	<u>Rice</u>	<u>Corn</u>	<u>Cotton</u>	<u>Safflower</u>	<u>Sorghum</u>	<u>Sugar Cane</u>	<u>Fruit Trees</u>	<u>Pasture, Beef/ Fattening</u>
<u>With Project, at Full Development</u>											
Contract cultivation	500	900	430	600	400	500	400	450	400	1,200	-
Seeds and planting materials	265	310	300	300	75	170	75	95	-	-	-
Pesticides and weed control	120	1,500	70	360	80	620	50	100	100	600	20
Fertilizers and inoculants	175	1,200	70	340	185	300	70	120	250	1,000	230
Implements and tools	30	800	30	100	60	100	45	35	150	300	10
Harvesting supplies	70	1,400	70	150	80	100	60	80	150	700	10
Labor	480	8,400	480	690	660	1,500	450	570	1,350	3,900	90
Repairs and maintenance	-	-	-	-	-	-	-	-	100	400	30
Animal health	-	-	-	-	-	-	-	-	-	-	60
Mineral salts	-	-	-	-	-	-	-	-	-	-	50
Supplements	-	-	-	-	-	-	-	-	-	-	250
Livestock purchases	-	-	-	-	-	-	-	-	-	-	10,800
Miscellaneous	260	490	150	260	160	510	250	150	500	900	150
Total	1,900	15,000	1,600	2,800	1,700	3,800	1,400	1,600	3,000	9,000	11,700

September 13, 1973

MEXICO

PANUCO FIRST-STAGE PROJECT

Cropping Pattern, Production, Costs and Net Value of Production

Crops	Area (ha)	Yields (kg/ha)	Without Project					
			Production (metric ton)	Prices (Mex\$/ ton)	Gross Production Value (Mex\$ '000)	Production Costs (Mex\$ ha)	(Mex\$ '000)	Net Value Production (Mex\$ '000)
<u>Las Animas</u>								
Soybeans	1,200	900	1,080	1,900	2,052	1,000	1,200	852
Corn	5,000	1,100	5,500	900	4,950	850	4,250	700
Cotton	1,000	1,500	1,500	2,700	4,050	2,700	2,700	1,350
Safflower	6,000	700	4,200	1,800	7,560	700	4,200	3,360
Sorghum	5,000	1,800	9,000	750	6,750	720	3,600	3,150
Subtotal rainfed	18,200	1,169	21,280	1,192	25,362	876	15,950	9,412
Pastures, rainfed	5,500	245	1,348	9,000	12,132	2,000	11,000	1,132
Vegetables and melons irrigated	1,200	11,000	13,200	1,800	23,760	6,000	7,200	16,560
Sugar cane irrigated	400	60,000	24,000	80	1,920	2,200	880	1,040
Fruit trees irrigated	200	8,000	1,600	2,000	3,200	5,000	1,000	2,200
Subtotal irrigated	1,800	21,556	38,800	744	28,880	5,044	9,080	19,800
Native vegetation	22,533	-	-	-	-	-	-	-
Total	48,033	1,279	61,428	1,081	66,374	750	36,030	30,344
Cropping intensity, %:	53							
<u>Puial Coy</u>								
Beans and pulses	2,000	1,000	2,000	1,900	3,800	860	1,720	2,080
Corn	6,000	1,100	6,600	900	5,940	850	5,100	840
Cotton	1,000	1,500	1,500	2,700	4,050	2,700	2,700	1,350
Safflower	2,000	700	1,400	1,800	2,520	700	1,400	1,120
Sorghum	6,000	1,800	10,800	750	8,100	720	4,320	3,780
Subtotal rainfed	17,000	1,312	22,300	-	24,410	896	15,240	9,170
Pastures, rainfed	22,000	245	5,390	9,000	48,510	2,000	44,000	4,510
Vegetables and melons irrigated	3,500	11,000	38,500	1,800	69,300	6,000	21,000	48,300
Fruit trees irrigated	500	8,000	4,000	2,000	8,000	5,000	2,500	5,500
Subtotal irrigated	4,000	1,063	42,500	1,819	77,300	5,875	23,500	53,800
Native vegetation	29,012	-	-	-	-	-	-	-
Total	72,012	975	70,190	2,140	150,220	1,149	82,740	67,480
Cropping intensity, %:	60							
<u>Chicayan</u>								
Pasture, rainfed	9,600	245	2,352	9,000	21,168	2,000	19,200	1,968
Subtotal irrigated	100	11,000	1,100	1,800	1,980	6,000	600	1,380
Native vegetation	7,300	-	-	-	-	-	-	-
Total	17,000	203	3,452	6,706	23,148	1,165	19,800	3,348
Cropping intensity, %:	57							
<u>SUMMARY</u>								
Rainfed	35,200	1,238	43,580	1,142	49,772	887	31,190	18,582
Pastures, rainfed	37,100	245	9,090	9,000	81,810	2,000	74,200	7,610
Irrigated	5,900	13,966	82,400	1,313	108,160	5,624	33,180	74,980
Subtotal	78,200	1,727	135,070	1,775	239,742	1,772	138,570	101,172
Native vegetation	58,845	-	-	-	-	-	-	-
Grand Total	137,045	986	135,070	1,775	239,742	1,011	138,570	101,172
Cropping intensity, %:	57							

