THE REPUBLIC OF EL SALVADOR

FEASIBILITY STUDY

FOR

DEVELOPMENT OF [illegible] INDUSTRY

[illegible]

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THE REPUBLIC OF EL SALVADOR

FEASIBILITY STUDY

FOR

DEVELOPMENT OF METAL-MECHANICAL INDUSTRY

DECEMBER, 1977

Japan International Cooperation Agency

PREFACE

The Government of Japan, at the request of the Government of the Republic of El Salvador, decided to undertake a study in which feasibility of developing metal-mechanical industry in El Salvador is examined, and entrusted its implementation to the Japan International Cooperation Agency.

The Agency mobilized experts in the related fields and organized a survey team headed by Mr. Ikuroh Ishikawa, executive managing director of Nomura Research Institute Co., Ltd. and dispatched the team to El Salvador for a period of 23 days from November 27 to December 19, 1976. The team conducted extensive survey in San Salvador and its vicinity, and also in Guatemala City, collecting data and information assisted by the Salvadorean counterpart team. Upon returning to Japan, the team analyzed the data and information, evaluated the feasibility of the development, and finalized this report.

In this report, we presented a concept for the development of metal-mechanical industry in El Salvador, prerequisite conditions for the development, results of economic evaluation of the four projects proposed by the El Salvador Government, and a program and strategies of the development.

We do hope that this report will contribute to the industrialization of El Salvador and will further solidify the close relationship which is already in existence between the two countries.

Finally, I would like to express our sincere gratitude to the survey team members for their effort to accomplish this task and to those governmental officials of El Salvador, the Embassy of Japan in El Salvador, the Ministry of Foreign Affairs and the Ministry of International Trade and Industry, both of the Government of Japan, who generously extended assistance to the accomplishment of this study.

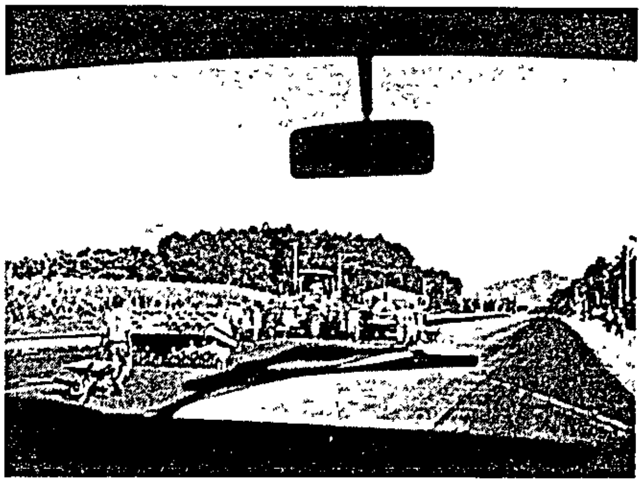
December, 1977

Shinsaku Hogen
President
Japan International Cooperation Agency

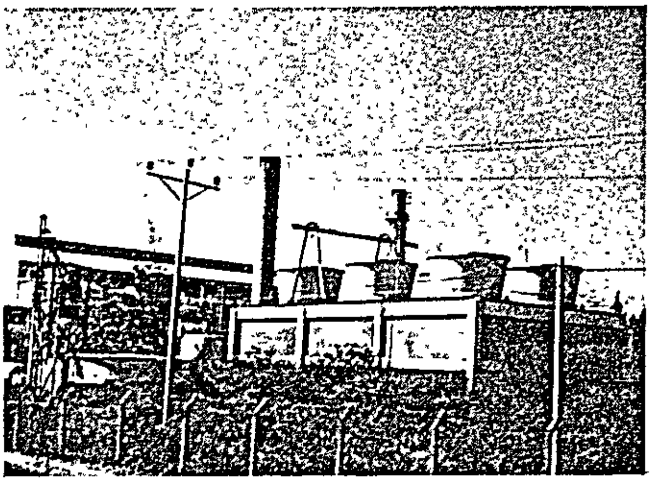
GENERAL MAP

EL SALVADOR

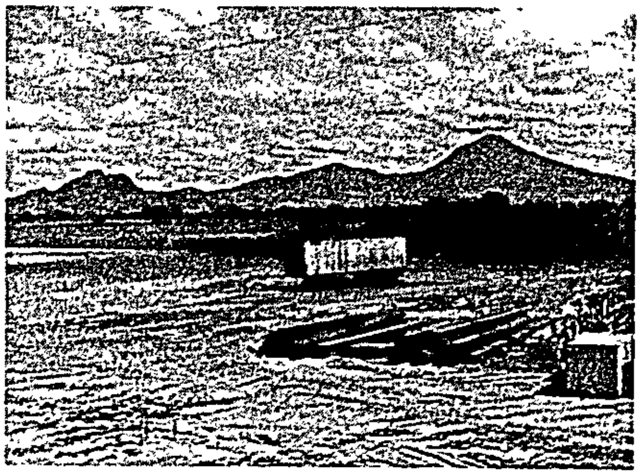
The Modern Port of Acajutla



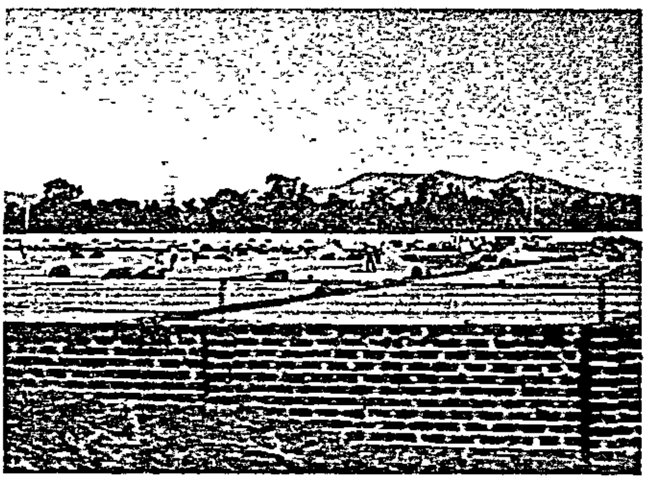
Panamerican Highway CA-1 near
San Andres, a Proposed Site
for Metal-Mechanical Industry



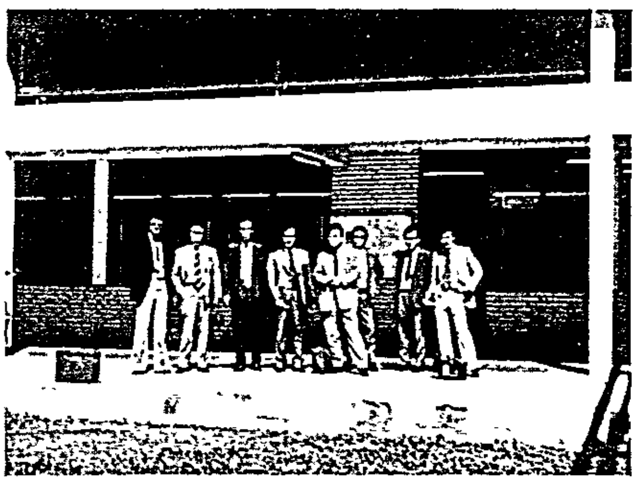
The CEL Thermal Power Station
in Acajutla



Construction Site for New
International Airport

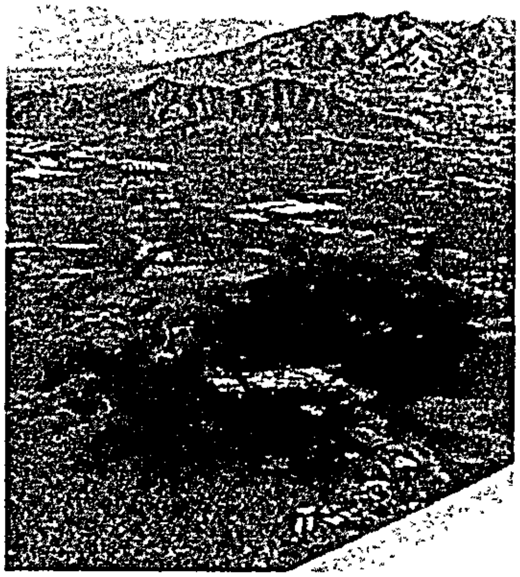


Coffee Harvesting in El Salvador

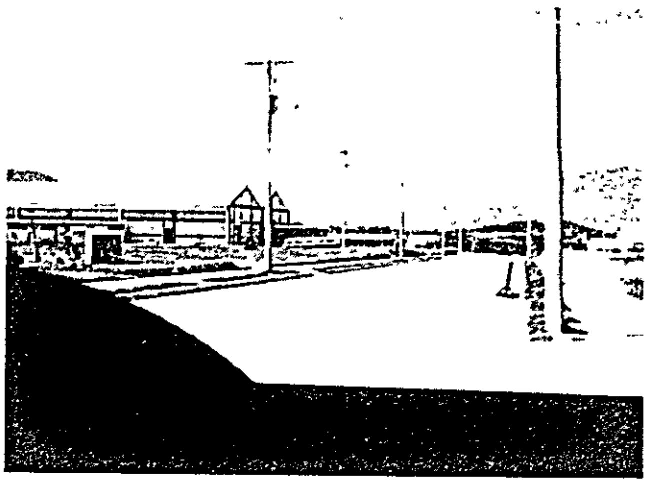


Visit to SIECA by the Mission

City of San Salvador Viewed
from the South

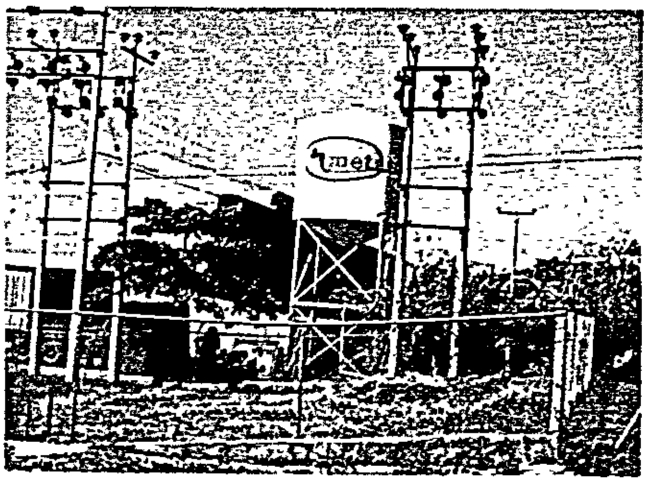


Possible Future Industrial
Zone From the Air



San Bartolo Industrial Free
Zone

Private Industrial Estate
in Nueva San Salvador



Factory for Galvanizing
Steel Sheet in Acajutla

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INTRODUCTION

INTRODUCTION

i) Background of the Survey

The Government of the Republic of El Salvador submitted a written request to the Government of Japan in May, 1976, asking it to undertake a feasibility survey of development of the metal-mechanical industry in El Salvador. In response, the Japan International Cooperation Agency organized and dispatched a team for a field survey for development of the metal-mechanical industry to El Salvador from November 27, 1976 to December 20, 1976. The field team consisted of eight members headed by Mr. Ikuroh Ishikawa. Based on the information and data collected in both El Salvador and Japan, the Agency studied the development feasibility of the metal-mechanical industry in El Salvador and drafted this report. This draft is to be submitted to the El Salvador Goverment for its review in order to prepare the final report on the subject.

ii) Objective of the Report

The objective of this report is to present a tentative conclusion to the El Salvador Government with repect to the feasibility of developing the metal-mechanical industry in El Salvador. In order to present the conclusion the analyses and studies have been conducted in the following five major fields:

I. The Present Economic Situation and the Industrial Development Plan of El Salvador

II. Guidelines for Developing the Mechanical Industry

III. The Selection of Plant Sites

IV. Economic Evaluations of the Proposed Projects

V. Impacts of Development and Development Strategies

iii) Members of the Field Survey Team

The members of the field survey team are as follows:

Chief	Ikuroh ISHIKAWA	Executive Vice President Nomura Research Institute
Deputy Chief	Tan HASHIDA	Senior Industrial Economist
Member	Saburo YUZAWA	Senior Economist
Member	Saizoh FURUYA	Senior Mechanical Engineer
Member	Tsuneo WATANABE	Senior Industrial Economist
Member	Tomoyoshi KARIYA	Senior Industrial Economist
Member	Takeshi TSUJI	Planning Advisor Ministry of International Trade and Industry
Member	Eiichi SEKI	Coordinator Japan International Cooperation Agency

iv) Field Survey

The team conducted the field survey from November 27, 1976 to December 20, 1976. The team devoted much of its time for gathering the information by way of interviews with the government officials and people at management levels of private firms, which the members of the team visited their manufacturing plants also. A considerable amount of the published information was also collected for the later systematic analysis. The basic objectives of the field survey were set forth as follows:

1. Market identification;

2. Technology analysis-skills inventory and supporting industries;

3. Analysis of managerial and sales-promotional capability.

The team worked out an interim report on the basis of the above-mentioned activities and submitted the report to the El Salvador Government before the team's departure from El Salvador.

The following are the activities in detail of the team in El Salvador.

Date	Place	Remarks
Nov. 27 (Sat.)		Leave Tokyo
Nov. 28 (Sun.)		Arrive in San Salvador Courtesy call to the Japanese Embassy
Nov. 29 (Mon.)	San Salvador	Visits to Ministry of Planification and INSAFI Meeting with the counterteam
Nov. 30 (Tue.)	San Salvador	Visits to UNDP, Ministry of Agriculture, Central Bank, and private firms*
Dec. 1 (Wed.)	Acajutla Santa Ana San Salvador	Visits to Acajutla and Santa Ana Areas, Ministry of Labor and Public Work, and private firms*
Dec. 2 (Thu.)	San Salvador	Visits to private firms*
Dec. 3 (Fri.)	San Salvador	Visits to Ministry of Economy, CEL, ANDA, and private firms*
Dec. 4 (Sat.)	San Salvador	Meeting with the counterteam
Dec. 5 (Sun.)	San Salvador	Putting the information in order
Dec. 6 (Mon.)	San Bartolo	Visits the free zone
Dec. 7 (Tue.)	San Salvador	Visits to private firms*
Dec. 8 (Wed.)	Guatemala City	Leave for Guatemala City Visits to ICAITI, SIECA, and private firms*
Dec. 9 (Thu.)	Guatemala City	Courtesy call to the Japanese Embassy in Guatemala. Interim meeting of the survey team. ISHIKAWA, WATANABE, and KARIYA Leave for Tokyo.
Dec. 10 (Fri.)	Guatemala City	Visits to ICAITI and UNDP
Dec. 11 (Sat.)	Guatemala City	Visits to private firms* Back to San Salvador
Dec. 12 (Sun.)	San Salvador	Putting the information in order
Dec. 13 (Mon.)	Comalapa	Visits to National Technical School and the New Airport site.
Dec. 14 (Tue.)	Santa Ana San Salvador	Visits to Technical College, Ministry of Economy, and private firms*
Dec. 15 (Wed.)	San Salvador	Final meeting of the team. The meeting with the Japanese Ambassador and his staff.

Date	Place	Remarks
Dec. 16 (Thu.)	San Salvador	Presentation of the interim report to Ministry of Planification and INSAFI
Dec. 17 (Fri.)		Leave for Tokyo Stop at Los Angels
Dec. 18 (Sat.)		Leave from Los Angels
Dec. 19 (Sun.)		Arrive in Tokyo

Note*: List of Private Firms Visited.

Agritrop (Guatemala)
ALDECA
Almacen Sagrera
ARCO

CAESS
Carlos Aviles
Casa Ama
Casa Castro
CEFESA
CELSA
CORINCA
COMSA

Empressa Electrica (Guatemala)

Fabrica Superior

HAZAMA-GUMI

IMACASA
IMSA
INCO
INDE (Guatemala)
INDECA
INSINCA
ITOH C.
IUSA

METASA

National de El Salvador

OXGASA.

Salvador Machinery
Saquiro
SIDEPASA
Sumitomo

TELEVOX

SUMMARY AND CONCLUSION

SUMMARY AND CONCLUSION

This study was conducted to identify feasibility of developing metal-mechanical industry in the Republic of El Salvador. The scope of work includes the following:

1) To analyze economic position of El Salvador and identify the role of metal-mechanical industry in the new Five Year Development Plan (1978-1982) and also to review basic policies related to the development objectives.

2) To review prerequisites for the development and to select appropriate industries to be located in El Salvador.

3) To select appropriate sites for the development.

4) To investigate economic and financial feasibility of the four metal-mechanical projects proposed by the Government of El Salvador.

5) To estimate and evaluate the impacts of the development and to identify strategies for the development.

CONCLUSIONS

1. TARGETS FOR INDUSTRIALIZATION OF EL SALVADOR

Actual economic growth achieved during the period of 1971 to 1975 reached 4.8% per annum and industrial sector of the GDP increased 4.5% every year for the same period. These are favorably compared with target figures of the previous Five Year Plan (1973-1977), 5.6% and 8.3% respectively, regardless of world-wide economic depression in 1974 to 1975. Taking into account of the high potential of economic growth and high population growth rate of 3.0% per annum in El Salvador, economic and industrial development for the next five years from 1977 to 1982 should aim at the following target figures (Table l).

Table 1 Targets of Industrialization for the period from 1977 to 1982

	Unit	Target in 1982	Average Growth Rate for 1977 to 1982
*GDP	1971 MM ¢	4,887	6.0
*GDP, Industrial Sector	1971 MM ¢	1,075	8.6
*Ratio of Industrialization	%	22.0	
*Gross Industrial Output(GIO)	1971 MM ¢	2,829	9.2
*GIO, Metal-Mechanical Sector	1971 MM ¢	340	17.9
*Apparent Consumption, Metal-Mechanical Sector	1971 MM ¢	725	10.6
*Apparent Self-Sufficiency, Metal-Mechanical Sector	%	25.0	
*Employment Target, Metal-Mechanical Sector	No. of Workers	18,000	11.0

2. REVIEW ON INFRASTRUCTURE AND MAN POWER NEEDED FOR THE DEVELOPMENT OF METAL-MECHANICAL INDUSTRY IN EL SALVADOR

Apart from industrial water supply and waste-water drainage, there are few bottlenecks which will deter the development. Since the metal-mechanical industry requires relatively small quantity of water, only potential problem to be considered is waste-water from electroplating.

The metal-mechanical industry in El Salvador currently employs between 5,000 to 11,000 people, depending upon statistics one looks into. Annual increase of employment is, however, not exceeding a hundred, resulting in excess supply of graduates from universities and technical colleges which number 600 every year. Supply of unskilled labourers is abundant except for harvesting season of coffee. Man power in real need in El Salvador includes highly skilled workers and trained engineers. Therefore, establishment of a training center, serving solely for this purpose, is recommended.

3. CONCEPTUAL FRAMEWORK OF THE DEVELOPMENT

Prime objectives of the development include import substitution, industrialization, increase of foreign currency earning and increase of employment. The following policies are to be formulated in order to attain the objectives.

1) To promote transfer and implantation of foreign technologies, in particular, to raise the level of machining and assembling technology.

2) To grasp characteristics of potential markets, particularly export market, for Salvadorean metal-mechanical projects and to select projects which meets the needs of the markets. In other words, to take full advantage of geographical and other features of El Salvador.

3) To achieve "El Salvador" type development in which industrialization aims at optimum conbination of import substitution and export outside the regional market, purposely to avoid the export-oriented "Hong Kong" type development.

4) In locating metal-mechanical industry in El Salvador, industrial promotion policies such as preferential treatment of financing, development of industrial estates and training centers, development of various subsidy systems, etc. should be utilized in order to supplement the weak international competitiveness of the industry at its starting period.

5) Careful consideration should be given to the adoptation and application of the common tariff system, industrial adjustment, common foreign exchange system, handling of assembly industries within the Common Market since negative effects of these systems are expected on the development of metal-mechanical industry at its beginning stage in El Salvador.

4. MARKETS FOR THE PRODUCTS OF EL SALVADOR METAL-MECHANICAL INDUSTRY

El Salvador alone does not form a sufficient market for the projects so the common market should be considered as minimum size as the market. However, some of labor-intensive products may be exported to North American markets by using the preferential tariff system. As other markets exports to the outside areas of the common market via Panama and to Latin American countries may be considered.

Problems attached to the exports to the outside areas of the common market and countermeasures to the problems are as follows:

1) Markets with preferential tariff systems in developed countries should be competitive with products made in Korea, Taiwan, Hongkong, Mexico, Brazil, and other countries. Thus, in order to enter the markets in developed countries joint-ventures with indegenous companies may be effective to share a part of the market. Also, active marketing through distribution channels may turn out to be effective.

2) In order to market metal-mechanical products some competitiveness other than price is also required such as quality, delivery date, and service. Thus, it seems necessary to introduce foreign technology, to carry out assembly production by knock down, and to utilize the existing service network at the beginning of production.

5. A STUDY OF PRODUCTION PATTERN AND TECHNOLOGY OF METAL-MECHANICAL INDUSTRY

In developing metal-mechanical industry in El Salvador possible combinations between production patterns and products are shown in Table 2 below.

Table 2

	Production Patterns	Examples of Products
I.	Products or functional parts are manufactured by simple fabrication or assembly.	+ Integrated circuits + Hand tools
II.	Ratio of domestic supply of parts for the existing assembly lines is increased.	+ Electrical refrigerators + TV Receivers + Air conditioners + Photographic cameras
III.	Assembly production starts with complete knock-down (CKD) or with CKD with some domestically produced parts.	+ Agricultural machinery except farm tractors + Metal-working machines + Water pumps + Electrical measuring instruments and meters
IV.	Assembly production starts with semi-knock-down (SKD) and gradually shifts to CKD.	+ Automobiles, esp. passenger cars + Farm tractors + Wire telecommunication equipment + Engines

Among required technologies to develop the industry, high level metal processing technologies must be introduced from developed countries. Especially, machining with high précision, castings of cast irons by sandmolding, metal mold with high precision, etc. must be established quickly. In addition to these technologies, inspection techniques of materials and products, and industrial standardization should be established also.

6. INDUSTRIES TO BE DEVELOPED WITHIN METAL-MECHANICAL INDUSTRY IN EL SALVADOR

In order to select specific industries which should be fostered in El Salvador within metal-mechanical industry, general selection standards are used such as improvement of the balance of trade, import subsitution and export promotion, increase in employment, industrialization, market ability of products, levels of skills, etc. In addition to these factors special characteristics of Central America were considered and the result of the selection is shown in Table 3 below. The selection of industries differs slightly from that done by the El Salvador government due to the emphasis on marketability of the products.

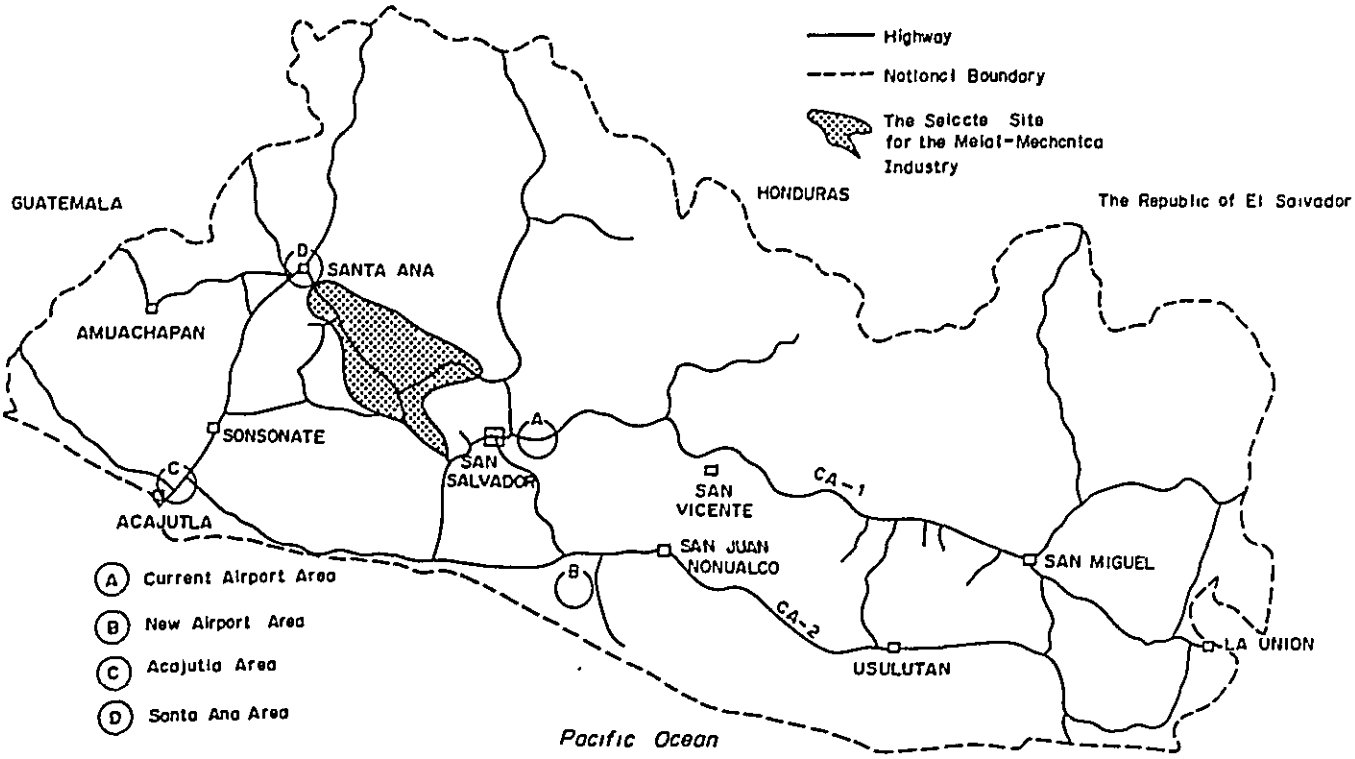
The El Salvador government specifically requested the JICA Mission to conduct economic evaluation on the following projects:

(1) Farming machinery and equipment;
(2) Meters for water, gas, and electricity;
(3) Small Compressor and engine;
(4) Hand tools for metal processing.

As the result of the field survey conducted in El Salvador by the mission, the small size farming tractor, electric meter, refregirator compressor, and hand tools were selected for further detailed economic evaluation, the results of which are described below.

7. SELECTION OF LOCATION FOR METAL-MECHANICAL INDUSTRY

The results of the field survey by the mission about location is as follows: The mission believes the area between Santa Ana and San Salvador be most appropriate for the location as shown in Figure 1, considering mild climate preferable



Source : The JICA Mission

Figure 1 Candidate Sites for Industrial Estates for the Metal-Mechanical Industry

Table 3 Metal-Mechanical Industrial Sectors Selected for Development in El Salvador

ISIC	NAUCA	Selected Industrial Sectors	Final Result	Projects Selected by El Salvador
38111	699-12-02	Machinist Hand-Tools	Recommended	Yes
38113	699-07-01	Nails, Bolts, Nuts, Washers, Rivets and Screws	Appropriate	No
	699-18-01	Locks, Padlocks, Keys, Fittings for Doors, Windows, Furniture, etc., of Iron and Steel	Recommended	Yes
	699-18-02	Locks, Padlocks, Keys, Fittings for Doors, Windows, Furniture, etc., of Bronze and Brass	Recommended	Yes
	699-29-02	Chains and Parts of Metals	Recommended	No
	716-15-01	Taps, Cocks, Valves and Similar Appliances	Recommended	Yes
38131	699-05-03	Nets, Fences and Gratings, of Wire or Expanded Metal	Appropriate	No
38132	699-18-03	Locks, Padlocks, Keys, Fittings for Doors, Windows, Furniture, etc., of Aluminium	Recommended	Yes
38191	716-13-18	Molds for Foundry, Glass and Plastic Forming, etc.	Appropriate	Yes
38210	711-05-01	Diesel and Semi-Diesel Engines	Appropriate	No
38221	712-02-01	Agricultural Machinery and Appliances for Harvesting, Threshing and Sorting	Appropriate	Yes
	713-01-00	Tractors	Recommended	No
38231	716-04-00	Machine Tools for Working Wood, Cork, Plastics, etc.	Appropriate	Yes
38291	699-29-02	Demestic Cooking Ranges and Ovens, Toasters, Non-electrical	Recommended	No
38292	716-12-01	Air Conditioning Machines and Equipment	Recommended	No
38311	721-01-02	Electric Motors	Appropriate	Yes
	721-01-04	Transformers, except for Electronic Equipment	Appropriate	Yes
	721-01-05	Electrical Apparatus for Making and Breaking or for Protecting Electrical Circuits (Switchgears, Rheostats)	Appropriate	No
	721-07-00	Other Electrical Articles and Accessories for Automobiles	Appropriate	No
	721-08-01	Electrical Measuring Instruments and Meters	Appropriate	Yes
	721-12-01	Portable Electro-Mechanical Hand Tools	Appropriate	No
38322	721-04-04	Electronics Parts (Condensors, Filters, Resistors, etc.)	Appropriate	Yes

Table 4 Selection of Sites for Metal-Mechanical Industry in El Salvador

Selection Criteria	San Salvador	New International Airport	Acajutla	Santa Ana	Mid Zone between San Salvador and Santa Ana
1. Land and Economic Infrastructure (Land Availability, Electric Power, Water Supply, Drainage, Transportation, Telecommunication)	Good	Not Clear	Good (Transportation to San Salvador : Fair)	Good (Water and Land Availability : Fair)	Not Clear (Largely Dependent on Future Development)
2. Convenience for Business and Transactions	Good	Not Good	Not Good	Fair	Good+
3. Man Power Availability	Good	Not Good	Not Good	Fair	Good+
4. Social Infrastructure	Good	Not Clear	Not Good	Not Good	Good+
5. Regional Development Program	Existing	Existing	Existing	Not Existing	Not Existing

+ Dependent on San Salvador

to metal-mechanical industry and other selection standards shown in Table 4. The reason may be stated as follows:

1) Labor is available from both cities;

2) Social infrastructure in San Salvador city may be used;

3) From the national development plan's viewpoint, the specified area may be developed along with the line connecting both poles;

4) Existing road networks in the area are well developed;

5) Little problem is expected for water supply;

6) 60 to 50 acres of land are easily obtainable, which are large enough for a metal-mechanical industrial estate.

8. ECONOMIC EVALUATION OF WATTHOURMETER MANUFACTURING PROJECT IN EL SALVADOR

Including El Salvador demand for watthourmeters (WHM) in Central Latin

America is estimated and shown in Table 5.

Table 5 Estimated Market of Watt-Hour Meters

Unit: Units/Year

	1976	1980	1985
Central American Regional Market	90,000	118,000	154,800
Salvadorean Market	15,000	21,000	28,500

In addition to this market the Panamanian export market with annual 20,000 units may be included. However, in these markets the specification of WHM is different so in order to calculate the estimates of demand for WHM the specification will be eventually integrated into a bottom-connected type. The profit statement, though in brief form, is presented in Table 6 below for the WHM manufacturing operation at the starting period in El Salvador:

Table 6 Estimated Profit and Loss Statements for the Watt-Hour Meter Project in 1980

Unit: 1976 US 1,000$

	1. El Salvador Domestic Market SKD Assembly 21,000 units/year	2. Central American Regional Market SKD Assembly 118,000 units/year	3. Central American Regional Market CKD Assembly 118,000 units/year	4. Central American Regional Market Regional Self-Sufficiency 10-20% 118,000 units/year
Sales	271	1,732	1,732	1,732
Manufacturing Cost	378	2,253	2,108	2,125
Gross Profit	- 107	- 521	- 376	- 393
Profit before Tax	- 167	- 637	- 506	- 661

As seen from the Table, each case shows the negative result.

Among the four cases shown in Table 6, Case 3, CKD assembly aiming at the Central American regional market, seems to be most hopeful so that the production activity of this case was assumed to continue up to 1985. For these continuous long-run activity, discounted cash flow (DCF) analysis was applied in order to test investment efficiency of the project. As the result, the total amount of investment, about 310 thousand US dollars will not be recovered from the project operation by 1985. Thus, the conclusion was that the project is not financially feasible. However, if a 20 percent increase in price of WHM and a 5% down of imported materials are realized, the internal rate of return (IRR) will become 5.7 percent p.a., which is a hopeful result. In other words, if the price of WHM in the region is to be raised by 20 percent or if the government's development funds are available for the project, say 100 thousand dollars, the project will become feasible even for the private business operation and investment.

9. ECONOMIC EVALUATION OF FARM TRACTOR MANUFACTURING PROJECT IN EL SALVADOR

In Central Latin America, the number of tractors currently held will be totaled about 39,000 units, including some 4,000 units in El Salvador. In the near future, the demand for tractors is expected to grow rapidly and the sizes of tractors demanded will be polarized into a large type and a small type. Under these condition this report selected a small type tractor with 12.5 H.P. for economic evaluation. Production scale for tractor is estimated as follows:

Table 7 Markets for Farm Tractors

Unit: Units/Year

	1980	1985
Central American Regional Market	720	840
Salvadorean Market	84	126

Combinations of production patterns and markets at the starting period of 1980 result in the following financial statement:

Table 8 Estimated Profit and Loss Statements for the Farm Tractor Project in 1980

	1. El Salvador Domestic Market SKD Assembly 84 units/year	2. El Salvador Domestic Market CKD Assembly 96 units/year	3. Central American Regional Market SKD Assembly 720 units/year	4. Central American Regional Market Partial Self-Sufficiency 840 units/year	5. Central American Regional Market CKD Assembly 840 units/year
Sales	239	272	2,045	2,385	2,385
Manufacturing Cost	527	466	2,366	2,911	2,863
Gross Profit	- 288	- 194	- 321	- 526	- 478
Profit before Tax	- 376	- 323	- 512	-1,392	- 707

As seen from the above Table, cases other than SKD production aiming at the CACM five countries do not seem feasible. The relatively hopeful SKD case was extented to 1985 and DCF analysis was applied to production operation for 1980 to 1985. The result indicates that if the current price for the tractor is maintained, the amount of investment for this project, about 870 thousand US dollars, will not be recovered. However, if 25 percent increase in the price of imported tractors (CIF priced, that is) is assumed, IRR becomes 10. 8 percent, which indicates a feasibility of the project. Thus, it seems necessary to support the price of the tractors supposed to be manufactured in El Salvador by arranging exfactory prices of the tractors within CACM to increase 25 percent or by financing through the government industrial development funds or the export subsidy.

10. ECONOMIC EVALUATION OF HAND TOOLS MANUFACTURING PROJECT IN EL SALVADOR

Wrenches which are one of the most basic hand tools are selected for the development project. The reasons are as follows: wrench manufacturing has a flexibility in investment plans; manufacturing processes are labor- intensive and; it seems possible that by Japanese makers' cooperation their market shares in the U.S. may be also shared by the El Salvador manufacturer.

If 7.5 to 15 percent of Japanese shares of the wrench market in the U.S. are shared by the El Salvadorean maker, the market size may be estimated as follows:

Table 9 Estimated Market Size for Exportation of Hand Tools from El Salvador

Unit: 1976 US 1,000$

	1979	1980	1981	1982	1983	1984	1985
Case 1	750	950	1,200	1,450	1,700	1,950	2,200
Case 2	190	240	300	547	850	977	1,100

Given these estimates of the demand for wrenches, the financial statement for 1979 to 1985 becomes as shown in Table 10 below with the assumption that the wrench manufacturing plant be built in El Salvador.

Table 10 Estimated Profit and Loss Statements for the Hand Tool Project in 1979 and 1985

Unit: 1976 US 1,000$

	Case 1		Case 2	
	1979	1985	1979	1985
Sales	750	2,200	190	1,100
Manufacturing Cost	611	1,378	278	806
Gross Profit	139	822	-88	294
Profit before Tax	-31	634	-248	119

In order to compare Case 1 and Case 2 in Table 10, DCF analysis was applied. The results were that in Case 1 IRR would become negative while in Case 2 IRR became 25 percent.

11. ECONOMIC EVALUATION OF COMPRESSOR (FOR REFRIGERATOR) MANUFACTURING PROJECTS IN EL SALVADOR

In Central American countries both El Salvador and Costa Rica have assembly plants for refregirators for house-hold usages and estimated 70 to 80 thousand units of compressors seem to be imported annually. By judgeing the export trend of compressors from Japan to these countries the major type of imported compressors is a compressor of 125W or so. The total demand for compressors in Central America is shown in Table 11. However, exports of compressors from El Salvador to the outside of the CACM region seem quite difficult because of price, brand image, service system, etc. Based on Table 11, estimated outputs are 40,000 in 1980, 70,000 in 1971, 100,000 in 1982, 120,000 in 1983 and thereafter. Production patterns shift from CKD assembly at the starting period in 1980 to production with 100 percent domestically produced parts in 1985. Under various conditions, the following financial statement may be obtained as shown in Table 12.

Table 11 Estimated Demand in Small Compressors for Refrigerators

Unit: 1,000 Units/Year

	1980	1981	1982	1983	1984	1985
New Demand						
El Salvador	45	47	49	51	53	55
Costa Rica	40	41	42	43	44	45
Replacement Demand	15	16	17	18	19	20
Total	100	104	108	112	116	120
Demand in Output						
75 to 125 Watts	75	76	77	78	79	80
more than 140 Watts	25	28	31	33	37	40

Table 12 Estimated Profit and Loss Statements for the Small Compressor Project for the Year 1980 to 1985

Unit: 1976 US 1,000$

	1980	1981	1982	1983	1984	1985
Sales	2,351	3,479	4,600	5,508	5,260	5,260
Manufacturing Cost	1,400	2,913	2,885	3,392	2,885	2,909
Gross Profit	951	1,286	1,715	2,116	2,375	2,351
Profit before Tax	300	352	1,269	1,658	1,946	2,183

Table 12 shows good financial results. However, if DCF Analysis is applied with 15 percent p.a. discount rate, IRR becomes negative so investment efficiency can not be expected. This is due to the assumption that because of a continuous shift of production pattern described above investment must be also continuous. Thus, if the longer period is taken for DCF analysis, the project may turn out to be feasible. However, it should be noted that the unit price of the compressors are assumed to be 2.2 times in 1980 and 1.6 times as much as the current price. Additionally, if the fact that about 10 percent of the cost of regregirators is due to the compressor, the above result does not seem to indicate much of a feasibility of the project.

12. DEVELOPMENT EFFECTS OF THE FOUR SPECIFIED PROJECTS

Foreign exchange earnings, technology transfer, employment and income, industrial linkages, pollution, monopolistic trends, unbalanced distribution of comestic resources, etc. are chosen as development effects possibly caused by developing the four projects, and merits and demerits of effects of effects are studied.

Foreign exchange earnings are estimated as shown in Table 13. Except the first year, foreign exchange earnings will be increased by exports. On the other hand, employment effects are 89 employed in the WHM projects, 46 in the tractor projects, 60 in the wrench project, and 131 in the compressor project. Total 326 are expected to be employed so employment effects may be concluded small.

Table 13 Estimated Balance of Foreign Exchange for the Four Projects

Unit: 1976 US 1,000$

	1979	1980	1981	1982	1983	1984	1985	Total
Watt-Hour Meter	-105	567	604	642	681	721	762	3,872
Farm Tractor	-128	235	262	298	-4	370	405	1,438
Wrench	-597	413	513	663	897	1,136	1,308	4,232
Small Compressor	-516	3,631	4,279	4,960	5,745	8,190	8,792	35,086

The results of qualitative analysis for each factor are shown in Table 14 below. Except the wrench projects profitability of the projects, if carried out on private base, are not good. However, the development of the three projects other than the wrench project may be conditionally possible from the viewpoint of developing the national economy and the viewpoint that the development of these project are preferable.

Table 14 Results of the Final Evaluation of the Four Projects

	Watt-Hour Meter	Farm Tractor	Wrench	Small Compressor
1. Results of Micro Analysis				
Profitability	Not Good	Not Good	Good	Not Good
2. Results of Macro Analysis				
Foreign Exchanges	Fair	Fair	Good	Fair
Technology Transfer	Good	Good	Good	Good
Employment	Fair	Fair	Fair	Fair
Income	Good	Good	Good	Good
Industry Linkage Effects	Good	Good	Fair	Good
Pollution	Good	Good	Fair	Good
Monopolistic Trends	Possible	Possible	Possible	Possible
Resource Segregation	Possible	Possible	Possible	Possible
3. Development or Not	Conditional	Conditional	Recommended	Conditional

13. DEVELOPMENT SCHEDULE FOR METAL-MECHANICAL INDUSTRY IN EL SALVADOR

The following products are considered to be produced by metal-mechanical industry in El Salvador: I) simple parts, II) complex parts, III) simple products, IV) intermediate products, V) low level assembly products, and VI) high level assembly products. Combinations of these parts and products may lead to some development patterns.

A. Reinforcing existing metal mechanical industry - the short-run objective.

B. Meeting the demand in the CACM region. To do so considerations may be given to governmental aids or protective systems - the medium term objective.

C. Fostering industries which are exporting products to the outside of the CACM region. To do so strengthening international competitiveners - the long run objective.

Figure 2 shows some of the concrete steps to achieve these objectives. As shown in the Figure the structure of products should be changed stepwise, leading to achieve the long run objective by measuring the timing of introduction of technology, exploiting the markets, etc.

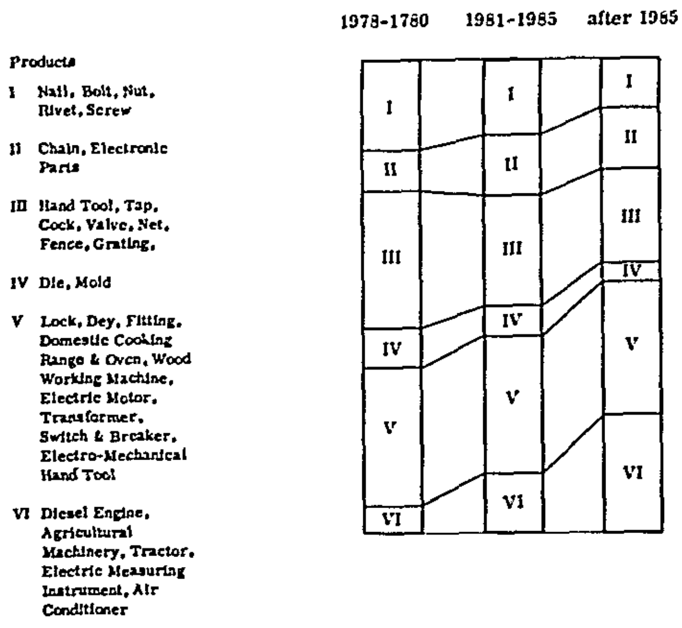


Figure 2 Schematic Example of Development Schedule for Metal-Mechanical Industry in El Salvador

14. STRATEGIES FOR THE DEVELOPMENT OF METAL-MECHANICAL INDUSTRY IN EL SALVADOR

As shown in Table 15, various strategies may be considered. Among these, financial direct assistances seem most important, which may be the main reason why the protective tariff system for the products of metal-mechanical industry in CACM has not been flexibly operated.

With respect to the aforementioned four projects the following points should be carefully considered in addition to general strategies:

1) WHM: Integration of specifications of products within CACM. An establishemtn of a WHM manufacturing plant by joint-venture among power companies in CACM. An attempt by CEL to produce WHM both for users and research and development.

2) Farm Tractor: SKD assembly production. Price differentials with large-type tractors.

3) Hand Tool: Smooth technology transfer. Flexible agreement with respect to fixing royalty rates.

4) Compressor: Adjustment with Costa Rica. Efforts of technology transfer.

Table 15 Strategies for the Development of Metal-Mechanical Industry in El Salvador

	Direct Assistance	Indirect Assistance	Others
1. Financial	+ Long-Term Loan with Low Interest for the Development + Subsidy Systems for the Development + Export Financing System (Export Subsidies)	+ Finance for Purchase of Domestically Made Machinery + Subsidy on Feasibility Studies of Projects	
2. Tax	+ Exemption from Import Duty on Equipment for Metal-Mechanical Industry * + Inter-Regional, Bilateral or Trilateral Common Protection Tariff * + Accelerated Depreciation and Exemption from Direct Tax		
3. Institutional		+ Formation of a Center for Metal-Mechanical Industry + Formation of an Organization for Export Marketing	+ Establishment of Industrial Standards + Gathering Technical Information and Distribution
4. Infrastructure	+ Construction of Industrial Estates for Metal-Mechanical Industry	+ Ample Supply of Water + Development of Social Infrastructure in the Vicinity of the Industrial Estates	+ Formulation of Regional Industrialization Programs
5. Incentives for Foreign Capitals		+ Observance of the Existing Overseas Remittance Systems -- Capital and Profit + Flexible Application of the Foreign Exchange Control on Remittance of Royalty + Flexible Control on Employment of Foreigners	+ Foreign Investment Guarantee Agreement + Overseas Public Relations + Preparation of Investment Guidebook for Foreign Enterprises
6. Man Power	+ Training Able Engineers and Skilled Labourers	+ Exemption of Training Costs from Income	+ Skill Grading and Qualification System

* To be negotiated with other countries in CACM

I. THE PRESENT ECONOMIC SITUATION AND THE INDUSTRIAL DEVELOPMENT PLAN OF EL SALVADOR

I. THE PRESENT ECONOMIC SITUATION AND THE INDUSTRIAL DEVELOPMENT PLAN OF EL SALVADOR

1. The Manufacturing Sector and the Metal-Mechanical Industry under The National Development Plan

1) Gross Domestic Product and Manufacturing Industry

The market values of Gross Domestic Product (GDP) achieved in El Salvador are compared with target figures for the same periods in Table I-1-1. Whereas the average annual GDP growth rate expected under the 1973-1977 Five-Year Development Plan was 5.6%, the actual performance was 4.8%. The 97% accomplishment of target must be highly evaluated in view of the oil crisis and the subsequent economic slowdown experienced throughout the world during this period.

Of the components GDP, sectoral targets were achieved in personal services, housing, finance, construction, and mining. Production in other sectors fell below the target---particularly in manufacturing, which accomplished only 87% of the target in 1975. This industry grew annually at an average rate of only 4.5% during 1971-1975. As the consequence, the ratio between the output of the industrial sector to GDP (or the rate of industrialization) declined from 19.2% in 1971 to 19.0% in 1975 (see Table I-1-2). The target value of industrial value added for 1977 was set 27.7% higher than the record of 1975. Achieving such a large increase value within two years--1976 and 1977-- was considered difficult. For this reason, the Government had the following prospects for 1976/77 at the time of the 1975 program review:

	A. Gross Domestic Product	B. Industrial Sector	Composition Ratio(B/A)
1975	3,272.2	620.0	18.9
1976	3,468.8	664.0	19.1
1977	3,652.3	711.4	19.5

The 1977 figures above will be used as the base for future planning framework in this study.

Table I-1-1 GROSS DOMESTIC PRODUCT: TARGET VS. ACTUAL

(in ₵ million in 1971 price)

	1971 Actual	1973 Target	1973 Actual	1975 Target	1975 Actual	1977 Target	1977 Actual
GROSS DOMESTIC PRODUCT	2,703.9	2,984.3	2,985.1	3,368.5	3,267.5	3,900.4	--
Agriculture & Stock-farming	729.0	789.8	752.4	869.1	854.2	912.6	--
Mining	4.3	5.9	5.1	6.5	6.6	6.8	--
Manufacturing	519.3	587.5	575.5	709.4	620.0	791.9	--
Construction	80.1	97.2	87.9	117.5	124.3	131.1	--
Utilities	40.3	52.1	48.9	62.9	56.9	69.6	--
Transportation & Communication	131.6	148.8	143.1	168.2	150.6	179.6	--
Commerce	587.1	635.5	670.1	705.7	710.0	755.7	--
Finance	62.1	74.7	81.2	88.7	93.6	96.7	--
Housing	100.3	101.3	110.9	106.5	118.9	109.3	--
Government	219.0	246.0	254.6	267.3	252.8	278.8	--
Personal Services	230.8	245.5	255.4	267.1	282.9	279.4	--

Source: Target: Plan Desarrollo Economico y Social, 1973-1977.
Actual: Apendice Estadistico

Table I-1-2 SHARE OF THE MANUFACTURING SECTOR IN GROSS DOMESTIC PRODUCT

	1971	1972[1]	1973[1]	1974[1]	1975[1]	Average[1]
A. GDP (₵ million)[2]	2,703.9	2,856.6	2,985.1	3,156.5	3,272.2	
Annual Growth Rate (%)	-	5.6(5.0)	4.5(6.0)	5.7(6.0)	3.5(6.5)	4.8(5.6)
B. Manufacturing Sector (₵ million)[2]	519.3	539.4	575.5	604.1	620.0	
Annual Growth Rate (%)	-	3.9(6.4)	6.7(7.1)	5.0(9.4)	2.6(10.3)	4.5(8.3)
C. Composition Ratio of Industrial Sector to GDP (B/A) (%)	19.2	18.9(19.5)	19.3(19.7)	19.1(20.3)	19.0(21.1)	

Source: Diagonostico del Sector Industrial, 1971-1975
Note 1: Figures in parentheses represent 5-year Development Plan targets.
Note 2: Actual, in 1971 price.

2) Gross Industrial Output

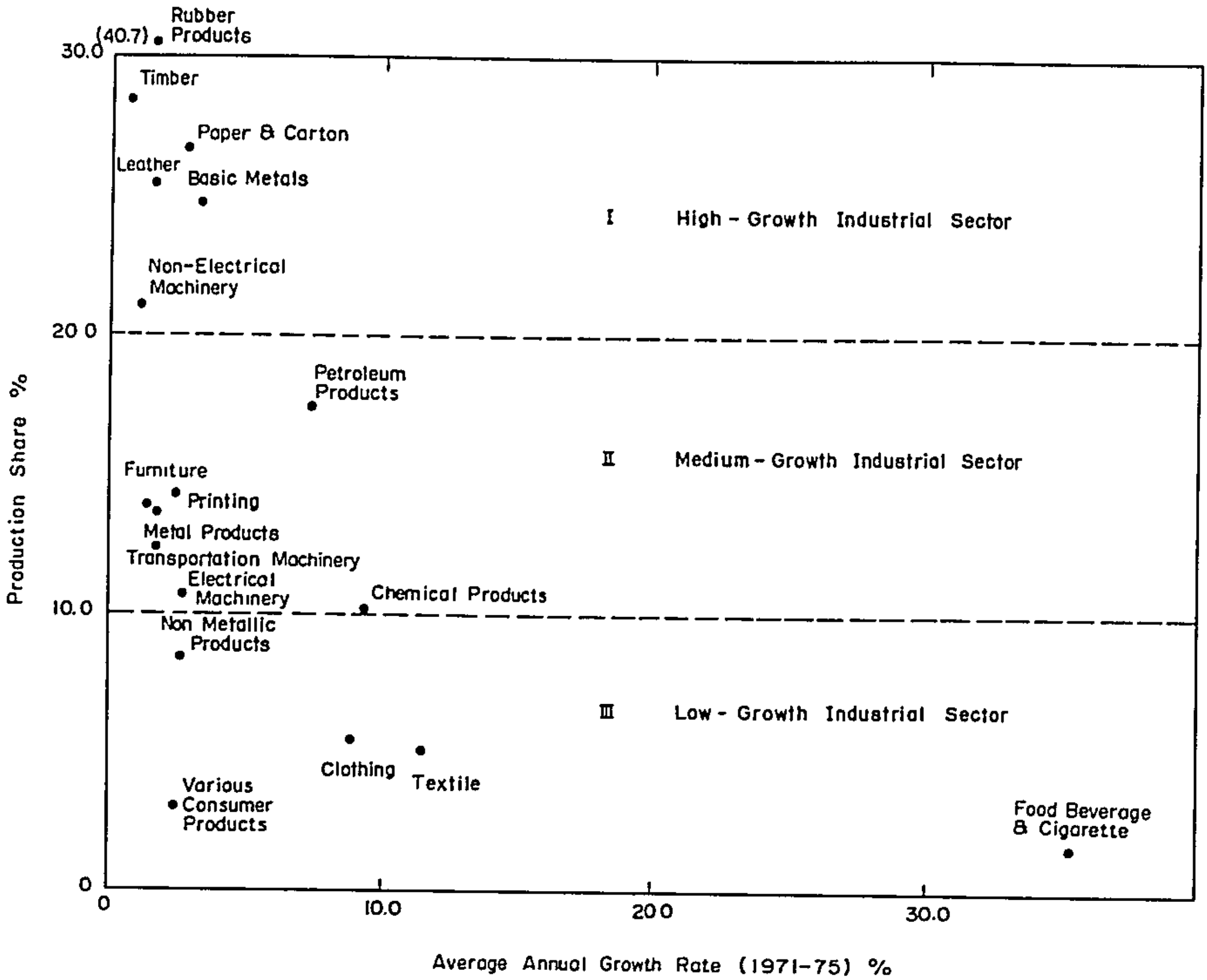
Gross industrial output statistics is shown in Table I-1-3. Major slowdown in output was observed in consumer goods, followed by consumer durables and capital goods, and then by intermediate goods. It is apparent that the decline of the overall growth rate of gross industrial output can be mainly attributable to the decline of consumer goods, which represent nearly 70% of total output, and in particular to foodstuff, texile, and footwear/clothing which constitute 86% of consumer goods (see Table I-1-4). Of intermediate goods, output of rubber products, paper/cartons, basic metal products, and petroleum products grew substantially. This indicates that industrialization has been progressing steadily. Products in durable consumer goods and capital goods sections, which represents the metal-mechanical industry subject to this study, all showed high growth rates.