MEXICO

PANUGO FIRST-STAGE PROJECT

Cropping Pattern, Production, Costs and Net Value of Production

With Project

September 19, 1973

Crops	Area (ha)	Yields (kg/ha)	Production (metric ton)	Prices (Mex\$/ton)	Gross Production Value (Mex\$ '000)	Production Costs (Mex\$/ha)	(Mex\$ '000)	Net Value of Production (Mex\$ '000)	Incremental net value of production (Mex\$ '000)
Las Animas									
Soybeans	12,500	2,500	31,250	1,900	59,375	1,900	23,750	35,625	34,773
Vegetables and melons	3,000	18,000	54,000	1,800	97,200	15,000	45,000	52,200	35,640
Beans and pulses	1,500	1,500	2,250	1,800	4,050	1,600	2,400	1,650	1,650
Rice	2,000	5,000	10,000	1,400	14,000	2,800	5,600	8,400	8,400
Corn	1,500	3,000	4,500	900	4,050	1,700	2,550	1,500	800
Cotton	9,000	2,500	22,500	2,700	60,750	3,800	34,200	26,550	25,200
Safflower	9,000	2,000	18,000	1,800	32,400	1,400	12,600	19,800	16,440
Sorghum	12,500	5,000	62,500	750	46,875	1,600	20,000	26,875	23,725
Sugar cane	500	100,000	50,000	80	4,000	3,000	1,500	2,500	1,460
Fruit trees	3,000	20,000	60,000	2,000	120,000	9,000	27,000	93,000	90,800
Pasture beef fattening	10,000	1,470	14,700	9,000	132,300	11,700	117,000	15,300	14,168
Total	64,500		329,700		575,000		291,600	283,400	253,056
Cropping Intensity, %: 134									
Pujal Coy									
Soybeans	15,500	2,500	38,750	1,900	73,625	1,900	29,450	44,175	44,175
Vegetables and melons	4,000	18,000	72,000	1,800	129,600	15,000	60,000	69,600	21,300
Beans and pulses	1,500	1,500	2,250	1,800	4,050	1,600	2,400	1,650	(430)
Rice	2,000	5,000	10,000	1,400	14,000	2,800	5,600	8,400	8,400
Corn	1,500	3,000	4,500	900	4,050	1,700	2,550	1,500	660
Cotton	15,000	2,500	37,500	2,700	101,250	3,800	57,000	44,250	42,900
Safflower	9,000	2,000	18,000	1,800	32,400	1,400	12,600	19,800	18,680
Sorghum	15,500	5,000	77,500	750	58,125	1,600	24,800	33,325	29,545
Fruit trees	4,000	20,000	80,000	2,000	160,000	9,000	36,000	124,000	118,500
Pasture, beef/ fattening	22,000	1,470	32,340	9,000	291,060	11,700	257,400	33,660	29,150
Total	90,000		372,840		868,160		487,800	380,360	312,880
Cropping intensity, %: 125									
Chicayan									
Soybeans	2,000	2,500	5,000	1,900	9,500	1,900	3,800	5,700	5,700
Vegetables and melons	1,000	18,000	18,000	1,800	32,400	15,000	15,000	17,400	16,020
Beans and pulses	1,000	1,500	1,500	1,800	2,700	1,600	1,600	1,100	1,100
Rice	2,000	5,000	10,000	1,400	14,000	2,800	5,600	8,400	8,400
Corn	1,000	3,000	3,000	900	2,700	1,700	1,700	1,000	1,000
Cotton	1,000	2,500	2,500	2,700	6,750	3,800	3,800	2,950	2,950
Safflower	2,000	2,000	4,000	1,800	7,200	1,400	2,800	4,400	4,400
Sorghum	2,000	5,000	10,000	750	7,500	1,600	3,200	4,300	4,300
Sugar cane	2,500	100,000	250,000	80	20,000	3,000	7,500	12,500	12,500
Fruit trees	1,000	20,000	20,000	2,000	40,000	9,000	9,000	31,000	31,000
Pasture, beef fattening	7,000	1,470	10,290	9,000	92,610	11,700	81,900	10,710	8,742
Total	22,500		334,290		235,360		135,900	99,460	96,112
Cropping intensity, %: 132									
Total	177,000		1,036,830		1,678,520		915,300	763,220	662,048

MEXICO

PANUCO FIRST-STAGE PROJECT

Cropping Pattern, Production, Costs and Net Value of Production
----- Summary with Project -----

Crops	Area (ha)	Yields (kg/ha)	Production (metric ton)	Prices (Mex\$/ton)	Gross Production	Production Costs		Net Value of	Incremental Net
					Value (Mex\$'000)	(Mex\$/ha)	(Mex\$'000)	Production (Mex\$'000)	value of Production (Mex\$'000)
Soybeans	30,000	2,500	75,000	1,900	142,500	1,900	57,000	85,500	84,648
Vegetables and melons	8,000	18,000	144,000	1,800	259,200	15,000	120,000	139,200	72,960
Beans and pulses	4,000	1,500	6,000	1,800	10,800	1,600	6,400	4,400	2,320
Rice	6,000	5,000	30,000	1,400	42,000	2,800	16,800	25,200	25,200
Corn	4,000	3,000	12,000	900	10,800	1,700	6,800	4,000	2,460
Cotton	25,000	2,500	62,500	2,700	168,750	3,800	95,000	73,750	71,050
Safflower	20,000	2,000	40,000	1,800	72,000	1,400	28,000	44,000	39,520
Sorghum	30,000	5,000	150,000	750	112,500	1,600	48,000	64,500	57,570
Sugarcane	3,000	100,000	300,000	80	24,000	3,000	9,000	15,000	13,960
Fruit trees	8,000	20,000	160,000	2,000	320,000	9,000	72,000	248,000	240,300
Pasture, beef fattening	39,000	1,470	57,330	9,000	515,970	11,700	456,300	59,670	52,060
Total	177,000		1,036,830		1,678,520		915,300	763,220	662,048

September 25, 1973

Cropping intensity, %: 129

MEXICO

PANUCO FIRST-STAGE PROJECT

Cropping Pattern, Production, Costs and Net Value of Production
Growing Season and Physical Areas in ha

Crops	----- Dry Season -----				----- Wet Season -----				----- Dry Season -----			
	January	February	March	April	May	June	July	August	September	October	November	December
Soybeans												
Vegetables and melons												
Beans and pulses												
Rice												
Corn												
Cotton												
Safflower												
Sorghum												
Sugarcane												
Fruit trees												
Pasture, beef fattening												
Physical areas in ha			137,000			110,000			115,000			137,000

September 20, 1973

MEXICOPANUCO FIRST-STAGE PROJECTThe Outlook for Cotton

1. Cotton is produced in varying quantities in more than 80 countries. Roughly one-third of the world crop is produced for export in raw (fiber) form and significant amounts are exported by producing countries as textiles. The United States, the USSR and the People's Republic of China are the world's three largest producers, accounting together for about one-half of the world output. The bulk of the remainder is produced by a large number of developing countries.
2. The United States remains the world's leading cotton exporter, although its share in the world cotton trade has been declining historically. During the past ten years, U.S. exports accounted on the average for 22 percent of the world's total exports. Over the same period, centrally planned countries accounted for another 13 percent and developing countries for the remaining 65 percent. (See Table 1.)
3. World cotton prices in current terms are forecast to decline by some 10 percent from recent high levels (1969/70-1971/72) by the end of the seventies. In terms of Mexican SM 1-1/16," a representative grade of medium-long cotton which normally accounts for more than 60 percent of total world cotton output, this points to a 1980 price of about 30.0 U.S. cents per pound, c.i.f. Liverpool. (See Table 2.)
4. The expected downward trend reflects a number of assumptions: (a) that the current high prices are temporary and reflect a demand-supply imbalance caused largely by a temporary supply shortage; (b) that in the absence of a decline in prices production will tend again to outpace consumption by the late seventies; (c) that inter-fiber competition will continue to limit the growth of cotton consumption but that no major breakthrough in man-made fiber technology will greatly accelerate recent substitution trends; and (d) that price adjustments will take place within the framework of a relatively freer, more competitive market. This, in turn, implies continued competition among some 60 exporting countries (many of them heavily dependent on cotton exports); absence, in future U.S. price support and cotton export policies, of the elements which made that country a residual supplier in the world market and led to recurring stock accumulation in the United States; and, finally, no international cotton agreement.
5. The future growth of world cotton production depends not only on the natural supply response to change in price but also - and quite crucially - on the cotton policies of the major producers. The United States and the USSR account together for almost 39 percent of world cotton production. The production policies necessarily influence the growth path of

world cotton supply. In our supply projections we have taken U.S. cotton output at about 13 million bales and USSR total output at about 11.5 million bales. The combined production share of the two countries would therefore remain roughly the same as during the past five seasons. Should the U.S. cotton policy change and output stabilize around 10 million bales and the USSR output remain at about 10.5 million bales, the projected surplus situation would turn, other things being equal, into one of rough demand-supply equilibrium and lead to prices 5 percent higher than those forecast in paragraph 3.