Table I-1-3 GROSS INDUSTRIAL OUTPUT: COMPONENTS AND GROWTH RATES

	1971		1972		1973		1974[1]		1975[1]		Average Annual Growth Rate
	Value[2]	Growth Rate(%)	Value[2]	Growth Rate(%)	Value[2]	Growth Rate(%)	Value[2]	Growth Rate(%)	Value[2]	Growth Rate(%)	1971-1975
GROSS INDUSTRIAL OUTPUT	1108.4	-	1148.5	3.6	1300.7	13.3	1404.9	8.0	1476.2	5.1	7.1
	(100.0)		(100.0)		(100.0)		(100.0)		(100.0)		
Consumer Goods	813.7	-	824.5	1.3	904.7	9.7	942.5	4.2	953.8	1.2	3.7
	(73.4)		(72.5)		(72.7)		(70.6)		(68.9)		
Intermediate Goods	225.3	-	250.9	11.4	313.2	24.8	363.5	16.1	409.6	12.7	16.1
	(19.9)		(20.8)		(20.5)		(21.8)		(22.8)		
Durable Consumer and Capital Goods	69.4	-	73.1	5.3	82.8	13.3	98.9	19.4	112.8	14.1	12.9
	(6.7)		(6.7)		(6.8)		(7.6)		(8.3)		

Source: Apendice Estadistico del Diagonostico del Sector Industrial, 1971-1975.
Note 1: Estimated Figures.
Note 2: In millions of Colones in 1971 price and figures in parentheses represnet composition percentages.

Based on their growth performance during 1971-1975, products in the manufacturing sector can be classified by their growth potentials as follows:



Source : Table I-1-4

Figure I-1-1 Trend of Growth of Industries

Table I-1-4 GROSS INDUSTRIAL OUTPUT: TREND BY PRODUCT CATEGORY

	1971	1972	Changes (%)	1973	Changes (%)	1974	Changes (%)	1975	Changes (%)	Average Annual Growth Rate(%) 1971-1975
GROSS INDUSTRIAL OUTPUT	1,108.4	1,148.5	+3.6	1,300.7	+13.3	1,404.9	+8.0	1,476.2	+5.1	+7.1
Consumer Goods	813.7	824.5	+1.3	904.7	+9.7	912.5	+4.2	953.8	+1.2	+1.1
Food/Beverage/Tobacco	487.4	494.7	+1.5	528.1	+6.8	526.4	-0.3	522.3	-0.8	+1.7
Texitile	139.1	145.3	+4.5	161.6	+11.2	170.9	+5.7	169.7	-0.7	+5.1
Footwear/Clothing	106.0	106.1	+0.1	121.1	+11.1	123.5	+2.0	131.1	+6.1	+5.5
Timber/Lumber	3.6	4.5	+25.0	4.9	+8.9	8.3	+69.4	9.8	-18.1	+28.1
Furniture	14.1	11.4	+2.1	16.2	+12.5	22.0	+35.8	22.9	1.1	+12.9
Printed matter	19.9	19.4	-2.5	23.8	+22.7	29.7	+24.8	31.4	+15.8	+14.5
Leather product	10.3	10.6	+2.9	19.3	+25.5	20.3	+52.6	25.6	+26.1	+25.5
Miscellaneous	33.3	29.5	-11.4	35.7	+21.0	41.4	+16.0	37.7	-8.9	+3.1
Intermediate Goods	225.3	250.9	+11.4	313.2	+21.8	363.5	+16.1	409.6	+12.7	+16.0
Paper/Carton	17.0	17.8	+4.7	28.6	+60.7	33.0	+15.4	43.2	+30.9	+26.3
Rubber product	6.8	6.4	-5.9	12.1	+89.1	17.6	+45.5	26.7	+51.7	40.7
Chemical	93.7	109.4	+16.8	127.6	+16.6	126.9	-0.5	138.4	+9.1	+10.2
Petroleum product	57.1	63.3	+10.9	84.6	+33.6	102.3	+20.9	109.3	+6.8	+17.6
Npn-metal product	29.8	33.2	+11.4	35.6	+7.2	40.0	+12.4	41.3	+3.3	+8.5
Basic metal product	20.9	20.8	-0.5	21.7	+18.8	43.7	+76.9	50.7	+16.0	+21.8
Durable consumer and Capital goods	69.4	73.1	+5.3	82.8	+13.3	98.9	+19.4	112.8	+14.1	+12.9
Metal product	15.7	15.4	+1.9	18.5	+20.0	23,5	+27.0	26.4	+12.3	+13.9
Machinery (non-electrical)	7.9	6.8	-13.9	9.1	+33.8	13.3	+46.2	17.0	+27.8	+21.1
Electrical Machinery	28.0	32.1	+14.6	35.2	+9.7	39.1	+11.1	42.0	+7.4	+10.7
Transportation	17.0	18.8	+5.6	20.0	+6.4	23.0	+15.0	27.4	+19.1	+12.7

Source: Apendice Estadistico del Diagonostico del Sector Industrial Periodo 1971-1975.
Note: Values are in millions of Colones in 1971 price.

An analysis of value added in the manufacturing sector during 1971-1975 reveals that, during this period, the industry accomplished quantitative, rather than qualitative, growth. It is evident from Table I-1-5 that labor productivity (in terms of value added per worker) declined in all segments of the industry. The indicated productivity decline was an overall phenomenon, rather than a peculiarity of any specific Industrial sectors.

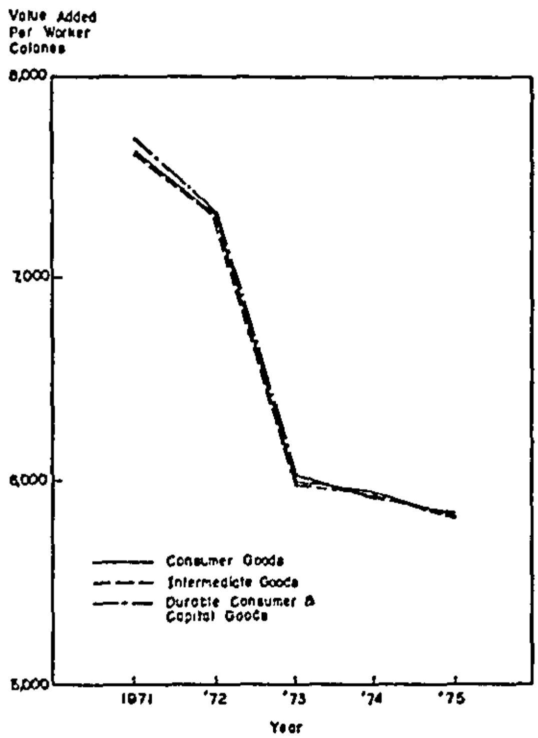
The decline in industrial value added per worker from 1971 to 1975 is shown graphically in Figure I-1-2. The decline is steep in 1972 and 1973, subsequent to which a moderate decline continues. The indicated deterioration of industrial productivity may not only affect adversely the economy of El Salvador as a whole, but also handicap her future commodity export to outside Central American Common Market by hampering international competitiveness of the commodities.

Productivity decline can also be understood in terms of a decreased ratio of value added to--or, conversely, an increased ratio of raw material cost to--gross industrial output. When this occurs, as it did in El Salvador (see Table I-1-6), profits of firms tend to be squeezed. In case of El Salvador, however, the cost increase seems attributable more to domestic price inflation than to increase in prices of imports, because the industry relies on import of 33.4% of raw materials in 1975--the remaining 66.6% is domestic origin--and the trend is believed to have changed little.

Table I-1-5 TRENDS OF VALUE ADDED, BY PRODUCT

	1971		1972		1973		1974		1975		1977 (Estimated)	
	Total (CMil.)	Per Worker (C)	Total (CMil.)	Per Worker (C)	Total (CMil.)	Per Worker (C)	Total (CMil.)	Per Worker (C)	Total (CMil.)	Per Worker (C)	Total (CMil.)	Per Worker (C)
TOTAL INDUSTRIAL PRODUCTS	519.3	7,625	539.4	7,303	575.5	6,007	604.1	5,949	620.0	5,830	711.1	6,186
Consumer Goods	381.1	7,624	390.8	7,298	418.5	6,009	426.8	5,953	427.3	5,832	470.8	6,186
Foods/Beverage/Tobacco	223.0	7,633	231.9	7,301	217.9	6,003	247.4	5,942	245.5	5,830	263.1	6,185
Textile	67.9	7,611	69.7	7,315	75.0	6,022	75.2	5,972	73.0	5,815	76.8	6,180
Footwear/Clothing	48.9	7,638	49.5	7,281	54.6	5,999	53.1	5,942	55.2	5,833	64.0	6,185
Timber/Lumber	2.4	7,059	3.1	6,998	3.1	6,472	5.0	6,158	5.7	5,956	7.8	6,166
Furniture	8.4	7,706	7.6	7,350	8.9	6,193	12.1	5,959	12.6	5,924	15.0	6,214
Printed matter	9.4	7,667	8.6	7,445	9.5	5,832	11.6	6,013	13.4	5,726	18.5	6,189
Leather product	4.2	7,706	4.3	7,288	4.7	6,136	7.1	5,824	8.7	5,843	12.1	6,192
Miscellaneous	16.9	7,521	15.9	7,175	14.8	5,941	15.3	6,026	13.2	5,911	13.5	6,181
Intermediate Products	103.1	7,608	112.3	7,309	117.8	5,998	131.6	5,945	141.2	5,824	174.2	6,196
Paper/Carton	6.6	7,458	6.7	7,562	7.1	6,174	7.6	5,758	9.5	5,956	13.5	6,181
Rubber product	3.5	7,338	3.3	7,449	3.7	5,514	5.1	6,273	7.2	5,613	12.8	6,187
Chemical	42.9	7,590	44.6	7,275	47.1	5,995	49.5	5,945	52.6	5,819	62.5	6,178
Petroleum product	25.1	7,678	27.5	7,300	28.3	6,029	30.7	5,928	31.7	5,845	37.0	6,169
Non-metal product	20.4	7,681	22.5	7,251	23.4	5,957	25.6	6,002	26.0	5,822	30.6	6,189
Basic metal product	4.6	7,504	7.7	7,447	8.2	6,115	13.1	5,864	14.2	5,805	17.8	6,193
Durable Consumer & Capital Goods	35.1	7,692	36.3	7,335	39.2	6,018	45.7	5,921	51.5	5,835	66.1	6,183
Metal product	7.4	7,765	7.4	7,157	8.1	6,040	10.1	5,852	11.1	5,799	14.2	6,177
Machinery (non-electrical)	5.3	7,783	5.0	7,519	5.5	5,741	7.7	5,833	9.7	5,703	13.5	6,161
Electrical machinery	14.9	7,544	16.0	7,470	16.9	6,084	18.0	5,907	18.9	5,925	22.0	6,173
Transportation Equipment	7.5	7,862	7.9	7,130	8.7	6,054	9.9	6,092	11.8	5,839	16.4	6,203

Source: Apendice Estadistico del Diagonostico del Sector Industrial, 1971-1975.



Source : Table I-1-5

Figure I-1-2 Estimated Trend of Productivity Measured by Value Added

Table I-1-6 TREND OF RAW MATERIAL COSTS AS PERCENT OF OUTPUT, BY PRODUCT GROUP

	1971	1972	1973	1974	1975 (Estimate)	1976 (Estimate)
TOTAL INDUSTRIAL PRODUCT	53.2	53.0	55.8	57.0	58.0	61.0
Consumer Goods	53.2	52.6	53.7	54.7	55.2	57.2
Intermediate Goods	54.2	55.2	62.4	63.8	65.5	69.7
Durable Consumer & Capital Goods	49.4	50.3	52.7	53.8	54.3	55.7
Metal product	52.9	51.9	56.2	57.0	58.0	60.0
Machinery (non-electrical)	32.9	26.5	39.6	42.1	42.9	44.9
Electrical machinery	46.8	50.2	52.0	54.0	55.0	57.0
Transportation equipment	57.9	58.0	56.5	57.0	56.9	57.0

Source: Apendice Estadistico del Diagonostico del Sector Industrial

Consumption remained unchanged from 1971 through 1977, and this is detrimental to manufacturing industry. In particular, inactive private consumtion, which represents three-fourths of total consumption, hindered development of an adequate price structure for manufactured commodities, in spite of the rise in raw material costs. This resulted, in turn, in reduction of firm profits, government tax revenue and a cutback on government expenditures. This vicious cycle situation is a serious and basic problem to create a low level of aggregate effective demand. A substatial increase in private consumption is called for.

3) International Trade

International balance of payments of E1 Salvador are shown in Table I-1-7. Surplus balance in capital transactions continued to compensate, at least partially, for deficit current balance during the period presented. Trade balance showed a substantial deficit since 1974 due to a rise in import prices. This situation, however, has been improved in 1976, due to a rise in coffee export price. Figure I-1-3 graphically shows the trade balance trend by commodity group. In 1975 the importation of all groups except machinery (including transportation equipments) tended to slow down as the exportation of foodstuff. A continued increase may be seen in the future in the importation of metal-mechanical products. Therefore, the future improvement in the trade balance position of E1 Salvador will depend largely on: (1) further increases in the export prices of coffee and other agricultural products: (2) the successful control of industrial product imports, particularly machinery, and in the longer run, (3) the control of net foreign exchange outflows by exporting more machinery. This observation is further supported by the fact that increase in the import values of durable consumer and capital goods have recently been substantial, as seen below.

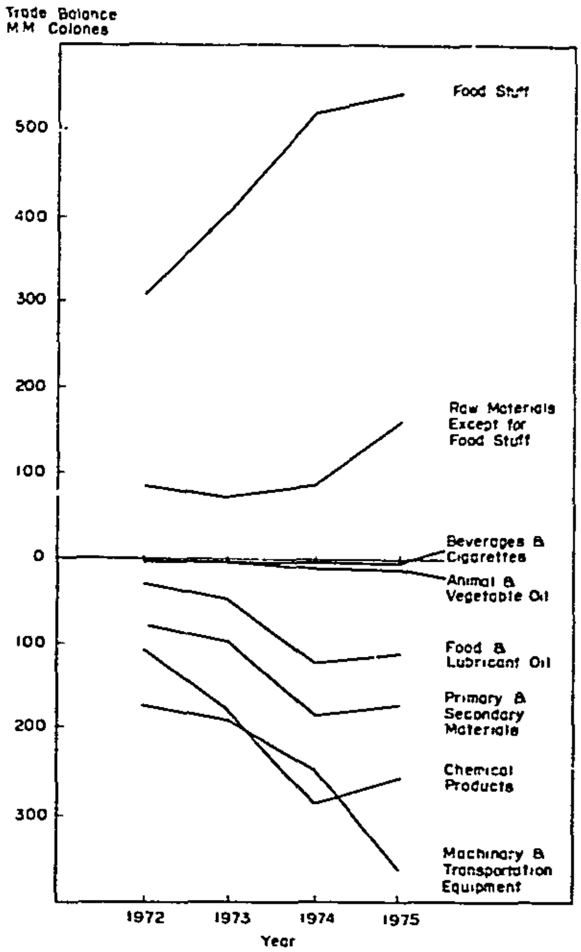
	1971 (₡Mil.)	1975 (₡Mil.)	Average Annual Increase Rate(%)
TOTAL IMPORTS	564.0	738.3	7.0
Consumer Goods	164.1	185.9	3.2
Intermediate Goods	237.0	243.8	0.7
Durable Consumer & Capital Goods	162.8	308.7	17.3

Table I-1-7 INTERNATIONAL BALANCE OF PAYMENTS OF EL SALVAEOR (in millions of Colones)

	1970	1971	1972	1973	1974	1975 (Provi-sional)
INTERNATIONAL BALANCE OF PAYMENTS	9.9	△ 23.6	39.0	△ 39.5	△ 122.5	120.8
Current Balance	32.0	0.0	31.5	△ 104.3	△ 339.3	270.1
Trade Balance	105.2	45.7	130.9	46.5	△ 148.8	△ 95.5
Export (FOB value)	590.5	608.0	754.3	896.0	1,156.4	1,290.0
Import (CIF value)	△ 180.3	△ 562.3	△ 623.4	△ 849.5	△ 1,305.1	△ 1,385.6
Services & Remittance	△ 96.8	△ 98.9	△ 102.3	△ 151.9	△ 183.5	△ 187.5
Freight, Insurance	△ 48.7	△ 56.3	△ 71.9	△ 85.1	△ 101.1	△ 126.2
Travellers' Cash	△ 29.9	△ 25.8	△ 23.8	△ 61.2	△ 53.3	△ 38.5
Other services	△ 18.2	△ 16.8	△ 6.6	△ 5.6	△ 26.1	△ 22.8
Transfer	23.6	53.2	2.9	1.1	△ 7.0	12.0
Capital Transaction	6.3	63.6	2.1	60.3	214.3	338.6
Private Capital	2.2	58.2	△ 29.6	39.1	153.6	297.7
Long-Term	1.9	14.9	17.3	19.0	141.3	196.7
Short-Term	△ 2.7	43.3	46.8	20.1	12.3	101.0
Public Capital	4.1	5.1	31.7	21.2	60.9	40.9
Statistical Error	△ 18.5	△ 51.6	5.4	4.4	1.9	42.6

Source: Banco Central De Reserva de El Salvador.

Note: △ indicates minus figures.



Source Banco Central de Reserva

Figure I-1-3 Trade Balances of El Salvador By Commodity

Table I-1-8 shows the trend of machinery importation by type for 1971-1977. Non-electrical machinery showed the largest import value, followed in descending order by electrical machineries, transportation equipments, and metal products. The rate of average annual increase in import value during 1971-1975 was highest for electrical machineries, followed, in descending order, by non-electrical machineries, metal products, and transportation equipments. Trade balance of these types of machineries is shown in Table I-1-9. Metal products and transportation equipments showed little change in balance, and the net import value of metal products, in particular, was brought to a minimum, due to the increased exportation of such products. On the other hand, deficit trade balance has been increasing in machineries (electrical and non-electrical). Thus, the following conclusions may be derived:

a. For the time being, export earning may be primarily achieved by metal products.

b. Import-substitution should be accomplished by machinery production (electrical and non-electrical).

Table I-1-8 IMPORTATION OF METAL-MECHANICAL PRODUCTS: VALUES[1] AND COMPOSITION RATIOS[2]

	1971	1972	1973	1974	1975	Average Annual Growth Rate 1971-1975(%)	1976 (Projected	1977 Projected
METAL-MECHANICAL PRODUCTS	162.9	226.9	216.4	236.5	308.7	17.3	321.9	352.1
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)		(100.0)	(100.0)
Metal Products	21.8	25.0	24.5	32.5	40.3	16.7	42.7	47.2
	(13.4)	(10.9)	(11.3)	(13.6)	(13.1)		(13.3)	(13.4)
Non-Electrical Machinery	62.1	89.3	81.5	96.6	132.8	20.9	137.1	151.9
	(38.1)	(39.1)	(37.7)	(40.5)	(43.0)		(42.6)	(43.1)
Electrical Machinery	31.4	44.0	46.2	46.5	76.2	24.8	76.4	85.6
	(19.3)	(19.2)	(21.3)	(19.5)	(24.7)		(23.7)	(24.3)
Transportation Equipment	47.6	70.5	64.3	62.9	59.4	7.7	67.7	67.1
	(29.2)	(30.8)	(29.7)	(26.4)	(19.2)		(21.0)	(19.1)

Source: Ministerio de Economia
Note 1: In millions of Colones
Note 2: Shown in parentheses

Table I-1-9 IMPORT-EXPORT BALANCE OF METAL-MECHANICAL PRODUCTS (in millions of Colones)

	1971	1972	1973	1974	1975	1976[1]	1977[1]
METAL-MECHANICAL PRODUCTS	-138.2	-201.1	-178.1	-200.2	-258.7	-263.4	-288.5
Metal Products	-14.0	-16.2	-12.7	-20.7	-24.3	-21.5	-23.5
Non-Electrical Machinery	-58.1	-81.6	-80.4	-95.5	-121.4	-130.1	-112.6
Electrical Machinery	-19.2	-30.0	-21.2	-21.5	-51.5	-46.3	-56.4
Transportation Equipment	-46.9	-70.2	-63.9	-62.5	-58.5	-64.5	-65.8

Source: Ministerio de Economía.

Note 1: Projected figures.

4) Employment of the Manufacturing Sector

Since 1974, the number of employed workers has increased little in the manufacturing sector, particularly in the consumer goods sector, as shown in Table I-1-10. The estimates for 1976/77 in the Table reflect an expectation that employment will exceed 10,000 in the durable consumer goods sector and capital goods sector, that is, the metal-mechanical industry sector, around 1977. Although industrial employment grew little, value added per worker dropped--as pointed out earlier.

5) Current Situation of Metal-Mechanical Industry

(1) Position in the Manufacturing Sector

How the metal-mechanical industry currently stand among other manufacturing industries can be understood from Table I-1-11. The comparisons in the Table show that both value added and employment, as a composition percentage to the industrial totals, have been increasing. Although, in 1975, the export ratio of metal-mechanical industry was 47% and was greater than 27% for the manufacturing sector as a whole, increases in the expect ratio for the metal-mechanical industry has been levelling off. On the other hand, the ratio of imports to total domestic demand for metal-mechanical products was 80%, which was about double the ratio of the manufacturing sector as a whole. As for the ratio of gross value added to gross output, the metal-mechanical industry showed a somewhat lower figure than the sector as a whole. The value added ratio has tended to decline throughout the manufacturing sector.

Table I-1-10 EMPLOYMENT IN THE MANUFACTURING SECTOR

	1971	1972	1973	1974	1975	1976 (Projected)	1977 (Projected)	Average Annual Increase Rate
MANUFACTURING	68,102	73,865	95,802	101,550	106,339	110,171	114,962	11.8
Consumer Goods	49,987 (73.4)[1]	53,552 (72.5)	69,618 (72.7)	71,694 (70.6)	73,268 (68.9)	74,365 (67.5)	76,105 (66.2)	10.0
Intermediate Goods	13,552 (19.9)	15,364 (20.8)	19,640 (20.5)	22,138 (21.8)	24,245 (22.8)	26,111 (23.7)	28,166 (21.5)	15.6
Durable Consumer and Capital Goods	4,563 (6.7)	4,949 (6.7)	6,514 (6.8)	7,718 (7.6)	8,826 (8.3)	9,695 (8.8)	10,691 (9.3)	17.9

Source: Ministerio de Economia.

Note 1: Figures in parentheses are in percentage.

Table I-1-11 METAL-MECHANICAL INDUSTRY IN MANUFACTURING SECTOR

	1971	1972	1973	1974	1975
VALUE ADDED (C million, 1971 prices)					
A. Sector Total	519.3	539.4	575.5	604.1	620.0
B. Met.-Mech. Ind.	39.7	44.0	47.4	58.6	65.7
C. B/A x 100	7.6%	8.2%	8.2%	9.7%	10.6%
EMPLOYMENT (persons)					
A. Sector Total	68,102	73,865	95,802	101,550	106,339
B. Met.-Mech. Ind.	5,176	5,983	7,855	9,952	11,272
C. B/A x 100	7.6%	8.1%	8.2%	9.8%	10.6%
EXPORT RATIO (export/gross output x 100)					
A. Sector Total	19.6%	20.9%	22.1%	25.9%	25.4%
B. Met.-Mech. Ind.	39.3%	41.6%	52.0%	53.2%	46.9%
IMPORT RATIO (import/domestic demand x 100)					
A. Sector Total	38.7%	40.7%	39.2%	41.6%	40.1%
B. Met.-Mech. Ind.	78.5%	83.1%	84.0%	81.6%	79.8%
VALUE ADDED/GROSS OUTPUT (C million, 1971 prices)					
A. Sector Total					
a. Gross output	1,108.4	1,148.5	1,300.7	1,401.9	1,476.2
b. Gross value added	519.3	539.4	575.5	604.1	620.0
c. b/a x 100	46.9%	47.0%	44.2%	43.0%	42.0%
B. Me.-Mech. Ind.					
a. Gross output	90.3	93.9	107.5	142.6	163.5
b. Gross value added	39.7	44.0	47.4	58.8	65.7
c. b/a x 100	44.0%	46.9%	44.1%	41.2%	40.2%

Source: Apendice Estadistio, 1971-1975

A comparison of import from the export to Central American Common Market countries and other countries by metal-mechanical and other manufacturing industries reveals that:

a. The metal-mechanical industry depends heavily upon imports, particularly from outside the Common Market, for raw materials; and that

b. 10% - 15% of the total export of metal-mechanical and other manufacturing industries goes to countries outside the Common Market.

(2) Analysis of Selected Industries

An analysis of data obtained from Bolotin Estadistico, Direction General de Estadistica y Censos for the selected twenty-five industries, as listed in Table I-1-12, supports the followings:

(a) Value Added per Worker: Value added per worker shrunk substantially in actual terms (in 1971 price) but not so much in terms of the twenty five industries types. Industries with a relatively high value added productivity are:

Cutlery, tools, and other hardware

Radio and television set assembly

Air-conditioner assembly

Electric bulb and fluorescent tube

Metal structure

Cork and other bottle caps

Agricultural equipment

Productivity of the latter three industries, however, has been fluctuating year to year. The value added productivity of these industries compares to that of the textile and shoe manufacturing industries, which are more internationally competitive among the manufacturing industries of El Salvador.

(b) Ratio of Value Added to Gross Output;

The average ratio of value added to gross output for the twenty-five metal-mechanical industries was approximately 50% in 1974, which is comparatively close to 45% of texitile and 64% of shoe manufacturing. The industries with a 50% or more value added ratio throughout 1972-1974 were:

Cutlery, tools, and other hardware

Windows, doors and metal fences

Hairpins

Machine reparing

Electric cable

Camera and other optical instruments

Electric bulb and fluorescent tube

(c) Ratio of Wages to Value Added: The ratio of wages paid to workers as percent of value added is slightly over 30% for the metal-mechanical industries on the average, which is close to the 30% recorded for the textile, industry. Those industries whose ratio is stabilized at 20% or lower are:

Wire nettings

Radio and television set assembly

Table I-1-12 METAL-MECHANICAL INDUSTRIES IN EL SALVADOR

ISIC	Industry
3710-0	Steel and iron casting
3720-0	Non-ferrous casting
3811-1	Cutlery, tools, and other hardware
3812-0	Metal furniture
3813-0	Metal structure
3813-1	Tanks (containers)
3813-1	Windows, doors & metal fences
3813-9	Wire nettings
3819-1	Nail and the like
3819-3	Hairpins
3819-3	Aluminium product
3819-5	Cork and other bottle caps
3819-9	Other metal products
3821-0	Machine repair (except transportation equipment)
3822-0	Agricultural equipment (including repair)
3829-0	Other machinery (including repair)
3832-0	Radio and television set assembly
3833-0	Refrigerator
3833-2	Air-conditioner
3839-0	Electric cable
3839-1	Battery
3839-1	Electric bulb and fluorescent tube
3839-9	Other electrical appliances and component parts
3843-1	Vehicle chassis
3852-0	Camera and other optical instruments

Source: Described in text.

Electric cable

Electric bulb and fluorescent tube

Those whose ratio fluctuates between 20% and 40% are:

Cutlery, tools, and other hardware

Air-conditioner

Aluminium product

Cork and other bottle caps

Vehicle chassis

Windows, doors, & metal fences

In view of all of the above, the following metal-mechanical industries can be evaluated to be of a high level:

Cutlery, tools, and other hardware

Cork and other bottle cap

Electric cable

Electric bulb and fluorescent tube

Air-conditioner

In addition to these, radio and television-set assembly, whose value added is high, is approaching a high level. Foreign capital investment is commonly seen in these industries.

(3) Characteristics

(a) Foreign capital is invested in many metal-mechanical industries with stable production, employment, and raw material data. This may be an indication of the efficient management, production, and sales in foreign investment firms.

(b) The scales of enterprises engaged in these industries are generally small. The number of employees in steel casting, which uses a relatively large number of workers, is 1,078 in total and is only 216 per firm on the average in 1974. Only three other types of metal-mechanical industries have 100 or more employees per firm: non-ferrous casting, nails and the like, and cork and other bottle caps.

(c) The degree of monopoly is evident. In 1974, as many as fourteen metal-mechanical industries were monopolized by one firm for each industry.

(d) Separated capital and management can be seen even in small scale enterprises. Owner family participation in business occurs only in eight industries, and the number of family participants is small.

(e) The number of skilled laborers is small. As many as eleven industries had none or only one skilled laborer.

(4) Problems

Based on the above analyses and on the information obtained by this Study Team in El Salvador through interviewing over twenty metal-mechanical sub-industries, the problems, defects, and shortcomings of the existing metal-mechanical industry of El Salvador are summarized below:

(a) Within these industries, there is little division of works, specialization and cooperation between enterprises. These enterprises have a strong tendency to attempt to cover the entire process and all processes of product manufacturing by themselves. The indicated hesitation to depend on other firms for component parts or partial processing seems to be due to the facts that other companies may be undependable on delivery and/or the quality of goods or services, and that use of outside firms may provide them an opportunity to influence price control. As a result, each enterprise is engaged in manufacture of a small number of a large variety of component parts, thus rendering the cost of products high. Thus, industrial standards should be established and production processes be standardized. But at the same time, division of work, specialization, and industrial cooperation should be pursued.

(b) There is a remarkable gap between foreign and national enterprises. Foreign capital enterprises excel in production control, quality control, labor management, and other aspects of management in general and, particularly, in the in-house training of employees drawing upon their technical base. The transfer of technology and management systems to domestic capital enterprises can be accomplished more effectively through technical cooperation agreements rather than through employment of individual foreign technicians.

(c) Product inspection is inadequate. With some exceptions among enterprises, product quality control are inadequate. Due partly to the lack of industrial standards, no inspection method has been established. From the consumers' point of view, quality varies widely from one merchandise to another. Parties concerned should be warned of the rising distrust against Central American products.

(d) Enterprises are unenthusiastic about productivity improvement. Because of the lack of competition between enterprises of the same industries or products, there is little enthusiasm towards cost reduction and productivity improvement. The presence of what can be called a seller's market adds to this tendency.

(e) Investors eagerly try to recover their investments. Investors in El Salvador generally tend to look at manufacturing industries as an object of their speculative investment and, therefore, try to recover their invested funds as quickly as possible. Thus, they are more interested in greater dividend payments than in the accumulation of retained earnings for re-investment in production facilities. Under this difficulty of securing plant and equipment investment funds for the survival of enterprises and for improvement of productivity, the metal-mechanical industry in El Salvador tends to remain small.

(f) Manufacturing machines and equipments are inadequately repaired and maintained. There is no system for maintenance after purchase, installation, and operation commencement of production facilities. The required maintenance technique is of a high level, and it appears that graduates of technical colleges in El Salvador are having difficulties in mastering such required techniques. Numerous improvements must be made on the cleaning of production machines and equipments, the maintenance of order and preparation in workshops, and other aspects concerning basic workshop routines. While the operation of production facilities can be mastered comparatively easily, few enterprises can repair these equipments. In fact, there have been several cases of a discontinuation of production activity due to machine failure.

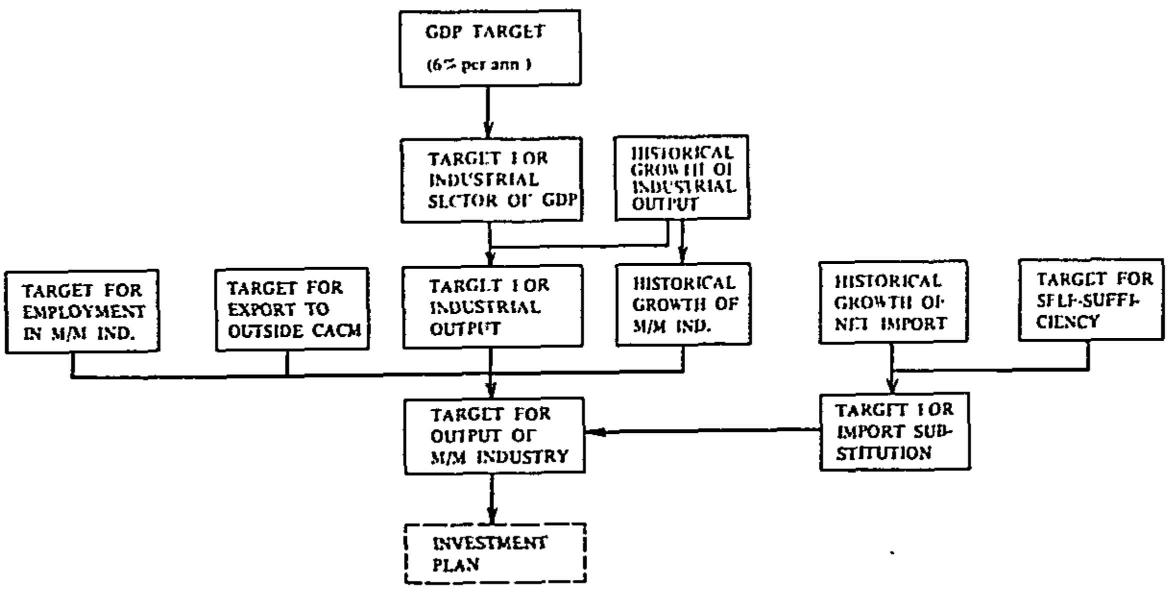
(g) Enterprises are little informed of the industrial situations of other Common Market countries. The level of the accumulated information pertinent to products and competitors' activities in other countries did not satisfy the expectation of this Study Team. In as much as export to Common Market countries will be a primary target for the time being, greater efforts should be made in this area.

6) Establishment of the Industrial Development Target

One of the new Five-Year Plan objectives for 1978-1982 will be to expand actively the manufacturing industry in order to create a take-off toward industrialization. The role which the metal-mechanical industry will be called upon to play in the growth process of manufacturing industry as a whole should be clarified. The new Five-Year Plan, now being drafted, was unavailable even in a summary form at the time this Study Team was in El Salvador (November-December 1976). Therefore, the industrial development targets and the role of the metal-mechanical industry under the Plan must be guessed through the simplified method as shown in Figure I-1-4 as follows:

(1) GDP Growth Rate

GDP grew by an annual average rate of 4.8% during 1971-1975. Although it did not reach the target rate of 5.6%, this achievement during the time of worldwide economic recession should be highly evaluated, as commented earlier. What level of real growth will be targeted under the next National Development Plan is yet to be seen, but the Study Team considers that an achievement of an average real growth of 6% per annum will be within a potential reach. Therefore, based on the 6% real growth per annum and on the estimated 3,652.3 million colons (in 1971 price) GDP for 1977 target GDP for 1982 will be 4,886.8 million colons in 1971 price.



SOURCE : The JICA Mission

Figure I-1-4 A Process for Establishment of the Industrial Development Target

(2) GDP share of the Industrial Sector

As shown in Table I-1-2, the average annual growth rate of 4.5% in the industrial sector during 1971-1975 was lower than the entire GDP growth rate for the same period. As a result, the industrialization rate somewhat slowed down. According to the estimates of Ministerio de Economia and of Ministerio de Planificion, the industrialization rate is to rise a little in 1976 and 1977 (see Table I-1-13).

Table I-1-13 GDP TREND AND GROSS INDUSTRIAL OUTPUT
(in millions of Colones in 1971 price)

Year	GDP	Industrial Sector Contribution to GDP		Gross Industrial Output	
		Value	Ratio	Value	Ratio of Value Added to Output
1971	2,703.9	519.3	19.2	1,108.4	46.9
1972	2,859.0	539.4	18.9	1,148.5	47.0
1973	2,978.8	575.5	19.3	1,300.7	44.2
1974	3,158.7	604.1	19.1	1,404.9	43.0
1975	3,272.2	620.0	18.9	1,476.2	42.0
1976[1]	3,468.8	664.0	19.1	1,660.0	40.0
1977[1]	3,652.3	711.1	19.5	1,823.3	39.0
1982[2]	4,886.8	1,075.1	22.0	2,829.2	38.0

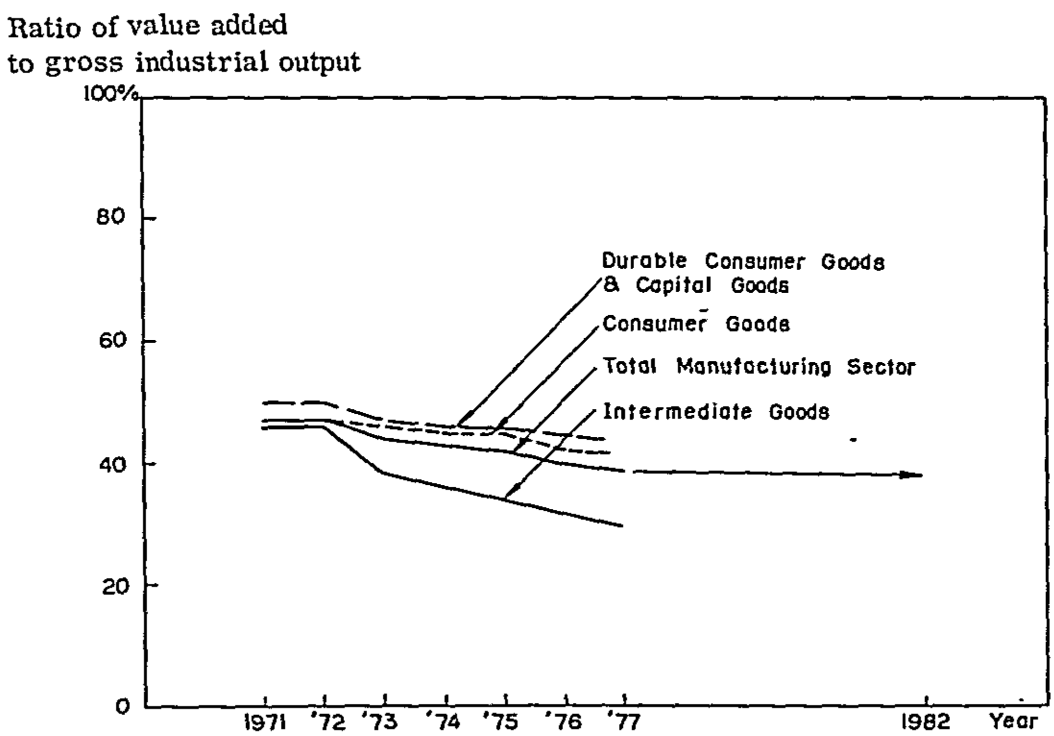
Source: Ministerio de Economia, Ministerio de Planificion, and the JICA Mission.
Note 1: Estimated by Ministerio de Economia and Ministerio de Planificacion.
Note 2: Projected by the JICA Mission.

It is desirable that this rate will reach, by 1982, the agricultural industry level which is about 25%. To achieve this, the industrial sector's share in GDP must reach 1,222 million colons (in 1972 price) by 1982, and in turn, to attain this level, industrial production must grow by 11.4% annually from 1977 to 1982. It is believed, however, that such a growth rate will be too high for the manufacturing sector which has grown at a pace no faster than GDP as a whole during the past ten years.

Therefore, it would be more appropriate to set the target industrialization rate for 1982 at 22% in order to bring the industrial sector to a position higher than the commercial sector and second to the agricultural sector within GDP. For this the required growth rate for the industrial sector will be an average 8.6% per annum higher than the performance to date, but only slightly higher than the target 8.3% under the 1971-1977 Five-Year Plan.

(3) Gross Industrial Output and the Metal-Mechanical Industry

While gross industrial output increased by an average annual rate of 7.4% during 1971-1975, output of metal-mechanical industries (which constitute the durable consumer and capital goods sector) increased by an average annual rate of 12.9% during the same period, as shown in Table I-1-3. The relatively large increase in gross industrial output was due more to a rise in the prices of raw and other materials than to an increase in value added. The ratio of gross value added continued to decline since 1972, as seen in Table I-1-13. The major cause was the lower value added ratio in the intermediate goods sector owing to the price inflation of petroleum products and chemicals (particularly petrochemical products) after 1973 (see Figure I-1-5).

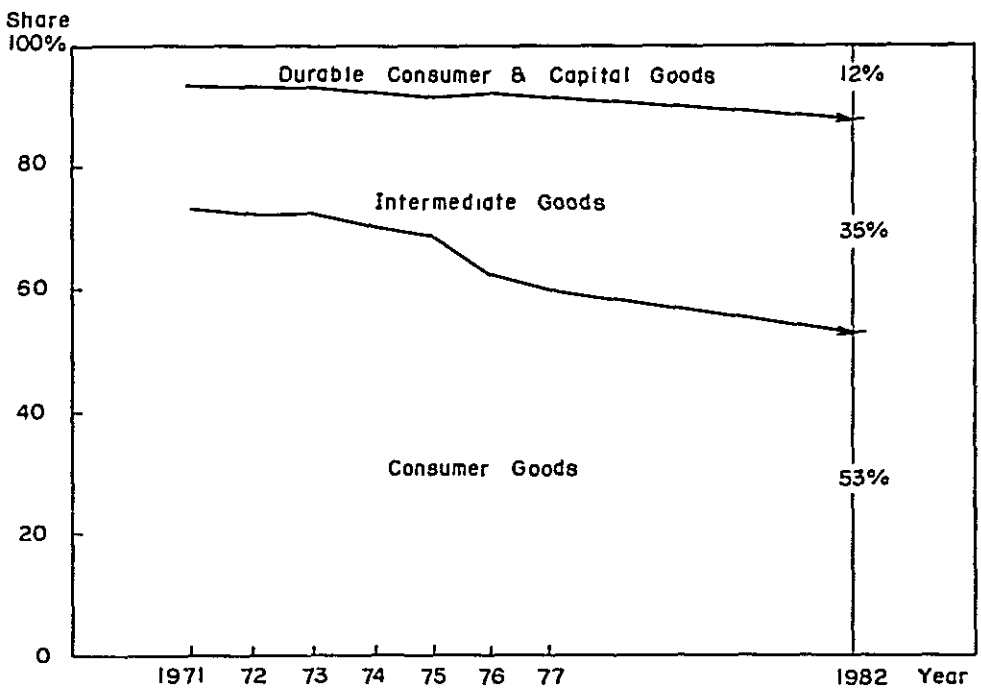


Source: Ministerio de Economia, the JICA Mission (Projection)

Figure I-1-5 Value Added Ratio Trend in Manufacturing Industry by Commodity Group

Decline in the value added ratio of the industrial sector is expected to slow down after 1977, owing to the leveling off of import price inflation and to the contribution by the durable consumer and capital goods group. Thus, the value added ratio is expected to settle down at about 28% by 1982. The average annual growth rate of gross industrial output during 1977-1982 will be 9.2%.

On the other hand, gross industrial output can be broken down, as shown in Figure I-1-6, by commodity group: consumer goods, intermediate goods, and durable consumer and capital goods. To redistribute the shares of these groups to 53% for consumer goods, 35% for intermediate goods, and 12% for durable consumer and capital goods by 1982 will not be very difficult.



Source: Ministerio de Economia, the JICA Mission (Projection)

Figure I-1-6 TREND OF GROSS INDUSTRIAL OUTPUT SHARES

Table I-1-14 TARGET GROSS INDUSTRIAL OUTPUT

	1977[1]	1982[2]	Average Annual Growth Rate
Gross Industrial Output	1,823.3	2,829.2	9.2
Consumer Goods	1,099.4	1,499.5	6.4
Intermediate Goods	574.6	990.2	11.5
Durable Consumer and Capital Goods	149.3	339.5	17.9

Note 1: Estimated by Ministeria de Economia, in ₵ millions, 1971 price.

Note 2: Projected figure by JICA Mission, in ₵ millions, 1971 price.

The industrial output target thus obtained is shown in Table I-1-14. It was assumed that some of consumer goods would be exported. Also, the annual average growth rate of 18% was assumed for durable consumer and capital goods groups. Growth of these industries at this rate is likely since they have already grown by an average of 13% each year during 1971-1975 and they will be assembling products of high unit prices.

(4) Trade Considerations

The import of metal-mechanical products increased at an average annual rate of 17.3% during 1971-1975, while nominal consumption of such products increased by an average of 12.3%. Assuming that nominal consumption of durable consumer and capital goods will continue to increase for some time along with the national economic growth,

$$\begin{pmatrix}\text{Nominal Consumption of Consumer} \\ \text{Durables and Capital Goods}\end{pmatrix} = -394 + 0.229 \times \text{GDP}$$

(Unit: ₵ million, in 1971 price)

nominal consumption of these goods in 1982 will be 725 million colons (in 1971 prices). Based on this, target figures for import/export and past trends, are shown in Table I-1-15. The target is to achieve 25% self-sufficiency of metal-mechanical products by 1982. As can be seen from the Table, the trade deficit

Table I-1-15 OUTPUT, IMPORT, AND EXPORT OF METAL-MECHANICAL PRODUCTS: PAST TRENDS AND FUTURE PROSPECT

	Unit	1971	1972	1973	1974	1975	1976[1]	1977[1]	1982[2]
Product Value	MM ₡ (1971)	69.4	73.1	82.8	98.9	112.8	129.6	149.3	339.5
Domestic Supply	MM ₡ (1971)	44.7	45.3	44.5	48.9	54.3	71.7	85.7	181.3
Export Value	MM ₡ (1971)	24.7	27.8	38.3	50.0	58.5	57.9	63.6	158.3
Export Ratio	%	35.6	38.0	46.3	50.6	51.9	44.6	42.6	46.6
Nominal Consumption	MM ₡ (1971	207.6	274.2	260.9	299.1	371.5	393.0	437.8	725.0
Self-Sufficiency	%	21.5	16.5	17.1	16.3	14.6	18.2	19.6	25.0
Import Value	MM ₡ (1971)	162.9	228.9	216.4	238.5	308.7	321.9	352.1	543.7
Sectoral Trade Balance	MM ₡ (1971)	△138.2[3]	△201.1	△178.1	△200.2	△258.7	△263.4	△288.5	△385.4

Note 1: Estimated by Ministerio de Economia

Note 2: Projected figures by JICA Mission

Note 3: △ Minus

of this sector (durable consumer and capital goods) will increase further as domestic demand for such products expands. However, due to developmental efforts, the increase in deficit will slow down from the average annual rate of 17% recorded during 1971-1975 to only 6%. The increase in Trade deficits at this rate will be much less of a problem in the entire commodity trade balance in the future. If, knock-down type production activities increase, trade deficit in this sector may become greater than as indicated above due to increased import of component parts.

(5) Employment Considerations

The employment level which may be expected under the development target stated above will be predicated upon the degree of labor-intensity of the industry types selected for future efforts and labor productivity, as well as value added productivity, of this sector. Assuming that:

(a) labor productivity in the metal-mechanical sector returns near to the 1972 level and reaches 7,000 colons (in 1971 prices) per worker by 1982, and

(b) the gross value added ratio of this sector approaches the average level of the entire manufacturing industry (38%), by increased import of component parts, a simplified computation suggests that the metal-mechanical sector will provide employment opportunities for about 18,000 workers in 1982. Starting from the estimated level of 10,691 workers in 1977, target for employment increase should be between 7,500 and 8,000 during the five years till 1982.

2. Development Conditions of the Metal-Mechanical Industry

1) Review of Infrastructure

The only element of infrastructure in El Salvador which is subject to concern from the standpoint of developing the metal-mechanical industry is industrial water supply and waste water disposal. Otherwise, the infrastructure appears to satisfy other prerequisites to the development thereof.

(1) Natural Conditions

The natural conditions which have a bearing upon the metal-mechanical industry are temperature, humidity, dust, and natural disasters such as earthquakes and harricanes. Average temperature in the coastal areas such as Acajutla is as high as 25 - 28 C, and the need for air-conditioning facilities makes the seaside locations unsuitable for precision machinery assembly. As far as temperature is concerned, the central highland is more suitable because the average temperature is 22.9 C in the Capital City, 20.7 C in Santa Tecla, and 22.7 C in Santa Ana. There is little humidity difference between coastal areas and the Capital City and its suburbs. The relative numidity is 75% in Acajutla, 76% in San Andres, 73% in San Salvador, 72% in Santa Ana, and 79% in Santa Tecla.

The seasonal wind during December through February, called "Norte", blows dust into factories located in sandy area. Factory walls in El Salvador are partially (or totally) constructed of cement blocks with ventilating holes and, therefore, manufacturing of certain products (such as electric meters) may require and adequate protection against Norte.

Intense rainfalls lasting only for a short time occurs in the rainy season (April through November), and drainage pipes must be of a large diameter. Maximum monthly precipitation is 611 mm. in San Salvador, 937 mm. in San Tecla, 525 mm. in San Andres, and 686 mm. in Acajutla. Assuming that the precipitation is concentrated to about an hour each day during the rainy season, drainage facility should have a capacity of dispassing about 30 mm. of rainwater per hour. Underdesigned drainage pipes causing overflow of rainwater into factory should be absolutely avoided in metal-mechanical industry factories.

Earthquakes are unavoidable in El Salvador, which is situated over a seismic belt. Frequent sensible earthquakes generally occur at the turn of the rainy season to the dry, and vise versa (March-April and October-November). Factories in El Salvador are of aseismatic structure of a certain standard. But future factory buildings should be constructed with light-weight steel frames for increased strength, and this calls for an amendment to the Building Code. The government has an emergency program to meet with earthquakes and other disaster situations such as relief work and the supply/rationing of water and food. In addition, enterprises should establish their own emergency programs and

Table I-2-1 ELECTRIC POWER DEMAND AND SUPPLY: A FORECAST

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
SUPPLY	255.2	285.2	292.0	292.0	355.0	385.0	385.0	502.0	523.0	562.0	682.0
Thermal	182.2	182.2	-	-	63.0	63.0	63.0	-	-	-	-
Hydraulic	97.0	97.0	232.0[1]	232.0	232.0	232.0	232.0	412.0[2]	412.0	412.0	532.0
Geothermal	30.0	60.0	60.0	60.0	60.0	90.0	90.0	90.0	120.0[3]	150.0[4]	150.0
DEMAND	183.5	203.0	246.4	269.6	316.2	356.2	377.4	399.7	437.9	477.2	519.2
SUPPLY OVER DEMAND	71.7	82.2	45.6	23.4	38.8	28.8	7.6	102.3	94.1	84.8	162.8

Source: CEL

Note 1: The capacity increase of 135,000 KW is based on the expected operation commencement of the Cerron Grande Plant.

Note 2: The Capacity increase of 180,000 KW is based on the expected operation commencement of the San Lorenzo Plant.

Note 3: No.3 geothermal generator at Ahuachapan is expected to start operating.

Note 4: No.4 geothermal generator at Ahuachapan is expected to start operating.

have employees familiarize themselves with this program.

(2) Demand and Supply of Electric Power

Electric power supply is fully adequate to meet its demand, and will in no way constitute bottlenecks to development of metal-mechanical industries. CEL foresees that the over-supply situation will continue after 1975. The excess supply capacity will diminish to a minimum in 1981, subsequent to which, however, it will expand again to about 100,000 KW due to the operation commencement of the San Lorenzo Hydraulic Generation Plant in 1982 and also due to a 25% increase in geothermal generation capcity in 1983.

The voltage fluctuations plus minus 5%, limited to short periods of time, should be rated "good". Power supply interruptions occur not because of inadequate supply capacity but due mainly to such accidents as a thunderbolt striking a power distribution network during the rainy season. Interruptions are relatively rare, and whenever one occurs the power supply is restored without delay in the Capital City and its suburban areas. In some areas outside the Metropolitan Area, a power supply interruption of about 30-40 minutes occurs at an average frequency of once a month.

(3) Industrial Water Supply and Drainage

Water supply shortage in 1976 was 0.3 M^3 per second in the Metropolitan Area and the same for all other areas, making a total of 0.6M^3 per second, according to ANDA. In 1986, the Metropolitan Area is expected to have a surplus of 0.4 M^3 per second but other areas will have a shortage of 0.6 M^3 per second, making a net shortage of 0.2 M^3 in nationwide average. Well drilling for water supply to factories located near residential areas may be disapproved by the government because the wells, when drilled and used, might be detrimental to residential water supply. Also, the subsidence of underground water level has been recognized in existing industrial areas. Thus new factories must be situated at a new location where an adequate underground water source is available. Water in El Salvador has a high SiO_2 content and a high temperature of about 30°C. It is safe to assume that the Si content is generally from 100-200 ppm. Therefore, water for boiler use must be deionized, at an additional cost.

Electroplating will present the most difficult drainage problems of all metal-mechanical industries. In El Salvador, with a dense population and a highly concentrated land utilization, it will be necessary for the government to invest required funds, to introduce foreign technology, and to take other necessary measures for the prevention of environmental pollution prior to development of an electro-plating industry. The Government may construct and directly operate, a central wastewater treatment/disposal plant. Effluent from electro-plating factories can be classified into (1) ordinary effluent, (2) high concentration effluent, and (3) leakage of solutions. The water volume (1) above is determined by the work volume per unit of time and the water volume involved in the work, and can be reduced by streamlining the work process and by recycling unpolluted water. (2) and (3) present problems. (2) is discarded used solutions, and (3) is leakage of undiscarded solutions through a breakage in the storage tank, misoperation of the filtering equipment, and/or partial damage in the electro-plating instruments. The resulting high concentration effluent becomes a source of environmental pollution.

Effluent in electro-plating factories are generally treated (1) by lowering the value of pH through water dilution or (2) through neutralizing. If effluent of 10 tons per day, with a 3 pH value is to be diluted to 6 pH (the regulatory minimum in Japan is 5.8-8.6), 10,000 tons of water will be needed per day. The use of such a tremendous amount of water for this purpose can result in the drying up of not only neighboring wells but also of the underground water source in the dry season. Therefore, the only reasonable alternative is to install a neutralization device at each electro-plating factory for the treatment of effluent drainage as it leaves the factory and before it enters a public drainage system.

Despite these difficulties, electro-plating is essential to the existence of a metal-mechanical industrial complex. Regardless of whether electro-plating is to be operated privately or officially, statutory provisions should be established for regulatory controls, such as tanks for recycling of solutions, pollution control devices, the prior estimation of drainage volume and the volumes of harmful substance(s) discharged from the factories, and a periodical pH value inspection of water downstream from the factory.

(4) Port and Transportation

Industrial products, raw materials, and component parts are imported via surface transporation through the Acajutla Port and via air through the Ilopango Airport, and both will cause no hindrance to development of the metal-mechanical industry. The Acajutla Port has the best port and harbor facilities of the five Central American Common Market countries and is only 85 kilometers from San Salvador.

Trade with Common Market countries is accomplished by land transportation. Roads, which are capable of accommodating trucks up to about 15 tons of carrying capacity, present no problem.

There is no commodities trade with Honduras, as diplomatic relations have been broken since the War of July 1969. Therefore, products exported to Nicaragua and Costa Rica are shipped via ferries which acrosses the Gulf of Fosenca. The departure time of ferries, however, depends upon the completion time of cargo loading. Because the arrival time of cargo via ferries cannot be foretold with accuracy, shipment of urgently needed cargos depends on air transportation.

In railway transportation, the International Railways of Central America (IRCA) merged with and absorbed the Ferrocariles de El Salvador (FES) and became the FENADESAL (National Railway of El Salvador) in December 1974. Railway facilities and operation still need much improvement, and metal-mechanical industries will therefore have to depend more on truck transportation.

(5) Telecommunication

The telephone communication system is excellent not only in San Salvador but in the entire El Salvador. Cross-wiring and connection waits are rare, and calls to other Common Market countries can be made directly from El Salvador. Instantaneous dial telephone communication with Japan has also become possible since November 1976. Although public telephones in San Salvador are still few, telephone installation at offices requires only about one month wait.

Despite the ANTEL announcement that a telex installation requires no waiting time, it appears that some firms have been waiting for over two years.

Mail pick up and delivery appear to be comparatively dependable, and undelivered and lost mails are very rare.

(6) Land and Building Construction

The acquisition cost of industrial land is low, the highest being the 30 colons per square meter in the Ilopango Airport vicinity. Others are 15-20 colons in Apopa and Acajutla, 10-15 colons in Santa Ana, and 5-10 colons in Cesaltepeque.

In the Metropolitan Area, the load bearing capacity of land is high although the rock-bed is considerably below the ground level and will easily support machine installation with a weight of up to about ten tons. Land near the new airport has a deep rock-bed and is covered with deposited sand and the load bearing rating is estimated at 20-30 tons per square meter.

The construction cost of ordinary buildings (concrete floors of 13cm, concrete block walls, asbesto cement roofs, ventilation fans) with the necessary drainage systems and wiring, at the time of survey by the Mission in El Salvador (November 1976), was 150-200 colons per square meter for factories, 180-250 colons for ordinary dwellings, 300 colons for high-grade houses, offices and apartment houses. It is assumed that these costs have risen 10%-20% by this time.

A space in the San Baltoro Free Zone adjacent to the Ilopengo Airport is available only through the rental of a land with factory building package (When the new airport is completed at Comalapa, the Ilopango Airport will be used for freight transportation). This Free Zone is to accommodate only those industries engaging in exportation to non-Common Market countries but there is no restriction on industry type. It consists of sixty-five industrial lots (fourteen completed end 1976) to be completed by 1985 and is 90 Hectares. A complete infrastructure will be available, including electric power supply, water supply (by ANDA: also wells may be drilled), and roads. Local offices of the Ministry of Finance (including the tax authority), Ministry of Economy, Ministry of Labor, a hospital and other necessary facilities are planned within the Free Zone.

Metal-mechanical industries such as tool manufacturers, exporting to no-Common Market countries will find it advantageous to be located in the Free Zone.

2) The Present Situation and Problems of Labor Force

(1) The Present situation

The current labor force situation in metal-mechanical industries (the selected twenty-five types, 3710-0 to 3852-0) is shown in Table I-2-3.

Table I-2-2 CURRENT LABOR FORCE SITUATION IN METAL-MECHANICAL INDUSTRIES

		1972	1973	1974
Number of Firms	Each	61	57	62
Number of Workers	Person	4,285	4,522(+237)	4,680(+158)
Proprietors and Families	Person	27	35(+ 8)	30(- 5)
Unskilled Laborers	Person	3,481	3,646(+165)	3,826(+180)
Skilled Laborers	Person	62	80(+ 18)	120(+ 40)
Administrative Clerks	Person	715	761(+ 46)	704(- 57)

Source: Boletin Estadistico

As seen, the capability to absorb employees is still limited in metal-mechanical industries, which represent from 6.6% (1972) to 8.2% (1974) of the total value added in manufacturing industry.

Noteworthy is the fact that skilled laborers increased by extremely small numbers. Despite the government's hard efforts to advance technical education and training, the labor demand in enterprises has grown little. Incidentally, an average of as many as 383 skilled laborers are being sent into the labor market every year, according to the statistics of the Ministry of Labor (Estadistico del Trabajo 1975, p.49) on six technical highschools of El Salvador (Tecnico Ricaldone, Tecnico Industrial, General Isidro Menendez, Thomas Jefferson, Colegio Santa Cecilia, Instituto Nacional de Santa Ana) (see Table I-2-3). The number of skilled laborers actually employed by industries increased by only eighteen in 1973, and by only forty in 1974. If university graduates in the technical department are also taken into consideration, the supply of skilled workers is substantially in excess of demand.

Table I-2-3 NUMBER OF TECHNICAL HIGHSCHOOL GRADUATES, BY TRAINING COURSE

Course	1971	1972	1973	1974	1975	1971-1975 Total
Machinery	61	97	144	175	201	678
Motor Vehicles	28	45	35	102	94	304
Electricity	60	78	142	174	198	652
Electronics	43	46	45	73	75	282
Total	192	266	366	524	568	1,916

Source: Ministry of Labor

It is certain that the government policy of creating a large number of skilled laborers will result in a fostering of human resources (recursos humanas) and the formulation of a base for the metal-mechanical industry development. But, if the actual labor demand-supply remains out of balance, educational objectives may become difficult to form and quality of technical school graduates may decline. The employment condition of the twenty-five types of the metal-mechanical industry is as follows:

(a) the number of skilled laborers is small compared with the number of unskilled laborers, (Table I-2-4)

(b) the number of administrative employees is fairly large in comparison with the number of unskilled laborers (Table I-2-4), and

(c) wage gaps between unskilled and skilled laborers and between un skilled laborers and administrative employees are extremely large on instance, the wage of skilled laborers is five times that of unskilled laborers, and the wage of administrative clerks is 2.5 times that of unskilled laborers.

Table I-2-4 EMPLOYMENT: METAL-MECHANICAL INDUSTRY VS. TEXTILE INDUSTRY

Year	Number of Skilled Laborers per Unskilled Laborers		Number of Admin. Workers per Unskilled Laborers	
	Metal-Mech. Industry	Textile Industry	Metal-Mech. Industry	Textile Industry
1972	56.0	NA	4.9	NA
1973	45.6	NA	4.8	NA
1974	31.9	14.7	5.4	14.7

Source: Boletin Estadistico

(2) Problems

The unemployment level in El Salvador is assumed to be from 15% to 20%. (No unemployment statistics could be found in Estadisticas del Trabajo of the Ministry of Labor, in Indicaderes Economicos 1976, 1-6, of the Ministry of Economic Planning, or in other materials.) This rate is higher if seasonal workers are considered potentially unemployed and included in the unemployment number. Assuming that 65% of the nation's population is in farming villages, the urban population can be estimated at 445,000, or 35% of the total economically active population of 1,271,000, according to Series Estadisticas Seleccionadas de Centroamerica y Panama (SIECA) No.15 (1975 Dic.). The total number of employees engaged in other than agriculture is 118,864 (December 1975) according to the same statistics. Simple subtraction of 118,864 from 445,000 does not give the unemployment number, because by definition the unemployee are those with the intention of being employed but cannot find employment.

While employment opportunities are limited for skilled laborers (as they increased by only 18 and 40 in 1973 and 1974, respectively, as observed above), the unskilled labor market is even more unfavorable and is a buyer's market. According to statistics of the Ministry of Labor (Estadistica del trabajo 1974, p.38---only 13,025 or 30% of the total job seekers registered in the Capital City and San Miguel could find employment in 1975), none of the registered 17,078 job seeking unskilled laborers was employed in 1975, and none of the cumulative total of 34,156 of such laborers from 1971 through 1975 was employed.

This situation may not be undesirable from the enterprise stand-point, as they can maintain a buyer market. A recruitment announcement is sometimes responded to by several hundreds of job seekers. The quality of unskilled laborers, however, is not necessarily high in comparison with unskilled laborers of Hong Kong or Taiwan. Criteria for selection of successful respondents is limited to (1) that he can write his name, (2) that he can read and write simple sentences, and (3) that he can subtract numbers. Furthermore, minimum wages paid to seasonal farm workers have risen rapidly during the last year or two, and, for this reason, population flow city to village has taken place during November to January. This also has reportedly affected enterprises located in the Capital City suburb, where the general quality of factory employment seekers has droped to a lower level than before. This situation must be said detrimental to the encouragement of manufacturing industries to come and locate in El Salvador.

Labor force problems in El Salvador, as identifies by the Mission, are as follows:

(a) Lack of In-House Vocational and Technical Training Opportunities.

While most of the larger foreign investment enterprises with 100 or more employees give in-house vacational and technical trainings to their employees, nearly all of the smaller national capital enterprises do not go beyond guidance provided in daily work. It is essential to provide a way for smaller native capital enterprises to systematically give vocational and technical training on a continual basis to their employees.

(b) Inadequate Trainers and Facilities of Vocational Schools

There was only one technical highschool in El Salvador until 1967 when a second was newly established in San Miguel. In 1974, the number of technical highschools increased to four with the establishment of one in

Santa Ana and one in Sonsonate. Training equipment and facilities per student are still inadequate. The training efficiency has been lowered because a continuously greater number of students have enrolled while little additions have been made to the necessary equipment and facilities. Also, the fact that a large number of trainers have been engaged in vocational education without receiving adequate training to teach and develop skilled workers will become a serious obstacle to effective training of students.

Fundamental deficiencies of these technical highschools to be remedied are the inadequacy of training facilities and the small scale laboratory style training method which had been introduced to compensate for the inadequate training facilities. If these schools are to produce skilled workers who are to meet industrial needs, their training should be accomplished in a situation which simulates the actual conditions present in factory workshops. It should be realized that the significance of the laboratory style training does not go beyond the provision of audio-visual education. Therefore, a check list of tools, machines, equipment, and facilities required for various technical and vocational trainings should be established, along with a program for physical development of these schools in accordance with such a list.

(3) Lack of Coordination between Industrial Needs and Technical Training

The training programs of technical schools are apparently ungeared to the kind of technologies needed by the existing industries. For this reason, graduates of these schools are having difficulties in finding jobs. In this regard, however, the program of one-year on-the-job training to follow a two-year school training implemented by the Instituto Tecnologio C.A. should be highly evaluated. A better coordination between industrial needs and technical and vocational training can be accomplished through providing opportunities (about once a year) for important members of both industry and education to exchange information on (1) the recent trend of technology, (2) techniques needed to be developed by school education, (3) current situation of graduates in workshops, (4) industry's plans for skilled worker recruitment, and (5) other relevant information.

Another problem in training is the fact that technical high schools are under the jurisdiction of the Ministry of Education and, therefore, there can be little connection between their training programs and the national development program formulated by the Ministry of Economic Planning (the former Five-Year Plan was by CONAPLAN), in terms of both quality and quantity. This problem can be possibly eliminated by better coordination between the two Ministries when formulating future development programs.

(4) Gaps between Blue and White-Collars

White-collar jobs are generally preferred over blue-collar jobs in any country. From the implications of labor management and production control, maintenance of high-quality products depends largely upon the unskilled laborers in workshops. Thus, laborers who have gained experience through many years of jobs in a workshop are assets to the enterprise. Workers familiar with the peculiar characteristics of manufacturing machinery used in the shop and who have the particular manufacturing know-how of the company should be well compensated for their contributions.

The wage structure is presumably a mixture between the occupational wage and merit pay concepts and, therefore, the employee wage rate often remains unchanged from initial employment. Wage revisions occur only with minimum wage amendment by the government and labor agreement revisions. Average wage paid to unskilled laborers are generally much lower than those paid to skilled laborers and administrative clerks. It is important that ways are opened for unskilled laborers to get wages comparable to those of administrative employees through their own efforts.

Possible means for this include; (1) an additional pay for one-month full attendance (2) an additional pay for full-attendance from three to six months, or to year, (3) an wage increase for the length of service with the enterprise (in the number of years), (4) incentive awards for constructive suggestions to improve the manufacturing process and increase productivity (5) an wage increase for completion of certain in-house training courses, (6) an wage in crease for voluntary participation in outside training, and (7) an wage increase for increased productivity.

If administrative and sales personnel work in workshops for a given length of time, they can deepen their understanding of the merchandise they handle and will be in a much better position to compete with other enterprises.

Also, the schism between blue-collar and white-collar worker should be eliminated and a sense of general unity be encouraged.

(5) Labor Mobility

Worker mobility to other companies through a high wage attraction, is rather high. This is true not only with able skilled laborers, but also with salesmen and managers. From the enterprise standpoint, this worker mobility means that they may not enjoy the fruits of the training costs they spent. Foreign investment firms often provide opportunities to able blue-collar and clerical workers for training at the home office in a foreign country. Such workers, however, when they return to El Salvador, often move to other firms, seeking a higher pay in consideration of the techniques and knowledge they obtained by this overseas training.

Employee training is welcomed from the national standpoint because it will aid the elevation of the nation's general technical standard. But loss of traing of enterprises should be compensated for by statutory benefits. The government's urgings on employee training should be accompanied by measures such as mandatory training for unskilled laborers, recognizing training costs as deductible business expense, and a national certification system on technical skills.

Inasmuch as the biggest motivation for workers to move from one enterprise to another is wage increase, enterprises should form a wage structure geared to worker seniority and a monetary compensation system for employee efforts.

3) Review of Central American Common Market

The JICA Mission conducted a review of the Central American Common Market (CACM) from the standpoint of planning the metal-mechanical industry development in El Salvador.

In summary, the CACM organization is not only weakened by the de facto secession of Honduras, but also its initial framework has become obsolete and often hinders industrial development in member countries. SIECA has formulated and submitted to member country governments a plan for a "Central American Economic and Social Community," which includes industrial coordination among countries, a common investment law, and free movement of capital and labor within the area. This plan, if adopted, will require delegating substantial sovereign power to the CACM authority, and, therefore, will not be put in force--at least for some time. The following review assumes that the metal mechanical industry will be subject to various incentive measures of CACM in effective today.

(1) Inadequate CACM Publicity

There is a investors' guidebook prepared by INSAFI which gives the summary information on various investment procedures and systems of El Salvador. No guidebook on the systems and operation of CACM has been prepared by SIECA or any other party. If this situation continues, it will become necessary for El Salvador to prepare for its own benefit a brochure on CACM for prospective foreign investors. It should be noted that in some cases in the past the absence of such a brochure was responsible for the withholding of foreign capital which was otherwise invested in El Salvador.

The following CACM systems should be clarified by the brochure:

(a) Specific industrial incentives such as the industrial integration system and special production activity system, and a list of industry types subject to the explanation of Resolucion 26 and a list of industry types, and

(b) Detailed explanation of tax incentives and provisions of tax treaties, including

Computation method of value added and computation examples;

Explanation of net increases in the international balance of payments;

List of raw materials and component parts suppliers within the Common Market;

Examples of Equiparacion;

Explanation of enterprise classified as C.

(c) Explanation of common tariff on imports from outside the Common Market; a list of items not subject to the common tariff and the tariff of each country on such items; explanation of other bilateral treaties.

(d) Explanation on assembled products, noting that products whose value added is less than 35% are not subject to free trade within the Common Market and that their raw materials and production machines are not subject to import tariff exemption. Because the large number of metal-mechanical products fall under this category, this should be further amplified by concrete examples. Exceptions to these bilateral treaties, such as radio and television sets, should be given.

(e) A Central American Settlement Organization exists and handles about 80% of trade within the Common Market but the currency exchange in member countries is not always without restriction.

Some foreign capital enterprises in El Salvador are attracted by the Common Market, and some are attracted by markets outside the Common Market. Those oriented to the outside markets may locate outside the Free Zone and, however, wish for import tax exemption on raw materials and component parts. If import tax exemtion is discontinued under Resolucion 26 when the production of such raw materials and component parts has commenced within the Common Market, and if their cost is excessive, the international competetiveness of their products outside the Market can deteriorate to the extent that the gain from import substitution is more than offset by the loss from reduced exportion value of the products. The applicable rules should be flexible enough so the continued tax-free importation of raw materials and component parts be authorized in the case of products to be exported to non-Common Market areas.

(2) Relationship between Manufacturer and User of Raw Materials and Component Parts

As stated in (1) above, the industrial incentive system of CACM tends to protect manufacturers of raw materials and component parts at the expense of international competetiveness of downstream industries. This is because manufacturers of raw materials and component parts cannot take advantage of economices of scale due to limited demand within the Common Market, with a resultant substantial price difference between the domestically produced and the import from the lowest priced supplier.

Another problems accompanying the use of Common Market-produced raw materials and component parts are quality and delivery time which are not always satisfactory. No unified industrial standard is available in the Common Market. A slight deviation from the raw material specification can greatly affect the quality of the final product. A typical example is the vinyl chloride resin of Polycasa, Nicaragua. The discontinuation of tax-free importation of vinyl chloride resin from outside the Common Market resulted in handicapping, in terms of both price and quality, the resin users manufacturing gramophone records, vinyl chloride pipes and toys. Some Costa Rican enterprises as a result of this have moved to Panama. Thus, the forced use of Common Market-produced raw materials and component parts can result in the termination of industrial activity, or movement to outside the Common Market, for both industries exporting to CACM and non-CACM countries (the metal-mechanical industry belongs to the former). It is essential that the system to encourage the use of Common Market-produced raw materials and component parts be delt with an extreme care.

(3) Need of Harmony and Coordination among CACM Countries

The JICA Mission's interview with SIECA, ICAITI, and BID revealed that there was little movement toward industrial integration among CACM countries, and it was presumed that the countries held individual industrial development programs.

16,000,000 population of Central American countries constitute too small a market to permit more than one enterprise in any industry per country. Prerequisite to the metal-mechanical industry development, therefore, is to coordinate an agreement by CACM countries on industry types to be developed in each country, self-complimentary supply of products and their materials, and a unified set of industrial standards. If the small-scale metal-mechanical industry are to be created in each country without coordination among countries, production costs will be so high that export to non-Common Market countries will be impossible.

The most important matter of coordination is the industrial standard. Common Market countries should begin discussions without delay on a unified industrial standard, with non-CACM exports in mind. Interviews conducted by the JICA Mission could find no such standard in El Salvador or in any other Common Market countries.

(4) Undervaluation of the Role of Knock-Down Type Industries

The only tax incentive available to knock-down type assembly industries is the import tax exemption on manufacturing machineries and equipments imported within three years. In the metal-mechanical industry, the more sophisticated a product is, the more often it is assembled through the knock-down system. Knock-down type assembly industries do not produce necessary materials domestically to bring the value added rate to 35%, because:

(a) The market is too small and unstable to risk the amount of capital needed for a complete line of process from raw materials to finished products; and

(b) The worker training needed for such a complete process would be impossible within a reasonable length of time.

Foreign investment enterprises particularly tend to avoid a heavy risk and attempt to develop their business in steps: SKD, CKD, and domestic production of some of the needed raw materials and component parts. Therefore, the current CACM system discourages the entry of foreign capitals into the assembly business in the Common Market. The most advanced assembly business in the Common Market is radio and television sets assembly, which receives import tax exemption on materials, as an exception, and protective tariff on imports. But the fact that imports subject to the protective tariff are still more competitive than radio and television sets assembled in the CACM area only proves that additional preferential treatment should be available to assembly industries. Such additional protection should be provided to heighten competitiveness of locally assembled products but not for mere protections sake, and should be discontinued as soon as the products gain the needed competitiveness.

The CACM agreement of assembly industries established in 1965 has been left unamended. This is becoming a negative factor to development of the assembly business, such as the metal-mechanical industry with the assistance of foreign enterprises. Assembly industries, though their value added rate is low, will trigger a higher technical level of the manufacturing sector as a whole and will offer a base for development of more sophisticated industries.

(5) Required Minimum Value Added Rate

It is stipulated that the value added rate within the Common Market is at least 35% for industries to receive preferential tax treatment. But few metal-mechanical industries will be able reach the 35% level. The 35% level of the value added rate is used as the base for preferential tax application in the United States, and the adoption of the 35% level by CACM indicates that CACM followed international precedence. Yet, CACM countries produce few raw materials to attain this rate of value added within the CACM boundary. Thus, the 35% requirement, in the final analysis, may be a barrier to foreign capital into CACM countries.

With regard to the use of Common Market-produced raw materials, a fairly rigid policy has been established in CACM, including Resolution 26 referred to above. Under the policy, enterprises, once located within CACM, must cease to enjoy tax-free importation and receive substantial adverse effects on price, quality, and delivery time resulting from the loss of such a tax benefit. It then appears that the basic CACM policy on Common Market-produced raw materials be disseminated, if possible, to metal-mechanical and other down-stream industries to make a long-term plan for raw material procurement. This will facilitate foreign capital entry into CACM countries.

A review of the value added rate, particularly the gross value added rate, of manufacturing industry reveals that the average rate had dropped from the 47% of 1971 to 39% in 1974 and particularly, the average for the intermediate goods sector had dropped to 30%. Yet, preferential tax treatment has been given to these existing industries as their low value added rates while, on the other hand, industries to be newly established may not enjoy this tax benefit unless they satisfy at least a 35% level of value added.

From this, it may be said that CACM does not welcome the rise of new industries. The 35% requirement should be flexible when dealing with new industries.

(6) Industrial Integration and the Common Foreign Investment Policy

Industrial integration among CACM countries has a deep connection with the common foreign investment policy of CACM, because foreign investors will automatically enter CACM countries to which their industry type had been allocated. But at present, with an inadequate industrial coordination, individual foreign investors may choose any country for entry. So, if the allocation of industry types is accomplished after foreign investment enterprises have already been establishes in CACM countries, confusion and difficulties may occur.

The basis of the common foreign investment policy of CACM can be traced back to "El Desarrollo Integrado de Centroamerica on la Presente Decada," which was submitted by SIECA in 1972. This provides a fairly strict control over foreign investments such as area restrictions in which foreign investors are allowed to operate, majority restriction, take-over prohibition, remittance restrictions, and employment restriction of foreigners. Under such a strict control, foreign investors other then those interested in a particular local market within CACM will probably be attracted away from CACM countries to Panama or other neighboring countries.

Controls on foreign investment must be moderated if export-oriented industries, such as metal-mechanical industries, are to be developed. The local environment must allow foreign investment enterprises to first accumulate capital, accomplish technical transfer, and increase international competitiveness of their products. To allow foreign investment enterprises to accomplish all of this and then gradually localize them would be the surest way to accomplish metal-mechanical industry development on the strength of foreign capitals.

4) A Review of Industrial Promotion Measures

(1) Loan System for Manufacturing Industry

The Fondo de Desarrollo Economico (Economic Development Fund) was established in 1966. Currently, five intermediary financial institutions, including INSAFI, are engaged in financial loans of the development fund. The prevailing loan conditions which the Mission could establish are selected and

Table I-2-5 INDUSTRIAL DEVELOPMENT LOANS SYSTEM

	Loan Period and Moratorium		
1) Agro-Industrialization Loan	Capital Loan:2-15 years (Moratorium 6 years) (Operational Loan:6 years (Moratorium 2 years)	Less than 50,000:20% of the price 50,000 - 250,000:with regard to the increment which is over 50,000, 30% of the value 250,000 - 500,000:with regard to the increment which is over 250,000, 10% of the value 500,000 or more:40% of the value	For intermediary financial institutions: Basic rate:6% General rate:8% For users: Basic rate:9% General rate :10% (Basic interest rate is applicable to assets of less than 500,000 and a loan of less than 100,000)
2) Agricultural/Industrial Study/Research Fund Loan	2-15 years (Moratorium 6 years)	Same as 1) above.	For intermediary financial institutions: Basic rate:1% General rate:4% For users: Basic rate:7.5% General rate:7.5% (Basic interest rate is applicable to assets of less than 50,000 and aloan of less than 100,000)
3) Equipment Investment Loan			For intermediary financial institutions:8% For users:10%
4) Operation Fund Loan			For intermediary Financial institutions:10% For users:12%
5) Export or Export Preparation Fund Loan	180 days	70% of FOB export price	For intermediary financial institutions: Basic rate:6% General rate:9% For users: Basic rate:9% General rate:11%

listed in Table I-2-5.

(2) Tax Incentives

It is believed that tax benefits stated in Incentivos Fiscales al Dessarrollo Industrial, which is common to all CACM countries, are applicable to foreign investment enterprises. Also, it is understood that newly established enterprises are exempt from the economic stabilization tax created by the San Jose Treaty.

(3) INSAFI Activities

INSAFI is an organization for the accomplishment of industrial development as well as a financial institution. As such, INSAFI may invest its own projects or participate in foreign capital investement projects. INSAFI is expected to take a leadership in capital participations in metal-mechanical industry development.

(4) CNP Activities

With regard to Centro Nacional de Productividad (CNP), a program for technical transfer has been implemented under OAS assistance. It is hoped that the information service and technical assistance under the program will cover the metal-mechanical industry.

(5) CACM Industrial Incentives

That the metal-mechanical industry is aided little by industrial incentives was pointed out earlier in regard to the assembly industry. To start assemblying a metal-mechanical product under a knock-down system has been generally practiced and produces a high success rate. It is ideal, therefore, that the industrial incentive system be revised to facilitate the rise of assembly industries under the knock-down system. If such a revision requires time to be realized, it is recommended that the countries involved coordinate immediately with each other on the types of assembly industries to be fostered and realize free trade among countries on a bilateral basis. Gradual expansion of the scope of such bilateral arrangements is hoped to help establish and develop assembly industries in CACM countries.

3. The Industrial Development Policy

1) A Basic Development Concept

(1) Changes in Policies

Efforts to develop import-substitution industries began in El Salvador in the 1960s, when Central American countries competed to develop such industries as a strategy for economic development. But, as time went by, the drawbacks of import-substituion industries became clear and Central American countries began to change their policies. A typical drawback was that, under heavy protection, they became very inefficient and international competitiveness of their products was very weak--contrary to the policy aim--and, in some instances, it slowed down the progress of industrialization. For this reason, El Salvador realized that the nation must pursue well-balanced and consistent development for the economy as a whole, rather than a partial solution for the economy such as import-substitution. Thus, El Salvador started to change its policy after the turn of the decade.

The Economic Social Development Plan of El Salvador for 1973-1977 (CONAPLAN, Plan de Desarrollo Economica y Social 1973-1977, 1972) placed the emphasis of national development on:

(a) Expansion of the industrial sector;
(b) Expansion of employment; and
(c) Earning of foreign exchanges.

While industrialization centered around this plan, this plan was to meet the challenge of a rapid population increase, to foster modern manufacturing industry through well-balanced development of various industrial sectors (particularly, manufacturing and agriculture), to disperse factories into rural areas, to elevate the value added ratio to achieve international competitiveness of products, and to increase the exportation of industrial products.

The problem is how to achieve these targets. The government (INSAFI, Plan Operativo: Desarrollo Rama Metalmechnica) looks at the metal-mechanical industry as a possibility for a new direction in industrialization and as a means for achieving the targets. This report will review the background against which the promotion of the metal-mechanical industry had come to occupy a central position in the Economic and Social Development Plan of El Salvador and the policy conditions on their promotion. Practical development strategies will be discussed in Chapters II and V.

(2) Backgrounds of the Metal-Mechanical Industry Promotion

The usual pattern in which industrialization is accomplished in developing countries may be described as follows:

Importation of Consumer Goods → Initial Industrialization → Domestic Production of Consumer Goods (Import-Substitution) → Domestic Demands Satisfied → Exportation of Consumer Goods

Importation of Capital Goods → Intermediate Industrialization → Domestic Production of Capital Goods → Posteior Industrialization

It should be noted that there inevitably is a time lag between domestic production of consumer goods and domestic production of capital goods. In the initial stages of industrialization, the procurement of capital equipments needed for domestic production of consumer goods must depend on imports. The availability of capital goods through importation from advanced foreign nations alleviates pressure to foster domestic capital goods industries. Thus, the rise of capital goods industries tends to get behind the rise of consumer goods industries. For instance, in Argentina, Brazil, and Mexico, where initial industrialization began in the 1930's, import-substitution on consumer goods progressed soon after but import-sustitution on large capital intensive industries such as steel, petrochemical, paper, pulp, and motor vehicles started in the 1950's and the 1960's. Imports have usually depended upon the supply of capital goods in such stages of domestic production or during such a process of industrialization. But the progress of domestic industrialization creates demands for capital goods industries. This is when the environment becomes ripe for domestic production of capital goods. Therefore, the rise of the metal-mechanical industry, which occupies the central position among capital goods industries, lags much behind the initial start of industrialization.

Of Central and South American countries, the Andes group attaches importance to the metal-mechanical industry. It is supposed that economic development in the Andes group has reached the stage explained above and domestic or regional demands have risen for the metal-mechanical products. The Andean Common Market has already implemented a program for development of Industria Metalmecanica (the metal-mechanical industry) and is reportedly thinking of establishing a tariff barrier against metal-mechanical products from outside the Market in the future.

But unlike the Andes group or other Central and South American countries, the initial industrialization in Central American Common Market is said to have started only in the 1960's. Then, why has the government of El Salvador already attached importance to the metal-mechanical industries? There seem to be two possible reasons.

For one, the Andes group and other Central and South American countries which have reached the stage of intermediate industrialization and in which demands for metal-mechanical products have risen can become attractive markets for the metal-mechanical industry of CACM countries if demand expands rapidly in the future. If the position of each country in the said time lag is considered a cross-section of the country's economic development state, the very fact that the industrialization situation of El Salvador is nearly thirty years behind that of South American countries supports the argument that El Salvador has desirable conditions for the establishment of the metal-mechanical industry. This argument is further supported from the viewpoint of international division of labor. A number of examples can be found in advanced nations to indicate the necessity of taking, in advance, the advantages of such a historical opportunity.

Secondly, the promotion of the metal-mechanical industry, which is an essential ingredient in a nation's industrialization, is to prepare for future industrialization and eventual choice of whether to depend on imports for metal-mechanical products or to produce them domestically.

For these reasons, it is believed that the promotion of the metal-mechanical industry seems appropriate in El Salvador. But, whether this promotion policy, when implemented, will actually be successful in their development is an

Table I-3-1 INTERNATIONAL COMPARISON OF MAJOR INDICES OF EDUCATION LEVELS

	Rate of Literary Population over 15 years old(%) 1970	Rate of Enrollment of Childre, Age group of 7-13 (in %) 1975	Rate of Enrollement of Studies, Age group of 14-19 (in %) 1975	Rate of Enrollment of Student, Age group of 20-24 (in %) 1975	Number of Teachers per 1,000 populations, age group or 7-24 1975
El Salvador	43.1	78.6	31.0	7.0	152.6
Costa Rica	11.6	100.6	49.5	16.5	250.7
Guatemala	53.8	58.0	15.8	4.3	107.6
Honduras	52.7[1]	81.1	17.2	4.6	149.2[3]
Nicaragua	42.1	73.9	23.0	6.7	119.7
Brazil	33.6	81.7	61.8	11.2	288.4
Mexico	25.8	100.0	33.2	9.0	169.5
Colombia	27.1[1]	77.5	40.5	8.0	197.1
Average of Latin American Countires	26.7	89.9	42.0	11.7	253.5

Source: Indicadores de Desarrollo Economica y Social en America Latina, 1976
Note 1: Figures for 1960
Note 2: Some children in Mexico and Costa Rica attend more than one school, which brings the enrollment data to over 100%
Note 3: Figure for 1968

entirely different matter. Therefore, conditions must be identified for the policy to be successful.

2) Conditions Surrounding Metal-Mechanical Industry Development

(1) Technology Transfer

One of the basic conditions for successful development of the metal-mechanical industry is successful transfer of technology developed in advanced countries to the El Salvador economy and full utilization of this technology. Metal-mechanical industry-related technology includes: casting, forging, heat-treatment, cutting, grinding, welding, and surface treatment. Is the economy of El Salvador, or its labor force, ready to absorb such technology within a reasonable length of time? Answer to this question can be found in the general educational level of labor force, the ratio of skilled laborers to the entire labor force, and the structure of the labor force.

Educational level in El Salvador is compared with levels in other countries in Table I-3-1. As can be seen from the Table, the level in El Salvador is lower than the Latin American average but is fairly high among Central American countries. The general educational level in a nation is related to its literacy rate. Particulary in countries, such as El Salvador, whose population is concentrated in the agricultural sector, the educational level of the farming population becomes an issue, since farmers will be absorbed into factories as industrialization progresses.

The next Table gives an indication of the educational level of the farm village. It is evident from this Table that the illiteracy rate is high among the agri-

Table I-3-2 ILLITERACY RATES OF THE AGRICULTURAL POPULATION

Size of Farming Land	Population (1,000 Persons)	Population Composition Rate (%)	Number of Illiterate Persons	Illiteracy Rate (%)
Less than 0.5	61.3	22.6	39.4	64.3
0.5-2.0	130.3	48.1	83.4	64.0
2.1-20.0	68.2	25.2	36.4	53.4
20.1-200.0	10.3	3.8	3.2	31.1
200.1 and over	0.7	0.3	0.1	14.3
Total	270.8	100.0	162.5	60.1

Source: Ministerio de Planification, Indicador Economicos y Sociales, 1976, P.47

sultural population, and particulary among small-scale farmers.

The fact that the educational level is fairly low in El Salvador, as revealed above, together with the high rate of potential unemployment discussed in the preceding sub-Chapter, as well as the rapid national population increase, all in all, substantiate the fact that the number of skilled laborers and highly technical workers is small. The total number of technological graduates of the El Salvador University and of the El Salvador Catholic University was only 137 in 1974.

Insufficient supply of skilled laborers means that the demand therefore is high. Then, skilled laborers must command a high wage and in fact, wages for highly skilled workers are high in El Salvador, as shown in Table I-4-3. This indicates that a dual structure of the economy has been formulated, where initial industrialization has begun. That is, a wage structure centering around a few skilled laborers and technical workers has been established in the industrial sector, modernized to a degree, whereas the primary and tertiary industries are supporting unskilled laborers and the potentially unemployed.

In fact, a gap between the manufacturing sector and other sectors is substantial in the economic structure, which is remarkably of dual labor markets. Value added per worker in the secondary industry is from three to nine times that of the primary and tertiary sectors, as shown in Table I-3-4. The existence of an economic structure of a distinct duality can be interpreted as an evidence that the initial industrialization process has already begun.

In view of the structure of the labor market and the low educational level of the working population, the labor market in El Salvador can be characterized as follows:

(a) Under-supply of skilled and technical workers and a resultant wage structure for them; and

(b) Over-supply and low educational level of unskilled laborers and a resultant low wage structure for them.

Can metal-mechanical technology be transferred to El Salvador despite such a dual labor market? From among the variety of types of metal-mechanical industries, those which require a large number of skilled workers may be eleminated and only those which are commensurate with the labor situation of El Salvador may be selected for promotion. Also, for the reasons stated in Chapter II below, the operational scale of the metal-mechanical industry will not by nature expand excessively, and each operation, due to its small scale, will require only a limited number of skilled workers. Further, labor-saving technology of advanced nations have replaced skilled and highly technical workers with automated equipment on a number of manufacturing processes.

Therefore, the metal-mechanical industry of El Salvador, when established, will require a fewer number of workers with skills acquired through years of experience. Thus, the overall environment existing in El Salvador is not necessarily unfavorable to the introduction of the metal-mechanical industry. Provided that an adequate training program (see Chapters II and IV for details) will be formulated in advance and certain incentives will be given by the government for individual enterprise efforts to train their employees at their expense, the successful transfer to El Salvador of technology required by the metal-mechanical industry is quite possible.

(2) Markets for the Metal-Mechanical Industry

If the necessary technical transfer is accomplished successfully, can an adequate market or markets be secured for the metal-mechanical industry of El Salvador?

Prospective individual markets will be discussed in detail in Chapter II. Here, institutional aspect of potential markets will be reviewd, centering on their preferential tariff systems. Reviewed below are the U.S. market with preferential system, the regular U.S. market, Japanese and EC markets with preferential system, regular markets in Japan, EC, and other advanced nations, Latin American markets, Central American Common Market, and the domestic market. The characteristics of these markets have been summarized in Table I-3-5.

Table I-3-3 WAGE IN THE METAL-MECHANICAL INDUSTRY

(Monthly Payment in US Dollars, 1975)

	Wage Range	Average Wages
Supervisors	78 - 1,080	265
General Mechanics	---	182
Warehouse Clerks	---	160
Plumbers	---	140
Steel-Mill Workers	72 - 198	111
Water Service Workers	---	150
Machine Assemblymen	---	160
Casting Workers	80 - 160	126
Draftment	---	120
Electrical Casting Workers	108 - 196	111
Lathemen	84 - 146	100
Boilermen	79 - 119	95
Electrical Welders	80 - 112	94
Electrical Plating Workers	72 - 114	91
Press Machine Workers	55 - 112	81
Mechanical Engineers	400 - 800	---
Chemical Engineers	320 - 800	---
Chief Accountants	320 - 600	---
Bilingual Secretaries	240 - 400	---

Source: ISAFI, Posibilidades dela Industrid Matal Mechanica en El Salvador

Table I-3-4 VALUE ADDED PER WORKER: BY INDUSTRIAL SECTOR

	Total	Primary Industry	Secondary[1] Industry	Tertiary Industry	Unemployment
GDP (Million)	3,100	920	680	1,800	
Composition (%)	100	27	20	53	
Number of Workers (1,000 persons)	1,300	600	50	450	20
Compositon (%)[2]	100	46	4	35	15
Value Added (GDP) Per Worker (1,000 colons)	2.6	1.5	13.6	4.0	

Source: ONUDI-INSAFI, Plan Operativo: Disarrollo Rama Metalmecanica, 1976.
Note 1: Consists of manufacturing industries
Note 2: The number of unemployed workers, 20,000, constitutes 15%.
The indicated sectoral distribution rates of workers add up to 95%, which comes to 100% with the addition of the 15% unemployment.

The margin of preferential treatment guaranteed by markets in the United States, EC, and Japan are often insufficient to make up for the gap in international competitiveness. The United States, EC countries and Japan offer same quotas of preferential treatment to developing countries regardless of their economic scale and, when a country goes over the quota, it may no longer receive preferential treatment. Therefore, when they have acquired the same level of competitiveness as other developing countries, Central American countreis with a small economic scale will be in a relatively advantageous position over other developing countries in the preferential treatment markets. Incidentally, the so-called system of collective origin, under which raw materials obtained within a region may be considered a part of the value added in an exporting country for certificate of origin purposes, is applicable to the Central American Common Market for protection.

In view of the above, it will be necessary to select appropriate market or markets for each item of export from El Salvador depending on the degree of international competitiveness of each product category. The followings should govern market selections:

(a) Items Which Will Become Fully Competitive in the World Market When Their Raw Materials and Production Machines Are Completely Liberated.

Such items should be produced in the Free Zone and exported to regular markets in advanced nations. Particularly in the case of preferential treatment markets in the United States and other advanced nations, a certificate of origin is required under certain conditions of value added (which means that an item, when processed, comes under a different tariff classification in EC). Therefore, when the rate of additional value added by the production activity for re-exportation is extremely small, the Free Zone will have to be utilized. For instance, Central American countries, stimulated by a success in Mexico, tend to go into what is called "Industrias Maquila" in Mexico. Guatemala has gone into it fully. This is a typical trade by processing, through which only an extremely smally value is added, and this has no alternative but to depend on the Free Zone system.

(b) Items with Moderate Value Added and Moderate Competitiveness

These are items whose gap in competitiveness with the products of other nations may be filled with the margin of preferential treatment. Industries prducing these items should actively export to countries with systems of preference such as United States and other advanced nations. In this case, it is not sufficient that the items are competitive with products manufactured in the destination country. In view of severe competition offered by early-started developing nations, the items must also be competitive with producets of Brazil, Mexico, Colombia, Korea, Taiwan, and so forth.

(c) Items with Less International Competitiveness due to Market Scales

If competitiveness of these items can be much improved by going into larger markets in advanced nations and if the remaining gap in competitive power can be covered by the margin of preferential treatment, they should be exported to advanced nations, particularly to the markets with systems of preference. Otherwise, the exportation to CACM markets should be considered. CACM offers a greater preferential margin than preferential treatment markets in advanced nations, and has no quota. The market scale in CACM is not large enough, however, and most measures for closing the gap in competitive power (including indirect measures, such as tax reduction or exemption on raw materials and machines) are confined by the common

Table I-3-5 FEATURES OF MAJOR MARKETS FOR THE METAL-MECHANICAL INDUSTRIES OF EL SALVADOR

Market	Institutional Characteristics			Economic Characteristics		
	Summary of Market with General Systems of Preference (GSP)	Degree of (Margin of) Preferential Treatment	Scale of Market with GSP	Scale and Growth Potential of Market	Market Stability for Exporting countries	Degree of Competition with Other Exporting Countries
U.S. GSP	Preferential treatment available only to developing nations	Generally, the exemption of preferential tariff (GATT rate) with the exception of certain items	Preferential treatment of each sub-group of items up to 50% of U.S. import value or $20 million, whichever is smaller. The scale is fairly large for developing countries with a small economy.	To scope of preferential treatment is expanded, geared to the increases in preferential imports, non-preferential imports, and prices.	High for items with a large margin of preferential treatment.	Early-starter developing nations offer intense competition.
Regular U.S. Market	---	---	---	Scale is large, but the overall growth potential is not so high: provided, the market can suddenly grow rapidly for some specific items.	Affected by business cycle turn in the U.S. economy and other factors	Severe competition
Japanese & EC Markets with GSP	Preferential treatment available only to developing countries. EC has a discriminatory preferential treatment and industrial cooperation with ACP countries	Generally, exempted tariff for most preferential countries (GATT rate) constitutes the market of preferential treatment: provided, only a part of the GATT rate constitutes such margin for certain items (Particularly the sensitive and semi-sensitive items of EC)	Small, because, unlike the U.S. system, 5%-10% of imports from countries other than developing nations is added to the basic quota (actual imports from developing nations). Any exporting nation ceases to enjoy preferential tariff when it reaches 50% of the ordinary quota.	The scale of GSP is expanded in accordance with actual performance, but large expansion may not be expected.	High for items with a large margin of preferential treatment	Early-starter developing nations offer intense competition
Regular Markets of Japan, EC, and Other Advanced Nations	---	---	---	Scale is fairly large, but the growth rate is not so high due to economic slowdown; provided, the market may suddenly grow rapidly for certain items.	Not so stable due to cyclic change of business and other factors; the degree of stability varies by the exporting country	Severe competition. Free trade within EC is an additional difficulty to exporters from outside. EC, EFTA, and major Mediterranean countries consitute a free trade zone for industrial products.

Market	Institutional Characteristics			Economic Characteristics		
Latin American Markets	El Salvador and other Central American countries have a relatively disadvantageous position in Brazil, Mexico, and Venezuela, which are important markets in Latin America, because of the mutual benefit among the countries of Free Trade Region. The disadvantage is stronger in the Andes Regional Unity.	Degree of preferential treatment by LAFTA countries to each other on the item, but is generally not so high. Andean Common Market has higher degree.	---	Scale of Latin American markets as a whole is of a medium size, but that for metal-mechanical products is as large as the EC market. Growth of the markets is faster than in advanced nations.	Not necessarily stable, as importation largely depends on the international balance of payment position which is affected by the exportation of primary products and inflow of foreign exchange (loans).	Not so servere due to protective tariff barrier. Entry into the Central American market will be difficult if subjected to the same discriminatory tariff rates applicable to imports from advanced nations.
Central American Common Market	Mutual preferential treatment among the five Central American countries (see 3) of Sub-Chapter 2 above in this Chapter	Margin of preferential treatment is extremely large	No particular quota has been established for preferential treatment	Fairly small and compares to medium scale markets in Latin American countries. Growth rate of market is extremely high for metal-mechanical products in view of future industrialization in.	Same as above	El Salvador enjoys an advantageous position in competing with other CACM countries
Domestic Market	---	---	---	Market scale is small, but the growth rate of metal-mechanical in industries markets will be extremely high as industrialization progresses	Stability is not necessarily high, but it is possible to stabilize markets for certain items under policy measures.	---

Source: The JICA Mission

industrial promotion system and so forth. Therefore, it is necessary that a certain level of value added rate is attained.

Many products of metal-mechanical industries fall under (a) above. Thus, it is quite likely that key types of metal-mechanical industries will be located in the Free Zone. It may be wise policy decision to have metal-mechanical industries in the Free Zone from the beginning, in view of their insufficient international competitiveness outside the Common Market (to be further discussed in Chapter II).

Items which fall under (b) above will be relatively few, judging from the current situation in El Salvador.

Particularly, much may not be expected from utilization of small preferntial margin and competition from other developing countries exist.

Next, the scale of each market and the speed with which each will expand in the future should be discussed. As far as metal-mechanical products are concerned, the scale and speed of future growth will vary largely with each market. Latin American market is considered large in scale and high in growth speed. According to an analysis conducted by ECLA, the metal-mechanical market in Latin America is as large as in EC and is much larger than in Japan (if the comparison is limited to markets available to exporting countries and excluding domestically-supplied markets). In addition, the future market potential of Latin American countries, which need large quantities of capital goods, is high for metal-mechanical products.

In comparison to markets in developing countries going through an industrialization process, the growth of markets (which are already large) in advanced nations is slow. Because market expansion in these nations will be smaller than in Central and other Latin American countries, market entry into advanced nations will have to be largely through encroaching on the shares of competing export countries.

3) Metal-Mechanical Industry Development Policy

(1) A Hong Kong Type Development Method

The Plan Operation of the Metal-Mechanical Industries Department of UNIDO-INSAFI claims that the metal-mechanical industries development in El

Salvador should be accomplished by a process-export type, which utilizes a free zone, as in Hong Kong type industrialization for the reason that "El Salvador has a number of advantageous points over Hong Kong in terms of infrastructure, labor force, the existence of a free zone, and geographical proximity to important commercial cities, such as Panama, and to large markets, such as the United States and economical access to these through modern transportation systems, such as cargo containers." Despite the apparent similarities, El Salvador is different from Hong Kong in many respects, and it is questionable whether its industrialization should be accomplished in the Hong Kong style.

First of all, meager as her natural resources may be. El Salvador gained at least 350 million dollars of foreign exchange by exporting her primary produce in 1975. Thanks to this, she does not need to depend solely on the export of industrial products, for foreign exchange.

On the other hand, Hong Kong, which prospered as a British colony for a long time and served as a supply center of industrial goods to China, has been quite separated from that market and, therefore, looked for its industrial export markets in other countries. The success of this small heavily populated and resourceless city was supported by a long-time accumulation of industrial potentials, which should not be overlooked. Of course, Singapore is an example of a relatively recent success under similar disadvantages (large population, poor natural resources) and without the accumulation of industrial potentials. The recent patterns of development in Korea and Taiwan is also centered on the promotion of commodity exportation.

It is extremely important to study these precedences in an attempt to find important alternative development methods for El Salvador. Whether the complete export-oriented development pattern, which was successful in Hong Kong and other Southeast Asian countries, will be successful in El Salvador as well should be well examined.

Off hand, it is conceivable that in El Salvador, experience can be accumulated through strengthening the Free Trade Zone as part of the development pattern, and creating in the Zone an environment close to that which existed in Hong Kong and Singapore, and observing its success. Hong Kong has process-trade based on human resources as its only means of earning foreign exchange.

El Salvador can take advantage of existing resources to accomplish industrialization and economic development. It is possible, and may be even desirable, that an overall economic development in such a manner and the Hong Kong type development in the Free Trade Zone, be accomplished concurrently in El Salvador.

(2) Suggestions for the Industrialization Policy

The new industrial policy of El Salvador, which was discussed in 1) above in this section, has adopted a growth standard, an employment standard, and the international balance of payments standard. The policy aims not only at increases in industrial production but also improvement of industry quality and thereby international competitiveness of the industry. The policy has moved a step forward from previous efforts on substitution of imported final consumer goods with domestic products.

An awareness of these needs stems from a reflection on difficulties experienced since the latter half of the 1960's in the industrialization progress expanding exportation of industrial products, and expanding industrial employment. This awareness in El Salvador is shared by other Central American and many other Latin American nations.

The reasons why import-substituting industrialization of the 1960's could not achieve the expected effects were:

(a) Investment per worker was small and the level of technology was low, and, therefore, productivity could not be improved,

(b) production inefficiency due to the lack of external economies,

(c) inflation of domestic production costs due to higher costs of raw materials and machines under the protective policy, and

(d) cost inflation of production in dollars due to over-evaluation of colons in relation to foreign exchanges under direct and indirect restrictions on imports under the protection policy.

In addition to these problems, bottlenecks peculiar to developing nations have caused product costs to rise, such as an inadequately developed money market, low political and economic stability, and inadequately developed infrastructure. Therefore, when El Salvador changes the policy of import-substitute industrialization to a new industrialization policy, it is essential to place policy emphasis on the elimination of these bottlenecks. Also, when international competitiveness of products is low due to reasons stated in (a) and (b) above, whether their domestic production should be continued or discontinued is another matter of political decision and relates deeply to the educational and technological policy of the Government. Incidentally, if a policy for offsetting such factors as those stated in (c) and (d) above is to be called a "compensation policy for equalization" (medidas de compensaction-igualadora), a policy (subsidy, etc.) for offsetting competitiveness gap in excess of this is called the "super compensation policy" (meidas de sobre-compensacion). These policies are considered to be justified for the exportation of certain items only when their application can facilitate the accomplishment of development objectives and when they can be expected to become unnecessary after a given period of time. In addition to these policies, the following are for the solution of such problems:

i) Fiscal incentive measures (for export promotion and employment expansion),

ii) Foreign exchange policy measures (for specific export products),

iii) Privileges of the free trade zone,

iv) Tariff policy measures (particularly, possible revision of the protection level of certain industries and the reduction or exemption of import tariff), and

v) Measures on standardization of quality control and merchandise design.

of these, i) through iv) are for adjustment away from the previous import-substitution under heavy protection, and clearly reflects the basic understanding of the new industrialization policy under the Economic Social Development Plan, discussed before. For the development of each industrial sector, particularly of the metal-mechanical industries, it is essential that these industrialization policy measures are implemented in each sector and applied to each item in a coherent manner and in harmony with each sectoral industry policy.

Also, it is important for metal-mechanical industries that these measures do not end at "compensation measure for equalization" but allows the "super compensation measure" for offsetting physical productivity gaps of any degree. It will be difficult for metal-mechanical industries, which are highly technology-intensive, to achieve, within a short period of time, a level of productivity which is comparable to the international level. Therefore, it will be necessary to protect these industries for a reasonable period of time, and that a policy for "super compensation measure" be established with said development standards in mind.

Be that as it may, offsetting the physical productivity gap is a passive policy for industrialization. The strength of the industrialization policy should be active measures for elimination of productivity gaps. Basically, such positive measures are nothing but the development of technology, the cultivation of human resources, and education. It has already been pointed out earlier that technical training, and educational policies should be geared to the industrialization policy.