6. Demand uncertainties, however, call for a certain degree of prudence in forecasting cotton prices. World cotton consumption is projected to grow at an average annual rate of 1.6 percent during the next ten years. Even this modest growth rate of cotton consumption presupposes some further improvement in the quality composition of cotton and progress in promotional activity and, furthermore, that no new breakthrough in the production of man-made fibers would occur - and lead to a faster displacement of cotton by man-made fibers.

7. World cotton demand remained weak throughout the late sixties, particularly in developed countries, where the general stagnation of the textile industry and strong competition from man-made (especially non-cellulosic) fibers led to a decline in the consumption of cotton. The increase in the utilization of cotton in developing and centrally planned countries only partially offset the overall decline in developed countries. Between 1966/67 and 1971/72, world cotton consumption grew at an average annual rate of 0.9 percent, compared to the 2.2 percent per annum of the preceding 11 years.

8. Competition from synthetic substitutes, moreover, is by no means restricted to developed countries. In Central America, South America and Asia, synthetic fibers have already penetrated the market and further inroads are expected during the next decade. During the past ten years, while cotton's share of world total fiber market fell from nearly 66 to 44 percent, the market share of man-made fibers increased from 29 to 50 percent. Inter-fiber competition hinges upon two main factors: relative prices and product performance. Prices of man-made fibers (especially polyester fibers) declined considerably in the past five years, thereby moving price parities in favor of man-made fibers. Recent high cotton prices, moreover, are likely to accelerate the trend in substitution of cotton by polyester fibers, particularly in developed countries. The quality or product performance of man-made fibers is superior to cotton in some crucial end-uses (e.g., apparel) where cotton lacks the "easy-care" properties characteristic of synthetic fibers (alone or blended with cotton). Although further sharp declines in the prices of the most important non-cellulosic fibers do not appear very likely in the short run, the possibility of increased competition from these fibers still remains strong, given the technical advantages that man-made fibers have in new high-speed spinning and weaving machines. This could seriously affect cotton demand and slow down its growth to a very modest 1 percent per annum over the next ten years.

9. At projected equilibrium levels of demand, supply and price for the mid-seventies, world raw cotton exports would experience a growth rate of around 1.2 percent per annum between 1967-69 and 1975, although developing countries' exports may grow at a higher rate (between 1.5 and 2.0 percent per annum). Assuming that world cotton prices move in the late seventies toward long-term equilibrium levels, world raw cotton exports may continue to grow throughout the late seventies at approximately the same rate envisaged for the earlier period. Export shares, however, become more difficult to predict, given their dependence on possible future policy actions by major producing and exporting countries such as the United States and the USSR.

10. The export performance and prospects of individual developing countries will continue to vary depending, inter alia, on availability of land, trends in yields, quality and marketability of cotton grown, domestic consumption trends and cotton textiles trade balances. Competition among producing countries is expected to continue and small producing countries with limited production alternatives are likely to push output and succeed in expanding their small shares.

11. Mexico is a medium-size cotton producer. It accounts for about 3 percent of world production and 5 percent of world exports. Cotton production in Mexico has been declining since the mid-sixties. (See Table 3.) Substantial reductions in acreage - particularly intense in some growing areas such as Mexicali, Altamira, Matamoros and Delicias - were responsible for the fall in cotton output. Yields, on the contrary, increased regularly throughout the past 20 years and somewhat offset the decline in cultivated areas. (See Chart 1.) Cotton production in Mexico appears to be constrained by severe competition for land coming from alternative cash crops (e.g., soy beans, wheat). In 1972/73, in spite of the sharp rise in cotton prices, acreage increased only marginally over 1971/72 and output actually fell with respect to the past year. Cotton prices, relative to those of competing cash crops, will to a great extent determine the future amount of land under cotton cultivation. Other factors, such as availability of water, will also have some influence over the choice of crop. Total acreage under cotton has tended downward throughout most of the post-war period. (See Chart 1.) Even considering the fact that recent years may have shown a fall in acreage below the historical trend and assuming continued government encouragement to cotton cultivation, total area under cotton is projected to be by 1980 only about 1.1 million acres. Yields on the contrary are expected to increase and to reach by the end of the seventies 893 pounds per acre. Total production of cotton is therefore projected to be by 1980 only slightly above 2 million bales. (See Table 3.)

12. Domestic consumption of textile fibers in Mexico has increased at over 5 percent per annum during the past 20 years. Man-made fibers consumption grew faster (at some 7.5 percent per annum) but still consumption of cotton also expanded at over 4 percent per annum throughout the

period. Based on income projections for the seventies and income elasticities of demand derived from regression analysis, ^{1/} cotton consumption in Mexico can be forecast to grow at an average of 2.0 percent per annum throughout the seventies and to reach 1 million bales by 1980. (See Table 3.) Exportable supply of cotton can therefore be estimated to be by 1980 at about 1.0 to 1.1 million bales, only slightly above the average of the past three seasons and considerably below the levels reached throughout the late fifties and most of the sixties. Mexico's share of world exports is expected to remain unchanged with respect to the past three seasons.

^{1/} Income elasticity of demand for all textile fiber was found to be 0.85, for man-made fibers 1.60, and for cotton 0.50. Cotton consumption was forecast individually and as a residual after forecasting total textile fiber consumption and man-made fiber consumption by 1980. All estimates converged within a fairly narrow range.