In addition to these long-term policy measures, a series of additional measures can also be included in the industrialization policy. The first of such measures is quality control and standardization, which was taken up by the Economic Social Development Plan. Such a measure will not only improve product quality but also aid enterprises and facilitate productivity improvement tremendously. Standardization and quality control had surprising effects on the development of the sewing machine and precision equipment industries in Japan.

A second measure is accelerated depreciation of fixed assets to encourage the introduction of technology and the expansion of production capacity. This measure, which was widely applied in Japan, will immensely contribute to the improvement of productivity.

Assistance to self-help efforts of enterprises in education, training, production control, and production rationalization is a third measure. Such assistance will encourage enterprises to strive for the improvement of their productivity. Far-reaching productivity movements achieved much success in Japan.

In addition to the application of these measures, revisions and improvements commensurate with the new industrial policy should be effected on such relevant and important matters as the procurement of funds necessary for industrialization, foreign exchange policy, tax system, small business policy, and coordination with other industrial sectors.

Of these, the small business policy has a special significance to the industrialization policy, particularly to metal-mechanical industries. It is quite possible to effect division of work between large and small enterprises wherein large interprises engaged in more capital-intensive and technology-intensive production activities and small enterprises in labor-intensive processing of raw materials and intermediate goods produced by large enterprises. The matching of large and small enterprises in this manner will enable the entire economic system to accomplish simultaneously the elevation of technological standards, improvement of overall efficiency, and employment expansion. Although in a long run the duality of the labor market will eventually have to be corrected into on market, it will be an important short or mid-term solution to concurrently foster both large and small enterprises to correspond to the dual structure. This is a practical way of materializing the productive employment of an abundant labor force which is available at low cost. Japan, too, has accomplished her industrialization under a dual economic structure, and her unique small business policy can be a matter of referrence to El Salvador as she proceeds under her industrialization policy.

II. GUIDELINES FOR DEVELOPING THE METAL-MECHANICAL INDUSTRY

II GUIDELINES FOR DEVELOPING THE METAL-MECHANICAL INDUSTRY

1. Prerequisites for Development

1) Potential Markets

(1) Market Selection

Possible markets for the metal-mechanical products manufactured in El Salvador include the following, in the order of importance:

a) Domestic market;

b) Central-American Common market

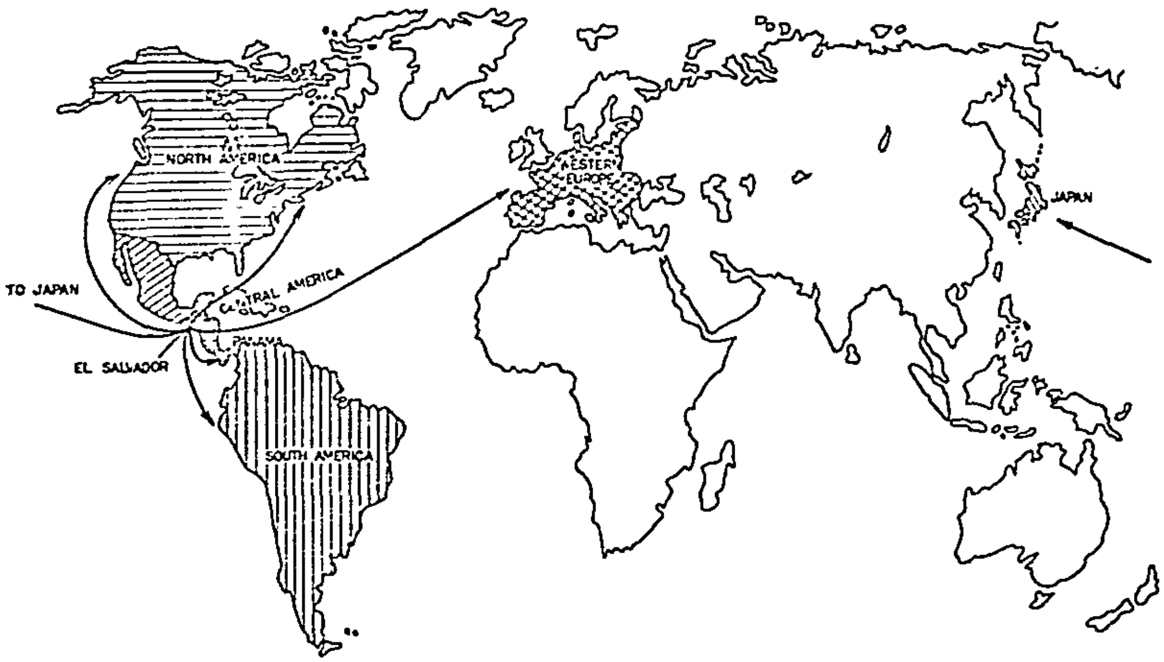
c) North-American market;

d) Panama;

e) Other Latin-American market;

f) Other developed markets such as Western Europe and Japan

International corporations are expected to form joint ventures with Salvadorean partners to accelerate development and are naturally interested in the two main local markets, namely a) and b).



Source: The JICA Mission

Figure II-1-1 Potential Markets for Metal-Mechanical Products from El Salvador

Next important markets include the two extra-regional areas, c) and d). Other markets will have varied importance for El Salvador depending upon metal-mechanical products exported. Intermediate goods with low value added and with low freight-absorption capacity will be exported only to domestic and neighbouring markets. Export of capital goods will be also limited to the regional market due to relative high price anticipated. Durable consumer goods will be exported to the regional and neighbouring markets at the early stage of production, and, with gradual buildup of international competitiveness, they will become exportable to the outside the regional markets.

Results of evaluation of the existing markets for possible export from El Salvador are summarized in Table II-2-1. Besides the Central American

Table II-1-1 Evaluation of Potential Markets of El Salvador

	Population (Million)	G N P per Capita (US$)	Export from El Salvador (US$1,000)*	Export Potential for Metal-Mechanical Products: Intermediate Goods	Capital Goods	Durable Consumer Goods
El Salvador	4.01	449	---	O	Δ	O
Costa Rica	1.97	948	31,940	O	Δ	O
Guatemala	5.43	649	75,956	O	O	O
Honduras	3.04	327	---	O	Δ	O
Nicaragua	2.16	653	36,264	O	Δ	O
U. S. A.	213.60	7,434	121,065	O	X	O
Panama	1.67	---	4,954	O	Δ	O
Japan	110.90	4,557	30,221	X	X	Δ
West Germany	61.80	7,291	62,957	X	X	Δ
Belgium	9.80	6,115	6,261	X	X	Δ
France	52.91	5,014*	9,315	X	X	Δ
Netherlands	13.65	5,954	26,160	X	X	Δ
Poland	---	---	9,109	X	X	X

O Exportable   Δ Export Probable   X Export Impossible

* Figures are for 1974

Source: IMF, Banco Central de Reserva de El Salvador, JICA Mission

regional markets, export of intermediate and durable consumer goods to the U.S. under the General Systems of Preference appears possible. Export competition in the U.S. is, however, very keen among such intermediate-industrialized countries as Brazil, Korea, Taiwan, and Mexico.

El Salvador's domestic market is unlikely to sustain large-scale development of the metal-mechanical industy in view of relatively small population and moderate per capita income. Even compared to some export-orientrd countries in East and South-East Asia, their population and income are known to surpass those of El Salvador as shown in Table II-1-2.

Table II-1-2 Export-oriented Countries in the East and South-East Asia

		Korea	Taiwan	Hong Kong*	Singapore
Population	1,000	34,660	16,070	4,350	2,250
GNP per Capita	US$	541	896	1,178	2,240
Export	% of GNP	30.3	40.7	79.4	94.9
Import	% of GNP	39.8	44.1	85.1	134.6

All Figures for 1975

Source: IMF * Estimated by The JICA Mission

Although populations of Hong Kong and Singapore are comparable to that of El Salvador, they are dependent not only upon manufacturing industy but also largely upon traditional free transit trading.

The Central American regional market with approximate population of 17 millons is, therefore, considered a minimal size for developing most of metal-mechanical industry in El Salvador. Since the average GNP per capita for the C.A. region is 579 U.S. dollars in 1974, which is on the same level as that of South Korea, and the population of the region is approximately half of that of South Korea, 50% of the Korean economy is regarded as a model for development of the metal-mechanical industry in this region. The regional demand for metal-mechanical products is expected be three times as large as the that of the existing one, if the development is modelled after South Korea as illustrated in Table II-1-3.

Table II-1-3 Comparison of Metal-Mechanical Industry between a Korean Model* and the Central American Market

(Unit: MM US$, %)

		Korean Model*	Central America	Difference**
Production	A	1,111	120	991
Export	B	351	30	321
Import	C	955	450	505
Domestic Demand	D	1,689	540	1,149
Export Ratio	B/A	32.3	25.0	
Self-Sufficiency	A/D	64.3	22.2	

* 50% of Korean Figures in 1975

** Korean Model minus Central America

D = A + C - B

Data for Central America are estimated for 1975

Source: The Korean Development Bank, The JICA Mission

It may be concluded from these figures that there is a big potential for developing the metal-mechanical industry within the Central American region, even if the fact that the region is essentially dependent upon agriculture is taken into account. The basic disadvantage of the C.A. market is a lack of common custom duty system for protection of metal-mechanical products assembled within the region.

The U.S. market will be most important for El Salvador among potential markets apart from domestic and regional ones. Characteristics of the U.S. market are summarized as follows:

a) The U.S. owns the huge and sophisticated metal-mechanical industry and is one of the biggest exporters of metal-mechanical goods;

b) The U.S. production of labor-intensive products are gradually being replaced by importation;

c) Export of metal-mechanical products to the U.S. has become increasingly competitive not only from developed areas but also from developing countries.

d) The market is spread out over wide areas. so freight difference has a large impact on competitiveness of imported goods. In a certain areas of the U.S., therefore, goods made in El Salvador will have advantage over other exporting countries.

e) Distribution channels for various metal-mechanical products are well organized in the U.S. and exporters to the U.S. could take advantage of them.

The U.S. import of metal-mechanical goods from developing areas is rapidly expanding as shown in Tables, II-1-4, 5, although net import value is relatively small (12% of total import in 1974).

Table II-1-4 U.S. Import of Metal-Mechanical Products

(US 1,000 Dollars, %)

Year	Imported from	69. Metal Manufactures Nes	71. Machinery Non-Electric	72. Electrical Machinery	73. Transport Equipment	Metal-Mechanical Total
1970	A. World	824,660	3,017,326	2,271,947	5,882,010	11,995,913
	B Developing Countries	57,609	77,076	456,512	28,557	619,754
	C. CACM Countries	144	-	-	-	144
	D. El Salvador	-	-	-	-	-
	E. Ratio B/A	6.9	2.5	20.1	0.4	5 1
	F. Ratio D/B	-	-	-	-	-
1971	A. World	836,821	3,112,763	2,555,060	7,905,301	14,710,145
	B. Developing Countries	37,650	74,733	420,319	30,727	563,429
	C. CACM Countries	164	-	-	-	164
	D. El Salvador	-	-	-	-	-
	E. Ratio B/A	4.5	2.2	16.4	0.4	3.8
	F. Ratio D/B	-	-	-	-	-
1972	A. World	1,144,204	4,410,168	3,376,738	9,613,753	18,544,863
	B. Developing Countries	96,660	130,825	1,058,060	83,038	1,368,583
	C. CACM Countries	267	108	983	-	1,358
	D. El Salvador	-	-	-	-	-
	E. Ratio B/A	8.4	2.9	31 3	0.8	7.3
	F. Ratio D/B	-	-	-	-	-
1973	A. World	1,048,727	4,024,751	3,235,485	8,263,266	16,572,229
	B. Developing Countries	106,330	166,357	1,213,758	120,572	1,607,017
	C. CACM Countries	314	132	1,393	-	1,839
	D. El Salvador	-	-	-	-	-
	E. Ratio B/A	10.1	4.1	37.5	1.4	9.7
	F Ratio D/B	-	-	-	-	-
1974	A. World	2,053,125	6,432,437	5,416,930	12,851,309	26,753,821
	B. Developing Countries	237,337	359,110	2,458,345	213,344	3,268,156
	C. CACM Countries	497	386	13,569	-	14,452
	D. El Salvador	100	277	11,978	-	12,355
	E. Ratio B/A	11.5	5.6	45.4	1.6	12.2
	F. Ratio D/B	---	---	0.5	-	0.4

Source: US Commodity Trade Statistics

Table II-1-5 The Growth of U.S. Import of Metal-Mechanical Goods from Developing Areas

(% per Annual)

	69. Metal Manufactures Nes	71. Machinery Non-Electric	72. Electrical Machinery	73. Transport Equipment	Metal-Mechanical Total
A. World	25.6	20.9	24.2	21.6	22.2
B. Developing Countries	42.5	46.9	52.0	65.0	52.0
C. CACM Countries	36.3	-	-	-	-

Source : Table II-1-4

Among the U.S. import of metal-mechanical products, value of transportation machinery is the largest and sources of import are primarily developed countries. Sizable U.S. import of automobiles from Western Europe and Japan dwarfs importation from developing countries in this category. Non-electrical machinery is the second largest metal-mechanical products imported to U.S.. Exportation of such non-electrical machinery as machine tools, construction machinery and industrial plants from developing countries to the U.S. seems still difficult due to technological reasons. The U.S. import of electrical machinery from developing areas has already reached 45% of the total and this is the area where El Salvador's export to the U.S. is rapidly increasing. Value of metal manufactures imported to the U.S. is the smallest but this category contains numerous labour-intensive products which will further replace those domestically made in U.S. Based upon these observations, export of some electrical machinery and metal manufactures from El Salvador to the U.S. would be considered as a short- term objective for develoment.

(2) International Competitiveness

The metal-mechanical goods manufactured in El Salvador will have to compete with products of other makes. The Salvadorean products should be competitive not only price-wise but also non-prisewise as indicated in Table II-1-6.

Table II-1-6 International Competitiveness of Goods

	Examples of International Competitiveness Factor
1. Price Competitiveness	Ex-Factory Price, Packaging Cost, Fleight, Usance
2. Non-Price Competitiveness	Brand Image, Previous Supply, Delivery Time, Specifications, Quality (Materials, Demensional Accuracy, Surface Finish, etc.), Industrial Standards, Servicing Manual, Service Guarantee, Design

Source: The JICA Mission

It is important for metal-mechanical products made in El Salvador to have higher non-price competitiveness, among others, brand image, quality and servicing. One of measures to attain the higher non-price competitiveness is to introduce foreign technology and to utilize trade brands and distribution channels of internationally established firms at the beginning of production.

2) Selection of Production Steps

(1) Production Steps of Typical Metal-Mechanical Products

Most of the products are currently manufactured in developed areas but there will be an increasing shift towards manufacturing in developing areas depending upon the characteristics of products. The characteristics of typical metal-mechanical products are illustrated in Table II-1-7.

Table II-1-7 Characteristics of Typical Metal-Mechanical Products

	a. Capital-Intensiveness	b. Technology-Intensiveness	c. Labour-Intensiveness	d. Ratio of Value Added to Total Value	e. Transport Cost-Absorption Capacity
1. Automobiles	O	O	X	X	X
2. Integrated Curcuits	O	O	O	O	O
3. TV Receivers	△	△	X	△	[illegible]
4. Telecommunication Equipment	△	O	△	△	△
5. Agricultural Machinery	△	△	△	△	X
6. Machine Tools for Metal Working	△	△	△	△	X
7. Internal Combustion Engine	△	△	△	△	△
8. Photographic Cameras	△	△	O	△	O
9. Water Pump	X	X	△	△	X
10. Domestic Electrical Appliances	X	X	O	△	X
11. Electrical Measuring Instruments	X	△	O	O	-

O High △ Medium X Low

Source: The JICA Mission

Stepwise transfer of production from developed to developing countries continuously takes places. In other words, production of a certain metal-mechanical goods gradually spreads out globally.

The transfer of production steps can be categorized as follows:

a) Vertical Transfer---Production steps including manufacture of and assembly of parts and components are distributed among countries on different stages of development.

b) Horizontal Transfer---Production steps are distributed among countries on the similar level of development.

c) Market Transfer---Initiation of local manufacturing in each country to meet the local demand.

d) Sectorial Transfer---Production of a certain metal-mechanical products takes place in countries with varied degree of development. The quality or the size of the product may differ from one to the other country depending upon basic needs which are characteristic to each country.

Possible production steps of typical metal-mechanical products are summarized as follows:

i) Passenger Automobiles

a) Knock down (KD) production 1---Domestic production of simple parts and components including tires

b) KD production 2---Domestic production of main components including engines

c) Integrated production and/or exportation of some parts and components---Developing automotive parts industry with signicant size of domestic market

d) Exportation of assembled cars---Matured automobile industry with high degree of international competitiveness

e) Large mass-production---Big internal market with high level of per capita income and high technological standards

Examples of transfer of production steps among typical developing countries are shown in Table II-1-8.

Table II-1-8 Examples of Transfer of Production Steps for Automobiles

Production Steps	1970	1975	1980
KD production 1	Indonesia, Nigeria	Indonesia, Nigeria	Indonesia
KD production 2	Taiwan, Korea, Iran, Philippines, Colombia	Philippines, Colombia, Iran	
Integrated production and/or exportation of some parts and components	Brazil	Taiwan, Korea	Iran, Philippines, Colombia, Nigeria
Exportation of assembled cars		Brazil	Taiwan, Korea
Large mass production			Brazil

Source: The JICA Mission

There are many conceivable types of automotive supply and possible processes will include the vertical, market and sectorial transfers. The market and sectorial transfers occur among developed areas, whereas the vertical transfer will take place from developed to developing countries.

It is expected that future transfer of production of automobiles from developed to developing areas will be a mixture of vertical, horizontal and market ones as is exemplified by the "Asian or ASEAN Car" projects.

Assembly of passenger cars may not be an appropriate industry to be located in El Salvador due to its high capital requirement and low labor-intensiveness. This also applies to the whole C.A. region with the exception of producing a few models of specialty cars, which is essentially market transfer.

Production of automotive parts can start to fulfill the regional demand, or export-oriented production is only possible, if vertical transfer successfully takes place with the assistance of international enterprises.

ii) Integrated Circuits

a) Fabrication and assembly---Assembly on extra-market sites

b) Small-scale integrated production

c) Large-scale integrated production

d) Transfer of assembly to developing countries

Typical examples are summarized in Table II-1-9.

Table II-1-9 Typical Examples of Production Steps for Integrated Circuits

Production Steps	1970	1975	1980
Assembly on off-market sites	Korea, Mexico, Taiwan	Korea, Mexico, Taiwan	Korea, Taiwan
Small-scale integrated production			
Large-scale integrated production			Mexico
Transfer of assembly to developing countries			

Source: The JICA Mission

Intergrated circuits, which are highly technology-intensive and have extremely high price-to-weight ratio, are being processed in developed countries, primarily in U.S., shipped to developed countries to be assembled utilizing relative merit of labor cost and reshipped to markets in developed areas. The vertical transfer will continue to spread and will be eventually replaced by the sectorial transfer with increasing use of integrated circuits in TV receivers in developing countries.

The existing assembly factory of Texas Instruments in El Salvador is a typical example of vertical transfer. As long as merit of labor cost exists, the vertical transfer could further prevail.

Market transfer of processing integrated circuits may not take place, however, since the basic manufacturing technology is too sophisticated to be transferred. Central American market is too limited to allow the market transfer to occur. Market transfer or sectorical transfer of final products in which integrated circuits are built would rather take place.

iii) TV Receivers

a) Small-scale KD production for import substitution---Undeveloped domestic market with most parts and components imported.

b) KD production for self-supply---Minimal level of established mass production with insufficient supply of the domestic parts and components.

c) Medium-sized production for self-supply---High level of self-sufficiency of domestically produced parts and components.

d) Large-scale assembly for export---Mass production with significant domestic supply of parts and components, usually taking advantage of inexpensive labor cost.

e) Integrated mass production---Large-scale production of parts and components and assembly are possible. Considerable portion of products is exported.

f) Declining self-sufficiency---Domestic production is limited to TV sets of high quality with increasing import of medium and/or low-priced sets.

Examples of the transfer are illustrated in Table II-1-10.

Table II-1-10 Examples of Production Transfer of TV Receiver

Production Steps	1970	1975	1980
Small-scale KD production for import substitution	Korea, Iran, Philippines, Indonesia	Philippines, Indonesia, Nigeria	Indonesia
KD production for self-supply	Taiwan, Brazil		Philippines, Colombia, Nigeria
Medium-sized production for self-supply			
Large-scale assembly for export	Mexico	Mexico, Korea, Iran Brazil	Iran
Integrated mass production			Mexico, Korea, Brazil
Declining self-sufficiency			

Source: The JICA Mission

The transfer is characterized by a typical vertical transfer. Among developed countries, however, market transfer is often observed in order to secure the existing foreign markets.

Existing assembly lines of TV receivers in El Salvador is a typical small-scale KD production to substitute import and most of parts and components are, however, imported. The next step is to raise self-sufficiency, that is to increase domestic production of parts and components.

Since there are varied electronic parts and components, it is important to select appropriate ones for domestic production. Either vertical transfer of production of the parts from developed areas to El Salvador or horizontal transfer within the C.A. region will take place. The latter is important because it is possible to promote the inter-regional division of manufacturing electronic parts and components.

iv) Wire Telecommunication Equipment

a) Small-scale KD production of simple apparatus---Parts and components are primarily imported.

b) KD production of some apparatus---Increased self-sufficiency to meet domestic demand which has expanded due to developments of telecommunication networks.

c) Large-scale production for complete self-sufficiency---Most apparatus can be manufactured under license of foreign technology. Mass production facilitates exportation of a certain products.

d) Export-oriented mass production---All types of the apparatus are manufactured and distributed internationally.

Examples and projection of production transfer for telecommunication apparatus are shown in Table II-1-11.

Table II-1-11 Examples and Projection of Production Transfer for Telecommunication Apparatus

Production Steps	1970	1975	1980
Small-scale KD production of simple apparatus	Korea, Iran, Philippines, Colombia	Philippines, Colombia	
KD production of some apparatus	Mexico, Taiwan, Brazil	Mexico, Chile, Taiwan, Korea, Iran, Brazil	Iran, Philippines, Colombia
Large-scale production for complete self-sufficiency			Chile, Taiwan, Korea, Brazil
Export-oriented mass production			Mexico

Source: The JICA Mission

Since the products in this category are highly technology-intensive and demand for the products is dependent upon development of telecommunication networks in a country, typical market transfer usually takes place.

Local production of wire telecommunication apparatus could start with assembly of telephone sets and simple automatic switchboards. The basic problem of manufacturing telecommunication apparatus is lack of interchange-ability among systems. Local production has, therefore, little choice other than to assemble apparatus of existing brands. This may introduce some difficulty in possible exportation of the products from El Salvador to the other C.A. countries, when they use different systems.

v) Agricultural Machinery

a) Small-scale production for import substitution

b) Export-oriented production---Multi-national companies sometimes promote trading of agricultural machinery between developed areas.

c) Mass production---Big domestic market with highly mechanized agriculture.

Table II-1-12 Examples and Projection of Production Transfer for Agricultural Machinery

Production Steps	1970	1975	1980
Small-scale production for import substitution	Mexico, Brazil, Portugal, Spain	Mexico, Brazil, Portugal	Portugal
Export-oriented production			
Mass production		Spain	Spain, Brazil, Mexico

Source: The JICA Mission

Summarizes examples of the transfer among the abovementioned production steps.

Actual production transfer of agricultural machinery takes the shape of market transfer, as the manufacturers tend to become merged and multinationalized. This usually results in vigorous market competition.

Agricultural machinery is one of the promising metal-mechanical goods to be manufactured in the C.A. region because of its low absorption capacity of transportation cost. Production of some mechanized agricultural implements are already in progress, though on a small scale. The C.A. region, nevertheless, may not form a large market for the products largely due to its topography and labor-intensive agronomy.

Steps which El Salvador can possibly take in the near future include small-scale production for import substitution on the regional basis. In this case, technology-intensive products such as tractors and combines are to be assembled on knockdown basis, whereas such products of low value added as disc ploughs and threshing machines are to be manufactured locally.

vi) Machinery for Metal Working

a) Production of general-purpose machinery---Due to labor-intensive nature of the products, sectorial transfer is taking place from developed to developing areas.

b) Exportation of general-purpose machinery.

c) Mass production---Countries with large domestic markets can start mass production of general-purpose and ordinary-grade machine tools.

d) Specialization in high-grade machinery---High-grade machinery are usually produced at selected companies in developed areas.

Table II-1-13 Examples and Projection of Production Transfer for Agricultural Machinery for Metal Working

Production Steps	1970	1975	1960
Production of general-purpose machinery	Taiwan, Korea, Brazil		
Exportation of general-purpose machinery	Spain, Mexico	Mexico, Taiwan, Korea	Taiwan, Korea
Mass production		Spain	Spain, Brazil
Specialization in high-grade machinery			

Source: The JICA Mission

Sectorial transfer is characteristic to the metal-working machinery. There is a clear division between manufacturers of high-grade and those of general purpose machinery, although production sizes of both types are somewhat similar, that is, relatively small.

If proper selection is made, some general-purpose machinery could be manufactured in El Salvador and could be exported primarily to the C.A. regional market. It is advisable to assemble the machines using locally manufactured parts and component rather than to start knock down, depending upon types of machinery.

vii) Internal Combustion Engines

a) Knock Down Production---Assembly is conducted using imported parts and components.

b) Mass Production/Exportation---At this stage, markets for IC engines including manufacture of truks, construction machinery, agricultural machinery, generators and other industrial machinery must have grown

Examples of production transfer are shown in Table II-1-14.

Table II-1-14 Examples and Projection of Production Transfer for Internal Combustion Engines

Production Steps	1970	1975	1960
Knock down production	Spain, Mexico, Taiwan, Korea, Brazil	Mexico, Taiwan, Korea	
Mass production		Spain	Mexico, Spain, Brazil, Taiwan, Korea

Source: The JICA Mission

Actual process of production transfer is primarily market transfer. In developed areas, horizontal transfer is sometimes observed. It is particularly important to identify appropriate types and sizes of local products which will find wider use in the C.A. region.

viii) Photographic Cameras

a) Production of inexpensive cameras---This type of production can take place in countries with relatively inexpensive labors.

b) Production of medium and high-grade cameras---Assembly is being transferred to developing countries which have already achieved considerable development.

c) Production of specialty cameras---In developed areas, specialty cameras is probably a single product left for domestic production.

Table II-1-15 shows examples of production transfer of cameras.

Table II-1-15 Examples and Projection of Production Transfer for Photographic Cameras

Production Steps	1970	1975	1980
Production of medium and high-grade cameras	Hong Kong, Taiwan	Singapore, Hong Kong, Taiwan, Korea	Singapore, Hong Kong, Taiwan, Korea, Brazil
Production of specialty cameras			

Source: The JICA Mission

Due to the high absorption capacity of transport cost, large scale sectorial transfer of production is currently taking place, usually starting with vertical transfer. Typical examples include establishing assembly factories in Singapore and Taiwan by Japanese and German manufacturers.

Inexpensive cameras are already assembled in El Salvador, demonstrating a successful example of sectorial transfer. Selection of mode of transfer including vertical and market ones seems influenced by strategies of multinational companies. Production of the medium-grade products in El Salvador is possible but the products are necessarily competitive with ones from Hong Kong, Taiwan and Singapore.

ix) Water Pumps

a) Small-scale production---Countries with less-developed economic infrastructure

b) Mass production/Exportation---Countries with sizable markets including water supply, sewage and drainage and irrigation facilities. Examples of production transfer are shown in Table II-1-16.

Table II-1-16 Examples and Projection of Production Transfer for Water Pumps

Production Steps	1970	1975	1980
Small-scale production	Taiwan, Iran, Spain	Taiwan, Iran	Colombia
Mass production/Exportation		Spain	Spain, Taiwan, Iran

Source: The JICA Mission

Since cost of transporting water pumps is high relative to their prices, market transfer is usually observed. Although mass production is usually preferred, if it is combined with building a new iron foundries in El Salvador, small scale production of certain types may become feasible.

x) Electric Refrigerator for Household Use

a) Small-scale KD production for import substitution---Knock down production is designed for supplying domestic market with protection of tariff barrier.

b) Medium-size production for domestic market---Assembly is primarily based upon parts and components domestically produced.

c) Integrated production---Domestic products become competitive with imported goods and some are exportable.

d) Large-scale exportation---With a large and stable domestic market, international competitiveness of the product develops.

e) Declining production---Domestic production declines in accordance with increase of production cost. Models in small demand are generally imported. Typical transfer of production is shown in Table II-1-17.
Typical transfer of production is shown in Table II-1-17.

Table II-1-17 Examples and Projection of Production Transfer for Electric Refrigerator for Household Use

Production Steps	1970	1975	1980
Small-scale KD production for import substitution	Korea, Iran, Philippines, Colombia	Philippines, Colombia	
Medium-size production for domestic market	Taiwan, Brazil		Philippines, Colombia
Integrated production	Spain, Mexico	Mexico, Taiwan, Korea, Iran, Brazil	Iran
Large-scale exportation		Spain	Mexico, Spain, Brazil, Taiwan, Korea
Declining production			

Source: The JICA Mission

Examples of vertical transfer include cases of Italy and Spain. Both countries take advantage of relative merits of inexpensive labor and material costs. Currently such countries as Taiwan, Mexico and Brazil are increasing export to their neighboring markets.

Two companies have already been assembling refrigerators in El Salvador. In view of the large export from El Salvador to the C.A. region, small-scale KD production for import substitution is now being replaced by medium-scale production. For increased local production, vertical transfer of production of refrigerating units including compressors and radiators is required.

xi) Electrical Measuring Instruments

a) Small-scale KD production of simple instruments---Most sophisticated products are imported, whereas domestic products only meet a fraction of local market.

b) Production of the medium-grade instruments---Major parts and components are imported.

c) Mass production of the medium-grade and assembly of high-grade instruments---Exportation of the medium-grade products are in progress.

d) Integrated production---Many types and sizes are manufactured.

e) Specialization in production of medium- and high-grade instruments ---Most low-grade products are imported.

Table II-1-18 shows examples of production transfer for electrical measuring instruments.

Table II-1-18 Examples of Production Transfer for Electrical Measuring Instruments

Production Steps	1970	1975	1980
Small-scale KD production of simple instruments	Taiwan, Brazil		
Production of the medium-grade instruments	Spain, Mexico	Mexico, Taiwan, Korea, Brazil	
Mass production of the medium-grade and assembly of high-grade instruments		Spain	Chile, Taiwan, Korea, Spain, Brazil
Integrated production			
Specialization in production of medium- and high-grade instruments			Mexico

Source: The JICA Mission

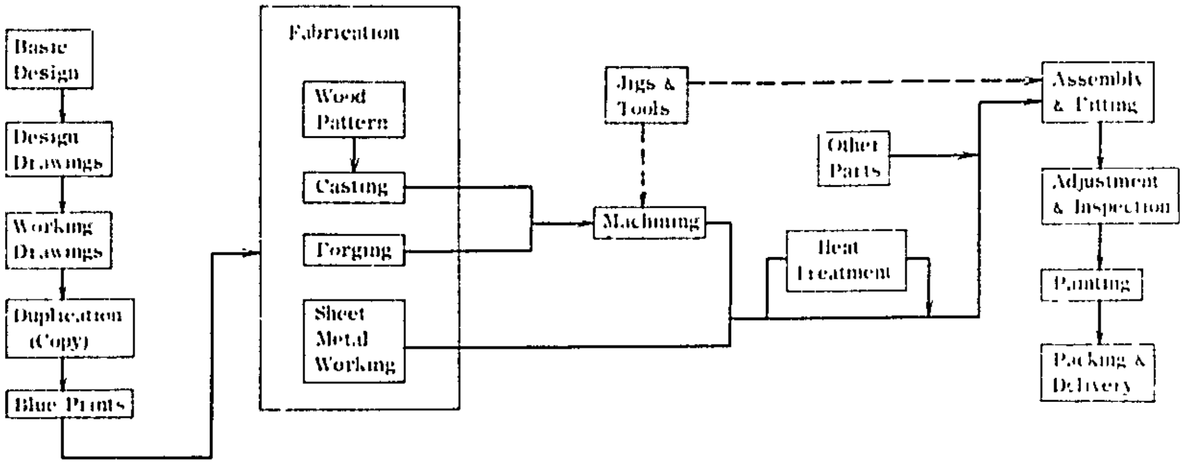
Electrical measuring instruments are usually manufactured in small numbers due to their diversified specifications. Because of this reason, vertical or horizontal transfer can be seldom observed. As for medium-grade products, market transfer sometimes takes place in order to reduce the price by setting up local assembly. This is typically represented by assembly in Korea and Taiwan through the investment by Japanese companies.

In El Salvador, KD production of simple electric meters has become possible. Mass production is, however, not preferred to small-scale production, since El Salvador's advantage of low labour cost may not be fully utilized. It is worthwhile to indicate that both Brazil and Mexico have established electrical measuring instrument industry and would certainly become stiff competitors with El Salvador.

3) Technology and Industry Required for Developing the Metal-Mechanical Industry in El Salvador.

(1) Production Technology

General process of manufacturing metal-mechanical products except for electrical and electronic apparatus is illustrated in Figure II-1-2.



Source: Handbook for Modern Mechanical Engineering

Figure II-1-2 Manufacturing Process of Typical Metal-Mechanical Products

A basic design of final products is put into shape by way of design and working drawings. Duplicated working drawings are usually distributed among each fabrication stages concerned including casting, forging, sheet metal working and machining, and parts and components thus manufactured are finally assembled. Parts and components also include mass-produced ones such as screws, bolts and nuts.

There are three kinds of main fabrication technology for metal-mechanical parts and components as shown in the Table II-1-19.

Table II-1-19 Fabrication Methods of Metal-Mechanical Manufactures

Types of Fabrication	Fabrication Technologies
1. Removal of materials from surface	Machining, Grinding and Polishing, Spark Machining
2. Joining foreign materials to surface	Welding, Plating
3. Deformation of materials	Forging, Extrusion, Sheet Metal Working, Casting

Source: Handbook for Modern Mechanical Engineering

Basic technology include machining, grinding, polishing, plastic forming (forging, extruding and sheet metal working), casting, and welding. In addition to fundamental technology, heat treatment and surface treatment constitute an important part of the technology. Other specific technology such as powder metallurgy, explosion forming, spark machining, and electrolytic machining are extensively used in industrialized countries.

In case of developing the metal-mechanical industry in El Salvador, the specific or sophisticated technology mentioned above may not be needed, because it is most important to implant basic technology to nucleate solid cores of the metal-mechanical industry. There already exist some of the basic technology in El Salvador but they are not enough sophisticated to produce articles of extra sizes, of precision or of uniform quality.

Based upon local survey conducted by the Mission, existing basic technology in El Salvador is summarized in Table II-1-20.

Table II-1-20 Status of Basic Metal Fabrication Technologies in El Salvador

Classification	Elements of Fabrication	Normal Size	Specifications: Bulky Size	Specifications: Precise/ Small Size	Specifications: Complicated Shape	Typical Fabricators in El Salvador
1 Machining	Machining by Lathes	O	Δ	Δ	Δ	IMSA, SARTI
	Drilling and Boring	O	O	Δ	——	SARTI
	Milling	O	Δ	Δ		IMSA, ROXY, TROVASA
	Surface Shaping	O	Δ	Δ	Δ	SARTI, Mechanica Industrial
	Gear Cutting	O	O	Δ	Δ	SARTI, Mechanica Industrial, MOLDTROCK
2. Grinding, Honing Lapping	Cylindrical Grinding	Δ				
	Internal Grinding	Δ				
	Surface Grinding	O	Δ	Δ		IMACASA, IMSA, TROVASA, ROXY
	Honing	Δ				
	Lapping	Δ				
3. Casting	Sand Molding	O	Δ	O	Δ	Ferrous: SARTI, Non-Ferrous: IMSA, SARTI
	Shell Molding	O	——	Δ		IMSA (Core Making)
	Centrifugal Casting					
	Die Casting	O	Δ	O	Δ	IMSA, Industrias Opticas

(Continued-1)

Classification	Elements of Fabrication		Normal Size	Specifications Bulky Size	Precise/ Small Size	Complicated Shape	Typical Fabricators in El Salvador
4. Forging	Hot Free Forging		O		Δ	——	IMACASA
	Hot Die Forging		O		Δ	Δ	IMACASA
	Cold Die Forging				Δ		
5. Sheet Metal Working	Sheet Shearing		O	O	Δ	——	IMSA, INDECA, TROVASA, PRADO, Fabrica Superior, DICASA, INCO
	Sheet Blanking		O	Δ	Δ	O	IMSA, IMACASA, Carlos Aviles, TROVASA, TAPPAN, INCASA
	Sheet Bending		O	O	Δ	Δ	INDECA, IMSA, PRADO, TAPPAN, Fabrica Superior, DICASA
	Deep Drawing		Δ		Δ		(CEFINSA)
	Spinning		O		Δ	Δ	Aluminio de El Salvador
6. Extrusion	Hot Extrusion	Al Steel	O	Δ	Δ	O	ALDECA (Alcoa)
	Cold Extrusion	Al	Δ		Δ		
7 Welding	Arc Welding		O	Δ	Δ	Δ	OXGASA, COMSA, ARCO, SARTI, CEFINSA
	Resistance Welding		O	Δ	Δ	Δ	INDECA, PRADO, Fabrica Superior, DICASA
	Gas Welding		O	O	Δ	Δ	COMSA, ARCO, SARTI
8. Polishing, Plating, Painting	Mechanical Polishing		O		O	O	IMSA, IMACASA
	Electrolytic Polishing		O	——	Δ	Δ	IMACASA
	Hot Dipping		O	Δ	Δ	Δ	METASA
	Electrolytic Plating		O	Δ	O	Δ	IMSA, Ave Fenix, Electro-depositos
	Spray Painting		O	O	O	O	INDECA
	Electro-Static Painting		O	Δ	Δ		IMSA
9. Heat Treatment	Quenching		O		Δ	Δ	IMACASA, IMSA, TROVASA
	Tempering		O		Δ	Δ	IMACASA, IMSA, TROVASA

O In existence　　Δ Possible in near future

Source: The JICA Mission

a) Machining: Machining is widely used in El Salvador primarily by utilizing lathes, milling machines, drilling and boring machines, planing machines, and so on. The purposes of machining in El Salvador include manufacture of simple parts, repairing parts and manufacture of dies and molds. Sizes of products vary from considerably large (SARTI) to small ones. The existing technological problems in El Salvador are as follows;

- o quality control in mass production; and
- o accuracy.

Full utilization of precision milling machines is one of the most important technology involved, since it facilitates improving quality of dies and molds for sheet metal working and plastics molding. The advanced precision milling technology is preferably to be introduced from developed countries.

Gear cutting is usually performed either with universal machines including milling machines or with gear cutting machines. According to the information collected by the JICA Mission of 1976, the use of single-purpose gear cutting machines in El Salvador is limited. The reason is that gear cutting at present is primarily aimed at supplying small number of repairing parts.

b) Grinding: For intermediate and final finishing, grinding is extensively utilized. Grinding machines are categorized according to shapes of surface to be ground, namely cylindrical, internal, surface and special grinders. It appears that technology for grinding machine parts of hardened steel has not been well-developed. Nevertheless, sophisticated grinding techniques such as honing and lapping may not be needed urgently.

c) Casting: At present, sand mold casting of cast iron, copper alloys and aluminium alloys is conducted at a few foundries in El Salvador. Products are generally small to medium-sized with the exception of SARTI's large-sized ferrous castings, and the majority of castings are in simple shape. Apart from the metals indicated above, neither specific castings of malleable and nodular cast iron nor cast steels are in production at this moment. It seems unlikely that demand for these specific castings will increase considerably in near future. The relating technology can be introduced whenever needed.

The existing problems of the El Salvador's casting industry are associated with quality and productivity. It is recommended to modernize the existing facilities and to employ new casting technologies, as has been clearly demonstrated by the improved quality of copper alloy castings after introducing shell core molding at IMSA. Die casting of aluminium and zinc seems technologically well established and problems left will include betterment of quality and yield.

d) Forging: Hot die forging has been extensively used for manufacturing simple agricultural implements at IMSA. Technology, therefore, has been well established, whereas cold die forging is presently not used in El Salvador. The latter technology will become important if mass production of such simple products as bolts and tablewares is planned.

e) Sheet Metal Working: Various techniques of sheet metal working are extensively utilized at factories in El Salvador. In particular shearing, blanking, and bending of metal sheets are well established. Deep drawing of sheet metal is far more complicated technology compared with the existing ones and is not yet adopted in El Salvador. Since it can produce various important parts and components, the technology expected to be introduced and implanted in El Salvador shortly.

f) Extrusion: Hot extrusion of aluminium and its alloys is successfully carried out at ALDECA. Hot extrusion of ferrous metals is, however, not performed simply because of a limited market for this products. Cold extrusion of metals, provided cold heading is excluded, is not very important technology except for manufacturing collapsible aluminium casings for dental cream.

g) Welding: Major technology including electric arc, electric resistant and gas welding is extensively used in El Salvador. Nevertheless, only ordinary welding is employed and neither specific welding nor welding specific materials is conducted.

h) Surface Treatment: Some factories in El Salvador already adopt such technology as buffing, hot dipping, electrolytic plating and electrostatic painting. Spray painting is in extensive use at many factories. There is a already noticeable shift from spray painting to electrostatic painting due to its better productivity. Batch-type electroplating, as is represented by a IMSA factory, is inefficient and an introduction of continuous or semi-continuous type is recommended.

Electrolytic plating has its own disadvantage of water pollution and its effluent treatment is inevitable. It is, therefore, advisable to locate electroplating factories together and to treat the whole effluant centrally.

i) Heat Treatment: Quenching and tempering are extensively practiced at IMACASA and, to some extent, at IMSA and TROVASA which produce dies and molds made of tool steel. For mass production as experienced at IMACASA, use of automatic heat-treating apparatus can save considerable technical troubles. Small-sized production of dies and molds may present some technological difficulty in El Salvador. According to an interview with a distributor of tool steel in San Salvador, however, purchasers of tool steel usually face little difficulty in heat treating the materials by themselves, if they receive working standards for the heat treatment prepared by steel manufacturers.

Considering the above mentioned investigation into the existing technological level in El Salvador, important technology needed for developing the metal-mechanical industry will include the followings:

Mass production of metalic parts and components of uniform quality by machining and grinding;

Precision machining of dies and molds;

Mass production of iron castings of uniform quality by sand molding;

Die casting of large-sized articles;

Hot die forging of small articles;

Deep drawing of sheet steel;

Proper heat treatment of various special steel.

In addition to manufacturing technology, varied tests for quality control of products are necessary as shown in Table II-1-21.

Table II-1-21 Varied Tests for Quality Control of Products

Classification			Test Methods
Materials Testing	Chemical Testing		Chemical Analysis, Chemical Etching, Spectochemical Analysis
	Mechanical Testing	Static Tests	Tensile Test, Bending Test, Shearing Test, Compression Test, Torsion Test
		Dynamic Tests	Impact Test (Tensile, Bending, Compression, Torsion) Fatigue Test (Tensile, Bending, Compression, Torsion)
		Simulative Tests	Fracture Test, Welding Test, Creep Test, Deep Drawing Test, Friction Test, Cutting Test, Wear (Friction) Test
	Hardness Tests	Static Hardness	Scratch Hardness Test, Indentation Hardness Tests
		Dynamic Hardness	Resilience Hardness
	Metallographic Testing	Macroscopic Test	Spark Test
		Microscopic Tests	Optical Microscopy, Electron Microscopy
	Non-Destructive Testing	Physical Tests	Supersonic Test, Eddy Current Test, X-ray Test
Measuring	Profile Measurement		Length Measurement, Thickness Measurement, Parallelness Measurement, Straightness Measurement, Angle Measurement, Out-of-Roundness Measurement, Cylinder Measurement.
	Surface Roughness Test		Surface Tracing Method, Interference Method, Optical Cut Method
Dynamic Testing	Power Measurement		Hydraulic Dynamometer, Friction Dnamometer, Air Dynamometer, Electric Dynamometer, Forsion Dynamometer
	Vibration Testing		Vibration Testers (Mechanical, Electrical)
	Dynamic Balancing Tests		Dynamic Balancing Machines (Electric, Mechanical)

Source: The JICA Mission

Certain important tests, names of which are underlined in Table II-1-21, are preferably standardized and quality of products is to be guaranteed through the industrial standards.

It is observed that industrial standards in El Salvador are yet to be established and numerous foreign industrial standards including American (ASTM, AISI, SAE, ASME, NEMA), European (BS, DIN, NF) and Japanese (JIS) ones are employed arbitrarily whenever they are in need. Quality control of products appears not a widely accepted concept in El Salvador.

(2) Supporting Industries

Supporting industries needed for developing the metal-mechanical industry in El Salvador include the followings:

a) The existing metal-mechanical industry;
b) Other machine-parts manufacturing industry;
c) Materials industry;
d) Other supporting industries

a) The existing metal-mechanical industry

The existing industry could form a nucleus of new and sophisticated metal-mechanical industry because of its technological potential. And it also gives the information about new industrial sectors which are missing in El Salvador at present but will become necessary as development progresses.

Table II-1-22 indicates distribution of the existing metal-mechanical

Table II-1-22 Existing Metal-Mechanical Industries in El Salvador

ISIC		Typical Manufacturers in El Salvador
3811		
	38111	IMACASA
	38112	ALUMINIO DE EL SALVADOR
	38113	FUCASA, IMSA, CLAPER, CEFESA
3812		
	38121	INCO, PRADO, PRODUCTOS DE METAL, METARAMA
3813		
	38131	COMSA, OXGASA, CARLOS AVILES
	38132	ARCO-SOLAIRE, INCO
3819		
	38191	CORHO Y LATA
	38192	CLAPER, CEFESA
	38193	AVE FENIX, ELECTRODEPOSITOS, IMSA
	38194	IMSA
3821		
	38210	
	38211	
3822		
	38221	IMACASA
3823		
	38231	
3824		
	38241	
	38242	
	38243	(METALMECANICA)
	38244	(SARTI)
	38245	
3825		
	38251	
3829		
	38291	PROESA-INTESA
	38292	TAPPAN
	38293	PRADO, INDECA
	38299	MOLDTROCK, TROVASA, SARTI, BIOLLO, MECANICA INDUSTRIAL
3831		
	38311	

(Continued)

ISIC		Typical Manufacturers in El Salvador
3832		
	38321	TELEVOX, ELECTRA
	38322	MANEXPORT, TEXAS INSTRUMENTS
	38323	
3833		
	38331	PRADO, IMSA
3839		
	38391	INPELCA
	38392	CONELCA
3841		
	38411	SERVIMAR
3842		
	38421	
3843		
	38431	FABRICA SUPERIOR, DICASA
	38432	IMSA
	38433	DURAPARTS
3844		
	38441	PROESA-INTESA
3845		
	38451	
3849		
	38491	CEFINSA
3851		
	38511	
3852		
	38521	INDUSTRIAS OPTICAS
	38522	ROSALES AMPLIFOTO
3853		
	38531	

Source: Onudi-Ministerio de Planification-Insafi Plan Operativo Para El Desarrollo de la Rama Metalmecanica

The JICA Mission

industrial sectors in El Salvador. The basic information was obtained from a study jointly conducted by ONUDI, Ministerio de Planificacion and INSAFI and also from interviews by the JICA mission.

It needs to be emphasized that the ISIC (CIIU) employed in this report is slightly different from that commonly used in El Salvador. It is clear from this table that production of such simple metal-mechanical products as cutlery, some hand tools, general hardwares, metal furnitures, metal structures, metal manufactures other than machinery is already in progress, although the number of types of the products is limited. As for assembled products, TV receivers, radios, electric refrigerators, and buses are a few examples currently in production in El Salvador. Comparatively simple assembly has, therefore, already become viable in El Salvador, provided that the markets exist.

The probable steps to be taken to rear the metal-mechanical industry in El Salvador are as the following:

To fill the industrial sectors presently missing;

To concentrate on developing several strategic industrial sectors.

b) Metal-mechanical parts industry

This industry is virtually nonexistent in El Salvador at present. The prime reason for this is that the scale of the existing metal-mechanical industry is too small to absorb mass-produced parts and not that production technology is nonexistent.

Parts needed in the metal-mechanical industry usually include two typical categories, namely machine parts (or functional machine parts), and electrical and electronic parts. Processes and technology employed for the production of each group of parts are essentially different. Table II-1-23 shows the present status and potential of machine parts production in El Salvador.

Table II-1-23 Present Status and Potential of Machine Parts Production in El Salvador

Classification	Elements of Machinery	Specifications: Normal Size	Bulky Size	Precise/ Small Size	Specific Fabrication	Specific Material
1. Screw, Rivet etc.	Bolt and Nut	O	△	△	△	△
	Screw, Clamp Screw	O	△	△	△	△
	Wood Screw	O	△	△	△	—
	Washer	△	△	△	△	—
	Pin	O	△	△	△	—
2. Shaft, Joint, Key, Spline etc.	Wheel Shaft	O	△	△		△
	Crank Shaft	△				
	Flexible Coupling					
	Universal Coupling	△				
	Fluid Coupling					
	Friction Clutch	△				
	Jaw Clutch	△				
	Key	△				
	Spline	△				
3. Bearing	Ball Bearing					
	Roller Bearing Plane Bearing	△				△
	Oil Seal					
4. Gear	Cylindrical Gear	O	O	△	△	△
	Bevel Gear	△		△		
	Worm Gear	O	△	△		
	Rack	O	△	△		
	Sprocket Wheel	O				
5. Belt, Chain, Speed, Changer	Flat Belt	△				
	V-Belt	△				
	Pulley	O	△	△		△
	Roller Chain					
	Silent Chain					
	Gear Speed Changer	O	△	△		△
	Belt or Chain Stepless Speed Variator	△				
	Friction Stepless Speed Variator	△				
	Hydraulic Stepless Speed Variator					

(Continued-2)

Classification	Elements of Machinery	Specifications				
		Normal Size	Bulky Size	Precise/ Small Size	Specific Fabrication	Specific Material
6. Hydraulic Joint, Valve etc.	Pipe Flange	△				△
	Pipe Fitting	△				△
	Stop Valve	△				
	Gate Valve	△				
	Butterfly Valve					
	Cock, Tap	O		△		△
	Gasket	△		△		
7. Spring	Coil Spring	△		△		
	Leaf Spring					
	Helical Spring	△		△		
	Torsion Bar					
8. Brake, Bumper, Damper	Belt/Drum Brake	△				
	Disc Brake					
	Spring Bumper	△				
	Friction Bumper					
	Rubber Bumper	△				
	Hydraulic Damper	△				
	Dynamic Damper					

Source: The JICA Mission　　　O In existence　　　△ Possible in near furure

o Screws, rivets and etc.

A few manufacturers in El Salvador are already producing screws and rivets in small scale. The production process is not automated and, consequently, the quality of products is not uniform. Accuracy of the screws is unacceptable for use in precision assembly. It is important to introduce header machines and/or thread rolling machines to produce uniform and precision screws, rivets and bolts. The timing of purchase of these machines entirely depends upon how rapid the expansion of markets is.

o Shafts, joints, keys, splines and etc.

Production of such simple items as straight shafts is possible at the current level of technology and equipment. Other shafts in specific shapes including crankshafts are not easily manufactured in El Salvador. Clutches except for ones for the use of automobile can be produced without difficulty.

o Bearings

Since the bearing industry is essentially based upon mass production technology, Salvadorean ball or roller bearing, even if they are successfully made, will not have enough price competitiveness. Production of specialty bearings such as oil-impregnated and miniature bearings may have to take some time before it starts, due to technological gaps. Only plane bearings which are easily machined are producible.

o Gears

Spur or flat gears are already in production with varied sizes. Herical and bevel gears are difficult to be machined with general-purpose machine tools, and therefore use of single-purpose machines will become necessary. Gear cutting machines tend to be expensive and demand for the products must be investigated before dicision of their introduction is made.

o Belts, chains, speed changers and etc.

Speed changers of simple mechanism are being assembled in El Salvador. Markets for these products will gradually expand, either domestically or regionally. Production of chains will possibly be established as an export-oriented industry, in particular extra-regional export.

o Hydraulic joints, fittings, valves and etc.

Except for water taps for domestic use, none of these articles are currently manufactured. The existing production facilities at IMSA will be able to produce more sophisticated taps, cocks and valves, if they are modernized and expanded. It is important to concentrate on producing limited types and sizes of these products which can be widely marketed, since Salvadorean products will have to compete internationally with those from Korea, Taiwan, Mexico and so forth.

o Springs

Springs manufactured in El Salvador only include wire springs for mattresses. Springs for simple industrial uses are relatively easy to produce but the products tend to be costly if they are made in small numbers. The current demands in both domestic and the regional markets, do not seem large enough to make mass production of springs a viable proposition.

o Brakes, bumpers, dampers and etc.

None of these are manufactured in El Salvador. The regional demands excluding those for automotive use are small and fragmented. Although the manufacturing process is technologically not too complicated, domestic production may not be economically feasible.

The following are summary of the above discussions:

- The existing metal-mechanical industry in El Salvador is already producing simple machine parts such as screws, flat gears and straight shafts. These products are, however, made in small numbers primarily for purpose of repairing imported machinery. Machine parts of uniform quality can be manufactured in quantity by introducing single-purpose machine tools. However, the markets and industrial standards of these products have to be established in advance.
- Demand for other machine parts can be met by import or domestic production. The latter will be greatly improved by introduction of foreign technology and by modernization of equipment.
- Machine parts of relatively high value added including metal chains can be manufactured in El Salvador and exported to the extra-regional markets.

Table II-1-24 Supply of Raw Materials in El Salvador

Materials	Specifications	Supply
1. Steel	Bar, Square	ACERO, CORINCA, SIDERURGIA SALVADORENA
	Angle	ACERO, CORINCA
	Wire	ACERO
	Plate	Imported from Japan and U.S.A.
	Sheet	Imported from Japan, West Germany, U.S.A. and France
	Tin Plate	Imported from Japan, U.S.A. and Netherlands
	Galvanized Sheet	METASA
	Pipe and Tube	Imported from Japan, U.S.A. and West Germany
	Special Steel (Tool Steel, Stainless Steel, Structural Steel)	Imported from Japan, West Germany, Belgium, Sweden, Spain and Austria
	Welding Electrode	Imported from Guatemala and U.S.A.
2. Aluminium	Extruded Shape	ALDECA
	Sheet and Foil	Imported from U.S.A.-----ALCOA
	Wire	Imported from U.S.A.
	Billet	Imported from U.S.A.-----ALCOA
3. Zinc	Ingot	Imported from U.S.A., Japan, Peru and Mexico
4. Copper Wire & Cable	Cable	CONELCA
	Formalin Wire	CONELCA
	Vinyl Wire/Fine Wire	Imported from Japan, U.S.A. and Europe
5. Copper	Bar	Imported from Peru, U.S.A. and Mexico
	Sheet	Imported from Europe
	Pipe and Tube	Imported from U.S.A., Mexico and Costa Rica
6. Plastics Resin	PVC	Imported from Nicaragua, U.S.A. and Japan
	Polyethylene	Imported from U.S.A. and Europe

Source: The JICA Mission

c) Materials industry

Domestic production of some materials is already in progress as shown in Table II-1-24. Most demand for ordinary steels except for steel bars for construction are met by import as well as the entire demand for special steel. ACERO and SIDEPASA are known to have plans of producing special steels but it may take some time before quality of the products reaches acceptable level.

Regarding supply of non-ferrous metals, aluminium extrusions are already self-sufficient. Other aluminium products including sheets, bars, foils, and wires are imported and distributed by ALDECA. Supply of copper and its alloys are totally dependent upon import and, consequently, there may be a problem of slow delivery. Copper wires and cables are primarily supplied by CONELCA but some important products including insulated wires for electrical machinery and vinylcoated wires are still imported.

It is generally accepted that quality control and industrial standardization of domestic production have yet to be established, and that users of domestic materials are not necessarily satisfied with the quality.

d) Other supporting industries

Supporting industries other than the machine parts industry include those indicated in Table II-1-25.

Table II-1-25 Other Supporting Industries

Classification	Item	Example
Tool	Cutting Tool	Twist Drill, Reamer, Tap & Die, Milling Cutter, Gear Cutter, Gear Shaving Cutter, Single Point Tool.
	Cemented Carbide Tool	Cemented Carbide Tip, Cemented Carbide Single Point Tool, Cemented Carbide Milling Cutter.
	Diamond Tool	Diamond Turning Tool, Diamond Wheel, Diamond Dresser.
	Grinding Wheel	Grinding Wheel
	Machinist Hand Tool	Spanner, Adjustable Wrench, Socket Wrench, Pipe Wrench, Side Cutting Plier, Screw Driver, Vice, Pipe Cutter.
	Electric Tool	Electric Drill, Electric Grinder, Electric Disc Sander, Electric Polisher.
	Pneumatic Tool	Pneumatic Grinder, Pneumatic Drill, Pneumatic Hammer, Pneumatic Impact Wrench.
	Blade	Shear Blade, Cutting Knife, Metal Cutting Band Saw, Wood Cutting Saw.
Die & Mold	Die & Mold	Die for Press (Blanking, Bending, Drawing, Progressive), Die for Forging, Mold for Casting (Gravity Casting, Die-Casting), Mold for Plastics, Mold for Glass, Mold for Ceramics

Source: The JICA Mission

Most products are imported with the exception of dies and molds. Dies and molds are manufactured in El Salvador by the following firms:

Press blanking dies---TROVASA, IMACASA, IMSA and etc.

Dies for die-casting---IMSA

Dies for forging---IMACASA

Molds for forming plastics---Roxy and etc.

Other sources of the supply includes manufacturers in Miami, U.S.A. It is understood that they take orders, manufacture dies and molds in Miami, and send them to customers in El Salvador on lease terms. The whole system appear well-organized but, in view of numerous troubles which are likely to occur during the use of dies and molds, it is better to have the manufacturers in El Salvador. The specialized manufacturers are preferably equipped with such modern machine tools as profile milling machines and electric discharge machines.

Important requirements for the supporting industries are not only quality and servicing but also punctuality of delivery. In this sense domestic products are regarded as less reliable, and the same applies to imports from the U.S.A. Salvadorean customers tend to prefer raw materials and parts imported from West Germany and Japan for this reason.

4) Requirements for Infrastructure and Man Power

(1) Infrastructure

Requirements for infrastructure to develop the metal-mechanical industry are generally not so stringent as those for other manufacturing industries. The basic requirements may include the following:

a) Mild climate---If the temperature is too high, efficiency of fabrication and/or assembly decreases. Siting metal-mechanical factories on the coastal plain is, therefore, not strongly recommendable and, if it becomes inevitable, air-conditioning the whole factory may be required.

b) Supply of electricity---Sufficient

c) Water supply---Relatively small quantity of water is required for metal-mechanical industry. Continuous water supply for cooling machines and for electro-plating throughout a year is more important.

d) Ease of transportation---Easy access to the port of Acajutla, which is the major entrance to importation of heavy production equipment, is desirable. As for shipment of products, easy access to trunk roads is also desirable.

e) Industrial estates---For prevention of environmental pollution including effluent from factories, noise and vibration, and industrial wastes, it is recommended to locate metal-mechanical factories within predetermined sites, namely industrial estates, and to treat industrial effluent and wastes collectively.

f) Easy access to governmental organizations concerned.

g) Availability of man power---It is particularly important to secure people with high qualification including managers, engineers, accountants and so forth, since these are people in big demand in El Salvador.

(2) Requirements for Man Power

Characteristics of man power requirements for metal-mechanical industry are represented by needs for diversified and well-skilled labourers. Table-II-1-26 illustrates outlines of necessary works, required skills and relative man power requirement within the metal-mechanical industry.

Generally speaking, level of skills required for assembly could be lowered by proper designing of products, whereas higher skills are normally needed in manufacturing parts and functional components.

Effective training could be achieved by improving the existing training curricula at the three institutes of technology or by establishing a training center for higher technology as well as by strengthening on-the-job trainings at each metal-mechanical firm.

Table II-1-26 Man Power Requirements at Metal-Mechanical Industry in El Salvador

Work Classification	Types of Work		Skills Required: High	Skills Required: Medium	Skills Required: Low	Relative Man Power Equipment: Large	Relative Man Power Equipment: Medium	Relative Man Power Equipment: Small
Machine Design		Designing	O					O
		Draftsman	O				O	
	Casting	Wood Pattern	O					O
		Melting		O			O	
		Molding	O				O	
	Forging	Die Making	O					O
		Forging			O	O		
	Machining	Lathe		O		O		
		Milling Machine	O				O	
		Drilling/Boring		O		O		
		Gear Cutting	O					O
	Grinding	Cylindrical		O				
		Internal	O				O	O
	Polishing	Mechanical			O		O	
	Plating	Galvanizing		O			O	
		Electrolytic	O				O	
	Sheet Metal Working	Sheet Shearing			O	O		
		Blanking		O			O	
		Bending			O	O		
		Drawing	O					O
Assembly	Electrical Machinery	Heavy Machinery	O					O
		Household Appliances		O			O	
		Radio, TV sets			O	O		
	Automobile	Engine	O				O	
		Body		O		O		
	Industrial Machinery	Assembly	①	②		②	①	
	Precision Machinery	Assembly	①		②	②		①

Source: The JICA Mission

2. The Selection of Industries for Development

1) The Results of Appropriate Industry Projects Selected by the El Salvador Government

The El Salvador government has compiled the data which could be used as a basis for development of the metal-mechanical industry in cooperation with the UN experts (UNIDO and UNDP) in 1975 and in 1976. The results are summarised in the following reports: INSAFI, Possibilidade de la Industria Metal-Mechanica en El Salvador, ELS/74/002/11-02/01, 15-7-1975; and ONUDI/MNISTERIO DE PLANIFICACION/INSFAFI, Plan Operativo para el Desarrollo de la Rama Metal-Mechanica, DEP/ELS/72/012, 10-1977. The two reports contain various projects of the metal-mechanical industry which is expected to be actively promoted. These projects are listed in Table II-2-1.

INSAFI's report of 1975 selected projects with an emphasis on the Central American Common Market. The 1976 report, on the other hand, is based on new ideas such as utilization of idle capacity in existing industries in El Salvador or export promotion in relation with the quota system under the preferential tariff system of the US. As far as Table II-2-1 is concerned, one may be able to observe a direction of development for the metal-mechanical industry, namely, development of sectors in the industry which do not exist in El Salvador.

The followings may be observed as basic motives underlying the reports to develop the metal-mechanical industry in El Salvador:

a) Utilization of potential capacity of private firms in El Salvador;

b) Increase in employment;

c) Import-substitution and export-promotion;

d) Leveling up of industrialization or development of new industries; and

e) Others.

a) Utilization of potential capacity of private firms in El Salvador

It seems most efficient if potential capacity of private firms is fully utilized. Especially, if idle capacity exists, needs should be high with respect to full utilization of the idle capacity for production. On the other hand, there are many

Table II-2-1 Projects Selected by El Salvador

ISIC	Contents of Projects
38111	*Machinist Handtools
	*Table-wares
38113	*Locks and Latches for Doors and Windows
	*Cocks and Taps of Bronze
	*Pipe Fittings of Cast Iron
	*General Hardwares
38131	*Pressure Tanks
38191	*Metal Molds
38221	*Agricultural Implements
	*Agricultural Machinery for Farm Use
	*Sprayers for Agricultural Use
38231	*Simple Machine Tools for Working Metals and Small Presses
	*Machine Tools for Working Wood
38243	*Printing Machines
38244	*Food Processing Machines and Machinery for Packaging
38251	*Business Machines Including Typewriters
38293	*Sawing Machines for Domestic Use
38299	*Rotating Machines Including Compressors and Pumps with Engines
	*Small Machines Including Pumps and Speed Variators
	*Automatic Weighing Machines
	*Water Meters
	*Conveyors and Elevators
	*Centrifugal Pumps
38311	*Electric Motors and Electric Welders
	*Small Electric Motors

(Continued)

ISIC	Contents of Projects
	*Electric Power Meters
	*Transformers for Electricity Distribution
	*Electricity Measuring Instruments & Meters
38321	*Telephone Sets
38322	*Electronics Components and Systems
38331	*Small Domestic Electric Appliances
38411	*Building of Steel Vessels
	*Building of FRP Ships
38421	*Repairing Railway Vehicles
38432	*Bodies of Buses and Trucks
38433	*Oil Filters for Automobiles
	*Bumpers for Automobiles
	*Reconditioning and Reclaiming Used Automotive Parts
38441	*Bicycles with or without Engines
38521	*Lenses and Frames of Glasses
38522	*Cameras

Source: Described in Text

projects which are selected because projects may be easily realized with diversification of existing firms or additional equipment investment or foreign technical assistance. Furthermore, projects are listed in relation with the existing electrical wire and cable factory. Projects concerned with manufacturing electric motors and transformers belong to this group. Some projects are concerned with the existing electric steel making factory. These projects are planned to utilize special steel which may be produced by the factory in the future.

Moreover, some listed projects are the ones which are considered to be listed since production is possible with existing levels of technique at private firms. Also, some projects are listed merely because some private firms have expressed their intention of entering the fields specified in the project. Though it is not all clear what is meant by the possibilities of production with the existing levels of technique, these projects should be categorized into the projects, as mentioned above, in which additional investment or foreign technical assistance is necessary for the production.

b) Increase in employment

This may be the main reason for development of the metal-mechanical industry. Many projects have been selected as examples of labor-intensive industry. Though it is clear that these projects are to utilize the coutry's relatively low cost labor, few of them state it clearly. This may be because as mentioned in Chapter I, one can only decide whether its labor cost is low in relation to its productivity.

c) Import-substitution and export promotion

The policy of import-substitution may be introduced when relatively rapid growth of the domestic market is observed. The policy of export-promotion may be introduced when the market growth is slow because of the small domestic market. It is assumed that the exports to Central American countries and outside will soon be increased since the domestic market of El Salvador itself is small. Therefore, it is only a matter of a choice between the two policies when policies for these projects are to be implemented.

The needs for exports can be classified into four cases. The first one is to bring up the industry as an export industry. The second case is aiming at exports to other Central American countries. The third, exports to countries outside of Central America. And lastly, to take advantage of the US preferential tariffs. As far as the exports to countries outside of Central America is concerned, competition with other developing countries on their way of industrialization as well as the advanced countries leaves little room for the optimistic future even in the exports of labor-intensive products. Regardless of the perspective of the exporting industries, securing domestic market and to certain extent of export market in Central America is essential at the beginning of their production. As for the quotas of US Preferential Systems, the result of the survey by the El Salvador government is shown in Table II-2-2, which seems to encourage exports considerably.

Table II-2-2 QUOTAS OF U.S. GENERAL SYSTEMS OF PREFERENCES

TSUS		1,000 US$
647.03	Hinges, Metal Fittings, Automotive Metal Fittings	26,600
680.20 22	Mannual Taps, Cocks etc.	101,379
680.45	Gearboxes and other Transmissions	21,706
682.07	Transformers (more than 1 KVA)	25,765
682.25	Electric Motors (smaller than 1/40 Hp)	29,515
682.30	Electric Motors (1/40 to 1/10 Hp)	21,133
682.40	Electric Motors (1/10 to 200 Hp)	38,880
684.20	Toasters, Electric Irons etc.	18,269
685.70	Buzzers, Sirens, Alarms	69,401
688.12	Automotive ignition wire set	11,827
692.55	Motorcycle parts	46,950

Source: INSAFI

d) Leveling up of Industrialization or Development of New Industries

This concept stems from an idea that new industries may be introduced so that they can relate existing selectors of industry to one another. In other words, a new industry which may have something to do with other industries is preferred most when they are developed. Furthermore, in order to increase the value added or to improve the absorption capacity of transportation cost in the case of export, selection of products with high price to weight ratio leads to introduction of higher stage of industrialization. There are also some cases where new industries can be expected due to the external factors such as increased amount of transportation between El Salvador and its surrounding areas, expansion of the fishing industry in the area and so on.

e) Other Grounds for the Selection

Consideration of the government's policy plays an important role. For example, the foundries necessary for promoting the metal-mechanical industry are established as pilot firms. Bicycle industry is to be introduced in order to provide an inexpensive means of transportation, and the introduction of the industry is in cooperation with a firm in Guatemala trying to achieve an integration in Central America.

Table II-2-3 shows the grounds for the selection and the classification of the projects.

Table II-2-3 Grounds for the Selection and the Classification of the Projects

Prime Objectives	Incentives for Development	Project Examples
•Full Utilization of Capabilities of the Existing Private Industries in El Salvador	•Utilization of Idle Production Capacity	•Locks and latches for doors and windows •General hardware •Cocks and taps of bronze •Telephone sets •Bicycles with and without engines
	•Possible Production with Additional Investment to the Existing Facilities	•Pressure tanks and large-diameter pipes •Machine tools for working wood •Al-evaporators of "roll-bond" for refrigerators
	•Possible Production by Introducing Foreign Technologies	•Grinding balls for cement mills •Agricultural implements
	•Possible Production by Diversification of the Existing Industry	•Agricultural implements
	•Possible Supply of Raw Materials (in Future)	•Machinists handtools •Cutting tools •Electric motors and welders •Transformers
	•Existing Plan of Production in Private Sectors	•Agricultural implements •Machine tools for working wood •Rotating machines including compressors and engines •Measuring instruments for electrical use
	•Existing Technological Competence in Private Sector	•Machine tools for metal working and small presses •Printing machines •Food processing machines •Business machines including typewriters •Machine elements including gearboxes and speed variators •Measuring instruments for electrical use •Conveyors and elevators •Agricultural machinery for farm-use •Discs for ploughs and harrows
•Increase in Employment	•Establishment of Labor-Intensive Industries	•Tablewares •Machinist handtools •Automatic weighing machines •Electric motors and welders •Measuring instruments for electrical use •Building FRP ships •Oil filters for automobiles •Reconditioning and reclaim of used automotive parts •Bicyles with and without engines •Lenses and frames of glasses •Sprayer for pesticide •Galvanized pipe fittings of cast iron
	•Advantage of Inexpensive Labor Cost	•Locks and latches for doors and windows
•Increase in Trade	•Import Substitution/Growth of Domestic Market	•Agricultural machinery for farm-use •Transformers for electricity distribution •Electric power meter

(Continued-2)

Prime Objectives	Incentives for Development	Projective Examples
		•Water meter •Electronics parts and systems •Photographic camera •Discs for ploughs and harrows •Sprayers for pesticides •Centrifugal pumps •Steel tubes and pipes for industrial and transportation •Sawing machines for domestic use
	•Increase in Export to the Regional Market	•Grinding balls for cement mills •Centrifugal pumps
	•Export to the Outside of the Regional Market	•Machinist handtools •Automatic weighing machines (esp. to Latin American Markets)
	•Advantages of the US General System of Preferences	•Cocks and taps of bronze •Machine elements •Parts for motorcycles •Transformers 1 KVA •Electric motors < 1/40 HP 1/40 - 1/10 HP 1/10 - 200 HP •Toaster and electric iron •Electronics parts and systems including electronic alarms •Metal fittings for automobiles •Ignition wire sets for automobiels
	•Fostering Export-Oriented Industries	•Rotating machines including compressors •Electric power meters •Water meters •Lenses and frames of glasses
•Sophistication of Industrial Structure/Development of New Industries	•Inter-connection between Existing Industries	•Rotating machines including compressors •Small electric motors for domestic appliances
	•Products with Higher Specific Prices (Price/to Weight Ratio)	•Automatic weighing machines •Measuring instruments for electrical and electronic uses
	•Preliminary Success in Existing Industries	•Photographic cameras
	•High Degree of Domestic Fabrication	•Centrifugal pumps
	•Growth in Fishing Industry and Surface Transport	•Steel shipbuilding
	•Growth in Land Transport	•Automobile projects •Repairing railway vehicles
•Others	•Establishment of Pilot Factory	•Iron and non-ferrous castings
	•High Social Benefit	•Bicycles with or without engines
	•Integration to Regional Manufacturers	•Bicycles with or without engines
	•Possible Production with Smaller Investment	•Lenses and flames of glasses

Source: INSAFI
ONUDI / Ministerio de Planificacion / INSAFI

According to the discussion so far developed, the criteria for the appraisal of the projects on the part of El Salvador are as follows:

a) Import-substitution;

b) Increase in export to outside of the area;

c) Full use of preferential tariffs;

d) Labor-intensive industry;

e) Production of intermediary materials;

f) Utilization of idle production capacity;

g) Inter-relation between industries and the sectors of metal-mechanical industry;

h) Incentive by private initiative;

i) Promotion of integration within Central America;

j) Relative reduction of cost (transportation, insurance, etc.).

Shown in Table II-2-4 are the projects appraised by these criteria.

Table II-2-4 Projects Appraised in El Salvador

Projects	Criteria									
	a	b	c	d	e	f	g	h	i	j
1. Locks & Latches	O		O	O		O		O	O	
2 Tablewares		O		O		O	O			O
3. Handtools	O		O	O		O	O		O	O
4. Hardwares	O		O							
5 Metallic Structures	O			O		O				O
6. Galvanized Sheets	O		O		O	O	O	O	O	O
7. Grinding Balls for Cement Mills	O				O	O	O	O	O	O
8. Water Cocks & Taps	O	O	O	O		O		O	O	O
9. Agricultural Implements	O		O	O	O		O	O	O	O
10. Agricultural Machinery for Farm Use	O			O	O	O	O	O		O
11. Machine Tools for Working Metals & Wood	O				O				O	O
12 Various Machines	O	O		O	O		O	O		O
13 Business Machines	O			O						O
14. General Castings			O			O	O	O		
15. General Machines	O			O	O	O	O	O		
16. Molds		O	O	O						O
17. Combution Engines	O			O			O	O		O
18. Automatic Weighing Machines		O	O	O	O					O
19 Transformers	O			O						O
20 Electric Motors	O	O	O	O	O		O			O
21. Micromotors & Small Electric Domestic Appliances		O	O	O		O				O
22 Water & Electric Power Meters		O		O						
23. Electronic Components & Systems		O	O							
24. Shipbuilding	O			O	O		O			
25. FRP Ships		O		O						
26. Railway Workshop				O						
27. Bus Bodies				O	O	O				
28. Automotive Parts		O	O	O			O	O		
29. Bicycles	O			O		O				
30. Conveyors & Elevators	O				O		O	O		
31. Photographic Cameras		O		O		O				
32. Glasses		O		O				O		

Source: ONUDI - Ministerio de Planificacion - INSAFI

Giving an equal importance to each of the criteria, we can evaluate a project by the number of criteria fulfilled in it. This classification is shown in Table II-2-5.

Table II-2-5 PROJECT PRIORITY BY NUMBER OF CRITERIA MET

No. of Criteria	Project Number*
1	26
2	4, 22, 23, 25
3	13, 19, 27, 29, 31, 32
4	5, 11, 14, 16, 24, 30
5	2, 17, 18, 21, 28
6	1, 15
7	3, 7, 10, 12, 20
8	6, 8, 9

* See Table II-2-4

The Table shows that the projects 6, 8, and 9 are of the highest importance. In these projects, some private firms of El Salvador have already participated and the market has been established as well as the technical skills (Project No.6---METASA, No.8---IMSA, No.9---IMACASA). These should be the ones to start with. Project No.1 is in a similar situation and the idle facilities can be put into use. Project No.10 can be realized through expanding the existing repairing function of some private companies. Other projects of a high priority aim at production of machinery for general use.

In the appraisal of the projects, the criteria which are most frequently referred are as follows:

- d) Labor-intensive industry;
- a) Import-substitution;
- j) Relative reduction of cost (transportation, insurance, etc.).

It can be said after all that among the selection criteria following are the ones of highest importance in accordance with the government pilicy:

- Import-substitution to export-promotion
- Labor-intensiveness
- Production of goods with high value added

2) Criteria for Selecting Appropriate Industries

(1) Basic Concepts of Selection

The main targets of industrialization of El Salvador will include the following:

a) Import substitution or foreign currency earnings by export;

b) Increase of employment;

c) Improvement of industrial structure and elevation of technology level

The metal-mechanical industry is expected to meet these requirements and, in particular, to contribute improvement of the foreign trade balance only preceded by the textile industry. The advantage of the metal-mechanical industry is that the spectrum of its products extends from such simple items as agricultural implements and tablewares to such sophisticated items as computors and aircrafts. It seems possible to achieve the mentioned targets by carefully selecting items to be manufactured in El Salvador.

The selected or appropriate sectors of the metal-mechanical industry will have to be successfully implanted into the industrial structure of El Salvador. The selection criteria, therefore, had better include active formation of solid industrial linkage, in other words, include possible introduction of the upstream and/or downstream industries to form integrated industrial structure. The criteria for industrial linkage are also interconnected with technology linkage. It is important to investigate if new technology will be successfully implanted.

In addition to the three general selection criteria, specific policy considerations proposed by the Government of El Salvador, if there are any, must be taken into account. Through the local survey by the mission and the contact with the Government officials, it has been understood that the development of metal-mechanical industry constitutes a part of the general industrialization program of El Salvador and no priority has been placed upon the specific industry.

Basic selection criteria employed are summarized as follows:

a) Growth/Market Criteria

b) Industry/Technology Linkage Criteria

c) Employment Criteria

d) Balance of Payment Criteria

e) Policy Criteria

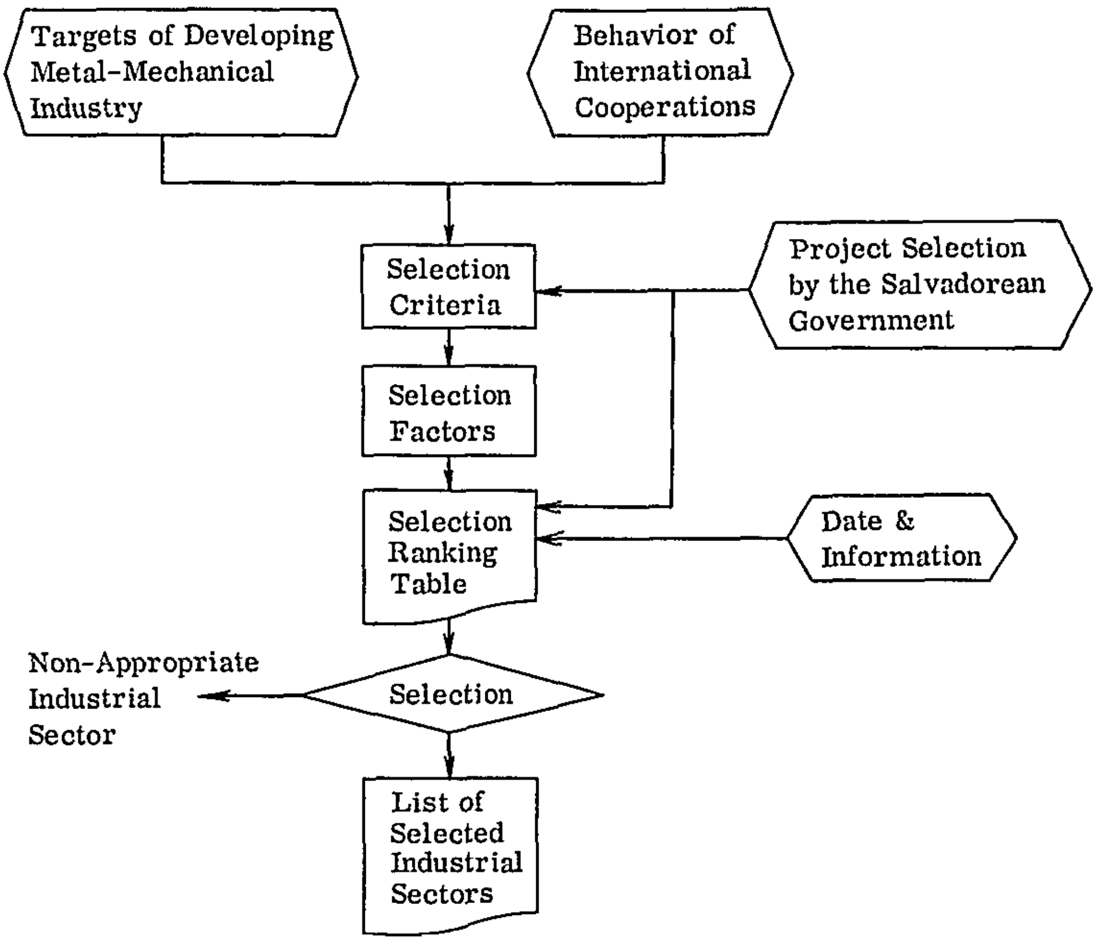
In this study, the above mentioned criteria are adopted for selecting metal-mechanical industrial sectors, and the result is to be compared with that obtained by Salvadorean studies. Selection is carried out for the industrial sectors included in the code number 38 of ISIC. However, in the actual selection process, industrial sectors are represented by NAUCA code number of 699, 711, 712, 713, 714, 715, 716, 731, 732, 734, 735 and a part of 812.

(2) Method of selection

The selection process includes the following steps:

a) Identification of targets of developing the metal-mechanical industry in El Salvador;
b) Analysis of behaviors of international enterprises;
c) Analysis of the selection conducted in El Salvador;
d) Identification of selection criteria;
e) Identification of selection factors ;
f) Data collection of selection factors;
g) Preparation of a ranking table;
h) Preparation of a table of selected or appropriate industrial sectors

The item b) is not necessarily taken into consideration. Instead, much importance has been placed on the Growth/Market criterion, since international firms which are expected participate in development of metal-mechanical industry will unmistakably attach importance to this. The whole process of the selection is shown in Figure II-2-1.



Source: The JICA Mission

Figure II-2-1 Flow Chart of the Selection of Selected Industrial Sectors

The five selection criteria are preferably subdivided into much finer selection factors which could describe each industrial sector quantitatively or at least semi-quantitatively. Figure II-2-2 illustrates the selection factors and broad basis of selection.

Data sources utilized for estimating selection factors are as follows:

- Anuario Estadistico Centroamericano de Comercio Exterior, SIECA;
- Comercio Exterior de Centroamerica, Series Estadisticas 1971, SIECA;
- Anuario Estadistico, Comercio Exterior, Direccion General de Estadistica y Censos, El Salvador;
- Boletin Estadistico, Direccion General de Estadistica y Censos, El Salvador;

- Census of Manufacturers, MITI, Japan;
- Imput/Output Table, Japanese Government, Japan.

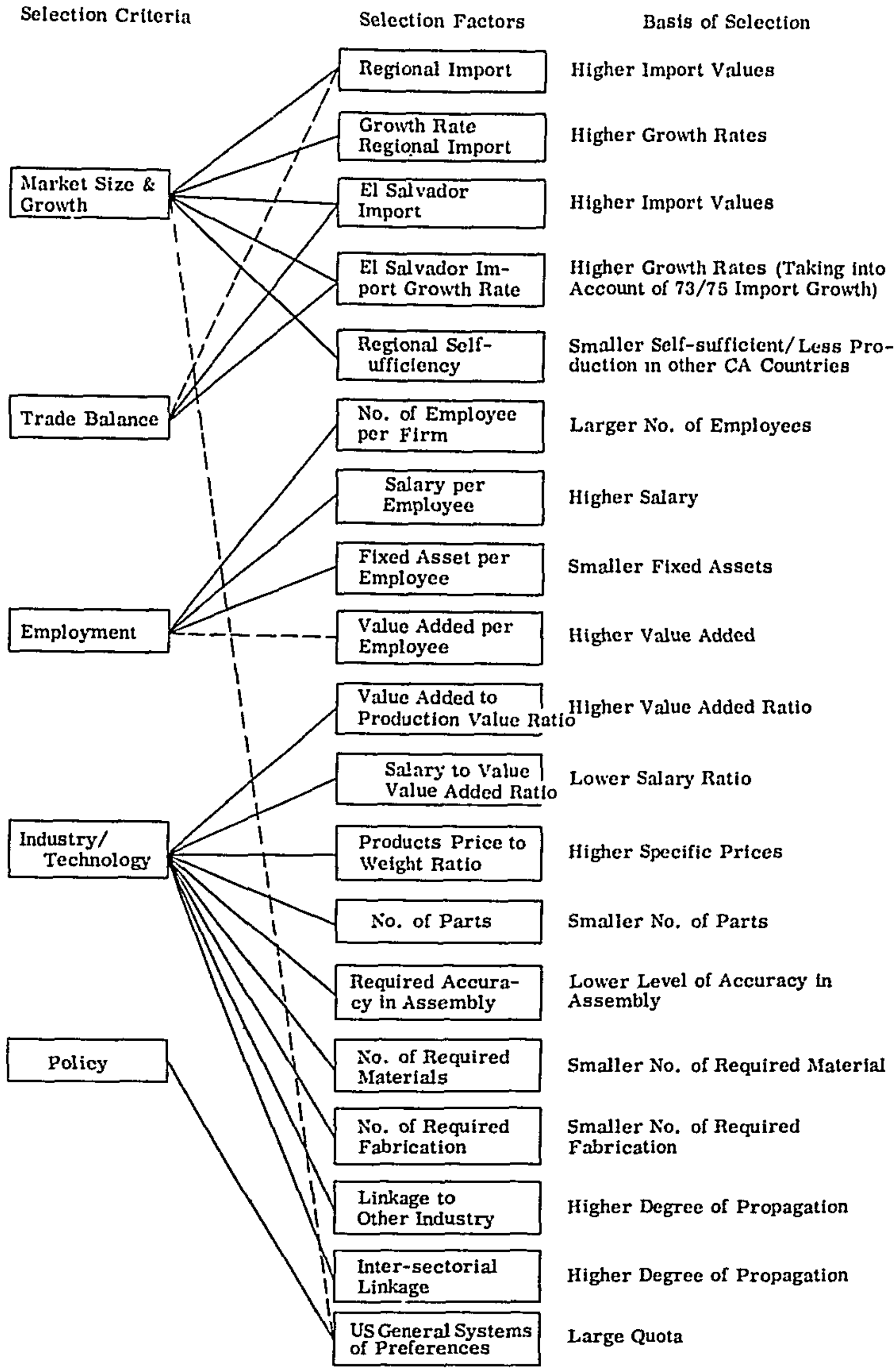
Japanese data are used in this study, because many metal-mechanical industry sectors are still non-existent in El Salvador. Efforts have been made, however, to interpret the Japanese data by taking into account of the regional characteristics of El Salvador.

3) Selection of Appropriate Industrial Projects

Selection was carried out according to the mthod described previously to identify metal-mechanical industrial sectors to be appropriately located in El Salvador. In advance to the final selection, preliminary selection was made on metal-mechanical products represented by 7-digits numbers of NAUCA based upon criteria of import substitution for both the C.A. regional and El Salvador markets. In other words, products whose import is too small, whose regional or domestic supply is large and whose import shows a rapid decline, were not taken into consideration. The preliminary selection has left 81 metal-mechanical items for the final selection as shown in Table II-2-6.

The actual steps of selection were described before. A ranking table was finally prepared based upon figures for each NAUCA product item in the following manner:

- Ranking was performed on five levels;
- Whenever data were not available, qualitative judgement was used for ranking;
- For comparison among each selection factor, weighted averages were computed;
- Basis of selection or determination of ranking level is described in Figure II-2-2.



Source: The JICA Mission

Figure II-2-2 Selection Factors

Table II-2-6 Basis for Selecting Industrial Projects

NAUCA No.	ISIC	Products
699-03-00	38113	Wire Cables & Ropes, of Iron & Steel
699-05-03	38131	Nets, Fences & Gratings, or Wire or Expanded Metal
699-07-01	38113	Nails, Bolts, Nuts, Washers, Rivets & Screws
699-12-02	38111	Machinist Hand-tools
699-13-02	38111	Domestic Utensils, of Iron & Steel
699-14-01	38112	Domestic Utensils, of Aluminium
699-16-02	38111	Spoons, Forks & Similar Tableware, Not-planted
699-17-02	38111	Safety Razors & Razor Blades
699-18-01	38113	Locks, Padlocks, Keys, Fittings for Doors, Windows, Furnitures, etc., of Iron & Steel
699-18-02	38113	Locks, Padlocks, Keys, Fittings for Doors, Windows, Furnitures, etc., of Bronze & Brass
699-18-03	38132	Locks, Padlocks, Keys, Fittings for Doors, Windows, Furnitures, etc., of Aluminium
699-21-02	38131	Tanks, Drums, Casks & Boxes, of more than 500L, of Metal
699-21-04	38191	Compressed Gas Cylinders, of Metal
699-22-01	38291	Domestic Stoves, Boilers, Cookers & Ovens
699-22-02	38291	Domestic Cooking Ranges & Ovens, Toasters, Non-Electrical
699-29-02	38113	Chains & Parts, of Metals
699-29-13	38111	Soldering & Welding Rods & Electrodes
711-05-01	38210	Diesel & Semi-Diesel Engines
711-05-02	38433	Internal Combustion Engines for Automobiles
711-05-03	38411	Marine Engines
712-01-01	38411	Plows
712-01-02	38221	Cultivators
712-01-03	38111	Rakes & Harrows
712-02-01	38221	Agricultural Machinery & Appliances for Harvesting, Threshing & Sorting
713-01-00	38221	Tractors
714-01-00	38251	Typewriters & Cheque-Writing Machines
714-02-03	38251	Calculating & Accounting Machines

(Continued-1)

NAUCA No.	ISIC	Products
715-01-00	38231	Machine-Tools for Wroking Metals (Drilling, Milling, Boring, Planing & Polishing)
715-02-00	38245	Metalworking Machinery, other than Machine Tools (Rolling, Forging, Drawing & Casting)
716-01-02	38299	Pumps for Water & other Liquids
716-03-02	38299	Elevators, Hoists & Escalators
716-03-04	38245	Construction Machinery (Excavating, Leveling, Boring, etc.)
716-04-00	38231	Machine Tools for Working Wood, Cork, Plastics, etc.
716-05-00	38299	Motorized Hand-Tools, Non-Electrical
716-06-00	38243	Machinery for Making of Finishing Cellulosic Pulp Paper of Paperboard
716-07-01	38243	Printing Machines (Type-Making, Setting & Paper-Cutting)
716-07-03	38243	Other Printing & Ancillary Machines (Types, Plates, etc.)
716-08-01	38241	Parts for Textile Machinery (Shuttles, Spindles, Bobbines & Spools)
716-08-02	38241	Textile Machinery for Combing, Spinning, etc.
716-08-03	38241	Textile Machinery for Weaving, Knitting, Embroidering, etc.
716-08-04	38241	Textile Bleaching, Washing, Dressing, Coating, Printing, etc. Machinery
716-11-01	38293	Sawing Machines & Needles
716-12-01	38292	Air Conditioning Machines & Equipments
716-12-02	38292	Refrigerators & other Refrigeration Equipments, Electrical or Non-Electrical
716-13-04	38299	Pumps for Air & Gases, Vacuum Pumps & Compressors for Air and Gases
716-13-05	38299	Sprayers & Atomizers for Agricultural, Fire-Extinguishing, etc.
716-13-08	38243	Machines for Cleaning, Filling & Labelling Bottles or other Containers, Packaging Machinery, etc.
716-13-12	38244	Food-Processing Machinery
716-13-16	38245	Mineral Crushing, Sorting & Molding Machinery
716-13-18	38191	Molds for Foundry, Glass & Plastic Forming, etc.
716-14-00	38192	Ball-, Roller-, or Needle-Roller Bearings
716-15-01	38113	Taps, Cocks, Valves & Similar Appliances
716-15-02	38433	Transmission Shafts, Gearboxes, Clutches, Speed Variators, etc. (except for Automobiles)

(Continued-2)

NAUCA No.	ISIC	Products
721-01-01	38311	Electric Generators & Dynamos.
721-01-02	38311	Electric Motors
721-01-03	38311	Alternators, Rectifiers, etc., except for Electronic Apparatus
721-01-04	38311	Transformers, except for Electronic Equipment
721-01-05	38311	Electrical Apparatus for Making & Breaking or for Protecting Electrical Circuits (Switchgears, Rheostats)
721-03-01	38391	Incandescent Lamps, including Sealed Beam Lamps for Automobiles
721-04-01	38321	Wireless Broadcasting Transmitters & Receivers, including Radios & TV Sets
721-04-02	38322	Electronic Tubes & Bulbs, Transistors
721-04-03	38323	Microphones, Loudspeakers & Amplifiers
721-04-04	38322	Electronics Parts (Condensors, Filters, Resisters, etc.)
721-05-00	38321	Electrical Line Telephone & Telegraph Equipment
721-06-02	38331	Electrical Ovens, Cooking Ranges, Water-Heaters, etc.
721-06-05	38331	Autoclave, Sterilizers, etc., Electrically Heated
721-07-00	38311	Other Electrical Articles & Accessories for Automobiles, Aeroplanes & Ships
721-08-01	38311	Electrical Measuring Instruments & Meters
721-12-02	38293	Domestic Electric Washing & Drying Machines
721-12-03	38293	Other Domestic Electrical Appliances, including Mixer, Vacuum Cleaners, etc.
721-12-04	38311	Portable Electro-Mechanical Hand Tools
721-19-07	38311	Plugs, Switches, Fuses, Switch Boxes, Other Electrical Fixtures
732-01-01	38431	Automobiles for Rough Roads (Jeeps, Land-Rovers, etc.)
732-01-02	38431	Passenger Cars, including Station-Wagons
732-02-00	38441	Motorcycles
732-03-02	38431	Trucks, Light-Trucks, Vans, Refrigeration Trucks, etc.
732-05-00	38431	Chassis with Engines Mounted
732-06-00	38432	Automotive Bodies, Chassis, Frames, etc.
733-01-01	38441	Bicycles
812-03-00	38121	Kitchen Sinks, Bathtubs, other Sanitarywares, of Metals
812-04-03	38391	Electric Lamps

Source: The JICA Mission

Determination of weights on the selection factors largely depends upon the policy criteria. It has become obvious from the foregoing discussion that, in selecting industrial sectors, priority is given to those selection factors categorized in such selection criteria as import substitution, increase of employment, and improvement of industrial structure and technological level. In this selection, El Salvador's capability of introducing and implanting foreign technology is also taken into account. It is generally recommendable to introduce industries with processes and technologies which are transferable and implantable into El Salvador rather than to introduce knock down manufacturing of highly technolgy-intensive products. In the former case, steady increase of domestic production can be expected. Weights for each selection factor estimated are shown in Table II-2-7.

Table II-2-7 Weights for Each Selection Factor

Selection Factors	Weight	Selection Factors	Weight
1. Regional Import	3	10. Ratio, Value Added to Production Value	2
2. Growth Rate Regional Import	3	11. Ratio, Salary to Value Added	1
3. El Salvador Import	2	12. Ratio, Product Price to Weight	1
4. El Salvador Import Growth Rate	2	13. No. of Parts	2
4'. El Salvador Import Growth Pattern 73/75	2	14. Required Accuracy in Assembly	2
5. Regional Self-sufficiency	3	15. No. of Required Materials	2
6. No. of Employee per Firm	2	16. No. of Required Fabrication	2
7. Salary per Employee	2	17. Propagation to other Industry	2
8. Fixed Asset per Employee	1	18. Inter-sectorial Propagation	1
9. Value Added per Employee	3	19. US General System of Preference	3

Source: The JICA Mission

The selection table, obtained by multiplying ranking table or ranking level figures (1 to 5) by the weights (1 to 3), is shown in Table II-2-8.

Table II-2-8 Selection Table

Selection Factors / Items or Industrial Sectors: NAUCA No.	ISIC	1. Regional Import	2. Growth Rate Regional Import	3. El Salvador Import	4. El Salvador Import Growth Rate	4'. El Salvador Import, Growth Pattern 73/75	5. Regional Self-sufficiency	6. No. of Employee per Firm	7. Salary per Employee	8. Fixed Asset per Employee	9. Value Added per Employee	10. Ratio, Value Added to Production Value	11. Ratio, Salary to Value Added	12. Ratio, Product Price to Weight	13. No. of Parts	14. Required Accuracy in Assembly	15. No. of Required Materials	16. No. of Required Fabrication	17. Linkage to Other Industry	18. Inter-sectoral Linkage	19. US General System of Preference	Total
699-03-00	38113	3	6	2	2	4	15	10	6	5	6	9	2	2	10	10	10	10	8	1	3	124
699-05-03	38131	3	3	2	2	1	12	10	6	5	6	9	2	2	10	10	10	10	8	1	3	115
699-07-01	38113	9	6	6	2	3	12	2	6	4	6	9	3	2	10	10	10	8	6	3	3	122
699-12-02	38111	6	6	6	2	4	15	2	4	5	6	12	2	4	10	10	10	8	6	3	3	124
699-13-02	38111	3	3	2	2	3	12	2	4	4	6	9	3	2	10	10	10	10	6	2	3	106
699-14-01	38112	3	6	2	2	4	3	2	4	4	3	9	3	4	10	10	10	10	6	1	3	99
699-16-02	38111	3	3	2	2	1	15	2	2	5	6	9	1	4	10	10	10	10	6	1	3	99
699-17-02	38111	3	6	2	4	4	9	2	4	5	6	15	2	10	10	10	10	10	6	1	3	122
699-18-01	38113	6	6	4	4	1	15	2	4	1	6	9	2	2	10	10	10	10	8	1	15	126
699-18-02	38113	3	6	2	2	4	15	2	4	1	6	9	2	6	10	10	10	10	8	1	15	120
699-18-03	38132	3	6	2	2	1	12	2	4	1	6	9	2	4	10	10	10	10	8	1	15	118
699-21-02	38131	3	3	2	2	2	9	2	6	4	6	9	3	2	10	10	10	10	6	1	3	103
699-21-04	38191	3	9	2	10	5	3	2	6	4	6	9	3	2	10	10	10	10	6	1	3	111
699-22-01	38291	6	6	2	4	3	15	4	4	4	9	9	1	2	8	8	10	8	6	2	3	114
699-22-02	38291	3	15	2	2	4	12	4	4	4	9	9	1	2	8	8	10	8	8	2	3	118
699-29-02	38113	3	12	2	4	5	15	2	8	2	6	12	3	2	10	8	10	10	6	4	3	127
699-29-13	38311	3	9	2	4	3	12	4	6	5	6	6	2	2	10	10	10	10	6	3	3	116
711-05-01	38210	15	6	6	2	4	15	6	8	4	3	6	5	4	4	6	6	4	4	1	3	115
711-05-02	38433	6	9	4	2	3	15	6	8	4	3	6	5	4	4	6	4	2	4	4	3	102
711-05-03	38411	3	6	2	2	4	15	4	8	4	9	9	3	8	2	6	4	2	4	3	3	109
712-01-01	38411	3	3	2	2	3	15	2	2	5	3	9	5	2	10	10	10	10	6	2	3	107
712-01-02	38211	3	3	2	2	5	15	2	4	5	9	9	2	2	8	8	5	8	6	1	3	105
712-01-03	38111	3	3	2	2	4	15	2	2	5	3	9	5	2	10	10	10	10	6	2	3	108
712-02-01	38221	6	15	4	4	5	15	2	4	5	9	9	2	2	4	8	8	4	6	3	3	118
713-01-00	38221	15	3	10	2	4	15	8	10	2	12	6	1	2	4	6	2	4	6	4	3	125
714-01-00	38251	6	6	2	2	3	15	6	4	3	6	9	3	8	4	6	6	4	2	2	3	100
714-02-03	38251	3	6	2	2	2	15	6	4	3	6	9	3	10	6	6	10	10	2	1	3	109
715-01-00	38231	3	9	4	2	4	15	4	8	4	9	12	3	4	4	4	2	6	2	3	3	105
715-02-00	38245	6	3	6	2	4	15	2	8	4	9	9	3	4	4	6	6	4	2	3	3	103
716-01-02	38299	9	6	6	2	5	15	2	8	4	12	9	1	4	6	6	2	2	4	3	3	109
716-03-02	38299	3	6	2	4	1	15	4	6	5	9	9	2	2	4	8	6	6	4	2	3	101
716-03-04	38245	15	12	10	12	4	15	2	8	4	9	9	2	2	4	6	6	4	6	3	3	136
716-04-00	38231	9	9	4	12	5	15	2	6	5	6	12	3	4	6	8	8	6	2	2	3	127
716-05-00	38299	3	9	2	2	5	15	2	6	4	6	12	1	8	6	6	6	4	6	3	3	112
716-06-00	38243	9	6	2	4	5	15	4	10	4	12	12	2	4	4	6	4	6	6	3	3	121
716-07-01	38243	6	6	6	4	3	15	2	8	5	9	12	2	6	4	4	2	4	6	2	3	110
716-07-03	38243	3	9	2	4	3	15	2	8	1	9	12	3	4	8	4	8	10	4	2	3	114
716-08-01	38241	3	3	2	2	5	15	2	4	5	3	15	5	4	8	4	4	8	6	2	3	103
716-08-02	38241	9	9	10	6	4	15	6	8	4	9	9	3	4	4	4	2	4	6	3	3	122
716-08-03	38241	12	6	10	6	5	15	4	8	4	6	12	4	4	4	6	4	2	6	2	3	123
716-08-04	38241	6	9	4	2	3	15	2	10	4	9	9	4	4	4	6	6	6	6	1	3	112
716-11-01	38293	6	6	4	2	2	15	4	4	5	3	6	5	2	6	6	4	6	2	2	3	93
716-12-01	38292	6	9	10	4	5	12	4	8	3	15	12	1	4	6	4	6	4	4	4	3	124
716-12-02	38292	6	6	6	6	5	6	4	8	3	15	12	1	4	6	4	2	2	2	3	3	104
716-13-04	38299	6	12	4	6	3	15	2	10	4	9	9	3	4	6	4	4	4	4	1	3	113
716-13-05	38299	3	6	2	2	3	15	8	4	5	6	9	2	4	8	8	6	6	6	1	3	107
716-13-08	38243	6	6	2	6	1	15	2	8	4	6	12	3	6	6	6	6	6	6	3	3	111
716-13-12	38244	3	6	4	2	4	15	2	8	4	9	9	3	4	6	6	6	4	4	2	3	104
716-13-16	38245	6	3	6	4	4	15	2	8	4	9	9	2	2	6	6	6	6	6	1	3	108
716-13-18	38191	3	15	2	8	4	15	2	8	4	6	15	5	4	10	6	10	8	2	2	3	132

(Continued-2)

NAUCA No.	ISIC	1	2	3	4	4'	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total
716-14-00	38192	6	9	4	4	3	15	4	6	3	9	12	2	6	10	4	10	6	4	3	3	123
716-15-01	38113	3	6	4	2	4	15	2	8	4	9	9	3	4	10	8	8	8	6	3	15	131
716-15-02	38433	3	6	4	2	4	15	2	8	1	9	9	3	4	10	8	8	8	6	3	15	131
721-01-01	38311	3	9	2	4	5	15	4	6	3	3	6	5	4	6	6	6	8	4	3	3	105
721-01-02	38311	3	6	4	4	4	15	4	6	5	3	6	5	4	6	6	6	8	4	3	15	117
721-01-03	38311	3	9	2	4	4	15	4	6	5	6	9	3	6	8	8	8	10	4	2	3	119
721-01-04	38311	9	9	6	2	5	15	4	6	5	6	9	3	1	8	8	6	8	4	1	3	119
721-01-05	38311	9	6	6	2	3	12	4	6	5	6	9	3	4	8	8	8	8	10	2	3	122
721-03-01	38391	3	3	2	2	3	6	2	2	5	3	9	3	4	10	8	8	4	2	1	3	83
721-04-01	38321	15	6	6	2	1	12	10	8	4	9	9	3	8	2	4	6	8	10	4	3	130
721-04-02	38322	3	9	2	2	2	15	10	4	4	3	6	5	6	8	2	6	8	10	5	3	113
721-04-03	38323	3	9	2	4	1	15	4	2	5	6	6	2	6	6	6	8	8	10	3	3	109
721-04-04	38322	6	12	4	4	3	15	2	2	5	3	9	5	6	8	4	10	10	10	1	15	137
721-05-00	38321	12	9	10	6	4	15	10	6	4	6	9	3	8	6	4	6	8	10	5	3	144
721-06-02	38331	3	6	2	2	1	12	4	4	5	9	9	1	2	8	8	6	6	2	1	3	91
721-06-05	38331	6	12	10	4	5	15	8	4	4	9	6	2	6	8	8	6	8	10	3	3	136
721-07-00	38311	6	6	4	2	3	15	2	6	5	6	9	4	6	8	8	6	8	10	5	15	131
721-08-01	38311	3	9	2	4	5	15	2	6	5	3	12	1	6	6	4	8	8	10	4	3	119
721-12-02	38293	3	6	2	2	2	15	4	1	5	9	9	1	2	6	8	6	8	2	1	3	98
721-12-03	38293	3	6	2	2	2	15	4	4	5	9	9	1	4	6	8	6	8	2	1	3	100
721-12-04	38311	3	9	2	4	3	15	2	6	4	6	12	4	6	6	6	6	8	10	2	3	117
721-19-07	38311	6	3	2	2	1	15	1	6	5	6	9	3	4	8	8	8	10	10	1	3	117
732-01-01	38431	15	6	4	2	3	15	10	10	1	15	3	1	2	2	4	2	4	8	4	3	114
732-01-02	38431	15	6	10	2	1	15	10	10	1	15	3	1	2	2	4	2	2	8	5	3	117
732-02-00	38441	3	3	2	2	1	15	10	10	1	15	3	1	2	4	6	6	4	2	2	(15)	92(107)
732-03-02	38431	15	3	10	4	3	15	10	10	1	15	3	1	2	2	6	2	2	8	4	3	119
732-05-00	38431	15	12	4	6	2	15	6	8	4	6	3	5	2	2	6	6	4	8	4	3	121
732-06-00	38432	15	6	10	2	3	15	6	8	4	6	3	5	4	4	8	6	8	2	8	3	121
733-01-00	38441	3	3	2	2	4	15	2	6	4	6	6	2	2	6	6	6	6	2	2	(15)	85(100)
812-03-00	38121	3	6	2	2	3	15	2	4	1	6	9	2	4	10	10	8	6	8	1	3	105
812-04-05	38391	3	3	2	2	4	15	4	4	5	9	9	1	4	8	8	8	8	2	1	3	103

Source: The JICA Mission

Appropriate industrial sectors which are considered to be favorably introduced to El Salvador were chosen out of industrial sectors with higher total figures in Table II-2-8. Table II-2-9 shows the result of the final selection.