Table 1: COTTON: RECENT TRENDS IN WORLD PRODUCTION, UTILIZATION AND TRADE

(million bales)

Year Beginning August 1	Average 1958/59- 1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72
<u>Consumption</u>										
United States	8.7	8.6	9.2	9.5	9.5	9.0	8.2	8.0	8.1	8.0
Western Europe	7.5	7.4	7.2	7.3	7.1	6.7	6.8	6.8	6.8	6.4
Japan	3.0	3.2	3.4	3.2	3.3	3.4	3.5	3.4	3.2	3.4
Other (excl. c.p.c.)	12.1	13.8	14.5	14.6	15.1	15.8	16.5	17.2	17.3	18.2
Centrally Planned	15.1	14.7	16.4	17.4	18.5	18.9	18.9	19.0	19.6	20.0
<u>World Consumption</u>	<u>46.4</u>	<u>47.7</u>	<u>50.7</u>	<u>52.0</u>	<u>53.5</u>	<u>53.8</u>	<u>53.9</u>	<u>54.4</u>	<u>55.0</u>	<u>56.0</u>
<u>Production</u>										
United States	14.0	15.3	15.2	14.9	9.9	7.2	11.0	10.0	10.3	10.3
Other (excl. c.p.c.)	19.0	22.2	23.0	23.7	22.9	24.0	26.5	25.9	23.5	28.0
Centrally Planned	13.5	12.9	14.8	16.1	17.3	17.8	17.0	16.4	18.7	18.7
<u>World Production</u>	<u>46.5</u>	<u>50.4</u>	<u>53.0</u>	<u>54.7</u>	<u>50.1</u>	<u>49.0</u>	<u>54.5</u>	<u>52.3</u>	<u>52.5</u>	<u>57.0</u>
<u>Exports</u>										
United States	5.0	5.7	4.1	2.9	4.7	4.2	2.7	2.8	3.7	3.2
Other (excl. c.p.c.)	9.0	10.4	10.6	11.6	10.7	10.3	11.6	12.3	11.2	12.3
Centrally Planned	1.8	1.8	2.1	2.4	2.5	2.6	2.2	2.4	2.6	2.9
<u>World Exports</u>	<u>15.8</u>	<u>17.9</u>	<u>16.8</u>	<u>16.9</u>	<u>17.9</u>	<u>17.1</u>	<u>16.5</u>	<u>17.5</u>	<u>17.5</u>	<u>18.4</u>
<u>Imports</u>										
Japan	3.1	3.2	3.4	3.1	3.6	3.5	3.1	3.5	3.7	3.6
Western Europe	7.0	7.2	6.5	6.8	6.8	6.5	6.5	6.1	5.9	5.9
Other (excl. c.p.c.)	2.8	3.3	3.3	3.4	3.8	3.9	3.7	4.1	4.7	4.5
Centrally Planned	3.3	4.0	4.3	4.2	3.9	3.8	3.7	4.4	4.4	4.3
<u>World Imports</u>	<u>16.2</u>	<u>17.7</u>	<u>17.5</u>	<u>17.5</u>	<u>18.1</u>	<u>17.7</u>	<u>17.0</u>	<u>18.1</u>	<u>18.7</u>	<u>18.3</u>
<u>Stocks</u> ^{1/}										
United States	8.0	11.2	12.4	14.3	16.9	12.5	6.5	6.5	5.8	4.3
Other Net Exporters	3.7	3.8	3.8	4.2	4.5	4.7	5.3	6.8	6.8	5.6
Net Importers (ex.c.p.c.) ^{2/}	5.9	5.8	6.8	6.2	5.9	6.4	7.0	6.6	6.1	5.8
Centrally Planned	3.1	2.5	3.0	3.6	4.0	4.1	4.1	3.8	3.1	3.9
<u>World Stocks</u>	<u>20.7</u>	<u>23.3</u>	<u>26.0</u>	<u>28.3</u>	<u>31.3</u>	<u>27.7</u>	<u>22.9</u>	<u>23.7</u>	<u>21.8</u>	<u>19.6</u> ^{3/}

Note: World totals may not add exactly due to rounding.

^{1/} August 1 of first year shown.^{2/} Including India and afloat.^{3/} Stocks on August 1, 1972, are estimated as follows (in million bales): United States, 3.3; other net exporters, 6.5; net importers, 6.5; centrally planned countries, 3.9; and world total 20.2.Source: International Cotton Advisory Committee, Cotton World Statistics, various issues.

Table 2: COTTON: RECENT TRENDS IN WORLD PRICES - C.I.F. QUOTATIONS AT LIVERPOOL
(U.S. cents per pound)

Origin	Specification	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72
United States	Orleans/Texas M1"	26.1	25.1	27.5	26.6	26.3	29.7	35.8
United States	Memphis SM 1-1/16"	29.3	28.7	33.8	30.4	29.2	31.8	36.6
United States	California SM 1-3/32"	33.4	n.a.	39.8 ^{/1}	33.9	31.3	33.3	38.3
Mexico	SM 1-1/16"	28.3	29.3 ^{/1}	31.9	28.9	29.3	33.1	38.2
Brazil	Sao Paulo Type 5, 1-1/32"	25.0 ^{/1}	24.8	27.8 ^{/1}	24.5 ^{/1}	24.7 ^{/1}	30.3 ^{/1}	34.8
Pakistan ^{/2}	289 F Punjab S.G.	28.0	26.0	26.3	26.1 ^{/1}	27.8	31.3	34.7
Turkey	Ismir St. I White, 1-1/16" RG	28.8	28.3	31.5	29.1	27.4	30.7	36.9
Syria	SM 1-1/16"	n.a.	28.2	32.2	30.6	28.4	31.1	38.8
Iran	SM 1-1/16"	28.1 ^{/1}	29.0	32.0 ^{/1}	30.1 ^{/1}	28.2	31.4	38.5
Nicaragua	SM 1-1/16"	27.1	27.6	30.4	27.4 ^{/1}	27.3	31.0	36.0
Greece	SM 1-1/16"	29.1 ^{/1}	28.9 ^{/1}	31.4	31.4	28.4	31.3	38.7
Uganda ^{/2}	B.P. 52	31.9	32.0	36.7	36.0	31.2	33.9 ^{/1}	n.a.
USSR	SM 1-1/16"	29.0	30.0	33.2	30.4	30.7	33.0	38.2
India ^{/2}	Bengal Desi Choice	25.9	21.8	24.1 ^{/1}	26.6	27.4	31.9	30.1
Peru	Tanguis Type 3	34.0	39.0	37.9	32.6	32.9	38.5	44.2
Peru	Pima No. 1, 1-9/16"	41.2 ^{/1}	43.9	47.7 ^{/1}	48.1	48.0 ^{/1}	47.4 ^{/1}	49.3
Sudan ^{/2}	G 5 L	38.9	33.9	35.2	37.7	38.7	38.8	39.6
Sudan ^{/2}	G 5 S	43.8	38.2	40.7 ^{/1}	44.3	44.0	45.2 ^{/1}	46.1
UAR	Dendera F.G.	39.6	40.4	44.7	49.3	49.3	48.5	55.2
UAR	Menoufi F.G.	49.8	51.3	55.8	62.5	63.2	61.2	64.9

n.a. = not available.

^{/1} Averages for less than twelve months.

^{/2} From 1967/68 on, shipment via Cape.

Source: International Cotton Advisory Committee, Cotton - World Statistics, various issues.