The major problems about the selected industrial projects are summarized as follows:

a) Insufficient sizes of the C.A. regional and Salvadorean markets---a disincentive to cooperation with international enterprises;

b) Small growth rates of the markets;

c) Insufficiency of existing technological capability in El Salvador;

d) Existing production in the C.A. region;

e) Too varied product lines in the industrial sectors selected;

f) Large capital investment involved.

The final selection took into account these problems and selected industrial sectors are further classified into either recommendable or appropriate sector. The recommendable sector can be possibly introduced to El Salvador without difficulty, whereas the appropriate sector will have some difficulties in the process of the introduction and/or implantation as shown in Table II-2-10.

Table II-2-9 Result of Final Selection

NAUCA No.	ISIC	Comment	Final Selection	
699-03-00	38113	Small Regional & Salvadorean Markets		
699-05-03	38131	Small Regional & Salvadorean Markets, Small Production in El Salvador	△	
699-07-01	38113	Small Production in Guatemala, El Salvador, Nicaragua & Costa Rica	△	
699-12-02	38111		O	•
699-17-02	38111	Small Regional & Salvadorean Markets, Small Production in Costa Rica		
699-18-01	38113	Production Capacity Available in El Salvador	O	•
699-18-02	38113	Production Capacity Available in El Salvador, Small Regional & Salvadorean Markets	O	•
699-18-03	38132	Production Capacity Available in El Salvador	O	•
699-22-02	38291	Small Regional & Salvadorean Markets (with High Growth)	O	•
699-29-02	·38113	Small Regional & Salvadorean Markets (with High Growth)	O	•
699-29-13	38311	Small Regional & Salvadorean Markets, Small Production in Guatemala		
711-05-01	38210	Insufficient Technological Competence	△	
712-02-01	38221	Too Many Product Lines	△	
713-01-00	38211	Relatively Slower Market Growth, Insufficient Technological Competence	O	
716-03-01	38215	Too Many Product Lines		
716-04-00	38231	Too Many Product Lines	△	
716-06-00	38213	Relatively Slower Market Growth		
716-08-02	38211	Highly Technology-Intensive		
716-08-03	38241	Highly Technology-Intensive		
716-12-01	38292	Small Production in El Salvador	O	
716-13-18	38191	Small Regional & Salvadorean Markets	△	
716-14-00	38192	Small Regional & Salvadorean Markets		
716-15-01	38113	Small Regional & Salvadorean Markets, Production Capacity Available	O	•
716-15-02	38133	Small Regional & Salvadorean Markets		
721-01-02	38311	Small Regional & Salvadorean Markets	△	•
721-01-03	38311	Small Regional & Salvadorean Markets		
721-01-04	38311		△	•
721-01-05	38311	Small Production in Costa Rica	△	
721-04-01	38321	Radios and TV Sets in Production in Guatemala, El Salvador & Costa Rica		
721-04-04	38322	Too Many Product Lines	△	
721-05-00	38321	Highly Technology-Intensive		
721-06-05	38331	Too Many Product Lines		
721-07-00	38311	Small Regional & Salvadorean Markets, Too Many Product Lines	△	•
721-08-01	38311	Small Regional & Salvadorean Markets	△	
721-12-04	38311	Small Regional & Salvadorean Markets	△	•
721-19-07	38311			
732-01-02	38431	Relatively Slower Market Growth, Highly Capital-Intensive		
732-03-02	38431	Too Many Product Lines, Highly Capital-Intensive		
732-05-00	38431	Highly Capital-Intensive		
732-06-00	38432	Small Production in El Salvador & Guatemala		

O : Recommendable △ : Appropriate

• : Export to the Outside of the Regional Market Possible

Table II-2-10 Selected Metal-Mechanical Industrial Projects in El Salvador

ISIC	NAUCA	Selected Industrial Sectors		Projects Selected by El Salvador
38111	699-12-02	Machinist Hand-Tools	O	yes
38113	699-07-01	Nails, Bolts, Nuts, Washers, Rivets & Screws	△	no
	699-18-01	Locks, Padlocks, Keys, Fittings for Doors, Windows, Furnitures, etc., of Iron & Steel	O	yes
	699-18-02	Locks, Padlocks, Keys, Fittings for Doors, Windows, Furnitures, etc., of Bronze & Brass	O	yes
	699-29-02	Chains & Parts, of Metals	O	no
	716-15-01	Taps, Cocks, Valves & Similar Appliances	O	yes
38131	699-05-03	Nets, Fences & Gratings, of Wire or Expanded Metal	△	no
38132	699-18-03	Locks, Padlocks, Keys, Fittings for Doors, Windows, Furniture, etc., of Aluminium	O	yes
38191	716-13-18	Molds for Foundry, Glass & Plastic Forming, etc.	△	yes
38210	711-05-01	Diesel & Semi-Diesel Engines	△	no
38221	712-02-01	Agricultural Machinery & Appliances for Harvesting, Threshing & Sorting		yes
	713-01-00	Tractors	O	no
38231	716-04-00	Machine Tools for Working Wood, Cork, Plastics, etc.	△	yes
38291	699-22-02	Domestic Cooking Ranges & Ovens, Toasters, Non-Electrical	O	no
38292	716-12-01	Air-Conditioning Machines & Equipments	O	no
38311	721-01-02	Electric Motors	△	yes
	721-01-04	Transformers, except for Electronic Equipment	△	
	721-01-05	Electrical Apparatus for Making & Breaking or for Protecting Electrical Circuits (Switchgears, Rheostats)	△	no
	721-07-00	Other Electrical Articles & Accessories for Automobiles, Aeroplanes & Ships	△	no
	721-08-01	Electrical Measuring Instruments & Meters	△	yes
	721-12-04	Portable Electro-Mechanical Hand-Tools	△	no
38322	721-04-04	Electronics Parts (Condensors, Filters, Resisters, etc.)	△	yes

O : Recommended △ : Appropriate or Conditional

Source: The JICA Mission

Outlines of the selected projects are as the following:

a) Production of nets, fences, and gratings:

Some of these products are already in small-scale production in the C.A. region, although rate of self-sufficiency is still small. Gradual increase of per capita income will result in increased housing construction, which will in turn increase the demand in these products. It will be important to manufacture the products with higher value added than those currently in production.

b) Production of nails, bolts, nuts, washers, rivets and screws:

Some nails and screws of low quality are manufactured in the C.A. region. Mass production of these products by introducing heading and thread rolling machines will result in extensive improvement in quality. The market for these products is, for the time being, limited within the C.A. region, because of their low price ot weight ratios.

c) Machinist Hand Tools:

Neither the C.A. regional nor Salvadorean market is large enough to encourage introduction of this industrial sector. Nevertheless, the total world market for the products is expanding rapidly. Among others, the U.S. market for the medium- to low-grade products shows remarkable increase. The supply sides which have historically been the developed countries are now suffering from increasing labor cost and, for this reason, production of this product in El Salvador appears to have become economically viable. In order to export to the extra-regional markets, mass production of selected hand tools will become necessary.

d) Locks, padlocks, keys, fittings for doors, windows, furniture and etc. of metals:

There exists some manufacturers of these products in El Salvador, for example FUCASA and IMSA and it seems their capacity is not fully utilized. Quality and price of the products are known to be less competitive with those of imported goods and, accordignly, technology is preferably improved by introducing foreign know-hows. And if necessary, integration and/or modernization of production facilities will be carried out. These products can be exported to the U.S. taking advantage of the quota arranged under the General Systems of Preferences.

e) Domestic cooking ranges, ovens, toasters, non-electrical:

In the area where town gas system is not available including the C.A. region, the demand for domestic cooking ranges ovens and so forth using kerosine and liquified petroleum gas will increase. On the other hand, use of electrical cooking ranges and ovens has become popular in El Salvador because of ample supply of electricity. Production of these non-electrical products may, therefore, be aimed at regional or outside export. The production process include simple metal working and assembling, and production will become possible either by utilizing the existing idle production capacity or by small addition of capital investment.

f) Chains and parts of metals:

Since these articles are normally mass-produced, possible production in El Salvador must be aimed at extra-regional exportation. It is desirable for El Salvador to acquire a segmented market transferred from international companies as well as technological assistance. The production process is fully automated and, therefore, capital-intensive.

g) Diesel and semi-diesel engines:

Demand for the engines is increasing in such markets as agricultural irrigation, coastal fishing, and small-scale power generation. Production in El

Salvador may start with semi-knock down (SKD) assembly. Complete knock down (CKD) production seems difficult for the time being, since types and sizes of engines vary from one market to the other. Even for CKD production, concentration on producing small numbers of types and sizes is important. Domestic production of major parts for engines will not be possible for a while due to large capital investment required and high level of technology involved. Extra-regional exportation of engines made in El Salvador may face stiff competition with products from industrialized countries.

h) Agricultural machinery and appliances for harvesting, threshing and sorting:

There are varied types and sizes of machines in this category. Therefore, production in El Salvador will have to center around limited types and sizes of machines. The production processes include simple metal working such as cutting, joining of metals and assembling, and small additional investment will enable such Salvadorean firms as IMACASA and SARTI to manufacture these machines. In designing these products, however, assistance from international firms specializing in this field will be needed.

i) Tractors for agricultural use:

The number of tractors in stock in the C.A. region is estimated at less than 30,000. Though the demand is steadily increasing, there is a problem of too varied types and sizes in demand. The production in El Salvador can possibly start with SKD assembly and then move toward CDK assembly, eventually producing some parts. In this step of domestic production, it is recommended to select appropriate types and sizes of tractors the future demand of which is expected to increase in the C.A. region.

j) Machine tools for working, cork, plastics, and so forth:

Since El Salvador does not yield much timber and wood, these products are, if produced in El Salvador, for inter-regional export. Proper selection of types and sizes of the machine tools will be most important.

k) Air conditioning machines and equipment:

Demand for air conditioning equipment is obviously increasing due to improved standard of living. In El Salvador, an assembly of small air conditionor for domestic use seems to have become possible. Domestic production of most parts, excluding compressors and radiators, is also possible. Refrigerating compressors will be possibly assembled on the same production line as compressors for electric refrigerators. Some air conditioning units are currently being assembled in El Salvador and its production facilities are preferably modernized.

l) Molds for foundry, glass, and plastic forming:

In this study, dies for forging and sheet metal working are included as well as metal molds. Although existing markets in the C.A. region, the namely metal working industry, die-casting and plastic forming industry, are still underdeveloped, the demand for dies and molds will unmistakably increase as these industries develop. Some of the dies and molds in demand in El Salvador are already domestically manufactured but it is desirable to foster specialized manufacturers. Capital investment for the industry is relatively large and, nevertheless, it is a labor-intensive industry.

m) Taps, cocks, valves, and similar appliances:

IMSA produces taps of copper alloy for the domestic market. Quality of the products, as the mission observed, is not high enough to be able to compete in international markets. The future market for these products will largely depend upon various water supply projects developed by ANDA and other water supply authorities in the C.A. region. If production of these products is planned in El Salvador, it is necessary to know exact requirements for each use (specifications) as well as industrial standards in use. This is particularly important, if products are to be exported to the United States by taking advantage of quota under the General Systems of Preferences. Production of water volumetric meters may be classified in this category.

n) Electric motors:

In planning production of these products in El Salvador, types and sizes are to be specified. It is recommendable to manufacture of electric motors with output of 20 to 500 Watts to meet the demand for domestic electrical appliances industry. The initial step of production will be CKD assembly or winding cores. Production is comparatively simple, though it requires considerable capital investment. Electric motores made in El Salvador may be exported to the United States under the General Systems of Preferences.

Quotas for Electric Motors

TSUS 682.25 Electric motors less than 50 Watts---$29,515,000 U.S.

TSUS 682.30 Electric motors between 50 to 80 Watts---$21,133,000 U.S.

TSUS 682.40 Electric motors between 80 to 160 Watts---$38,880,000 U.S.

It is advisable to select electric motors with output of less than 100 Watts for the production in El Salvador.

o) Transformers, except for electronic equipment:

Except for large transformers for substations, transformers for power distribution and electrical welding are possibly manufactured in El Salvador. The production process is, however, not necessarily high labor-intensive compared with production of transformers for electronic equipment. Export to the U.S. can take advantage of quota under the General Systems of Preferences.

It is important, in planning domestic production of electric motors and transformers, to use electrical wires manufactured by CONELCA, for this will contribute to increased value added within El Salvador. Production technology involved is not too sophisticated in view of possible assistance from international firms. Probably marketing will be one of the largest problems to be solved.

The problems may include the following:

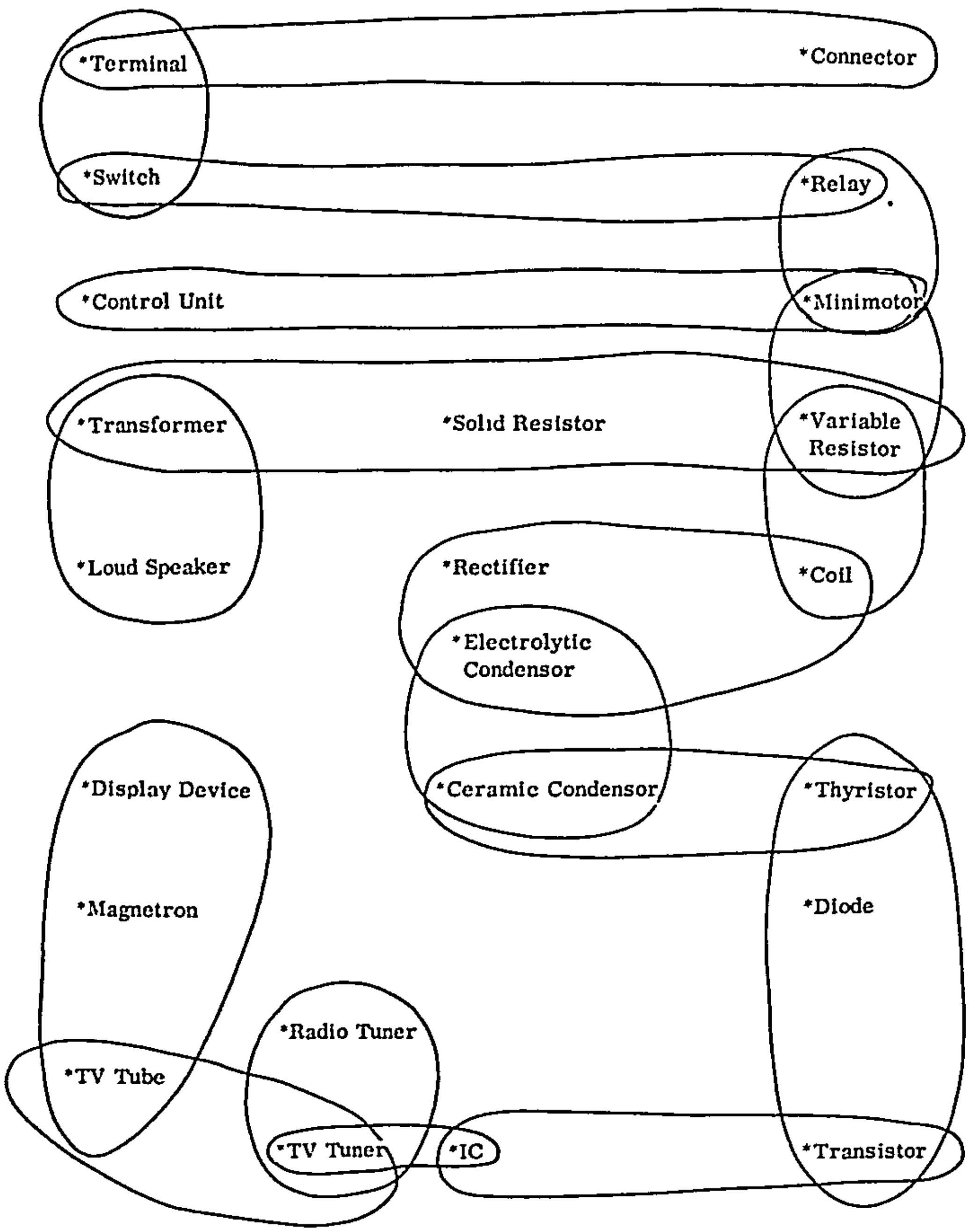
- Customers tend to be influenced by the "brands" of the products when they purchase the product;
- Reliability of the performance is of prime importance and, therefore, strict quality control during production is needed;
- In exporting these to the international markets, competition of price arises among products from developing countries.

p) Electric apparatus for making and breaking or for protecting electrical circuits including switchgears and rheostats:

Most are possibly manufactured in El Salvador except for large-scale circuit breakers. There is, at least, one manufacturer which assembles some of these products in Costa Rica and it will be necessary to arrange appropriate division of products. For production in El Salvador, small items including electro-magnetic switches are recommended.

q) Electronic parts including condensors, filters, resistors and so forth:

As domestic production of radios and TV receivers increases, import of electronic parts and components auguments and local production of some of these become economically feasible. Problems about local production is proper selection of parts and component to be manufactured. Figure II-2-3 shows production groupings of electronic parts and components.



Source: The JICA Mission

Figure II-2-3 Production Grouping of Electronic Parts and Components

It is recommended to start with producing items which belong to the same or nearby groupings, since common production technology and equipment are effectively utilized. Accordingly possible production in El Salvador will include the following combinations:

Switches, relays, and so forth;

Transformers, resistors, and coils;

Connectors and terminals.

It should be emphasized that electronic parts and components manufactured in El Salvador will be favorably exported to the United States under the General Systems of Preferences.

r) Other electrical articles and accessories for automobiles and other uses:

Only manufacture of electrical parts for automotive use is considered. These include the following:

Starting Motors,

Alternators,

Voltage Regulators,

Distributors,

Ignition Coils,

Ignition Plugs,

Lamps,

Wipers,

Horns or Klaxons,

Switches,

Meters,

Connectors,

Wires and Cables,

Wiring Harnesses,

Electronic Systems,

Table II-2-11 shows possible production steps according to ease of production.

Table II-2-11 Production of Electrical Parts for Automotive Use

Production	Articles
1. Possible Production in Developing Countries	Wires and Cables, Wiring Harnesses
2. Possible Production in Fast Developing Countries	Connectors, Starting Motors, Alternators, Distributors, Voltage Regulators, Ignition Coils, Wipers, Switches, Horns or Klaxons
3. Production in Developed Countries	Meters, Electronic Systems

Source: The JICA Mission

Electrical cables and wires could be exported to the U.S., taking advantage of quota under the General Systems of Preferences. In connection with this, production of wiring harnesses and connectors can be concieved, although the inter-regional markets are still small. Alternators could be manufactured in conjunction with production of electric motors. Other potential products will include such items as starting motors, distributors, voltage regulators, ignition plugs, wipers and switches, and selection of the products must be made basing upon availability of sizable markets.

s) Electrical measuring instruments and meters:

Among articles classified in this category, ammeters and voltmeters have limited markets and therefore production of watt-hour-meters in El Salvador is only a possibility. Being a precision instrument which has to guarantee its accuracy for a long period, watt- hour-meters are preferably assembled by SKD at the onset of production and afterwards by CKD. Domestic production of its parts will take some time due to the stringent requirements for quality.

Conditions for the start of assembly in El Salvador will include;

- Transfer of technical know-hows from foreign companies;
- Cooperation of electric power companies in the C.A. region---Unified specification, preference in purchase and so forth.

t) Portable electro-mechanical hand tools:

There are varied types and sizes of products in this category, namely from simple and small hand tools for the "Do-it-yourself" use to heavy tools used at factories. Both types and sizes are manufactured primarily in developed countries with enough price competitiveness. Since value added of the product is small, the merit of relatively inexpensive labor cost can not be fully utilized. Consequently, production in El Salvador could start, only if technologies and makers are provided by foreign firms. Production of the electro-mechanical hand tools may be linked with production of electric motors in order to attain higher value added.

4) Comparison of the Selected Projects with Those Proposed by the El Salvador Government

Comparison is made on selected projects with those proposed by El Salvador. Out of 22 industrial sectors selected by the Mission, 12 sectors are identical with the projects selected in El Salvador. The result of this study shows that few projects have been selected for the metal-mechanical industrial sectors classified from ISIC 38243 to 38531 except for ISIC 38311. Various problems such as small market sizes and large technological gaps prevent sophisticated industrial sectors from being selected. Some of the projects selected in El Salvador but not in this study, however, present attractive prospect in long term, either in terms of marketability or industrial linkage. Some examples are shown in Table II-2-12.

Table II-2-12 Examples of Promissing Projects in El Salvador

ISIC	Projects	Comments	
38293	Domestic Sawing Machines	C.A. Regional Market	60,000 units/year
38299	Refrigerating Compressors	For Regrigerators C.A. Regional Market	 80,000 - 90,000 units/year
38299	Water Pumps	C.A. Regional Market	10,000 units/year
38441	Bicycles	C.A. Regional Market Already in Small Production in Guatemala	60,000 units/year

Source: ONUDI / Ministerio de Planificacion / INSAFI
The JICA Mission

Currently these markets are not large enough to encourage establishing mass production. However, demand for these products is expected to increase steadily in accordance with increase of standard of living in the C.A. region. Among others, production of compressors for refrigerator will be of interest in future, for these are same type of compressors as used for small air conditioners and the production is inter-related with manufacture of electric motors.

It is understood that the Government of El Salvador is particularly interested in developing the following four metal-mechanical industrial sectors:

a) Agricultural Implements;

b) Electricity, Water and Gas Meters;

c) Small Compressors and Motors---Motomecanica;

d) Hand Tools for Metal Working.

a) Regarding possible manufacture of agricultural implements the mission has been informed that IMACASA is shortly setting out production of disc ploughs and other simple implements, and they have already placed an order for necessary production equipment. Other agricultural machinery include harvesting and thrashing machines, and agricultural tractors. The former was not examined in detail due to complexity of products. Feasibility of producing small agricultural tractors in El Salvador was, therefore, investigated.

b) Production processes for electricity, water and gas meters are fundamentally different each other and they are regarded as independent industrial sectors. Production of gas meters were not chosen as the subject of detailed investigation, since town gas systems have not been developed in the Central American countries.

Market sizes for both water and electric power (Watt-hour) meters are almost identical---100,000 units/year for the C.A. market. By taking into account of the Japanese involvement in the past, namely CAESS' purchase of Japanese watt-hour meters, and impacts on technological level of El Salvador, possible production of watt-hour meters was investigated.

c) Articles indicated under the title "motomecanica" in the El Salvador's request include small compressors for air and gas, and small gasoline engines. It is unlikely that compressors and engines can be manufactured in the same production line. Furthermore, it seems also not possible to assemble air and refrigerating compressors in the same production line. From the technological point of view, manufacture of the following three products, namely,

air compressors,

refrigerating compressors, and

gasoline engines

would form considerably different industrial sectors.

The C.A. market for air compressors is found too small to give an incentive to international firms which would extend assistance to El Salvador in manufacturing the product. As far as an assembly of small gasoline engines in El Salvador is concerned, demand appears declining because of increased gasoline price, which is almost double compared with that of diesel oil, and relatively short life as compared with diesel engine. Assembly of diesel engines, a project selected as appropriate in this study, is regarded as a long term objective.

Since manufacturers of electric refrigerators in El Salvador hold a predominant position in the C.A. region with the annual output of 80,000 to 90,000 units, production of refrigerating compressors seems most promissing among articles included under the title of "motomecanica". A feasibility study was, therefore, conducted on this product.

d) In the category of "hand tools for metal working", varied types and sizes of articles are included as indicated below;

- cutting tools---twist drills, reamers, taps and dies, milling cutters, single point tools and etc;
- cemented carbide tools---cemented carbide tips, single point tips and etc.
- diamond tools---diamond dies, diamond wheel cutters and etc;
- machinist hand tools---spanners, wrenches, pliers, screw drivers, vices and etc;
- electro-mechanical hand tools---electric drills, electric grinders, domestic drill kits and etc;
- pneumatic hand tools---pneumatic grinders, pneumatic drills, pneumatic impact wrenches and etc;
- cutting blades and knives---shear blades, wood cutting saws and etc.
- files---machinist files, set files and etc;

Among these products, machinist hand tools and electro-mechanical hand tools are selected as appropriate and recommended respectively in this study. Detailed feasibility of producing machinist hand tools in El Salvador was investigated on account of appropriate technology level and prospect of extra-regional exportation.

III. THE SELECTION OF FACTORY SITES

III. THE SELECTION OF FACTORY SITES

1. The General Framework for the Selection

The selection of appropriate sites to locate industries will have a significant impact on the future development of the industries. The selection of the sites must be determined based on many factors such as considerations of planned regional development and objectives of industrialization. Thus, the discussion will proceed in relation to the following points:

(1) Land utilization plans in El Salvador,

(2) Limiting factors caused by infrastructure,

(3) Limiting factors caused by the industries, and

(4) Natural conditions, labor conditions, etc.

There are four areas which are said to be candidates for industrial estates plants in El Salvador (See Figure III-1-1). They are:

(a) The vicinity of the current airport (San Bartolo),

(b) The vicinity of the new international air port under construction,

(c) The vicinity of the Port Acajutla, and

(d) The vicinity of Santa Ana city.

With regard to the selection of plant sites for the metal-mechanical industry, it should be pointed out that it will be inefficient if each manufacturer selects its plant site independently. For the metal-mechanical industry has a strong inter-industry linkage as its characteristics. Thus, the location of the metal-mechanical industry should be strongly administered from the beginning of the project implementation. Though the El Salvadorian government has built a free zone near by the Ilopango airport and tries to invite industries of all kinds, the metal-mechanical industry should from its own industrial estate. There are four reasons for that. The first reason is that since the industry must be contained in El Salvador or, at best, in CACM region for sales and production, the smallness of demand will not creat any clear advantage to locate the industry within the free zone area with some exceptions. One example of the exceptions may be the case of the multinational corporations

(MNC's). MNC's may be able to use El Salvador as a base for improvement trade for exportation within the framework of the world-wide marketing strategy. In this case the countries to which exports are made are known in advance so the plant produces only a predetermined share of its total supply.

The second reason is due to the characteristics of the metal-mechanical industry, namely, the close linkage with other industries. Grographical closeness among related industries seems to create more efficiency.

The third reason is a possibility of industrial pollution. In the metal-mechanical industry the electroplating process becomes an important process but it produces polluted water. In order to build pollution control facilities it requires a considerable amount of investment. Thus, rather than each private firm builds its own pollution control devices, it seems more efficient for the government to build facilities in one place by public investment funds if these firms are gathered in one place in advance.

The fourth reason is the necessity of the technical center to be built in the center of the industrial estate. For development of the metal-mechanical industry it requires almost day to day guidance of technical supervision, quality inspection, information service, etc. provided by the Center. Without these services the metal-mechanical industry may face difficulties in the future.

From these reasons stated above, the selection of appropriate plant sites for the metal-mechanical industry is equivalent to the selection of the location of the industrial estate which is presumably constructed by the government with infrastructure facilities, centralized pollution control facilities, and the Technical Center as the core of the estate. In addition to these conditions, the industrial estate must be also considered from a view that it may be also participated by foreign firms. Based on these considerations the selection of the plant sites will be discussed below.

2. Criteria for the Selection of the Sites

Generally the establishment of firms are determined, based on the three major factors, namely, land, capital, and labor. In this report the fourth factor, namely, the national land utilization plans of the El Salvador government, will be added to the analysis of the criteria.

1) Land and Infrastructure

* A possibility of purchase of, at least, 50 acres of flat land.
* A possibility of pumping up underground water.
* Conditions for transportation, in particular, road situation.
* Availability of drainage for discharging treated effluent.

2) Financial Capital and Business Environment

* Accessibility to banking systems at hand.
* Accessibility to suppliers of raw materials.
* Accessibility to customers and shipping facilities (airports and harbors).
* Accessibility to official organization.

3) Labor and Living Environment

* Availability of skilled labors.
* Availability of professional office workers such as accountants and belingual secretaries.
* Accessibility to facilities which make living convenient such as restaurants, movie theaters, retail stores, hospitals with modern equipment, etc.
* Availability of commuting means for workers such as bus transportation.
* Housing conditions.

4) The National Land Utilization Plans

* Specifications of plant sites by the national land utilization plans.

3. A Study of the Candidate Sites

Based on the criteria listed above the four candidate sites are chosen as mentioned above. Some detail study will be made for each site in the subsequent analysis.

1) The Vicinity of the Current Airport--the San Bartolo Area

From the capital city San Salvador to the airport, an industrial zone has been formed, in a sense without planning, along CA-1 (the Pan-American High Way). The industrial zone consists of many kinds of industries with various sizes and is best developed in the nation. With the new airport under construction the current airport may be changed to the airport specialized only for cargo flights. Thus, the said industrial zone may become more attractive for the plant sites.

In addition, the area has an access to labor, transportation, and various infrastructure. With an exception of water problem, by and large this area seems superior to other areas. Based on these favorable conditions, a free zone is under construction near by the airport. The free zone is aiming at the formation of a new industrial estate and at the so-called Hong Kong type industrial estate. By the Hong Kong type it means that manufacturers within the estate can import raw materials without duty and products are to be exported to the outside of the nation. In other words, production activities of the firms within the free zone are not to meet domestic demand but rather to export their products. For the export markets the U.S. markets are expected to play a significant role.

However, since the firms within the free zone must be severely conditioned since they must be entirely export-oriented. For this reason, the free zone may be useful for MNC's for their world marketing strategies, but for the industries which must aim at the domestic market of El Salvador, at least at the initial level, the free zone may not be so useful as one may think.

2) The Vicinity of the New International Airport under Construction

The new international airport is located along with the highway CA-2 to La Union, in cotton fields about 10 km towards the ocean from Comalapa. It is located in the low land so high temperature and humidity are observed.

The new airport is expected to open by April, 1979 and a new highway is under construction linking with San Salvador. Upon the completion of the new airport, development of the vicinity of the airport is expected. However, there is no concrete plans for development so, even if development proceeds, it may take a 8 to 10 years span. Thus, it seems difficult to select land appropriate for development of the metal-mechanical industry in the vicinity of the new airport. Additionally, the new airport area is farthermost from Port Acajutla. Since the La Liberta habor has been used as a fishing port rather than a commercial port, the shipment of imported parts and materials must reach the vicinity of the new airport via Acajutla by way of CA-2. This requires additional costs of transportation. Also, infrastructure has not been developed so it is difficult to select this area as an appropriate site.

If the government constructs a free zone in the area, acquisition of land and development of infrastructure may be secured. However, accessibility to business conveniences such as banking systems, raw materials supply, etc. may cause problems, for it takes about one hour from San Salvador. Though a new highway is planned, it will take at least a several years before its completion. The situation would be the same for the construction of a free zone as well. From these reasons, the vicinity of the new airport may not be appropriate for the plant sites of the metal-mechanical industry.

3) The Vicinity of the Port Acajutla

The Port Acajutla is truly the best trading port in Central America. Flat land continues from Acajutla to Sonsonate and the area has potential for industrial development. This area was chosen as a possible site for construction of an industrial estate. The reasons may be found in a condition that this area is close to a good port and convenient to control pollutions.

The area is about 120 km away from the capital city. Population of Acajutla runs about 26 thousands and 5.5 thousands housing units are counted. Out of 26 thousands, city population accounts for 33% or 8.6 thousands, while rural population accounts for the rest of them.

Land purchase, electricity supply, communication, etc. may not cause much problems. As to water supply, a certain amount of water supply, thought it is not certain, may be obtained. Though road situations seem good, the problems seem to be that the area is furthermost from the capital city among the four candidate sites.

Development of the metal-mechanical industry in El Salvador may presumably start off with knock-down types of production. Thus, there seems to be little merit to establish the factories in the industrial zone at the seaside where the heavy and chemical industries such as steel manufacturing have been operating.

The geographical distribution of manufacturers of the metal-mechanical industry in El Salvador is listed in Table III-3-1. It can be seen that more than 80% of them

Table III-3-1 A Distribution Pattern by District of Metal-Mechanical Makers in El Salvador

	San Salvador	Sonsonate	La Liberta	Santa Ana	Ahuachapan	Cuscatlan	Usulutan	San Miguel	La Paz	La Union
Iron and Steel	5	1	1							
Non-ferrous Metals	1									
Cutlery, Tools	3									
Steel Furniture	12		1	1	1	1				
Metal Structures	12		2				1	1		
Other Metal Products (excluding Machinery)	9						1		2	
Agricultural Machinery	2			1						
Machinery (excluding Metal working and Wood-working Machine)	2									
Other Machinery (excluding Electrical Machinery)	7									
Radio, T.V. Sets and Communication Equipment	5			1						
Household Appliances				1						
Other Electric Products and Parts	13									
Shipbuilding and Repair	1									
Motor Vehicles	2									
Aircraft	1									
Transport Equipment	5									1
Camera, Optical Instrument	4									
Watch	1									1
Total	87	1	4	4	1	1	2	1	2	2

are concentrated in San Salvadoe and its vicinity. Thus, even if a new factories would be built in the vicinity of Acajutla, business will be done mainly with these manufacturers in San Salvador and its vicinity. This will inevitably raise costs of production.

Employment of labor may not be problem so long as unskilled labor is concerned. However, a problem is to hire skilled labor. There is INSTITUTO NACIONAL THOMAS JEFFERSON in Sonsonate and 29 mechanics (Mecanico)and 30 elecritians (Electricista) graduated from the institute in 1975. Though the graduates seem to have participated in their own fields actively, they need on the job training at least for a period of two to three months. Also professional office workers such as accountants or secretaries fluent in English are hard to find.

Although foreigners may be hired for management and technical supervisions in order to supplement the lack of skilled labor, daily life environment in the vicinity of Acajutla may not be suited for their expectations. The San Bartolo Free Zone has been successful because it has located close to San Salvador where daily life-environment has been amply provided. The similar example may be found in Colon Free Zone in Panama. In the Colon Free Zone daily life-facilities seem to be amply provided due to the U.S. control of the Canal. Thus, if joint-ventures are attempted, particularly with the U.S. firms, these facilities should be developed. The factory sites selection should include a consideration on this matter.

Based on the information obtained above it may be concluded that the vicinity of Acajutla may not be best suited for the site for rhe metal-mechanical industry.

4) Santa Ana and its Vicinity

The city of Santa Ana is located about 80 km North-West of San Salvador. It altitude is about 550 m so the climate of Santa Ana is regarded as mild and agreeable. The highway CA-1 links Santa Ana with San Salvador and extends to Guatemala. With CA-1 traffic time has been reduced considerably. Thus, San Salvador and Santa Ana may not constitute an independent economic zone any more. Rather along CA-1 an integrated economic zone may be formed. Policy-wise this development seems desirable to reinfore the localization of industries. Thus, the region between Santa Ana and San Salvador may have the following merits, if the sites are selected somewhere in-between the two cities:

(1) The intermediate location between the two cities is convenient for workers to commute to and from the factory sites from both cities. Also, labor may be obtained from both cities.

(2) If it is possible to cummute from San Salvador, daily life-facilities in San Salvador are available. This may alleviate some problems for foreign employees who wish to stay in San Salvador.

(3) If a factory or an industrial complex of the metal-mechanical industry is to be constructed in the intermediate location between the two cities, it may cause favorable impact on development of the area.

(4) A railway runs along with CA-1 so, if necessary, it is available.

(5) Underground water is expected to be plenty, though the precise information must waite for drilling.

(6) 50 to 100 acres of land should be obtained easily.

(7) The area is close to the Port Acajutla.

5) A Tentative Conclusion

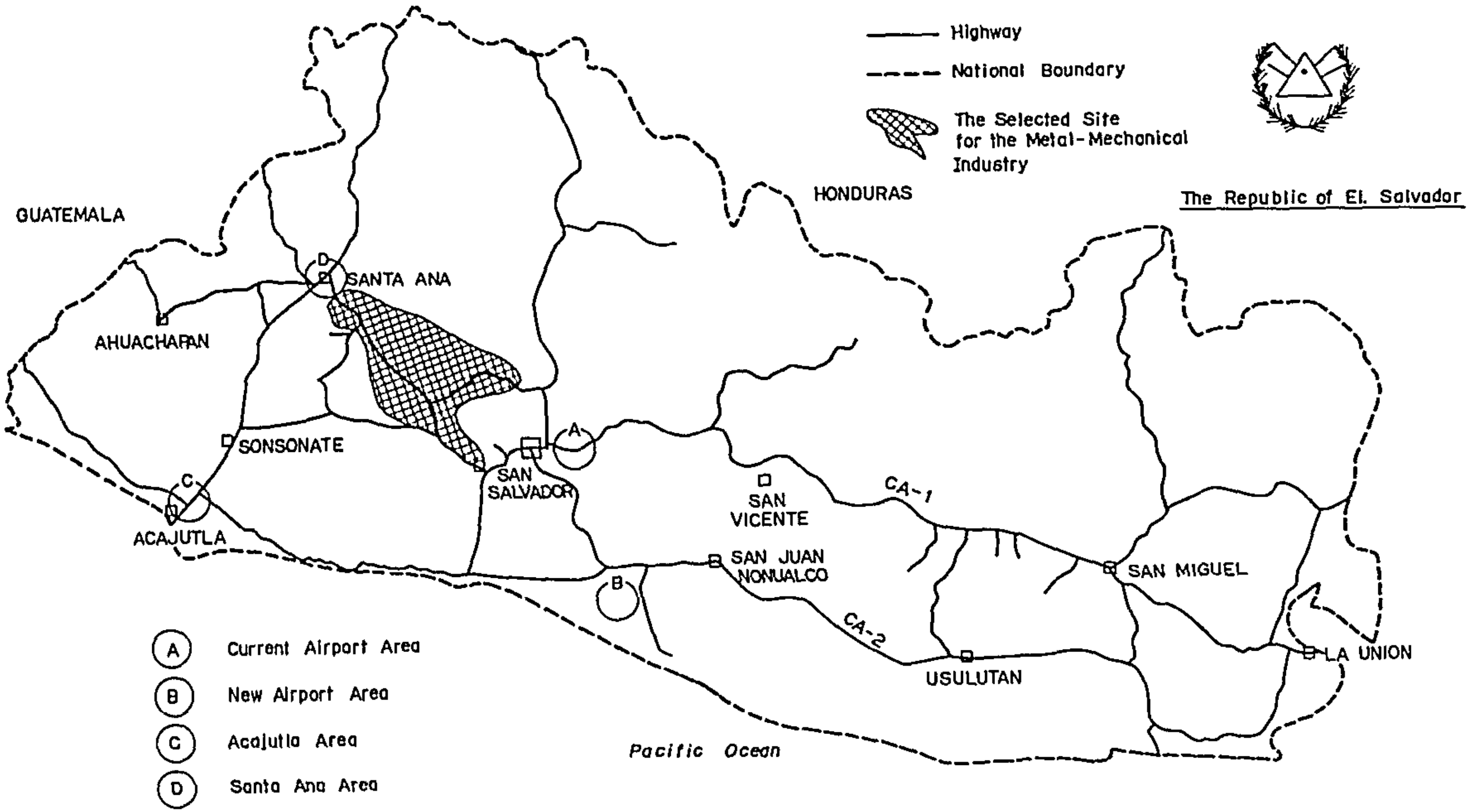
Based on the information obtained for the four candidate sites a tentative conclusion may be drawn as to the best possible site for the plant (or the industrial complex) of the metal-mechanical industry: The area between San Salvador and Santa Ana along the highway CA-1 would be the best available site among the four selected sites (See Table III-3-2). The area is expected to be developed

Table III-3-2 Comparison among the Sites Proposed for Industrial Estate for the Metal-Mechanical Industry

	San Salvador	The Vicinity of the new airport	Acajutla	Santa Ana	Capital City-Santa Ana
1) Land and Infrastructure: Electricity, Water Supply, Drainage, Communication and Transportation	Favorable	Vague prospects, unfavorable natural conditions	Favorable, but difficulties in natural conditions and transportation to and from the Capital City	Generally developed but troubles with land use and water supply	None at present, depending upon the Government's efforts for development
2) Business Environment	Favorable	Vague prospects	Not acceptable	A little difficult	Favorable (Possible to depend on the existing condition)
3) Availability of Labor Force	Favorable	Vague prospects	Not acceptable	A little difficult	Favorable
4) Facility for Daily-life	Favorable	Vague prospects	Not acceptable	Less acceptable	Favorable
5) The Government Plan for Rigional Development	Yes	Yes	Yes	Not available	Not available

Source: JICA Mission

in the future with or without the metal-mechanical industry. For the low land along the coast line has a climate of high temperature and humidity so the area is not generally suited for industrial development. The East and South East areas of the country have not been developed sufficiently to locate new industries particularly due to the lack of infrastructure. On the other hand, the region between the two cities is equipped with various advantages over other areas of the country as stated above. Thus, the selection of the factory site should be focused on this area at the early stage of development of metal-mechanical industry.



Source : The JICA Mission

Figure III-1-1 Candidate Sites for Industrial Estates for the Metal-Mechanical Industry

Ⅳ. ECONOMIC EVALUATIONS OF THE PROPOSED PROJECTS

IV. ECONOMIC EVALUATION OF THE PROPOSED PROJECTS

1. Electric Power Meter Assembly Industry

1) Selection of the Type of Products

(1) Types and Specifications of WHM Currently Used in El Salvador

Listed below are types and specifications of Watthourmeters (WHM) currently used in El Salvador:

(a) Single phase, 2-wire, 120V, 60HZ, 15/100A (class 100)

(a') Single phase, 2-wire, 120V, 60HZ, 10A, 10/30A, 15/45A

(b) Single phase, 3-wire, 120/240V, 60HZ, 15/100A (class 100)

(b') Single phase, 3-wire, 120/240V, 60HZ, 15A, 15/45A

(c) Three phase, 3-wire, 240V, 60HZ, 15/100A (class 100)

(c') Three phase, 3-wire, 480V, 60HZ, (class 200)

(c") Three phase, 3-wire, 240V, 60HZ, 2.5(10)A, (class 10)

(d) Three phase, 4-wire, 120/240V, 60HZ, (class 100)

(e) Three phase, 4-wire, 120/240V, 60HZ, 30/200A, (class 200)

(f) Three phase, 4-wire, 240/480V, 60HZ, (class 100)

The majority of WHM in El Salvador is a bottom connected type with metal-base glass cover, sometimes with metal cover. These WHM in El Salvador have four-or five-digit indicators for the register. National power company-CEL (Comision Ejecutive Hidroelecrica del Rio Lempa) purchases WHM by the international tender (Licitacion). CAESS (Compania de Alumbrado Electrico de San Salvador S.A. - the largest electrical power distributing company in ElSalvador), on the other hand, purchases WHM based on cost estimates submitted by manufactures. The majority of WHM purchased by CAESS comes from Canada, but a few WHM from Japan are also used.

(2) Types and Specifications of WHM Currently Used in CACM Countries

The followings are types of WHM and their specifications currently used in CACM countries:

(g) Single phase, 3-wire, 120/240V, class 200, socket type (g') Single phase, 3-wire, 120/240V, class 100, socket type

(h) Single phase, 2-wire, 120V, class 100, socket type

(h') Single phase, 2-wire, 120V, 10(30)A, socket type

(i) Three phase, 4-wire, 240V, delta, class 200, socket type

(i') Three phase, 4-wire, 120/240V, class 100, socket type

(j) Three phase, 4-wire, 240V, delta, class 20, socket type for use with instrument transformer

(k) Three phase, 4-wire, 208/120V, Y, class 20

(k') Three phase, 4-wire, 240V, class 20, both, socket type for use with instrument transformer

(k'') Three phase, 4-wire, 120/240V, class 10

WHM used in CACM countries have either the cyclometer type register or the pointer type register.

(3) Future Types of WHM in El Salvador and CACM Countries

In the future the same types and specifications of WHM should prevail in both El Salvador and CACM nations unless some drastic changes happen. Thus, under an assumption that a plant assembles WHM in El Salvador, it is neces sary that the type of WHM to be integrated into one type, bottom-connected due to economic reasons. This case study shall proceed under the assumption that the bottom connected type WHM be used in both El Salvador and CACM countries.

2) Determination of the Production Scale

(1) Estimation of the Size of Demand for WHM in El Salvador

Today some 20,000 WHM are used in El Salvador, where all WHM have been imported. The annual demand for WHM is estimated around 15,000 units in 1976, of which 23% is a 1P-3W type, 75% a 1P-2W type, and 2% 3P-3W and 3P-4W types.

An annual increase in demand is estimated as 10% of 15,000, namely 1,500 units. So quantities demanded will be 21,000 in 1980 and 28,500 in 1985 in El Salvador.

(2) Estimation of the Size of Demand for WHM in CACM Countries

Estimated one million WHM may be used in CACM nations. All WHM have been imported in this area. Quantities demanded for WHM are approximately 90,000 annually, of which a 1P-3W type shares 30%, a 1P-2W 65%, and 3P-3W and 3P-4W types 5%.

An annual increase in demand for WHM is expected as 8% of 90,000, namely, 7,200 units based on data provided by INDE and EE in Guatemala. So demand will reach 118,800 in 1980, and 154,800 in 1985.

(3) Possibilities of Exportation of WHM to Outside of CACM Region

It is estimated that the market size for WHM in Panama is about 20,000. As indicated above, the Panamamian market may be counted if the type of WHM is fully integrated into the bottom-connected type in Panama also.

The US should be excluded from the consideration of the potential markets for WHM, because such top class manufactures as GE, Westinghouse, Sangamo, Duncun, etc. are competing each other in the US market.

It may be possible to export WHM to such Latin America countries as Equador, Columbia, Venezuela and Peru if the price of WHM is right. However, to consider these countries as dependable markets seems unfounded because there are well-established WHM manufacturers in Brazil and Argentine. Latin American markets should be considered as supplemental rather than permanently stable.

3) Patterns of Production

(1) Production Flow Charts

Considering various factors related to production of WHM in El Salvador, it is decided that complete manufacturing of WHM is almost impossible in El Salvador. Thus, the suitable type of production of WHM in El Salvador is limited to assembly-production. In Figures followed, patterns of assembling process of WHM are presented for different types of WHM.

Flow Chart of Assemblying Process for 1P-2W and 1P-3W Meter

Flow Chart of Assemblying Process for 3P-3W Meter

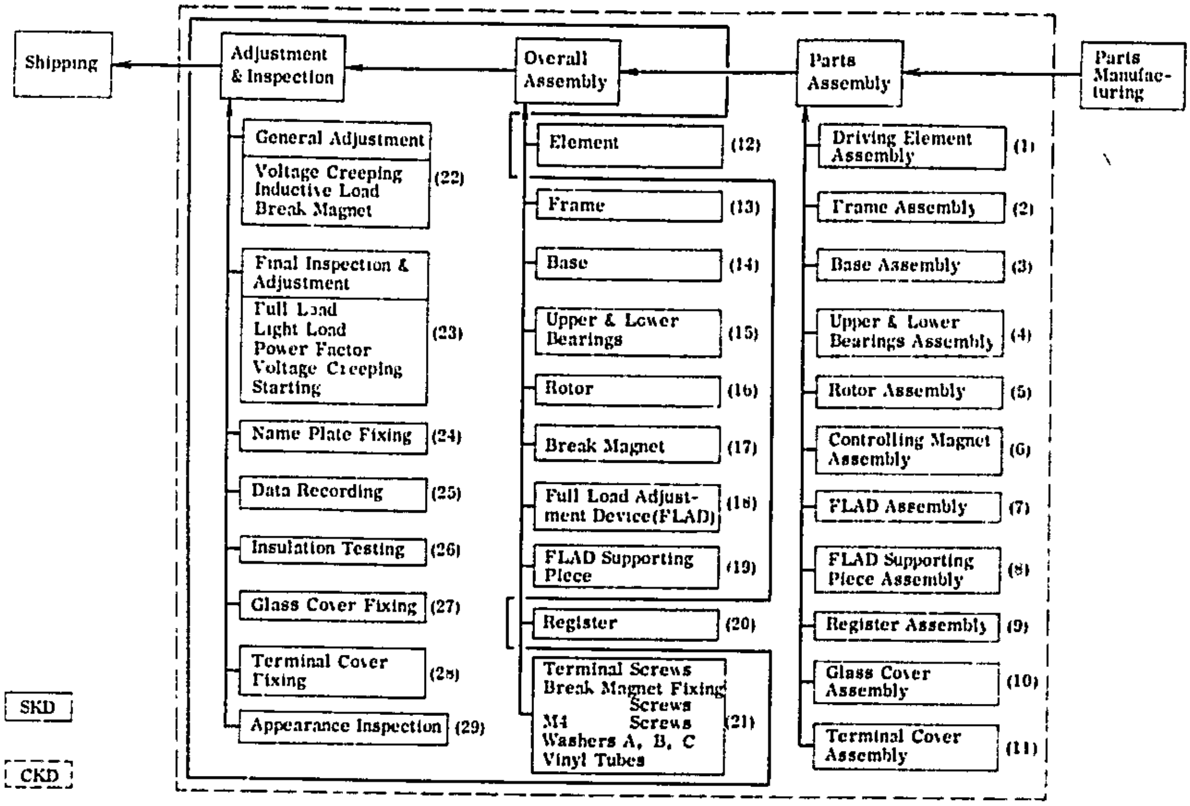


Figure IV-1-1 An Assembly Flow Chart of WHM, Type-1P-2W and 1P-3W

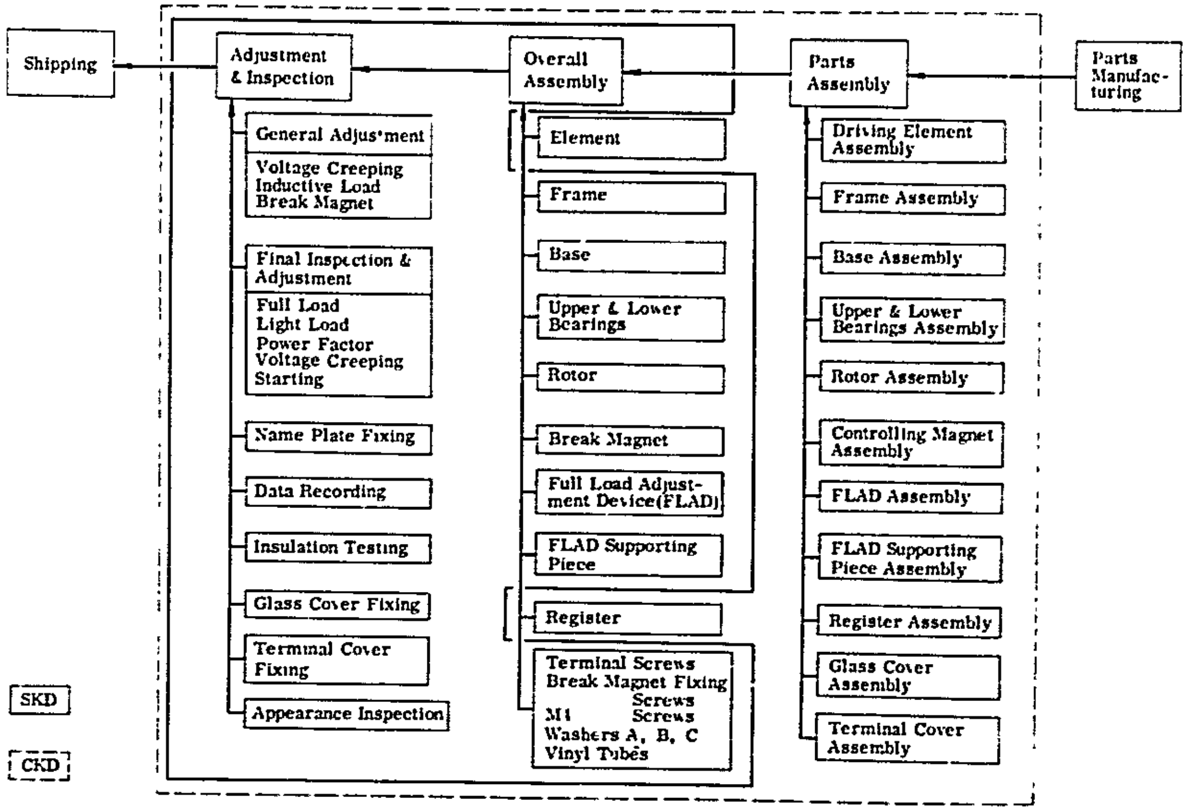


Figure IV-1-2 An Assembly Flow Chart of WHM, Type-3P-3W

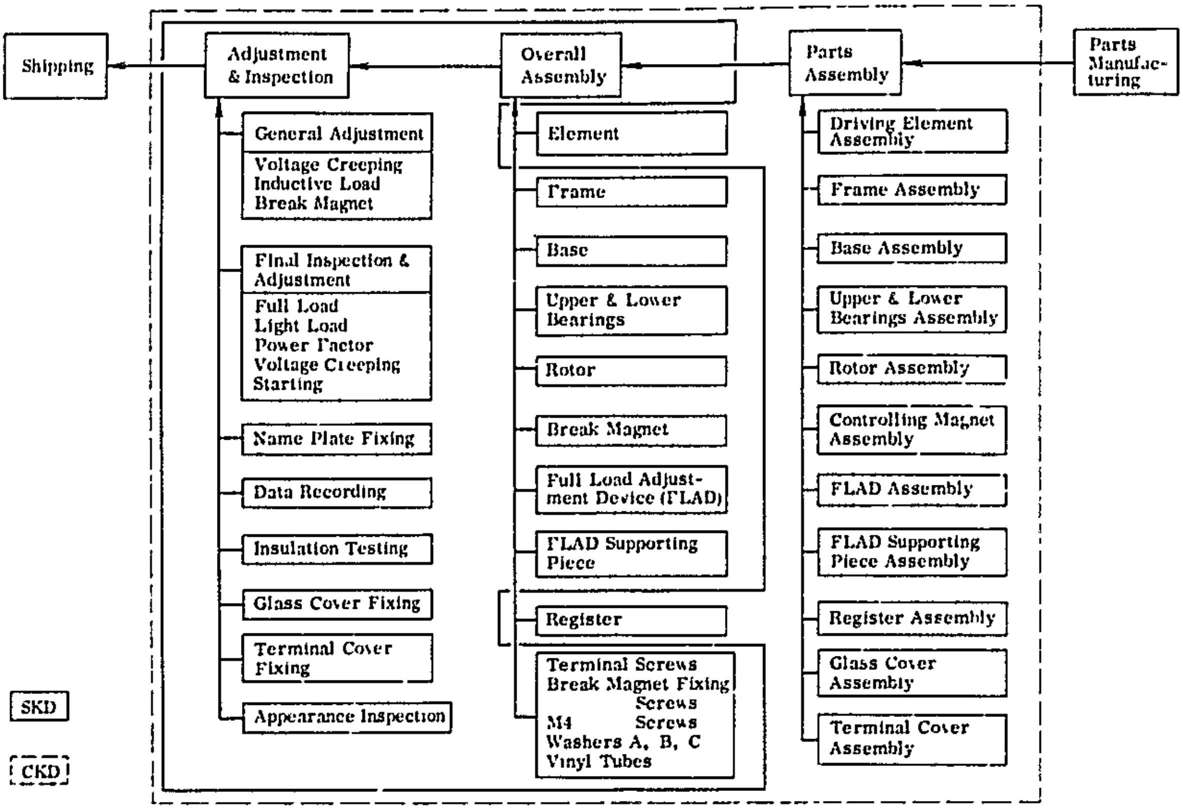
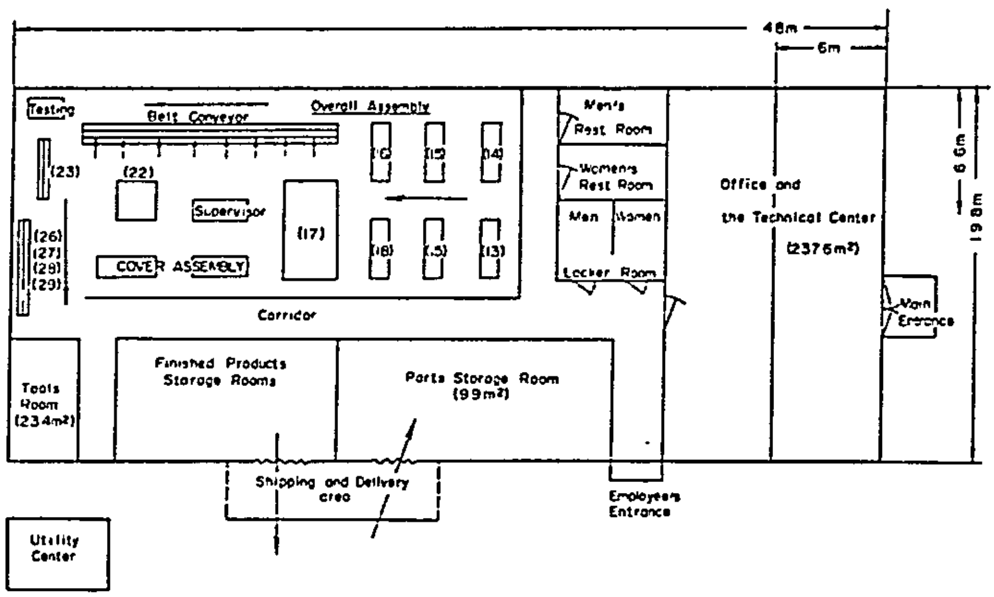


Figure IV-1-3 An Assembly Flow Chart of WHM, Type-3P-4W

(2) Layouts of a WHM Assembly Plant

The layout of the assembly plant differs from SKD to CKD so the layout is drawn for each assembly case in the following Figures:



(Source) The JICA Mission

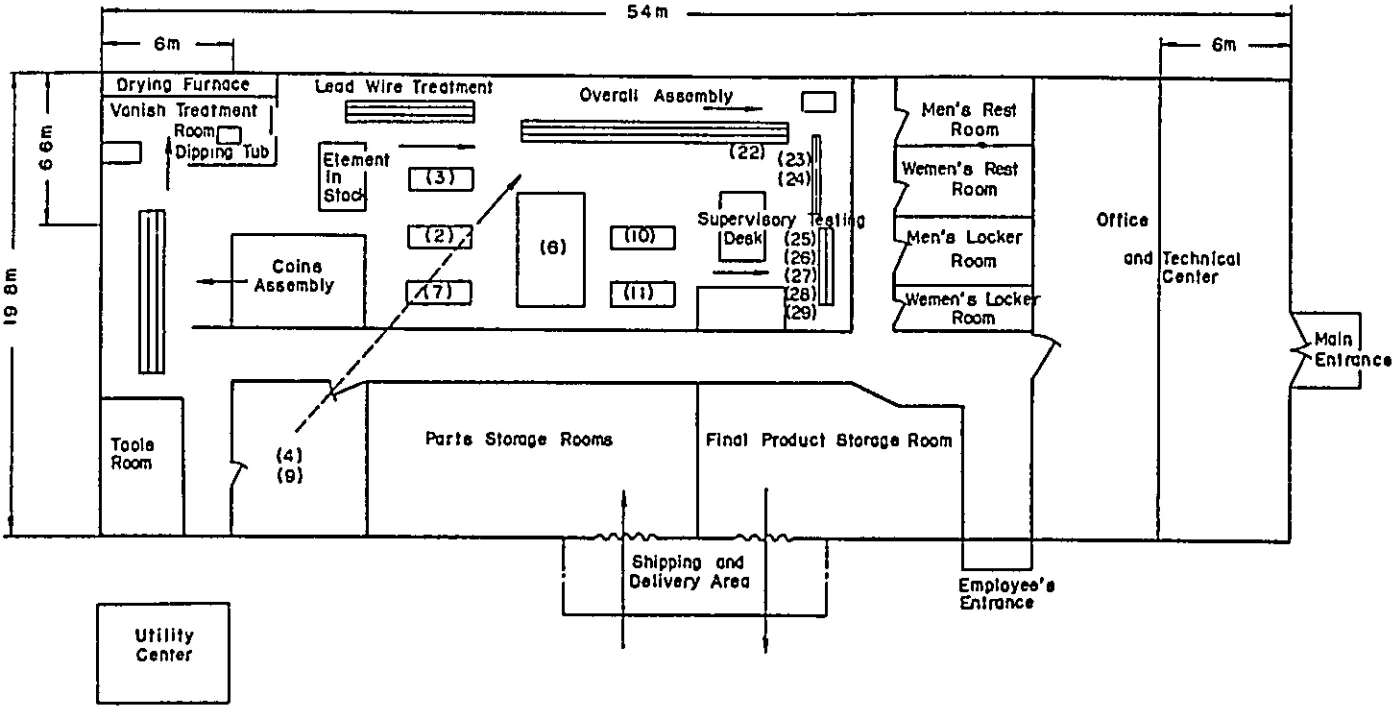
Note 1: Arrows indicate the general direction of flow of assembly.

Note 2. Flexible partitions should be used.

Note 3. The utility center will have the installation of cubicles, generators, compressors, and water pumps.

Note 4: The numbers on the layout correspond to those in Figure V-1-1.

Figure IV-1-4 A WHM Assembly Plant Layout, Case of SKD



(Source) The JICA Mission

Note 1: Flexible partitions should be used in principle.

Note 2: The utility center has the installation of the cubicle, the generator, and the water pump.

Note 3: The numbers on the layout correspond to those in Figure IV-1-1.

Figure IV-1-5 A WHM Assembly Plant Layout, Case of CKD

4) Investment Plans

Table IV-1-1 presents estimates of plant and equipment expenditures for assembling WHM in El Salvador. In estimating these investment expenditures two assumptions are made: First, the assembly plant is assumed to be built by the end of 1979, so equipment expenditures are estimated accordingly; and secondly, since the size of demand for WHM is so small that no special consideration is given to equipment expenditures due to the differences between SKD and CKD.

Table IV-1-1 The Investment Schedule for the WHM Assembly Plant in El Salvador by Type of Production and Market (in US$)

Type of Production The Target Market	SKD El Salvador	SKD CACM	CKD CACM	PLC CACM
Investment				
(1) Land and Building				
Land	15,000	15,000	18,000	21,000
Building	106,900	106,900	118,820	151,500
(2) Equipment				
i) Standard Devices				
Rotaly Standard				
Standard Watt Meter	40,500	40,500	40,500	40,500
Standard Volt Meter				
Standard Amp. Meter				
A.C. Watt Meter				
R.C. Counter				
Standard Potential Transformer				
Standard Current Transformer				
ii) Testing and Adjusting Equipment				
Testing and Hanging Boards Voltage Creeping & Balancing Boards	49,500	49,500	49,500	49,500
Inductive Load and Break Magnet Devices	12,600	12,600	12,600	12,600
Generator	11,250	11,250	11,250	11,250
iii) Overall Assembly				
Belt Conveyors	3,600	3,600	3,600	3,600
A Set of Jigs	7,200	7,200	7,200	7,200
iv) Parts Assembly				
Controlling Magnet Assembly	8,100	8,100	8,100	8,100
Bare Assembly	900	1,350	1,350	1,350
Frame Assembly	1,350	1,350	1,350	1,350
Bearings Assembly	3,150	3,150	3,150	3,150
Rotary Assembly	9,450	9,450	9,450	9,450
FLAD Assembly	1,350	1,350	1,350	1,350
Class Cover Assembly				
Terminal Cover Assembly	900	900	900	900
Element Assembly			47,300	47,300
Register Assembly			8,100	8,100
Coils Assembly			27,000	27,000

Continued

Type of Production The Target Market	SKD El Salvador	SKD CACM	CKD CACM	PLC CACM
v) Utility Center Installation				
Compressor	1,800	1,800	3,600	5,400
Cubicle (Transformer)	13,500	13,500	13,500	18,000
vi) Parts Manufacturing				
200 tons Press				96,000
60 tons Press				60,600
30 tons Press				17,700
20 tons Press				12,600
Spot Weldes				19,700
Multi Spindle Drilling Machine				10,100
3-Dimensional Drilling and Tapping Machines				50,500
Tapping Machine				3,000
Drilling Machine				1,300
Hand Press				800
Automatic Lathe				111,100
Gear Cutting Machines				136,400
Ventilator				11,720
Shearing Machines				6,600
Others				16,700
vii) Tools Equipment				
Jig Boring Machine				101,000
Electric Discharge Machine				45,500
Surface Grinding Machine				65,700
Cylindical Grinding Machine				35,400
6 feet Lathe				11,100
Milling Machine				16,600
Drilling Machine				3,000
Hardening Furnace				6,000
Metal Saw				14,100
Hand Saw				6,600
Electric Welding Machine				1,500
viii) Others				
3 feet Lathe	6,750			
Milling Machine	14,400			
Drilling Machine	1,350	22,500	22,500	22,500
Equipment Total	155,300	188,100	272,300	1,130,600
CIF Priced	181,500	217,200	308,500	1,175,300

Source: The JICA Mission

5) Production Cost Estimates

Costs of production of WHM are presented in Table IV-1-2. To estimate these costs the following assumptions were made:

- Container transportation is utilized in order to ship parts of WHM to be assembled in El Salvador.
- Revenues are calculated, based on the price data provided by CAESS and the observed bidding prices in the past.
- Costs of direct materials are estimated equal to costs of imported parts, CIF priced, with import duty assumed free.
- Statutory fringe benefits are calculated as 14% of pay rolls and bonus worth for twenty-days are included.

Table IV-1-2 Estimated Profits and Loss Statements for Different Cases of the WHM Assembly Plant in El Salvador in 1980

(in US$1,000 in 1976 Prices)

Production Pattern	SKD	SKD	CKD	PLC
Target Market	El Salvador	CACM	CACM	CACM
Projected Output	21,000	118,800	118,800	118,800
Revenue	271	1,732	1,732	1,732
Costs	378	2,253	2,108	2,125
Materials	298	1,848	1,694	1,534
Personnel Exp.	57	163	229	363
Technical Fees	6	37	23	31
Sales Exp.	8	41	41	41
Others	9	164	121	156
Gross Profit	-107	-521	-376	-393
Depreciation	31	35	47	146
Interest Payments	29	81	83	122
Long Terms	16	14	19	58
Short Terms	13	67	65	64
Profit Before Tax	-167	-637	-506	-661
Corporate Income Tax	0	0	0	0
Net Profit	-167	-637	-506	-661

Source: The JICA Mission

- A straight-line-method is used to calculate costs of depreciation. The rates of depreciation are 2% for building and 10% for equipments.
- Costs of Utilities:

  Costs of water supply is estimated as $120 per month, while costs of electricity are shown in the following Table IV-1-3.

Table IV-1-3 Costs of Electricity

	El Salvador SKD	CACM SKD	CACM CKD	Local 10-20% Contents
Electricity Reception Capacity (KVA)	50	50	75	100-150
Electricity Consumption (KWH)	7,500	7,500	11,000	18,000
Costs of Electricity (US$/month)	183	183	267	433

Source: The JICA Mission

- Costs of expendable items and repairs are based on data provided by some Japanese WHM manufactures.
- Costs of insurance on the plant and indirect and direct taxes are estimated as 0.3% and 0.5% of total costs minus costs of materials, respectively.
- Royalty is estimated as 2% of costs of direct materials, CIF priced.
- The interest rates are assumed to be 8% p.a. for the long-term loans and 13% p.a. for the short-term loans, respectively.
- Labor efficiency in El Salvador is estimated as one-half of that in Japan.
- The basic wage rate in El Salvador is estimated as $300 per month.
- Sales expenditures are estimated as 3% of revenue.
- Cash payment is assumed for all sales.

From the profit and loss statement presented in Table IV-1-2 it seems obvious that the WHM assembly project in El Salvador will lead to net loss every year from 1980 to 1985. Several reasons may be attributable to this unfavorable result. A relatively large amount of investment required for the small market and high levels of skills required for producing WHM are some of these reasons. Accordingly, the feasibility of establishing the plant for WHM in El Salvador seems questionable, if profitability of the plant operation is the sole criterion to evaluate the project.

6) The Level of Skills

(1) Changes in Patterns of Production

A SKD production method described in this report is an application of SKD production pattern which has been practiced by a company jointly established by a Japanese electric power company and a Japanese WHM manufacturing company. Characteristics of SKD may be described as follows: The initial investment can be small and a probability of success may be high in technicalwise if qualified persons under appropriate guidance may be appointed to supervise production. It is an assembly process of upper and lower bearings and rotary assembly which may require the highest degree of precision in the entire assembly process for SKD.

The timing of the transition to CKD from SKD must be determined under a careful consideration on market characteristics, abilities of El Salvadorean workers, and profitability. If it is not necessary to shift to CKD immediately, the transition should be made in one to two years after sufficient preparation is made for skill levels of laborers and operation systems. The transition to CKD requires an additional process for assembly, which includes an assembly of elements for a motor of the meter, coiling, and a register assembly which especially demands precision. This means that skills required for the additional assembly process must be one rank higher than those required for other processes.

The next stage to CKD is a production pattern in which some of or all parts are manufactured in El Salvador. This type of production is hereafter abbreviated as PLC (Production with Local Contents) throughout this report unless otherwise specified. Though complete PLC of WHM in El Salvador seems questionable in the near future, partial PLC (10 - 20% local contents) is conceivable. However, even at this low level of local contents PLC seems to encounter a considerable difficulty technically, in addition to the fact that efficiency of investment might drop sharply due to insufficient home demand. One aspect of technical difficulty for any schemes of PLC arises from the lack of existence of related industries which are required to produce parts of WHM in El Salvador. Skills for pressing, automatic lathing, gear cutting, etc., may not be found in El Salvador. It seems to take two to three years for the technical training for personnels who are required for the domestic production of WHM in El Salvador.

(2) Levels of Skills

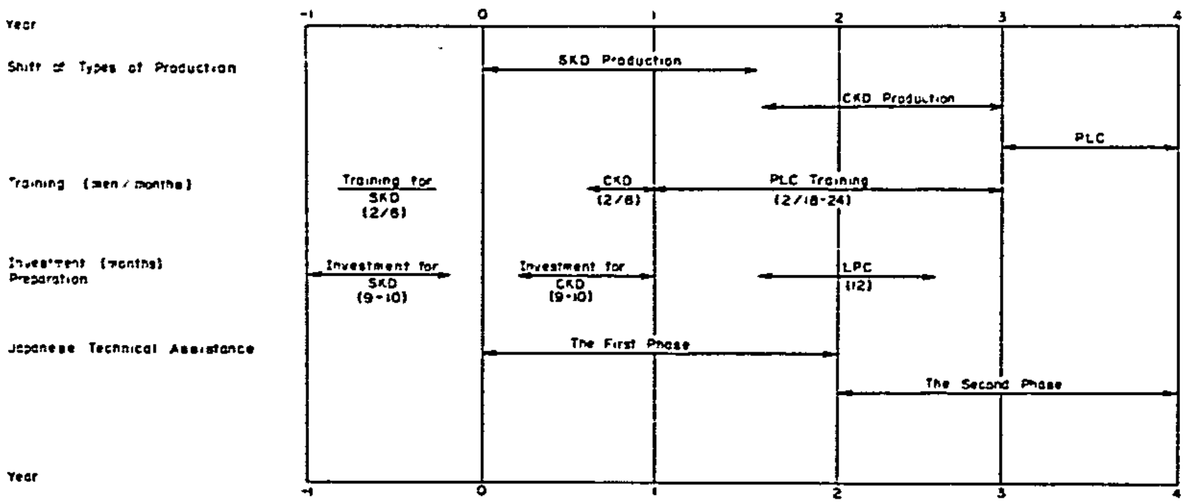
Parts manufacturing is a precision work and is generally grouped into pressing, spot welding, drilling, tapping, automatic lathing, gear cutting, and bench-lathing. In order to complete parts manufacturing, sub-sectors which manufacture tools and metal molds are additionally required. Sheet metal working of precision parts must be done at the plant site. Materials must be imported. However, plating and painting can be sub-contracted in El Salvador. Spot welding is done at the plant site. Drilling and tapping are easy enough for any sub-contractors in El Salvador. Automatic lathing and gear cutting must be done at the plant site. Bench-lathing the same. Diecast or metal mold has to be imported from Japan. As special parts, magnet, bearing jewels, bearing needle, register shafts, rubber packing and glass covers have to be also imported.

Die casting and tool manufacturing have to be supervised till the firms could efficiently produce them. Other things which can be obtained in El Salvador are corrugated boxes and name plates.

(3) Technical Training

(a) On the Job Training in Japan

On the job training in Japan centers around bringing up skilled labors, and is divided into three cases: CKD, SKD and PLC. The related information is listed up in the following Figure:



Source The JICA Mission

Figure IV-1-6 The Summary of Technical Training

Table IV-1-4 Schedules for On the Job Training in Japan

	Curriculums	Level of Skills of Trainees	No. of Trainee	Period of Training (month)
SKD	◦ Theoretical Approach to WHM ◦ Total Assembly Process ◦ Design Technique . ◦ Adjustment and Inspection	Electrical Engineer	1	6
	◦ Parts Assembly ◦ Complete Assembly Process ◦ Pasts Inspection ◦ Quality Control	Foreman for Electricians	1	6
CKD	◦ Coil Winding	Electricians	1	4
	◦ Element Assembly	Foremann for Electricians	1	6
PLC	◦ Pressing, Automatic Lathing	Mechanics	1	6-12
	◦ Finishing, Gear Cutting	Foremann for Mechanics	1	6-12
	◦ Die Casting	Foreman	1	18-24

Source: The JICA Mission

(b) On the Job Training in El Salvador

On the job training must be conducted for all levels of labors at the plant El Salvador. Thus, managerial training should be included in this program as well.

(4) Japanese Technical Assistance

In cases of SKD and CKD an electrical and a mechanical engineer should dispatched to El Salvador for the first phase on the job training for the period of two years. When LPC starts, an extra engineer will be needed for the second phase training program (See Fig. IV-1-6).

(5) Alternative Plans

The idea to establish an assembly plant of WHM in El Salvador seems difficult to be realized mainly due to the insufficient demand estimated. However, skills and techniques closely associated with assembly production of WHM which may be called instrumentation engineering, are indispensable factors for modernization and industrialization of El Salvador economy. For this reason it seems quite appropriate to establish an assembly plant for WHM somehow in El Salvador.

An alternative plan to a privately operated assembly plant is a assembly plant operated by national enterprises such as CEL. WHM assembled in this manner may be used by CEL itself or may be exported to other countries in CACM. If this plan were realized, the production of WHM and its profitability of operation becomes a national rather than a private concern. Thus, private profitability judgement can be ignored. At the same time basic engineering skills of instrumentation may be acquired by laborers at the national plant by on the job training.

If production of WHM is conducted by the national enterprise it must secure the licences through contracts from some foreign makers in order to assemble WHM. If this happens, the national enterprise should be careful not to be purchase the licence for manufacturing parts of WHM. For costs of the licence may become prohibitive and investment expenditures for manufacturing parts of WHM can not be ignored by any means.

(6) Supplementary Remarks

WHM are very much price-competitive products so it is important to cut sales expenditures as small as possible. Perhaps one way is direct sales of WHM to customers without having any sales dealers or representatives inbetween.

The low land near the coast line of El Salvador is not suited for an assembly plant of WHM because of high humidity.

As to the type of WHM, they should be integrated into a bottom connected type. If this happens, parts of WHM for the assembly can obtain from any one of these countries; Japan, Korea and Taiwan. In order to maintain smooth production schedules suppliers of parts must be carefully selected; otherwise, the delay of delivery may cause various problems in production schedules.

7) Evaluation of Profitability of the Project

An examination of profitability of the WHM assembly plant in El Salvador was briefly conducted in the previous section. However, that examination was based on the information of the first year - 1980 - production alone. As one may recall, this project was assumed to last till 1985. Thus, the evaluation of the project can be justified only when the production operation of the entire period was properly examined. A method to evaluate profitability of the project in the long run is called DCF analysis as discussed in hand tool manufacturing industry below. The results of DCF analysis of the WHM assembly plant between 1980 to 1985 are presented in Table IV-1-5.

Table IV-1-5 DCF Analysis of the WHM Assembly Plant in El Salvador (the Base Case) (in US$1,000)

	1980	1981	1982	1983	1984	1985
Revenue	1,732.00	1,838.00	1,944.00	2,049.00	2,155.00	2,261.00
Costs	2,108.00	2,232.00	2,356.00	2,480.00	2,605.00	2,729.00
Materials	1,694.00	1,798.00	1,901.00	2,004.00	2,108.00	2,210.00
Personnel Exp.	229.00	239.00	248.00	258.00	268.00	279.00
Technical Fees	23.00	24.00	25.00	27.00	28.00	29.00
Sales Exp.	41.00	43.00	46.00	48.00	51.00	53.00
Others	121.00	128.00	136.00	143.00	150.00	158.00
Gross Profit	-376.00	-394.00	-412.00	-431.00	-450.00	-468.00
Depreciation	46.70	46.70	46.70	46.70	46.70	46.70
Interest Payment	83.39	87.09	90.73	94.10	98.11	101.78
Long Term Loans	18.68	18.68	18.68	18.69	18.68	18.68
Short Term Loans	61.71	68.41	72.05	75.72	79.43	83.10
Profit Before Tax	-506.09	-527.79	-549.43	-572.10	-594.81	-616.48
Corp. Income Tax	0.00	0.00	0.00	0.00	0.00	0.00
Net Profit	-506.09	-527.79	-549.43	-572.10	-594.81	-616.48
Dividends	0.00	0.00	0.00	0.00	0.00	0.00
Retained Earnings	-506.09	-527.79	-549.43	-572.10	-594.81	-616.48
Cash Flow	-376.00	-394.00	-412.00	-431.00	-450.00	-468.00

--+-DCF Analysis-+--

Discount Rate is 15.00%

Initial Investment is 467.00

Discounted Net Present Value (DNPV) is -2,035.26

Internal Rate of Return (IRR) is -0.00%

DUPV at IRR is -2988.85

Source: The JICA Mission

As seen from the Table, the establishment of the assembly plant of WHM in El Salvador seems quite difficult under currently prevailing conditions. With the discount rate 15% p.a. DNPV (the discounted net present value) of cash flow indicates a negative value, and at the same time IRR (the internal rate of returns) is not positive either. Thus, total investment expenditures of US$467,000 will not generate a stream of profits sufficient to pay the sum of the principal and the interest payments within the period specified (1980-1985).

However, it seems useful to find out, then, under what conditions the project might have the positive value of DNPV. Some trial calculations were attempted and the results were presented in Table IV-1-6 and IV-1-7 below.

Table IV-1-6 DCF Analysis and Trial Calculations (an Example)

(in US$1,000)

	1980	1981	1982	1983	1984	1985
Revenue	2,096.00	2,224.00	2,352.00	2,480.00	2,608.00	2,736.00
Costs	2,023.00	2,142.00	2,261.00	2,380.00	2,499.00	2,619.00
Materials	1,609.00	1,708.00	1,806.00	1,904.00	2,002.00	2,100.00
Personnel Exp.	229.00	239.00	248.00	258.00	268.00	279.00
Technical Fees	23.00	24.00	25.00	27.00	28.00	29.00
Sales Exp.	41.00	43.00	46.00	48.00	51.00	53.00
Others	121.00	128.00	136.00	143.00	150.00	158.00
Gross Profit	73.00	82.00	91.00	100.00	109.00	117.00
Depreciation	46.70	46.70	46.70	46.70	46.70	46.70
Interest Payment	80.62	84.17	87.64	91.15	94.66	98.21
Long Term Loans	18.68	18.68	18.68	18.68	18.68	18.68
Short Term Loans	61.94	65.49	68.96	72.47	75.98	79.53
Profit Before Tax	-54.32	-48.87	-43.34	-37.85	-32.36	-27.91
Corp. Income Tax	0.00	0.00	0.00	0.00	0.00	0.00
Net Profit	-54.32	-48.87	-43.34	-37.85	-32.36	-27.91
Dividends	0.00	0.00	0.00	0.00	0.00	0.00
Retained Earnings	-54.32	-48.87	-43.34	-37.85	-32.36	-27.91
Cash Flow	73.00	82.00	91.00	100.00	109.00	117.00

++++DCF Analysis++++

Discount Rate is 15.00%

Initial Investment is 467.00

Discounted Net Present Value (DNPV) is -119.73

Internal Rate of Return (IRR) is 5.70%

DNPV at IRR is -0.86

Source: The JICA Mission

Table IV-1-7 Alternative Plans

	Original Plan	Alternative-1 Unit Price up 10% Materials Cost down 5%	Alternative-2 Unit Price up 20% Materials Cost down 5%	Alternative-3 Unit Price up 25% Materials Cost down 5%
DNPV at 15%	< 0	< 0	< 0	> 0
IRR (%)	< 0	< 0	5.7 > 0	26.9 > 0

Source: The JICA Mission

Changes made were the costs of materials (including parts) and prices of WHM. The trial computation is not based on changes in estimated demand for WHM. As the result, the efficiency of investment seems to be guaranteed if the costs of materials were down 5% and if the price of WHM were up 20%. The above computation may indicate that the feasibility of the project may exist if some alternative plan can be realized in order to establish the assembly plant for WHM in El Salvador. Also, the feasibility of the project is affected by not only the profitability of the project but also by the economic contribution it may exhibit for industrialization of the El Salvadorian economy.

2. Farm Tractor Manufacturing Industry

1) Farm Machinery in El Salvador and CACM Countries

(1) Mechanization of Agriculture

Generally mechanization of agriculture in the Central American countries has been slow and only applied to a certain jobs of agriculture. Farm tractors are used for plowing and soil preparation. Planters are used for fertilizing, seeding, weeding, and hay-cutting. The P.T.O. shaft of the tractor is used as a power source for threshing. Motorized pumps are used for irrigation. Spraying and dusting equipment is used for spraying and dusting. Corn shellers are used to shell corns. Cutter are used for cutting cattle feeds. As the power force for these machines, gasoline engines or diesel engines are used. Although plants for these machines, gasoline engines or diesel engines are used. Although increasing number of machines are used, generally humans and animals are the main work forces in agriculture. Tables IV-2-1 and IV-2-2 show the usage of farm machines in El Salvador and imports of farm machinery by CACM countries, respectively.

Table IV-2-1 Farming Machineries in El Salvador By Kind and By District

	Total	Ahuacha-pan	Santa Ana	Sanso-nate	Chalate-nango	La Liber-tad	San Salva-dor	Aucat-lar	La Paz	Chaba-nas	San Vicente	Usulu-tan	San Miguel	Mora-zon	La Union
1. Engines	887	75	-	142	30	134	46	69	83	11	63	112	92	17	3
2. Motors	899	49	20	121	77	240	9	34	71	15	78	112	39	-	5
3. Tractors	2,642	126	-	247	142	289	158	102	543	14	178	516	272	1	54
4. Grain Thrashers	225	25	-	10	13	28	13	8	26	20	31	19	23	3	6
5. Plow	29,185	1,034	10	822	2,776	1,325	1,404	2,325	2,494	3,912	4,264	5,953	2,722	629	515
6. Rastras	3,277	102	5	160	92	179	73	74	461	129	330	1,310	284	2	61
7. Cultivators	1,157	76	50	155	40	249	34	35	216	2	48	173	63	5	16
8. Fertilizer	498	20	5	32	10	67	11	15	172	2	32	93	28	5	16
9. Seeders	471	24	5	35	9	43	8	4	167	-	35	98	35	-	14
10. Havesters	16	8	-	4	1	10	2	5	9	-	7	14	10	-	1
11. Corn Milling Machines	998	95	-	69	60	106	34	50	76	8	53	236	201	3	7
12. Dryers	108	20	-	14	2	25	5	3	12	1	5	14	5	2	-
13. Dusting & Spraying Mach.	1,034	110	40	135	19	263	19	131	76	16	18	120	65	-	22
14. Cutters	359	27	-	62	17	71	17	9	43	5	25	38	33	7	3
15. Flour Mills	359	19	-	40	21	64	10	14	34	64	20	26	38	2	7
16. Milkers	22	1	-	1	-	13	1	-	2	3	1	-	-	-	-
17. Trucks	1,167	146	10	176	31	221	94	73	86	13	31	140	109	9	28
18. Four Wheel Driving Cars	839	119	-	91	24	136	51	42	58	12	35	148	101	15	7
19. Pick-ups	1,718	156	325	167	45	184	76	97	125	20	76	171	215	15	76

Source: Tercer Censo Nacional Agropecuario 1971

Table IV-2-2 Imports of Farming Machinery in El Salvador and CACM Countries (in US$)

	Year	El Salvador	CACM Countries
Farming Tractors	1971	1,494,809	16,167,222
	72	-	17,886,377
	73	1,959,189	19,605,533
	74	3,246,747	7,713,538
	75	4,577,070	31,255,803
Cultivating Machinery	1971	364,739	1,738,887
	72	1,045,168	5,634,138
	73	588,490	2,911,747
	74	584,392	2,683,620
	75	-	3,982,083
Harvesting Machinery	1971	387,716	5,261,388
	72	817,097	7,994,413
	73	1,165,861	6,085,518
	74	703,199	4,524,579
	75	-	8,339,928
Diesel Engines	1971	932,829	7,346,716
	72	1,578,318	12,476,319
	73	1,062,499	11,185,354
	74	-	-
	75	-	8,132,491
Gasoline Engines	1971	38,190	302,092
	72	78,077	517,438
	73	54,601	498,984
	74	50,262	305,530
	75	-	455,196

Source: Anuario Estadistico Centroamericano de Comercio Exterior, El Salvador

(2) Demand for Tractors in CACM Countries and El Salvador

The number of tractors imported by El Salvador and CACM countries are shown in Tables IV-2-3 and IV-2-4. These tractors are made by such manufacturers

Table IV-2-3 Annual Imports of Tractors by HP and the Total Number of Tractors Held in El Salvador

	No. of Imports				No. of Tractors
	-50 HP	-99 HP	100+HP	Total	in El Salvador
1971	94	148	27	269	2,642
72	N/A	N/A	N/A	N/A	N/A
73	114	179	32	325	2,967
74	165	259	47	545	3,512
75	205	321	58	584	4,096
Total	578	907	164	1,723	

Source: The JICA Mission and Anuario Estadistico Comercio Exterior, El Salvador

Table IV-2-4 Annual Imports of Tractors and the Total Number of Tractors Held in CACM Countries

	Imports				The Total Number
	-50 HP	-99 HP	100+HP	Total	of Tractors
1971	1,017	1,598	291	2,906	
72	1,077	1,693	308	3,078	
73	1,137	1,788	325	3,250	
74	392	615	112	1,119	
75	1,396	2,194	399	3,989	32,942

Source: The JICA Mission

as John Deere, Massey Furguson, Ford, International Harvester, and Kubota. Accordingly they are imported from the US, Britain, Belgium, West Germany, and Japan. The future trend of demand for tractors is expected to change to models equipped with engines smaller than 29 HP (the opinion expressed by the Distributor Farm Center in El Salvador). The trend towards smaller tractors may be explained by the following reasons:

- Larger tractors has spread fairly well but as to the smaller types whose quality hasn't been reliable they haven't been used enough.
- The desire for mechanization has been stimulated lately even among farmers below the average scale.
- Prices of tractors and fuel costs went up sharply so smaller but economical tractors are demanded.
- Tractors have been used for plowing, but are recently demanded for field management works over sugar-cane fields such as weeding, cultivating, etc.

In general demand for tractors has widely fluctuated with changes in prices of agri-products, quantities harvested, and the general economic trend, but the rate of usage of tractors is only 5% so the future demand should undoubtedly increase.

(3) Farming-Engines for Agri-Business in CACM countries

(a) Usage of Farm Engines

The major usages of farm engines are as follows:

Water pumping for irrigation

Milling flour

Cutting cattle feeds

Threshing

Spraying and Dusting

Portable cutter

Other engines, which are similar to farm engines, are used for:

Power generating (portable)

Civil works and construction (compressors)

Among these usages of engines demand for diesel engines for irrigation are expected to grow in the future. According to the Department of Agriculture in El Salvador, 325,000 ha of land is planned for irrigation. Among 325,000 ha, only 33,000 ha has been irrigated. Out of 33,000 ha private land is 26,000 ha and public land 7,000 ha.

Water sources of irrigation are rivers and underground water. In order to pump water some type of motive forces are needed. However, these areas without irrigation system currently can not depend on electrical motors due to the lack of power supply. Thus, engines instead of electrical motors must be used. 5 to 80 HP engines are used for pumping of irrigation.

(b) Classification of Engines by Usage

Air Cooled Gasoline Engines:	Knapsack spraying and dusting equipment
	Small pumps
	Grain thrashing
	Cutter for feeds
	Power generator
	Civil works and construction
Water Cooled Gasoline Engines:	Pumping
	Grain threshing
	Seed Cutter
	Milling
Water Cooled Diesel Engines:	Pumping
	Grain threshing
	Feed cutting
	Milling
	Power generating
	Civil works and construction

(c) The Origins of Imports and Makers

Engines used in Central American countries are imported from Britain, the US, West Germany, Italy and Japan. Makers are also numerous such as Perkins, Wisconsin, Lister, Briggs, etc.

(d) · The Future Trend of Engines

Demand for engines has been shifting from gasoline engines to diesel engines because of high running costs of engines caused by the oil price increase in 1973.

- Price of gasoline is far more expensive than that of diesel (1976):

  Price of gasoline .... 2.5 ¢/gallon

  Price of diesel oil ...... 1.2 ¢/gallon
- These are more troubles with gasoline engines than diesel engines.
- Gasoline engines have a shorter life-span.
- Starting becomes difficult for gasoline engines due to evaporation if they are left unused for some time.
- Gasoline is dangerous to handle.

As mentioned above, diesel engines are generally favored, but demand for gasoline engines may persist for knapsack spraying and dusting equipments and portable cutters which require light weights, particularly for engine with ordinal 2 cycles or 4 cycles. Favored diesel engines used in CACM countries have slow speed with 700 to 1500 R.P.M. so they are relatively heavy and fuel costs are high. Thus, demand for high speed engines may increase in the near future, though high speed engines are technically difficult to handle at present time.

2) The Selection of the Type of Tractor

(1) The Present Situation of Farm Tractors in CACM Countries

Five Countries in CACM, El Salvador, Guatemala, Honduras, Nicaragua, and Costa Rica have a similar type of agriculture so in what follows the type of agriculture is assumed to be the same for all countries.

Tractors are mainly used in the large-scale plantations, and the average size of the tractors is estimated around 65 HP. The current number of tractors in use is estimated around 39,000 (1975) in CACM countries whereas around 4,000 (1975) in El Salvador. The rate of use of tractors in El Salvador is estimated 5.4% (1971). However, the use of tractors is forecasted to increase rapidly in El Salvador from the following reasons:

The wage rate of agri-labors will increase.

Increase in production of food due to population growth.

Desire to be freed from hard labor in the field.

Increase in land-holding for the average farm family due to land reforms.

On the other hand, there are some barriers which may work against mechanization of agriculture. These are:

Increase in unemployment due to population growth and stagnation in industrial production.

Increase in the price of tractors and a rapid increase in fuel costs.

Worsening foreign-exchange situations due to the unbalance of foreign trade.

(2) Makers, Horse Powers, and the Origines of Imports of Tractors Currently in Use.

i) Makers

The following names of the makers are listed according to the volume of sales of tractors:

1. John Deere
2. Massey Ferguson
3. Ford
4. International Harvester
5. Kubota

ii) Horse Powers

The classification of tractors in use by horse power is listed below.

Horse Power	Share of Total Tractors in Use
100 H.P. and over	10%
50 H.P. and over	55%
30 H.P. and over	25%
29 H.P. and below	10%

iii) The Origins of Imports

The country-origins of importation of tractors are listed below according to the descending order of the sales volume:

1. US
2. Britain
3. Belgium
4. West Germany
5. Japan

(3) Usages of Tractors

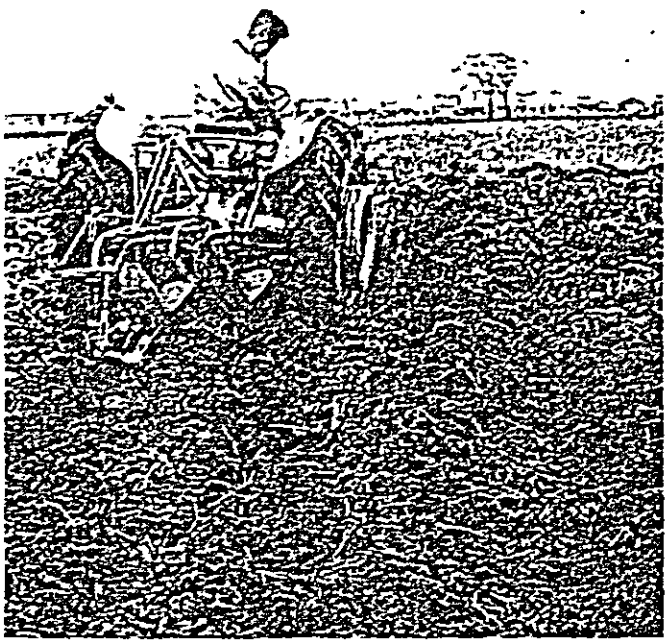
The major agricultural commodities in Central American countries are maiz, sugar caine (AZUCA DE CAÑA), millet (MAICILLO), cotton (ALGODON), rice (ARROZ), kidney beans (FRIJOL), coffee, cattle-raising, etc. For these agri-products tractors are used in various ways.

The job most often tractors are used is plowing with disk-plow and soil preparation after plowing, with disk harrow. Every tractor with 50 HP and over is sold with these implements of disk-plow and disk-harrow.

Other works using tractors are fertilizing, seeding, covering, and compacting with planter, weeding and mowing of pasture with rotary cutter, grain threshing pumping, and cutting with the use of P.T.O. shaft. Each job is briefly explained below.

i) Plowing with Disk-Plow

If one uses disk plow, plowing is done by rotating disks. Plowing by disks mixes and pulverizes soil well so the following job, namely, harrowing becomes very easy. For this reason every medium to large size tractor is sold always with disk-plow.



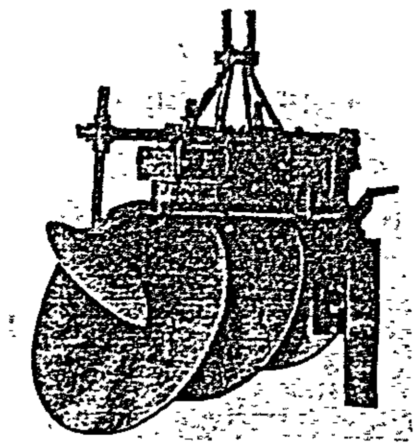


Figure IV-2-1 Disk Plow

ii) Pulverizing Soil and Soil Preparation with Harrow

After soil is plowed, pulverizing soil and soil preparation must be done before crops are planted. To do this disk harrow is used. If one uses disk harrow, disks attached to harrow will pulverize soil, cut stalks and others to prepare soil. Like disk-plow every large size tractor is sold with disk-harrow.

Figure IV-2-2 Disk Harrow

iii) Management by Cultivator

Cultivators are used for management jobs such as intertillage to pulverize and soften the soil of aggregate structure between row spacing of the plant, weed control to prevent the waste of fertilizer, and molding to prevent the lodging of plant and to promote ferility of the soil. However, cultivators are not used for management jobs so much as for the jobs mentioned in i) and ii) above.

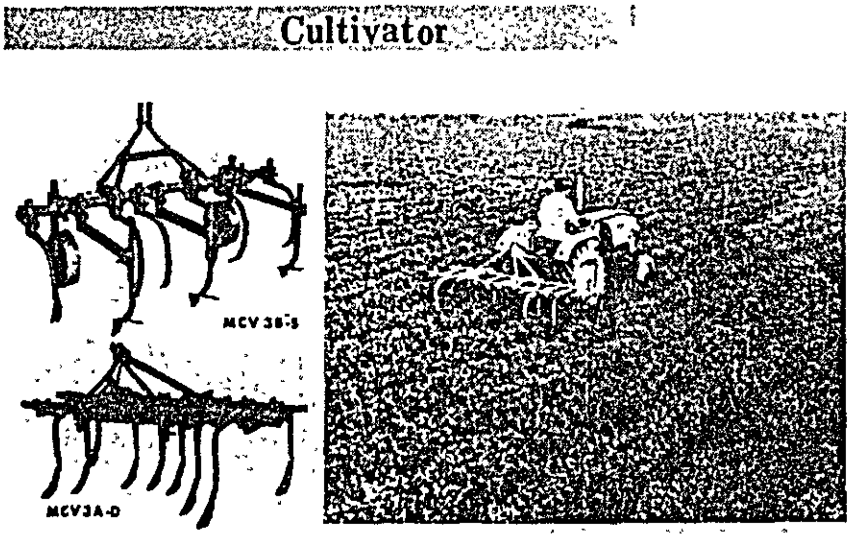


Figure IV-2-3 Cultivator

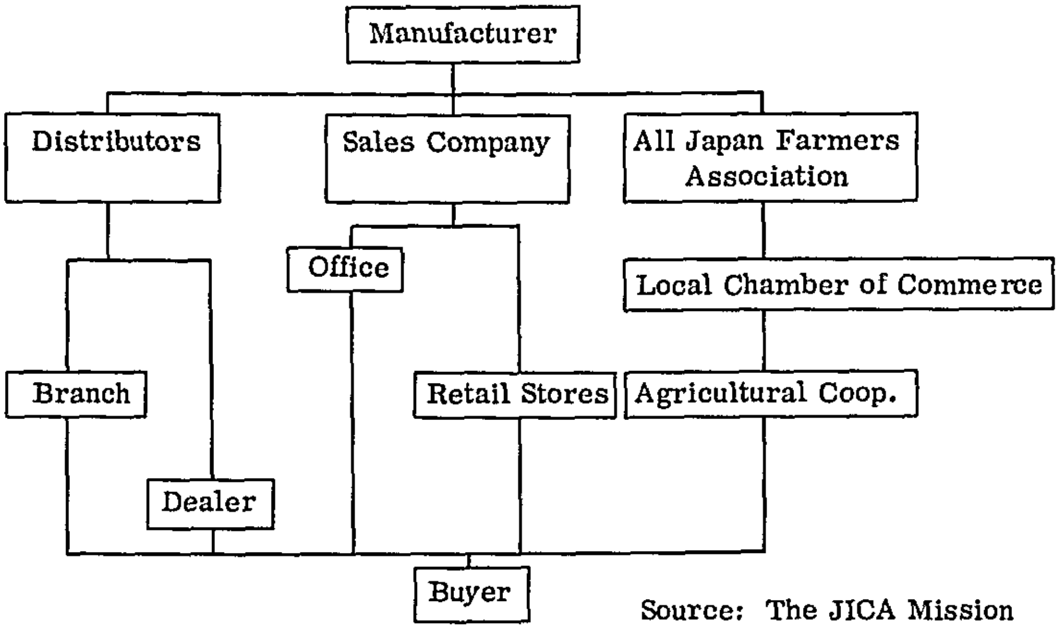
iv) The Planter

The planter can do fertilizing, seeding, covering, and compacting as one continuous process of job so it is efficient enough to be used by some.

Figure IV-2-4 Planter

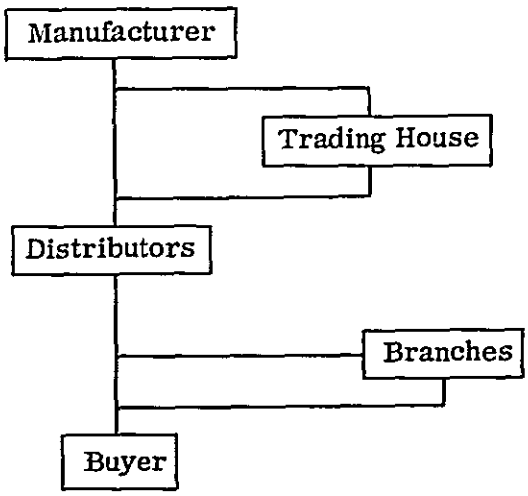
(4) Sales Routes and Current Situations of Servicing

i) Sales routes are not so complicated as those seen in Japan, since sales agents are used. In the following diagrams sales routes in El Salvador and in Japan are comparatively drawn.



Source: The JICA Mission

Figure IV-2-7 Sales Routes in Japan



Source: The JICA Mission

Figure IV-2-8 Sales Routes in El Salvador

ii) A Method of Collecting Outstanding Sales Accounts

When sales are made, down payment runs 20 to 40 percent of the price, the rest of which is collected in one to two years. Buyers could receive bank loans for up to 75% of the price with the annual interest rate of 8% as the four-year deferred payments.

ii) Servicing

With the instruction provided by each tractor manufacturer, repair technicians are available. Also service parts are in stock so no specific problems do not exist as far as servicing is concerned. However, from now on, skilled laborers in this field may tend to be in shortage.

(5) The Problems of the Extensive Use of Tractors

i) Technical Problems

There is no tractor manufacture in CACM countries. Although sales and repair jobs are emphasized at the retail outlets, research and instruction are not sufficient with respect to efficient uses of tractors. So tractors are not used properly. Also, various implements have been imported, but they do not automatically fit to all tractors so breakdowns of tractors have been caused.

Though much research in this regard have been conducted at the government's Agricultural Center, the education of farmers on the subject is not sufficient. The introduction of tractors in the farming may be hindered by high rate of illiteracy, which amounts to 50 to 60 percent.

ii) Employment Policies of Farm Labor

A rapid rate of increase in population (3 to 4% p.a.) and stagnation of industrial production provide basic condition for unemployment in El Salvador. What makes the situation worse is the seasonal flustuation of the rate of employment in agricultural sector. The seasonal fluctuation is mainly caused by the harvest seasons of major crops such as coffee, rice, and cotton. The harvest seasons for the three crops is closely overlapped so shortage (10 to 20%) for agriculture labors induces urban labors to move into agricultural areas in this season. This causes the increase in the wage rates in the agricultural sector.

However, in seasons other than the harvest season labors in the agricultural sector are over-supplied. It is estimated 30 to 40% over demand. Stagnation of industrial development has failed to absorb extra labors in the agricultural sector.

Table IV-2-5 Minimum Daily Wage Rates for Seasonal Farm Labors

(in Colons)

	1967	1973	1974	1975	1976
Daily Wage Rates	2.50	3.20	4.00	5.50	8.50
Rate of Increase in Wage Rates (%)		28	25	38	54

Source: INSAFI

Tractors are used only for carriage in the harvest season of coffee, cotton, and rice, when excess demand for farm labors appears. Conversely, the tractors are used fully in the seasons when shortage of the farm labor appears, so they tend to amplify the problem of unemployment. Therefore, the government hesitates to implement mechanization policy to intorduce tractors into Salvadorian agriculture.

iii) Rapid increases in the price of tractors and fuel costs make the usage of tractors economically very difficult.

(6) Future Trends of Types of Tractors in El Salvador and CACM Countries

Although medium to large size tractors made in US and European countries have been mainly used in El Salvador and CACM countries, demand for small size tractors with 29 and less HP engines is estimated to grow rapidly in these areas. Followings are some of the reasons for this:

i) Large-size tractors have been relatively in wide use so the tractor market for the large size has grown close to a saturation point.

ii) Demand for small-size tractors has been increasing due to a rapid increase in the price of tractors and fuel.

iii) Desire for mechanization has been increasing among farmers below the average.

iv) Land reformation has caused the size of land holding to be decreased so demand for the smaller type tractors is expected to increase.

v) Up to now quality of the smaller size tractors was not so good. But lately it is possible to obtain high quality small size tractors.

vi) Tractors have been mainly used for plowing, but new demand for tractors arises from the supervisory jobs needed for sugar-cane fields and orchards.

Trends of change in demand may look like Table IV-2-6.

Table IV-2-6 Trends of Change in Demand for Tractors

Horse Power	Present	Future
100 H.P. and over	10%	10%
50 H.P. up to 99	55%	45%
30 H.P. up to 49	25%	20%
29 H.P. and less	10%	25%

Source: The JICA Mission

(7) The Selection of the Type of Tractor for Production

From the preceeding discussion, tractors to be produced in El Salvador were decided as those with the engine 12.5 H.P. To reiterate the reasons for the selection of types as follows:

- Demand for smaller type of tractor will increase in the future.
- Smaller types of tractors are rarely used so it is easy to establish one particular maker.
- There are various jobs fitted to smaller type tractors
- Prices of tractors and fuel costs are cheap enough for many farmers to buy them.

(8) Specifications and Characteristics of the Tractor for Production

(a) Specifications of the tractor for production are given in Table IV-2-7.