Table 3: MEXICO'S COTTON SUPPLY AND DISTRIBUTION
1951/52 TO 1971/72 AND PROJECTIONS TO 1980

	Area	Yield	Production	Consumption	Exports
	(1,000 acres)	(lb./acre)	(.....1,000 bales.....)		
1951/52	2,182	280	1,280	315	981
1952/53	1,937	308	1,250	320	988
1953/54	1,863	312	1,215	330	948
1954/55	2,278	380	1,810	385	1,248
1955/56	2,617	410	2,242	445	2,018
1956/67	2,157	416	1,877	470	1,304
1957/58	2,264	445	2,106	480	1,411
1958/59	2,553	442	2,359	480	1,800
1959/60	1,863	426	1,660	485	1,298
1960/61	2,234	449	2,100	500	1,602
1961/62	1,972	482	1,990	510	1,488
1962/63	2,058	557	2,400	515	1,888
1963/64	1,949	511	2,085	560	1,419
1964/65	1,941	587	2,385	600	1,608
1965/66	1,959	638	2,615	650	2,118
1966/67	1,733	618	2,240	670	1,386
1967/68	1,703	562	2,000	710	1,233
1968/69	1,787	655	2,450	685	1,623
1969/70	1,296	646	1,750	685	1,221
1970/71	995	692	1,440	675	756
1971/72	1,134	723	1,715	735	905
1980/81 (projected)	1,100	893	2,050	900	1,100

Source: International Cotton Advisory Committee, Cotton - World Statistics (various issues); and IBRD, Economic Analysis and Projections Department.

CHART 1: COTTON, PLANTED AREA AND YIELDS IN MEXICO
(1951/52 - 1971/72)



MEXICOPANUCO FIRST STAGE PROJECTMarkets and MarketingMarkets

1. The project would give rise to an increased production of soybeans, vegetables and melons, beans, rice, cotton, safflower, sorghum, sugarcane, fruits and beef, as against a reduction in the output of corn from the area. An analysis of the estimated national production, projected demand and supply position in 1982 and the comparative position of the proposed project incremental production is given at Table 1. This shows that only in the case of rice does project incremental production at full development represent more than the 20% of the gap between projected national demand in 1982 and estimated national production in 1973. Project incremental production of soybeans, rice, cotton, sorghum, fruits, vegetables and beef would go towards meeting expected internal market deficiencies in these products. Only in the case of safflower is current production above the projected national demand level for 1982; but the extra output of safflower should not pose marketing problems since it is interchangeable with other oilseeds for which an overall deficiency is projected.

2. According to the national projections given in Table 1, export surpluses may arise in the case of corn and beans; the project would in fact decrease the supply of corn and have a minimal effect on the future supply of beans. It should also be noted that there is an export element in the 1982 demand projections for cotton and sugar, but, these are traditional Mexican export crops. The annual average of unrefined sugar exports for the period 1970-1972 was 580,000 tons and this is expected to increase to 820,000 tons by 1976. The cotton situation is analysed in detail in Annex 18, which concludes that by 1980, Mexican lint exports are likely to be about 1.0 to 1.1 million bales (or slightly above the average of the past three seasons) representing about 5% of world exports. No export market problems for the likely project production of these crops are anticipated.

Marketing

3. General. Adequate attention must be given to the marketing, storage, processing, and related aspects so that the additional production can be handled. The present storage capacity in the area is insufficient, and, while a regional initiative can be expected to correct the situation, efforts must be coordinated. Government should review marketing and processing requirements and take the necessary steps to meet the needs. The following paragraphs review briefly the existing facilities and explore the areas that require study and action.

4. Cattle are usually sold "on the hoof" to packing plants in Mexico City and Monterey. Sugarcane and cotton are the only crops processed in the region; soybean and safflower are sold to processing mills in the large cities outside the region. Some initial attempts to export mangoes are underway; they are graded and packed in the region and trucked directly to the border either by the farmers or the packing plant operators. Transportation companies provide non-refrigerated trucking services for the movement of produce.
5. Apart from direct sales by producers of seed cotton, sugarcane and rice to processing plants, the normal marketing channels are provided by middlemen-truckers. These buyers, who collect at the farm gate, frequently provide credit to farmers, and the prices they pay reflect the cost of the services they render. Government annually fixes guaranteed prices for key commodities such as maize, sorghum, safflower, soya and beans, and acts as residual buyer through the Compania Nacional de Subsistencias Populares (CONASUPO). For these operations, CONASUPO has warehouse space in Tampico (15,000 tons capacity) and in Mante (3,500 tons).
6. Storage. At present levels of agricultural activity, the Panuco Region has insufficient storage capacity at certain periods of the year despite the fact that, since the cotton industry peaked in the mid-1960's and then declined because of pest attacks and bad weather, two out of seven cotton gins have been left idle and are now used for grain storage. Preliminary and tentative estimates suggest that, when the project is fully operational, additional storage capacity of the order of 120,000 tons would be needed.
7. Processing. Of the 487 classified industrial establishments in the vicinity of the project area, most are in Mante, Panuco, Tamuin and Valles and are concerned with processing cotton, sugar and foodstuffs such as tortilla flour and bakery products. Owing to the decline in production of seed cotton and sugarcane, there is a surplus ginning and sugar refining capacity in the area, which, with improvements and modernization, should be able to handle easily the expected increase in production of these crops under the project.
8. There are no plants in the region for the processing of oilseeds (safflower, soybean and cotton seed) despite the high internal demand for vegetable oils and cake (as animal feed). With the participation of Nacional Financiera and Banco Agropecuario, a feasibility report is being prepared for a group of farmers who are contemplating establishing an oilseed mill with a processing capacity of 20,000 tons of soybeans per year at a total capital cost of Mex\$12 million (US\$1.0 million). This evaluation will have to take into account the fact that existing milling capacity in other regions is in excess of current needs and believed to be adequate to meet national requirements up to 1980. By that date, the growth of oilseed output from the project (which, at full production, is expected to reach 74,000 tons of soybeans, 33,000 tons of cottonseed and 34,000 tons of safflower), should be sufficient to warrant expansion of processing facilities in the project area.

9. Abattoirs and meat packing plants. To meet the projected rise in the regional demand for meat, based on population growth and higher per capita consumption levels, not only would production have to be increased (as envisaged under the project) but also the existing slaughter-houses and the one meat packing plant in the region would have to be improved and enlarged, or new units established. This would call for considerable investment. For example, to modernize the installation at Tampico to enable it to handle 600 head per day would cost an estimated Mex\$20 million (US\$1.6 million).

10. Fruit and vegetable packing and processing. The region has two small fruit packing establishments, dealing chiefly with mangoes, and two vegetable packing plants, mainly for tomatoes and onions. Their individual capacities range from 50 to 100 tons per day with storage from 1,200 m² to 1,800 m². To handle the increased output expected from the project, this through-put capacity would have to be increased, and the investment cost is preliminarily estimated at Mex\$14 million (US\$1.2 million).

Conclusion

11. The expansion of output proposed under the project would call for an expansion and improvement of the storage, transport, packing and processing facilities (and related managerial capabilities) existing in the Panuco region, except in the case of sugar and cotton, where there is at present surplus processing capacity. It is, however, difficult to determine the exact facilities that would be required seven to eight years from now. Moreover, it is assumed that the private sector will, of its own initiative, provide for expansion of these services, as it has done in other parts of Mexico. Since, as indicated above, the total investment requirements, particularly in the processing sector, are likely to be considerable. Government assistance, by way of credit or otherwise, may well be necessary. If sufficient private capital is not forthcoming, Government should be prepared to authorize public investment to ensure that the development of marketing facilities parallels the growth of production under the project.

MEXICO

PANUCO FIRST STAGE PROJECT

Analysis of Estimated National Production, Projected Demand and Supply and the Project Production

	Estimated National Production 1973 ^{1/}	Projected National Production 1982 ^{2/}	Projected National Demand 1982 ^{2/}	Projected Surpluses and Deficiencies 1982 ^{4/}	Gap Between (3) and (1) (5)	Project Incremental Production ^{5/} (6)	(6) as percent of (5) (7)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
-----Metric '000 tons-----							
Soybeans	240	488	609	(121)	369	74	20
Vegetables and melons ^{6/}	1,140	1,417	1,766 ^{3/}	(349)	626	91	14
Beans	1,060	1,447	1,205	242	145	4	3
Rice	410	546	541	5	131	30	23
Corn	9,950	13,250	12,385	865	2,435	-	-
Cotton (Fibers)	400	555	960 ^{3/}	(405)	560	20	4
Cotton (seeds)	680	898	1,664	(766)	984	33	3
Safflower	460	312	288	24	(172)	34	20
Sorghum	2,410	4,188	4,205 ^{3/8/}	(17)	1,795	130	7
Sugarcane	33,570	52,763 ^{8/}	57,773 ^{3/8/}	(5,010) ^{8/}	24,203 ^{8/}	276	1
Fruits ^{7/}	700	1,280 ^{9/}	1,690 ^{9/}	(410) ^{9/}	986	154	16
Beef	1,080	1,570	2,026	(456)	946	48	5

1/. Mission estimation, net of waste

2/. Source: Mission estimation and Caracteristicas de la Agricultura Mexicana by M.R. Cisneros

3/. Including domestic and external demand

4/. (2) minus (3)

5/. According to the Production Table Chapter VI

6/. Tomatoes were chosen as the representative vegetable

7/. Avocado, mango, guayava, papaya and tamarind were chosen as the representative fruits

8/. Conversion factor of 12.5 was used in order to express unrefined sugar in raw sugarcane equivalent

9/. The projections are 1990, since only by that time the project fruits would reach full production.

MEXICO

PANUCO FIRST STAGE PROJECT

Farm Budget
Projected Income on 15 ha Ejido Farms

<u>Crops</u>	<u>Without Project</u>		<u>With Project at Full Development</u>	
	<u>Cropped Area</u> <u>(ha)</u>	<u>N.V.P.</u> <u>(Mex\$)</u>	<u>Cropped Area</u> <u>(ha)</u>	<u>N.V.P.</u> <u>(Mex\$)</u>
Soybeans	0.25	178	3.40	9,690
Vegetables and melons	1.00	13,800	0.90	15,660
Beans and pulses	0.43	404	0.45	495
Rice	-	-	0.75	3,900
Corn	2.40	120	0.50	500
Cotton	0.43	580	3.00	8,850
Safflower	1.73	969	2.60	5,720
Sorghum	2.40	1,512	3.40	7,310
Sugarcane	-	-	0.30	1,500
Fruit trees	0.01	110	0.70	21,700
Pasture beef-fattening	1.35	277	3.40	5,202
Total cropped area	<u>10.00</u>	<u>17,950</u>	<u>19.40</u>	<u>80,527</u>
Native vegetation	7.00		-	
Total farm size	<u>17.00</u>		<u>15.00</u>	
Cropping intensity, %	57		129	

<u>Farm Income</u>	<u>Without</u> <u>Project</u>	<u>With</u> <u>Project</u>	<u>Increment</u>
		<u>Mex\$</u>	
Net value of Production (NVP)	17,950	80,527	62,577
Annual Interest on short-term credit at 12% p.a.	<u>1,213</u>	<u>12,038</u>	<u>10,825</u>
Farm family benefit	<u>16,737</u>	<u>68,489</u>	<u>51,752</u>

MEXICO

PANUCO FIRST-STAGE PROJECT

Farm Budget
Projected Income on 20 ha Private Farms

<u>Crops</u>	<u>Without Project</u>		<u>With Project at Full Development</u>	
	<u>Cropped Area</u> <u>(ha)</u>	<u>N.V.P.</u> <u>(Mex\$)</u>	<u>Cropped Area</u> <u>(ha)</u>	<u>N.V.P.</u> <u>(Mex\$)</u>
Soybeans	1.50	1,065	4.5	12,825
Vegetables and melons	5.00	69,000	1.2	20,880
Beans and pulses	2.50	2,350	0.6	660
Rice	-	-	1.0	5,200
Corn	13.50	675	0.7	700
Cotton	2.50	3,375	4.0	11,800
Safflower	9.50	5,320	3.5	7,700
Sorghum	13.50	8,505	4.5	9,675
Sugarcane	0.05	130	0.4	2,000
Fruit trees	0.05	550	0.9	27,900
Pasture, beef-fattening	<u>7.00</u>	<u>1,435</u>	<u>4.5</u>	<u>6,885</u>
Total cropped area	55.00	92,405	25.8	106,225
Native vegetation	42.00		-	
Total farm size	97.00		20.0	
Cropping intensity, %	57		129	

Farm Income

	<u>Without</u> <u>Project</u>	<u>With</u> <u>Project</u>	<u>Increment</u>
	<u>Mex\$</u>		
Net Value of Production (NVP)	92,405	106,225	13,820
Annual Interest on short-term credit at 12% p.a.	<u>6,673</u>	<u>16,009</u>	<u>9,336</u>
Farm family benefit	85,732	90,216	4,484

September 24, 1973

MEXICO

PANUCO FIRST STAGE PROJECT

Farm Budget

Projected Income on 20 ha Colono Farm

<u>Crops</u>	<u>Without Project</u>		<u>With Project at Full Development</u>	
	<u>Cropped Area</u> (ha)	<u>N.V.P.</u> (Mex\$)	<u>Cropped Area</u> (ha)	<u>N.V.P.</u> (Mex\$)
Soybeans	0.50	355	4.5	12,825
Vegetables and melons	2.20	30,360	1.2	20,880
Bean and pulses	0.94	884	0.6	660
Rice	-	-	1.0	5,200
Corn	5.30	265	0.7	700
Cotton	0.94	1,269	4.0	11,800
Safflower	3.80	2,128	3.5	7,700
Sorghum	5.30	3,339	4.5	9,675
Sugarcane	0.01	26	0.4	2,000
Fruit trees	0.01	110	0.9	27,900
Pasture, beef-fattening	3.00	615	4.5	6,885
Total cropped area	<u>22.00</u>	<u>39,351</u>	<u>25.8</u>	<u>106,225</u>
Native vegetation	17.00		-	
Total farm size	<u>39.00</u>		<u>20.0</u>	
Cropping intensity, %	57		129	

<u>Farm Income</u>	<u>Without Project</u>	<u>With Project</u>	<u>Increment</u>
		Mex\$	
Net value of production (NVP)	39,351	106,225	66,874
Annual Interest on short-term credit at 12% p.a.	<u>2,669</u>	<u>16,009</u>	<u>13,340</u>
Farm family benefit	<u>36,682</u>	<u>90,216</u>	<u>53,534</u>

PANUCO FIRST STAGE PROJECTFarm Budget
One Thousand ha Livestock Cooperative Farm

	Years (1) (2) (3) (4) (5) (6-10)						
	Without Project	-----With Project-----					
<u>Basic Assumptions</u>							
Carrying Capacity, AU/ha/year	1.0	1.3	2.0	3.0	3.0	3.0	3.0
Turnover/ha/year ^{1/}	1.0	1.5	2.0	2.0	2.0	2.0	2.0
Number of animal units per ha per year	1.0	2.0	4.0	6.0	6.0	6.0	6.0
Live weight after fattening, kg/AU	450	450	450	450	450	450	450
Live weight at purchases, kg/AU	200	200	200	200	200	200	200
Total live weight sold kg/ha	450	900	1,800	2,700	2,700	2,700	2,700
Total live weight before fattening kg/ha	200	400	800	1,200	1,200	1,200	1,200
Balance	250	500	1,000	1,500	1,500	1,500	1,500
Losses due to various causes 2%	5	10	20	30	30	30	30
Net live weight, kg/ha	245	490	980	1,470	1,470	1,470	1,470
Farmgate price, live weight, Mex.\$/kg	9	9	9	9	9	9	9
-----Thousand Mex.\$-----							
<u>Gross Production Value</u>	2,205	4,410	8,820	13,230	13,230	13,230	13,230
Investment costs based on Annex 17, page 2	-	1,700	-	-	-	-	-
Operating costs based on Annexes 15 and 17, pages 1 and 3	-	4,000	8,000	11,700	11,700	11,700	11,700
Total production costs	2,000	5,700	8,000	11,700	11,700	11,700	11,700
<u>Net Value of Production</u>	205	(1,290)	820	1,530	1,530	1,530	1,530
Incremental net value of production	-	(1,495)	615	1,325	1,325	1,325	1,325

NOTES:

1. In the case of an ejido farm the area would group 100 ejidatarios for 10 ha farm each, or about 67 ejidatarios of 15 ha farm each, but also applies to Colonos and private farmers.
2. The ejido farm would operate as a cooperative closely supervised by technicians from the PLAMEPA Extension Service.
3. AU: animal units.
- 1/. Without the project annually one young steer is bought per ha and sold after fattening. With the project in year two, twice a year a young steer is fattened and sold in the year of purchase.

October 19, 1973

MEXICO
PANUCO FIRST-STAGE PROJECT

Farm Budget
Agricultural Taxation

<u>Crops</u>	<u>State</u> ^{1/2/} <u>Taxes</u>	<u>Federal</u> ^{2/} <u>Taxes</u>	<u>Total</u>
	-----Mex\$1 ha-----		
Soybeans	36	55	91
Vegetables and melons	621	-	621
Beans	38	52	90
Rice	92	-	92
Corn	40	75	115
Cotton	171	-	171
Safflower	41	108	149
Sorghum	38	52	90
Sugarcane	78	-	78
Fruit	216	-	216
Pasture	150	57	207

1/ Membership fee to the Associations of the private farmer which is Mex\$15 per ha is not included.

2/ Includes sowing license, land, state and crop production taxes.

Note: Current collection of agricultural taxes in the Panuco region is almost negligible. The Mexican authorities intend to take steps to improve the situation following the implementation of the project and will establish proper administrative procedures. The above table shows the taxes per ha according to current law.

MEXICOPANUCO FIRST-STAGE PROJECTEconomic Rate of Return

1. The rate of return from the project to the economy has been calculated on the following assumptions:

- (a) Agricultural Output Prices. For export and import - substitution commodities, i.e. soybeans, rice, corn, cotton lint, cottonseed, safflower, sorghum, sugarcane and beef, international prices for 1980 ^{1/} have been used. After calculating the equivalent FOB or CIF prices, allowances were made for local port expenses, transportation costs and processing costs in order to arrive at the economic farmgate price. The only destination considered for vegetables and fruits was the domestic market; consequently, low prices and suitable marketing constraints were imposed to reflect the situation. The assumption is a fairly conservative one, since the export of some fruits and vegetables is considered as a possibility in the future. The following Table shows the farmgate prices used in the calculation of both economic rates of return, and farm budgets.

<u>Commodity</u>	<u>Farmgate Price Assumptions</u>	
	<u>Economic Rate of Return</u>	<u>Farm Budget (based on Prevailing Prices)</u>
	<u>Mex\$/ton</u>	
Cotton	2,750	2,750
Rice	1,100	1,400
Corn	580	900
Sorghum	800	750
Beans	2,500	1,800
Soybeans	1,200	1,900
Safflower	1,450	1,800
Vegetables and melons	1,500	1,800
Fruits	1,600	2,000
Sugarcane	80	80
Beef	9,000	9,000

^{1/} As projected by the Commodity and Export Projections Division of the Economic Analysis and Projections Department of the Bank.

- (b) Labor Costs. In view of the considerable under-employment existing in the Mexican rural sector, official wage rates are considered to be higher than the opportunity cost of labor. For this reason a shadow price of 50% of the official wage rate for farm labor was used in the economic rate of return calculation ^{1/}.
- (c) Development Schedule. Physical construction of the Las Animas and Chicayan Projects would be completed in four years and Pujal Coy in five years. Agriculture benefits would start to accrue immediately after termination of physical construction and would reach full development by the eighth year for Las Animas and Chicayan and by the ninth year in the case of Pujal Coy. In the case of fruits, however, production would not start until the fifth year after completion of construction works and would not reach full development until five years later.
- (d) Project Costs. The investments and their timings are as shown in Annexes 8 and 10. To give the economic investment cost, the items for land acquisition and price contingencies have been excluded. Incremental operational and maintenance costs corresponding to the area to be irrigated under the project in each year have been included in the calculations.
- (e) Project Life. For economic analysis purposes, the Project life has been taken as 40 years.
- (f) Project Benefits. These have been calculated considering the economic farmgate prices and the development schedule (Annex 15). Project economic benefits are defined as the increments over the benefits obtainable without the project. Only direct benefits and their corresponding costs were considered. Annex 15 shows the incremental net value of production based on current farmgate prices. These values have been adjusted for the economic farmgate prices for produce outlined in this Annex eliminating the taxes paid from the production cost used in Annex 16 and making the adjustment mentioned above in labor costs.

Economic Rates of Return and Sensitivity Analysis

2. Calculated on the basis of the assumptions detailed in para. 1, the economic rates of return are estimated to be 19% for Las Animas, 20% for Pujal Coy and 22% for Chicayan. The cost and benefit streams involved in this calculation are shown in Table 1.

^{1/} Nacional Financiera uses the same criteria in its evaluation of similar projects.

3. To test the sensitivity of these results to variations in basic assumptions, the following tests were made:

<u>Assumption</u>	<u>Change</u>	<u>Rate of Return</u>		
		<u>Las Animas</u>	<u>Pujal Coy</u>	<u>Chicayan</u>
(a)	Construction period extended by one year, investment costs increased by 20% and incremental benefits starting one year later	15%	16%	18%
(b)	Benefits decreased by 25%	12%	12%	14%
(c)	Full farm labor costs valued at official salary rate	18%	19%	21%
(d)	Benefits increased by 25%	25%	26%	29%
(e)	Combined (a) and (b)	10%	10%	11%

The above mentioned results show that, within a reasonable range of circumstances, the risk of not achieving an acceptable rate of return for the proposed project is low. Cases (b) and (e) are unlikely to happen since the output price assumptions are already very conservative.

MEXICO

PANUCO FIRST-STAGE PROJECT

Project Economic Cost and Benefit Streams
(Mex\$ million)

	-----Years-----																		
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18-40</u> ^{/1}	
<u>Las Animas</u>																			
<u>Without Project</u>																			
Production Net Value	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
<u>With Project</u>																			
Production Net Value ^{/2}	36	36	36	36	76	221	279	283	285	291	301	313	328	322	355	361	361	361	361
Investments	73	348	294	137	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O & M Costs	-	-	-	-	8.3	11.7	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3
Incremental Stream	-73	-348	-294	-137	28	173	228	232	234	240	250	262	277	271	304	310	310	310	310
<u>Pujal Coy</u>																			
<u>Without Project</u>																			
Production Net Value	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
<u>With Project</u>																			
Production Net Value ^{/2}	99	99	99	99	99	196	409	472	481	482	485	495	511	528	512	566	577	577	577
Investments	55	260	394	297	48	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O & M Costs	-	-	-	-	-	22.6	28.8	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3
Incremental Stream	-55	-260	-394	-297	-48	74	281	336	345	346	349	359	375	392	376	430	441	441	442
<u>Chicayan</u>																			
<u>Without Project</u>																			
Production Net Value	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
<u>With Project</u>																			
Production Net Value ^{/2}	22	22	22	22	45	108	134	138	139	142	146	150	156	127	164	164	164	164	164
Investments	14	115	144	44	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O & M Costs	-	-	-	-	3.9	4.9	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
Incremental Stream	-14	-115	-144	-44	17	81	107	111	112	115	119	123	129	100	137	137	137	137	137

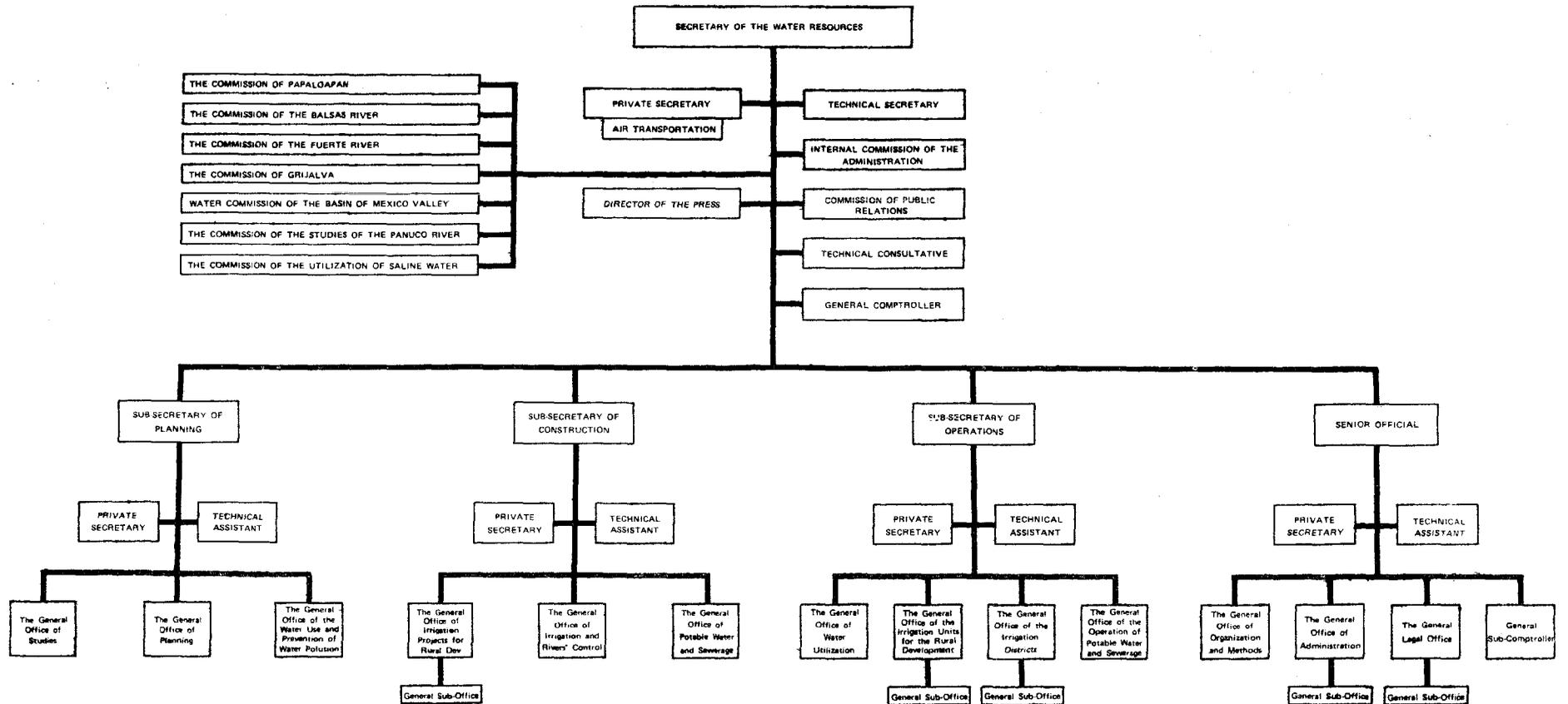
^{/1.} Values in this column are slightly lower in the 24th and 34th years for Las Animas and Chicayan and the 25th and 35th years for Pujal Coy because assumed replacements are taking place in those years.

^{/2.} Gross value of production minus agricultural investment and production costs.

November 6, 1973

MEXICO
Organization of SRH

THE PRESIDENT OF THE REPUBLIC



PRESIDENT OF MEXICO