Table IV-2-7 The Specifications of the Tractor to be producted in El Salvador

	The Type of the Tractor	12.5 HP Four Wheel Driving Tractor
Engine	Type	Vertical, Water-cooled, 4-cycle, Diesel
	Bare Engine HP, RPM	12.5 HP, 2700 RPM
	Total Displacement	577 cc
	Cylinder	2-Cylinders
	Starting	Electric Starter with Battery
	Battery	12V-45Ah.
	Cooling	Pressurized Radiator
	Fuel	Diesel Oil
	Fuel Tank Capacity	10 liters
Size	Overall Length	1,790 mm
	Overall Width	920 mm
	Overall Height	1,100 mm
	Wheel Base	1,160 mm
	Min. Ground Distance	260 mm
	Tread, Front	720 mm
	Tread, Rear	650 - 850 mm
	Min. Turning Radius	1,600 mm
	Weight	385 Kg
	Tire, Front	5 - 13, Rag
	Rear	7 - 14, High Rag
	Clutch Method	Dry Single, Pedal Type
	Speed Changes Method	Gear Shifting
	Speed Change	Forward 6-Stage, Reverse 2-Stages
	P.T.O. Speed Change	3-Stages (Transmission Case Rear and Tractor Body Front)
	Lifting and Lowering Device	Hydraulic
Rotary Device	Device	Direct Mount
	Driving	Center Drive
	Tilling Width	950 mm
	Revolution of Blade Shaft	168,250,400R

Source: The JICA Mission

(b) Characteristics of the Specified-Type Tractor

i) Production and Actual Usage

Production of the specified tractor has began in 1971 and about 150 thousands tractors have been produced. In Central Latin American countries the same type tractors have been used since 1972.

ii) Four-Wheel Drive

The tractor has received high reputation in its performance due to its original design of four wheel drive. Though the engine is small it exhibits excellent hauling power, workability in rice paddies and fields, and maneuvability in hauling and other movements.

iii) Two Cylinder Water Cooled Diesel Engine

Mounted on the tractor is the smallest two-cylinder water cooled diesel engines. Without saying, diesel engines are more reliable than gasoline engines. Also it lasts longer with less fuel costs, requires less maintenance cost, and is therefore economical.

iv) Compact Design

The tractor is designed for the field management and for the small-scale farm family so it is compactly designed and light-weighted. Even the aged and the women can easily handle it.

(c) The Reasons why the Tractor is fitted to Central Latin American Countries

i) Intertillage and Weeding for Sugar Cane Fields

With rotary it has the best suited body frame and structure for ridging, furrowering, soiling, and weeding. Rotary equipments and rotary-plow are developed especially for this type of the tractor. Their performance has been well received not only in Japan, but also South East Asian countries, Guatemala of Central America, and just about all other countries where the tractor has been used.

ii) Field work, Coffee Plantation, Intertillage of Orchards, Weeding, and Dusting and Spraying.

The width of the tractor is narrow, howling power is greater (1.5 times as strong as that of two wheels drive), and the height of the tractor is low so that the center of gravity of the tractor is lower.

From these characteristics of tractors, field works, plowing in the orchard, intertillage, and weeding can be done either in flat land or at mildly sloped land.

iii) Others

With the three point linking system general working equipments can be attached. Implements for industrial usages and equipments to utilize motor power for pumping can be differently deployed so various kinds of jobs can be done by one tractor.

3) Determination of Production Scale

(1) A Estimated Size of the Market in El Salvador and CACM Countries

(a) The Market Conditions to date

No data are available to show the number of imports and current holding tractors. Thus, the following data shown in Tables IV-2-8 and IV-2-9 are estimates for the year 1971 to 1975, based on imports data, which only show the total weight and values, and the interview conducted in El Salvador and other CACM countries.

Table IV-2-8 The Number of Tractors Imported and Currently Held in El Salvador

	Imported				Currently Held
	-50 HP	-99 HP	100+HP	Total	
1971	94	148	27	269	2,642
1972	NA	NA	NA	HA	-
1973	114	179	32	325	2,967
1974	165	259	47	545	3,512
1975	205	321	58	584	2,096

Source: The JICA Mission

Note: NA-Not Available

Table IV-2-9 The Number of Tractors Imported and Currently Held in CACM Countries

	Imported				Currently Held
	-50 HP	-99 HP	100+HP	Total	
1971	1,017	1,598	291	2,906	
1972	1,077	1,693	308	3,078	
1973	1,137	1,788	325	3,250	
1974	392	615	112	1,119	
1975	1,396	2,194	399	3,989	32,942

Source: The JICA Mission

(b) *The Estimated Number of Tractors* Imported in 1980 and in 1985

The number of tractors to be imported in the future should be estimated, based on various factors such as the national economic conditions, the rate of increase in population, the number of the unemployed, the food production conditions, cultivated areas by the kind of crops, the improving conditions of land reform, the national policies for mechanization, the past trend of importation of tractors, etc. However, it is difficult to estimate the future trend of many of these factors so the future trend of tractors to be imported were derived simply from the past trends of importation of tractors, increases in prices of tractors, and field investigation on the spot. The results are shown in Table IV-2-10 and IV-2-11.

Table IV-2-10 Estimates of the numbers of Tractors to be Imported in El Salvador

	29 and less HP	30 HP and over	50 HP and over	100 HP and over	Total
1980	115	92	207	47	461
1985	121	96	217	49	483

Source: The JICA Mission

Table IV-2-11 The Number of Tractors Imported in CACM Countries

	29 HP and less	30 HP and over	50 HP and over	100 HP and over	Total
1980	1,019	815	1,834	407	4,075
1985	1,081	865	1,945	432	4,323

(c) Estimated Demand for the Selected Type Tractor

With reference to opinions given by dealers in El Salvador and in CACM countries, the estimated number of the tractors to be imported would be as follows, given the ratio of 7 to 3 between tractors mounted by engines with 12 HP or so and with 20 HP and over, respectively:

Table IV-2-12 Estimated Demand for the Tractor with Engines of 12 HP or so

	El Salvador	CACM Countries
1980	81	713
1985	85	757

Source: The JICA Misson

(d) The Estimated Full-Saturation Point

It is difficult to compute the saturation point for the tractor's market, but if one applies the rule of thumb, namely, one tractor with 2 HP per one hectar of land, the estimated saturation point can be computed from arable land. The result is shown in Table IV-2-13.

Table IV-2-13 The Saturation Point of the Number of Tractors

	El Salvador	CACM Countries
Arable Land	1,316,000 ha	12,215,000 ha
Estimated Saturation HP	2,632,000 HP	24,430,000 HP
Estimated Saturation Number*	46,000 Units	430,000 Units
100 HP and over	4,600	43,000
50 HP and over	20,700	193,500
30 HP and over	9,200	86,000
39 HP and less	11,500	107,500
(12 HP or so)	(8,050)	(75,250)

* Average Horse Power + 57 HP

Source: The JICA Misson

The specified type of the tractor will reach the saturation point at 8,050 units in El Salvador and 75,250 in CACM countries. The renewal demand for the tractor is, then, give the average of 10 years of duration, 805 units p.a. in El Salvador and 7,525 units p.a. in CACM countries.

(2) Probing the Possibilities of Exports

Even if El Salvador is assumed to have mastered the techniques to produce tractors, there are still unfavorable conditions for El Salvador to exports to CACM countries.

- Materials have to be still imported.
- There are no related industries in El Salvador so product of specialized makers such as rediators, electrical equipments, tires, etc. must be also imported.
- Production efficiency may be low (0.5 to 0.6 times of that of Japan.)
- Even though El Salvador wishes to raise the portion of local contents, it is quite difficult for her to do so because of the lack of related industries and techniques, and because of the larger amount of investment required to do so.
- It is difficult to obtain well-trained skilled laborers.

From these reasons, it seems not easy for El Salvador to export tractors to CACM countries in price-wise as well as quality- and quantity-wise.

(3) Determination of Production Scale

Annual production scale is estimated, as shown in Table IV-2-14.

Table IV-2-14 An Estimated Scale of Tractor Production in El Salvador

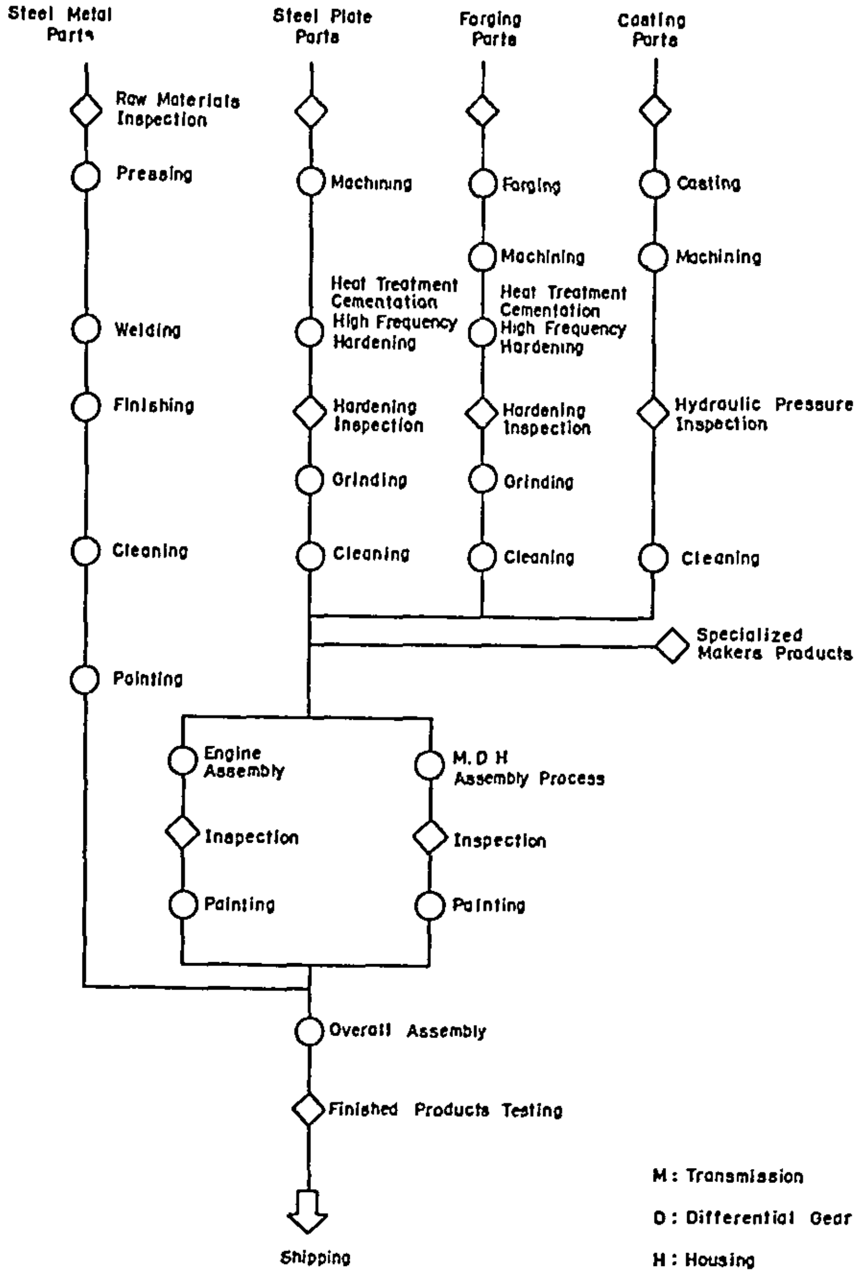
	El Salvador Market	CACM
1980	84 Units/Year	720 Units/Year
1985	126	840

Source: The JICA Mission

4) Types of Production

(1) Manufacturing Process of Tractors

As shown in Figure IV-2-9, manufacturing process of tractors consists of casting, forging, machining, heat-treatment, press-welding, parts inspection, painting, assembly, and test-driving inspection (However, bearings, oil seals, radiators, fuel pumps, electrical equipments, etc. are purchased from specialized makers). In this way, manufacturing of tractors requires high technology covering full range of technique of the metal-mechanic industry. It seems impossible for El Salvador to digest all these techniques by herself presently. Ways of introducing techniques of manufacturing tractors to El Salvador must be sought. The following system seems to be best fitted to production of tractors in El Salvador; the first method is semi knock down (S.K.D.) production, the second is complete knock down (C.K.D.) but engines, completed, must be imported and finally the third is CKD with some local contents plus imports of completed engine (PLC).



Source: The JICA Mission

Figure IV-2-9 A Flow Chart of Tractor Manufacturing Process

(2) Production Process of SKD

As mentioned in the previous section, SKD should be the first step of production of tractors in El Salvador due to the current technological level observed in El Salvador. As SKD productions continues, production and sales systems should be firmly established while knowledge of tractor assembly can be obtained and skilled personnels of production of tractors can be trainned. In so doring SKD production should provide a stepping stone towards the next step of CKD. Production process of SDK is presented in Figure IV-2-10.

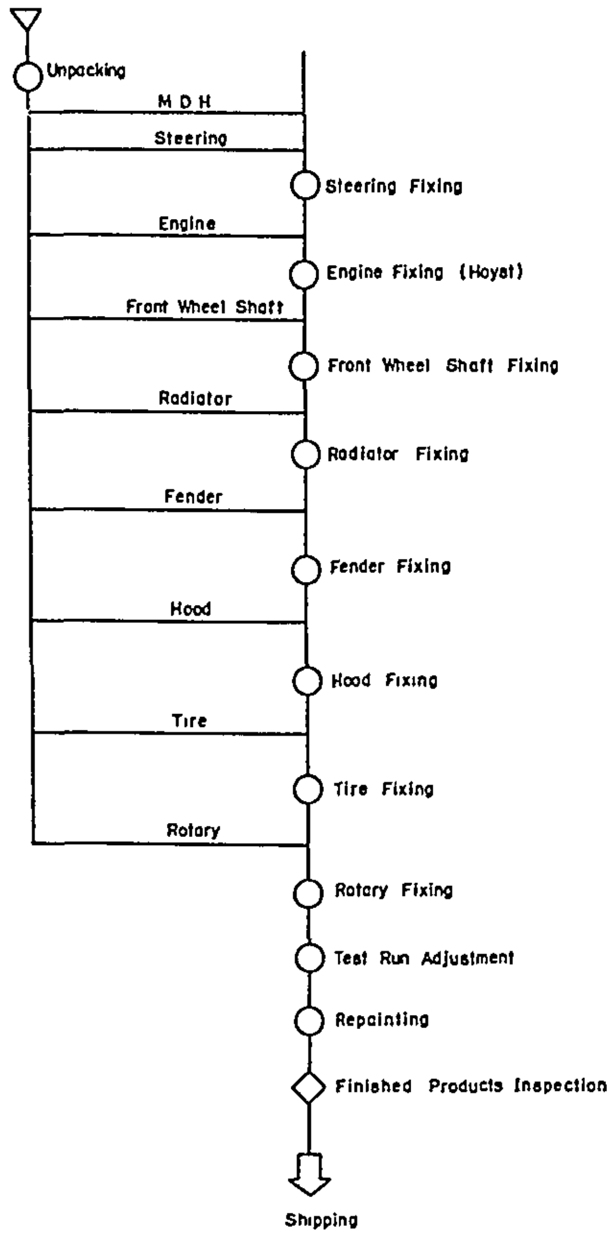
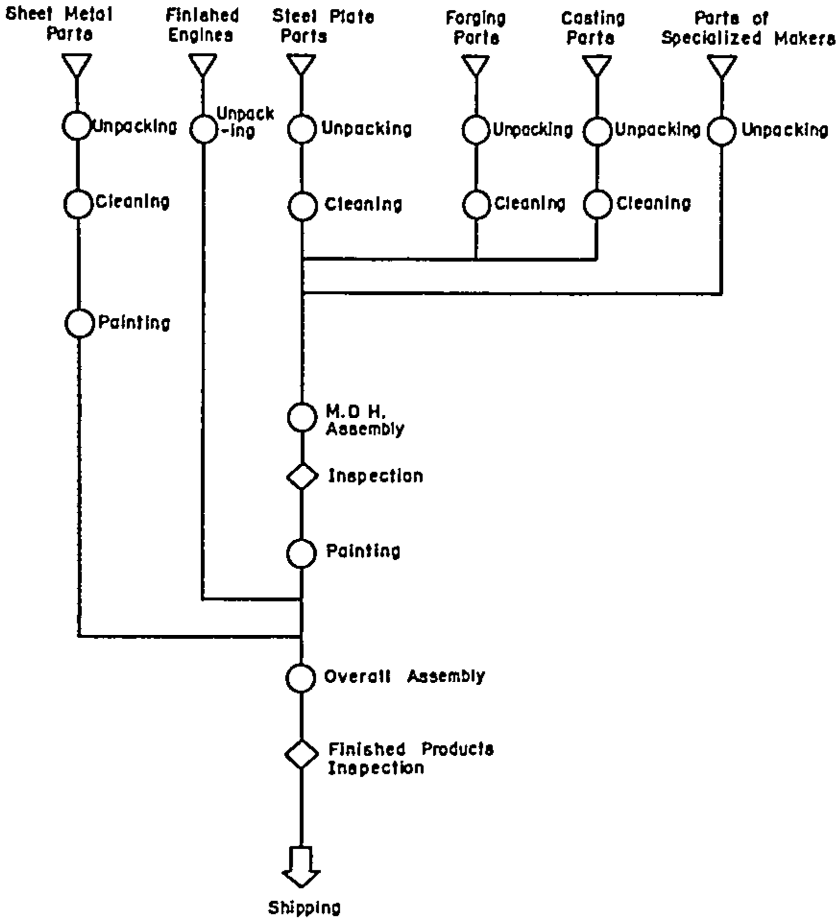


Figure IV-2-10 A Flow Chart of SKD Tractor Assembly Process

The tractor maker with which El Salvadorian tractor plant has technical assistance contract will provide parts which are assembled for each block specified and painted. In El Salvador these parts are assembled for the final product, which should be test-drived, adjusted, repainted, and inspected again as the final product to be shipped.

(3) Production Process of CKD

In CKD all parts are assembled at El Salvadorian plant without assembling previously. However, engines must be imported in the finished condition. For, engines are the heart of tractors and a high degree of techniques is required to assemble them. With any malfunctions of engine, performance of tractors will be significantly affected. Production process of CKD is shown in Figure IV-2-11. CKD consists of washing imported parts, sub-assembly, inspection , painting, final assembly and inspection on final products. Thus CKD means to master all the techniques of assembling tractors except engines.

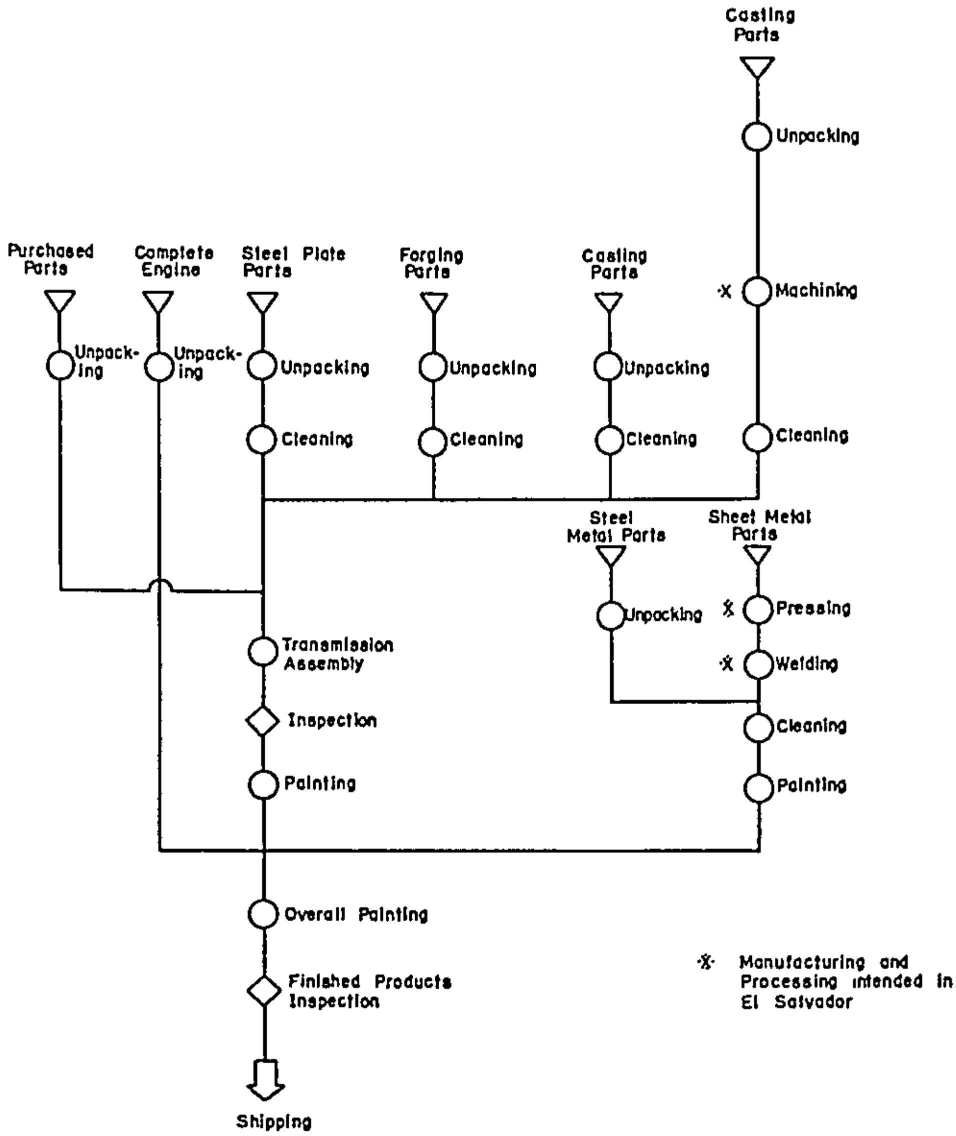


Source : The JICA Mission

Figure IV-2-11 A Flow Chart of CKD Tractor Assembly Process

(4) Production Process of PLC

Assembly process of this case is the same as of CKD. Planned local contents are parts made out of sheet metals and casting parts. Materials for each process are planned to be imported and processing is planned to be done in El Salvador. It seems quite difficult to expect that by 1985 these parts are manufactured in El Salvador. However, it seems also useful to compute what kind of results may be obtained under the given conditions so that costs estimation for this type of production shall be included in this study.



Source : The JICA Mission

Figure IV-2-12 A Flow Chart of PLC Tractor Assembly Process

Itemized below are the list of contents which are supposed to be manufactured domestically in El Salvador. The selection of these items are done, based on value added conditions as well as costs of freight.

Casting Parts

Transmission Case

Differential Gear Box

Rear Cover

Axle Case, Left

Axle Case, Right

Axle Cover, Rear

Sheet Metal Parts

Frame Clutch Housing

Instrumental Panel

Hood

(5) Major Parts and Structure of Materials

In Table IV-2-15, names of parts and structure of materials are listed according to every composite part.

Table IV-2-15 Major Parts and Type of Materials

Major Parts	Parts	Type of Materials	Units
Engine	Crank Case	Cast Iron	1
	Oil Pan	Cast Aluminum Alloy	1
	Cylinder Liner		3
	Cylinder Head	Cast Iron	1
	Head Gasket		1
	Exhaust Value		3
	Head Cover	Aluminum Die Casting	1
	Decompress Shaft	Carbon Steel	1
	Cam Shaft	Chromium Molybdenum Steel	1
	Idle Gear	"	
	Piston		3
	Connecting Rod	Carbon Steel	3
	Crank Gear	Chromium Molybdenum Steel	1
	Crank Shaft	"	1
	Flywheel	Nodular Cast Iron	1
	Ring Gear	Carbon Steel	1
	Nozzle Holder		3
	Fuel Cam Shaft		1
Transmission Case	Transmission Case	Aluminum Die Casting	1
	Rear Cover	Cast Iron	1
	Upper Cover, Front	Aluminum Die Casting	1
	Upper Cover, Rear	"	1
	1,2,3,4,5 Shaft	Chromium Molybdenum Steel	5
	Gear	"	12
	Rear Axle	"	1
	Spiral Level Pinion	"	1
	P.T.O. Shaft	"	1
Wheel Shaft Case	Wheel Shaft Case	Orginary Cast Iron	2
	Rear Wheel Shaft	Carbon Steel	2
	55 Gear	Chromium Molybdenum Steel	1
	Swing Shaft	Carbon Steel	1
Differential Gear Box	Differential Gear Case	Aluminum Die Casting	1
	Differential Gear Shaft	Chromium Molybdenum Steel	2
	Differential Pinion Shaft	"	

Major Parts	Parts	Structure of Materials	Unit
	Differential Side Gear	Chromium Molybdenum Steel	4
	Differential Pinion	"	4
	37 Spiral Lever Gear	"	2
Others	Frame Clutch Housing	Orginary Steel	1
	Fender	Cold Rolled Sheet	2
	Hood	"	1
	Muffler		1
	Fuel Tank	Plastic	1
	Instrumental Panel	Cold Rolled Sheet	1
	Rubber Tire		4
	Rotary Case	Ordinary Structural Steel	1
	Rotary Frame	Cold Rolled Sheet	1
	Rotary Cover	"	1

Source: The JICA Mission

5) Plant and Equipment Investment Plans

(1) Assumptions

(a) Production Schedules

Two cases of the production schedule are assumed. The first case is such that when production starts in 1980, the market is limited to El Salvador and the type of production is SKD. As the production continues to grow, output should increase so the type of production may be possibly changed. By 1985 the production type is assumed to be shifted to CKD.

The second case's market is expanded to CACM countries from the beginning of production with SKD in 1980. This case shall be gradually shifted to deploy local contents in production. Thus, by 1985 the case uses some parts which are domestically produced in El Salvador. These two schedules are presented in Table IV-2-16. Throughout this section the assumptions of the first case and the second case shall be used as assumed above unless otherwise indicated. Thus, investment plans are based on the projected plant and equipments requirements in 1985, as described below.

Table IV-2-16 Production Output and Types of Production

	Markets	Scheduled Output	Types of Production
The First Case 1980	El Salvador	84	S.K.D.
1985	El Salvador	96	C.K.D.
The Second Case 1980	CACM	720	S.K.D.
1985	CACM	840	P.L.C.

Source: The JICA Mission

(b) Efficiency

Neither the first case nor the second case is efficient enough to use the belt-conveyer system for assembly due to the small number of output.

A technical level gap between El Salvador and Japan seems to exist. Thus, it is necessary for this study to estimate efficiency coefficients which are shown in Table IV-2-17.

Table IV-2-17 Efficiency Coefficients of El Salvador taking Japan's case as Unity

	Equipment	Labor (Hours)	Efficiency Coefficient
Assembly Job	3	1.7	5.1
Operational Job	3	1.7	5.1
Painting Job	3	1.7	5.1
Machining Job	1	1.7	1.7
Pressing Job	1	1.7	1.7
Welding Job	1	1.7	1.7

Source: The JICA Mission

Note: Effieiency coefficients indicate that, for example, in the case of assembly job, it takes 5.1 Hours in El Salvador when it takes only 1 Hour in Japan.

(c) Working Hours

Monthly working hours for a labor are estimated as 188 hours.

Labor requirement is based on zero overtime and 90% attendance (the wage rate for over time is scheduled as double of that for regular time).

One-shift (day-shift) is assumed.

(d) Equipment expeditures are measured as of CIF priced at the Port Acajutla.

(e) Spare parts for equipment for one year are assumed to be stocked.

(f) Considerations on Equipment

- Assembly Equipment

  Output is low so truck should be used rather than conveyer.

- Washing and Painting

  City water as well as well water do not have good quality as shown in Table IV-2-18 so water cannot be used for pretreatment for paiting and washing. Therefore, liquid detergent with thinner should be used for washing, and pretreatment should be done by using wash-primer.

Table IV-2-18 Water Quality in El Salvador

	ANDA Water Supply	Well Water
Cl^-	25.0	16.0
So_4^{--}	89.0	48.0
No_3^-	0.14	0.40
F^-	0.4	0.4
Ca^{++}	43.0	23.0
Mg^{++}	21.0	7.0
$Si0_2$	100.0	100.0
$CaCO_3$	194.0	88.0
Solid Substance	297.0	260.0
PH	7.1	7.6

Source: ANDA

Note: The sum of values of $C1^-$ and So_4^{--} must be smaller than 30 while each value of $C1^-$ and So_4^{--} should be less than 15; otherwise, paint will peel off later.

Painting should be done with the infra-red curing furnance since electricity is relatively cheap.

(g) Machining Equipment

Die-cast parts and casting parts will be imported from Japan for further machining in El Salvador.

Considering economical use of equipment, six different kinds of machining should be done in the same production line (jigs, cluster plates, tools, etc. should be necessarily changed according to the modification).

(h) Sheet Metal Working Equipment

Among parts for CKD large-scale parts of sheet metals are decided to be manufactured domestically in El Salvador due to the high cost of freight.

(i) A Training Center

A training center will be set up at the plant site. The center is scheduled to be under supervision of the sales department.

(j) A testing field should be provided in order to test tractors or to inspect matching of implements, etc.

(k) Dining room shall be prepared, but the number of employee is small so kitchen facilities are not included.

(2) Equipment Plans

(a) Equipment Plans for the Two Cases

Equipments for the two cases are listed in Tables IV-2-19 and IV-2-20.

Table IV-2-19 Equipment Expenditures for the First Case

(in US$1,000)

	The First Case SKD	The First Case CKD
Assembly, Operation, Painting	186.7	258.0
Machining	0	0
Sheet Metal Working	0	0
Repair	98.3	0
Tool Grinding	0	0
Transporting	12.6	0
Power	0	13.6
Inspection	16.6	0
Auxiliary	10.0	10.0
Equipment Transporting Exp.	0.3	0.2
Installation Exp.	20.7	21.0
Plant Construction Exp.	121.1	0
Building Auxiliary Equipment Exp.	36.3	0
Land Costs	54.0	0
Miscellaneous	16.7	0
Total	573.3	302.8

Source: The JICA Mission

Note: The figures in the CKD case are additional to those in the SKD case.

Table IV-2-20 Equipment Expenditures for the Second Case

(in US$1,000)

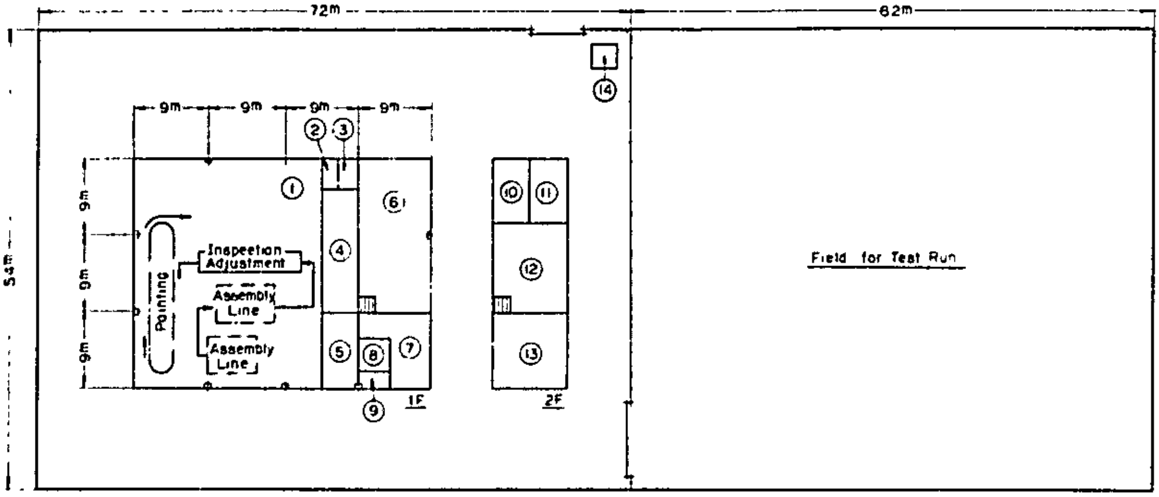
	The Second Case SKD	The Second Case PCL
Assembly, Operation, Painting	188.2	260.3
Machining	0	2,790.2
Sheet Metal Working	0	1,187.6
Repair	98.3	0
Tool Grinding	12.6	16.1
Power	0	13.6
Inspection	16.1	0
Auxiliary	10.0	33.3
Equip. Transporting Exp.	0.3	5.3
Installation Exp.	20.7	173.3
Plant Construction Exp.	249.4	210.9
Building Auxiliary Equip. Exp.	74.8	63.6
Land Costs	162.4	0
Miscellaneous	33.3	16.7
Total	866.1	4,817.1

Source: The JICA Mission

Note: Equipment expenditures listed in the CKD column are additional to those in the SKD column.

b) Plant Layouts

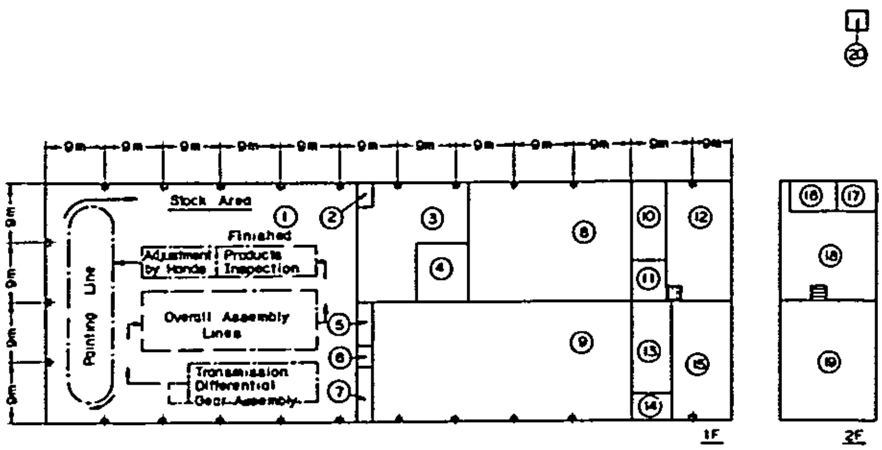
Fiture IV-2-13 shows the proposed plant layout when the expected market is limited to El Salvador only, while Figure IV-2-14 shows the proposed plant layout when CACM is the expected market.



NO	The Section of the Plant	NO	The Section of the Plant
1	Assembly Plant	8	Locker Room
2	Transport Equipment	9	Rest Room
3	Power Room	10	Manager's Room
4	Spare Room	11	President's Room
5	Repair Service Section	12	Office
6	Training Center	13	Meeting Room
7	Luncheon Room	14	Guard's Post

Source The JICA Mission

Figure IV-2-13 A Tractor Assembly Plant Layout for the First Case



Source : The JICA Mission

NO	The Section of the Building
1	Assembly Plant
2	Power Room
3	Repair Service Section
4	Grinding Section
5	Spare Room
6	Transport Equipment
7	Inspection Room
8	Metal Shaping Section
9	Machining Section
10	Training Section
11	Office
12	Training Center
13	Locker Room
14	Rest Room
15	Luncheon Room
16	Manager's Room
17	President's Room
18	Office
19	Meeting Room
20	Guard Post

Figure IV-2-14 A Tractor Assembly Plant Layout for the Second Case

6) The Organization of the Firm and Personnel Planning

The first case may require the system of the firm organization and personnels shown in Figure IV-2-15

President	Executive Directors	Department	Manager	Engineers & Office-Workers	Fore-man	Worker	Assis-tant
President	Executive Directors	Sales Dept.	1	2			
		Produc. Dept.	1		1	SKD - 5 CKD - 7	
		Admin. Dept.	1	1			2

Total SKD 16
CKD 18

Figure IV-2-15 The Organization of the First Case

President	Executive Directors	Division	Department	Manager	Engineers & Office-Workers	Fore-man	Worker	Assis-tant
President	Executive Directors 3	Sales Div.	Sales Dept.	1	5			
			Engineering Service Dept.	1	5		2	
			Storage & Transportation Dept.			1	2	
		Prod. Div.	Power & Mainten. Dept.	1	2	1	3	
			Processing Dept. *			2	12	
			Assembly Dept.	1	2	3	23	
		Adm. Div.	Account Dept.	1	2			
			Personnel Dept.	1	2			2

Total 85

Note :
Increase of CKD in the second case this processing dept. will be omitted.

Figure IV-2-16 The Organization of the Second Case

The wages of these employed may be shown as in Table IV-2-21.

Table IV-2-21 The Wages of the Tractor Assembly Plant

(in US$1,000)

	Direct Man		Indirect Man		Sales Man		Total Man	
The First Case SKD	6	1.53	5	2.57	5	4.33	16	8.43
The First Case CKD	8	1.77	5	2.57	5	4.33	18	8.67
The Second Case SKD	20	4.30	9	5.10	17	15.5	46	24.9
The Second Case PLC	47	10.87	21	16.93	17	15.5	85	43.3
The Second Case CKD	33	7.67	18	13.93	17	15.5	68	37.1

Source: The JICA Mission

7) Production Cost Estimates for Manufacturing Tractors in El Salvador

In this section cost estimates of the two cases of the tractor assembly plant will be surveyed. As a version of the second case, a sub-case shall be added. The subcase is, instead of shifting to PLC, to remain at CKD. In Table IV-2-22, data sources of cost accounting are presented. In Table IV-2-33 the results of examining profitability of running the assembly plant for the two cases are presented.

Table IV-2-22 Data Sources for Cost Accounting

US$1,000

	The First Case		The Second Case		
	SKD	CKD	SKD	PLC	CKD in 1985
1. Production Output (Units/Year)	84	96	720	840	840
2. Equip. Exp.	344.7	302.8	346.2	4,526.0	333.7
3. Building Construction Exp.	157.5		324.2	275.7	
4. Plant Site (Land)	54.0		62.4		
5. Spare Parts	16.7		33.3	16.7	
6. Wage (US$1,000/month)	8.4	0.2	24.9	18.4	12.2
7. Electricity/month	0.1	0.5	0.1		1.7
8. Plant Insurance					
9. Sales & Shipping Fees					
10. Direct & Indirect Taxes					
11. Royalty	268.9		302.4		
12. Technical Assistance Fees	74.4	54.0	89.5	130.5	63.1
13. Working Capital	·				

Cource: Tho JICA Mission

Note: Figures for CKD and PLC are additional to those of SKD for each case.

Table IV-2-23 Estimated Profit and Loss Statements for Different Cases of the Farm Tractor Manufacturing Plant in El Salvador

(in US$1,000 in 1976 price)

	The First Case		The Second Case		
	SKD	CKD	SKD	PLC	CKD
Target Market	El Salvador	El Salvador	CACM	CACM	CACM
Projected Output (Units/Year)	84	96	722	840	840
Revenue	239	272	2,045	2,385	2,385
Costs	527	466	2,366	2,911	2,863
Materials	204	232	1,748	1,975	2,039
Personnel Exp.	49	52	299	333	259
Technical Fees	68	79	78	104	91
Sales Exp.	12	14	102	119	119
Others	194	89	139	380	355
Gross Profit	-288	-194	-321	-526	-478
Depreciation	56	84	87	563	117
Interest Payments	32	45	104	302	112
Long Terms	22	34	35	225	45
Short Terms	10	11	69	77	77
Profit Before Tax	-376	-323	-512	-1,392	-707
Corporate Income Tax	0	0	0	0	0
Net Profit	-376	-323	-512	-1,392	-707

Source: The JICA Mission

As seen from Table IV-2-22, manufacturing tractors in El Salvador does not seem to produce good results. The main reason for the unprofitable results is undoubtedly due to the smallness of the markets. It seems evident that especially an attempt to manufacture some parts in El Salvador will certainly end up with a disastrous result (The Second Case - PLC). Though some modification of the production patterns are conceivable and they will be discussed in the following sections, the feasibility of establishing a firm which attempts to produce tractors in El Salvador seems discouraging so long as the profitability calculated soley by the production cost factors.

8) An Examination of Technological Levels

(1) Changes in Types of Production and Technological Levels

(a) SKD

In CACM countries tractors are relatively in wide use so no serious problems exist about repair jobs. Also, from the relatively widespread use of automobiles in this region, production by SKD does not seem to raise any serious questions, if capable personnels at supervisory positions are available.

(b) CKD

After two years of production by SKD it may be possible to change production to CKD, though engines have to be still imported. In two years of SKD production it seems possible for them to obtain knolwdges, techniques which are related to CKD assembly such as washing parts and painting.

(c) PLC

Works chosen for manufacturing parts domestically in El Salvador are related to sheet-metal works of cases such as pressing and welding. It is necessary to acquire a certain level of techniques to do these jobs. Contents of these works are as follows:

Milling
Boring and Drilling
Perforating
Pressing
Welding
Tool grinding

Parts inspection

Maintenance and repair

Repair of jigs and dies

Among works mentioned above, levels of techniques of pressing and welding were inspected at private companies in El Salvador. The levels were low and products had problems in quality. However, by supplying metal molds and standardizing each job, manufacturing parts seems possible. As far as other jobs are concerned, it is quite difficult to estimate the levels of techniques at present time.

(2) Related Industries

Manufacturing process and purchasing parts of tractors are quite similar to those of automobile industry. In developing nations such as Brazil, India, Thailand, Korea, etc., makers of service parts were established first because demand for service parts grew rapidly in these countries. When demand for automobile grew sufficiently KD plants of automobiles were established, following makers of service parts. At this stage of development plants to manufacture tractors were planned and built in these countries.

However, El Salvador and other CACM countries do not have industries related to automobile industries. Thus, there are few industries which can be used for production of tractors in the region. The followings are products which are required to produce tractor:

i) Items to be purchased: tires, batteries, beanings, oil seals, radiators, fuel infection pumps, and nozzles

ii) Makers of intermediate inputs: iron and steel, metal sheet, aluminum die casting, casting iron, forging products and plastics.

iii) Other services: machining, metal-sheet working, metal dies plating and heat treatment.

With respect to those products and services, it is almost impossible to find companies to be subcontracted in El Salvador. However, there is a private company which has technologies to provide these products. This company is currently making farming tools such as hoes, axes, picks, etc. This company is also pushing an idea to manufacture disk plows for tractors, disks for disk horrows, and pawls for rotary equipments under technical tie-up with a West German manufacturer.

(3) Technical Education of El Salvadorians and Plans to Dispatch Japanese Technicians to El Salvador.

(a) On the Job Training of El Salvadorians in Japan

Qualifications for this training would be: (1) college graduates (possibly with the mechanical engineering degree) and (2) English conversation ability. The training schedules may be summarized as follows:

a.	Assembly · Painting Driving 2 5.5 man.months	Learning on Products	Assembly	Painting	Driving Test	
		0.5 month	3 months	1 month	1 month	
b.	Machining 1 8.5 man.months	Basic Knowledges on Products	Machining	Intensive Study	Inspection	Repair Electricity
		0.5	4	1	1	2
c.	Pressing Welding 1 8.5 man.months	Basic Knowledge on Products	Pressing	Welding	Inspection	Repair Electricity
		0.5	4	1	1	2
d.	Sales Engineer-ing 4.0 man.months	Basic Knowledge on Product	Breaking up and Reassembly		Field Operation	Sales Education
		1	1		1	1

(b) Plans to Dispatch Japanese Technicians to El Salvador

Installation of Equipments
2 men x 1 Year

Production Guidance
2 men x 1 Year

Operation & Service Training
1 man x 3 months

It is estimated to cost US$3,200/month for a dispatched Japanese technician. In Table IV-2-24 training schedules are summarized.

Table IV-2-24 Training Schedules for Each Case

		The First Case		The Second Case		
		SKD	CKD	SKD	PLC	(CKD)
El Salvadorean Technician on the Job Training in Japan	Assembly Painting Operation	1man x 3months	1 x 2	1 x 5.5	1 x 5.5 1 x 5.5	1 x 2 1 x 5.5
	Machining	-	-	-	1 x 8.5	-
	Pressing Welding	-	-	-	1 x 8.5	-
	Sales Engineering	1 x 3	1 x 4	-	-	-
Japanese Technician Technical Assistance in El Salvador	Installation	1 x 3	1 x 3	1 x 6	2 x 10 1 x 6	1 x 6 1 x 6
	Production Guidance	1 x 6	1 x 2	1 x 6	2 x 10 1 x 6	1 x 6 1 x 6
	Sales Service Guidance	1 x 3	-	1 x 3	-	-

Source: The JICA Mission

(4) An Examination of Types of Licences

Licences for production of tractors can be obtained from some manufacturers. Under the licence technical know-how and data will be given to the assembly plant in order to maintain smooth production of tractors. In exchange for the licence, US$233,000 would be paid while 3% of the total sales will be claimed as royalty. Documents for technical assistance and the timing to present these are summarized and listed in Table IV-2-25.

Table IV-2-25 A List of Documents for Technical Assistance

	SKD	CKD	PLC
Assembly drawings of product	o		
Part drawings	o		
Parts list	o		
Assembly manual	o		
Related patents	o		
Technical standard in the Firm	o		
Assembly flow chart	o	o	
Technical guidance for inspection	o	o	o
Raw materials specification list for parts			o
Auxiliary materials specification lists		o	o
Parts processing flow chart			o
Surface treatment standard		o	o
Heat treatment standard			o
Others	o	o	o

Source: The JICA Mission

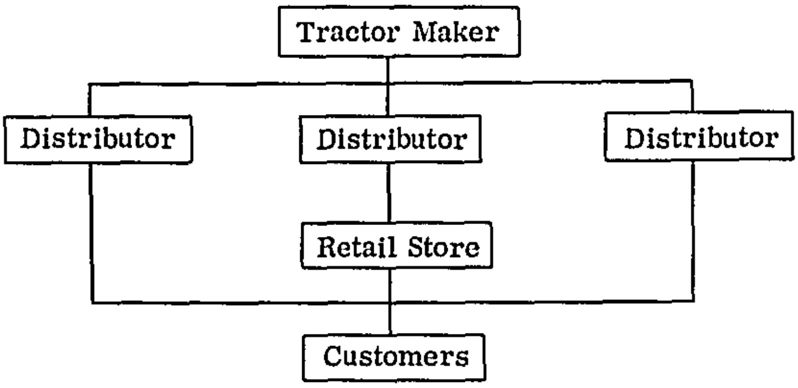
Note: These technical documents and data are limited to machining in the company and products by sub-contractors, and are not delivered with respect to the prducts produced by specialized makers.

9) Others

(1) Sales

(a) Sales Routes

Sales routes are shown in Figure IV-2-17.



Source: The JICA Mission

Figure IV-2-17 Sales Routes

(b) Sales and Service

Agents are responsible for sales, circuit service, and repair.

(c) Training of Agents

For training employees at agents (sales engineers and service engineers) the training center should be established, as mentioned above.

(2) Merits and Demerits of Considering El Salvador as a Strategic Location for Production

To locate the tractor assembly plant in El Salvador among CACM countries seems to have some merits as well as demerits, which are listed below.

(a) Merits

- Supply of labor is plenty (quality of labor in El Salvador is said to be superior to that of any other countries in CACM and that they are diligent).

- El Salvador is located in the center of Central Latin American countries so costs of transportation should be less expensive, compared with production in other countries.
- The Government is willing to promote the metal-mechanical industry.
- El Salvador is ready to accept technical assistance from Japan.

(b) Demerits

- Demand is low so efficient equipment installation is impossible. Also technical levels are inferior to those in advanced countries.
- Few related industries exist so deployment of local contents seems impossible. Therefore, absorption of excess labor and savings of foreign exchanges are not greatly expected.
- Technical levels are low so costs and quality of products become big issues.
- Raw materials must be all imported.
- In CACM countries there is a tendency of mistrust to those produced within CACM region so sales may become a bottleneck for the operation.
- In each case of production schedules, profitability worsens as production technique shifts from SKD to CDK and to PLC. Thus, the future of tractor industry in El Salvador is doubted.

10) An Examination of Profitability

In order to examine in details profitability of the project a further study was conducted. In order to do so several cases were considered but the case with SKD aiming at CACM market was selected. The long run analysis of profitability was conducted for this case.

DCF analysis was applied to the case for the period of 1980 to 1985. The results are shown in Table IV-2-26. As seen from the Table, investment merits of US$866 thousand look very dim. With the discount rate of 15% p.a. DNPV takes a negative value so does IRR. From these results the future of the project looks not bright at all.

Table IV-2-26 DCF Analysis for the Tractor Assembly Plant (Base Case)

(in US$1,000)

	1980	1981	1982	1983	1984	1985
Revenue	2045.00	2113.00	2182.00	2250.00	2318.00	2386.00
Costs	2366.00	2445.00	2524 00	2603.00	2686.00	2763.00
Materials	1748.00	1807.00	1865.00	1924.00	1984.00	2040.00
Personnel Exp.	299.00	311.00	323.00	336.00	350.00	364.00
Technical Fees	78.00	78.00	78.00	78.00	78.00	78.00
Sales Exp.	102.00	105.00	109.00	112.00	116.00	119.00
Others	139,00	144.00	149.00	153.00	158.00	162.00
Gross Profit	-321.00	-332.00	-342.00	-353.00	-368.00	-377.00
Depreciation	86.60	86.60	86.60	86.60	86.60	86.60
Interest Payment	103.38	105.68	107.96	110.30	112.70	114.98
Long Term Loans	34.64	34.64	34.64	34.64	34.64	34.64
Short Term Loans	68.74	71.04	73.32	75.66	78.06	80.34
Profit before Tax	-510.98	-524.28	-536.56	-549.90	-567.30	-578.58
Corp. Income Tax	0.0	0.0	0.0	0.0	0.0	0.0
Net Profit	-510.98	-524.28	-536.56	-549.90	-567.30	-578.58
Dividends	0.0	0.0	0.0	0.0	0.0	0.0
Retained Earnings	-510.98	-524.28	-536.56	-549.90	-567.30	-578.58
Cash Flow	-321.00	-332.00	-342.00	-353.00	-368.00	-377.00

DCF Analysis
Discount Rate is 15.00%
Initial Investment is 866.00
Discounted Net Present Value (DNPV) is -2168.82
Internal Rate of Return (IRR) is - 0.00%
DNPV at IRR is -2951.50

Source: The JICS Mission

However, if the project to establish a tractor assemble plant in El Salvador is to be considered within a larger frame-work of industrialization of El Salvador economy rather than just profitability of the plant operation, the problem may be to find under what conditions the plant operation may become profitable. In order to find answers, some maneuvers were made. The results are shown in Tables IV-2-27 and IV-2-28. As seen from Table IV-2-28, if the price of tractors was

Table IV-2-27 Sensitivity Analysis for the Tractor Assembly Plant

(in US$1,000)

	1980	1981	1982	1983	1984	1985
Revenue	2557.00	2642.00	2727.00	2812.00	2897.00	2983.00
Costs	2366.00	2445.00	2524.00	2603.00	2686.00	2763.00
Materials	1748.00	1807.00	1865.00	1924.00	1984.00	2040.00
Personnel Exp.	299.00	311.00	323.00	336.00	350.00	364.00
Technical Fees	78.00	78.00	78.00	78.00	78.00	78.00
Sales Exp.	102.00	105.00	109.00	112.00	116.00	119.00
Others	139.00	144.00	149.00	153.00	158.00	162.00
Gross Profit	191.00	197.00	203.00	209.00	211.00	220.00
Depreciation	86.60	86.60	86.60	86.60	86.60	86.60
Interest Payment	103.38	105.68	107.96	110.30	112.70	114.98
Long Term Loans	34.64	34.64	34.64	34.64	34.64	34.64
Short Term Loans	68.74	71.04	73.32	75.66	78.06	80.34
Profit Before Tax	1.02	4.72	8.44	12.10	11.70	18.42
Corp. Income Tax	0.03	0.12	0.21	0.30	0.29	0.46
Net Profit	1.00	4.60	8.23	11.80	11.40	17.96
Dividends	0.20	0.92	1.65	2.36	2.28	3.59
Retained Earnings	0.80	3.68	6.58	9.44	9.12	14.37
Cash Flow	190.97	196.88	202.79	208.70	210.71	219.54

DCF Analysis
Discount Rate is 15.00%
Initial Investment is 866.00
Discounted Net Present Value (DNPV) is -98.73
Internal Rate of Return (IRR) is 10.80%
DNPV at IRR is -0.89

Source: The JICA Mission

Table IV-2-28 Alternative Plans

	Original Plan	Alternative-1 Price up 20%	Alternative-2 Price up 25%	Alternative-3 Price up 30%
DNPV at 15%	<0	<0	<0	>0
IRR(%)	<0	<0	10.8>0	25.6>0

Source: The JICA Mission

raised by 25% (or if any other conditions occur, which is equivalent to 25% increase in price), profitability of investment as well as the plant operation should be achieved.

3. Hand Tool Manufacturing Industry

1) Assumptions

The general economic climate for hand tool industry in El Salvador was discussed in the previous chapter. In this section the selection of the product among hand tools shall be made and the analysis will follow with respect to the feasibility of establishing a firm in El Salvador which manufactures the selected products. This study is based on the following three assumptions:

Assumption-(a) Wrenches are selected as products. In particular, open-end wrench and combination wrench will be the major products shown in Figure IV - 3 - 1.

Assumption-(b) Japanese wrench manufacturers are assumed to render technical and management assistance to the planned wrench manufacturer in El Salvador.

Assumption-(c) The period of analysis for this study is from 1980 to 1985.

2) Determination of the Product for Production

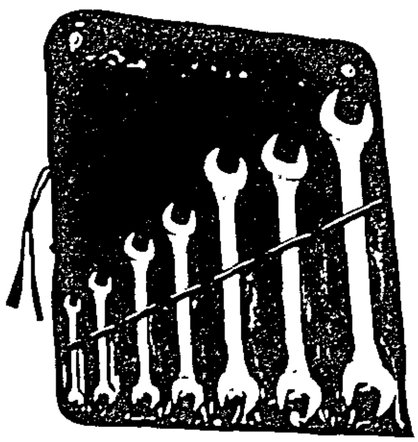
Various kinds of hand tools for various purposes are manufactured. Each hand tool differs from others in production processes, machining equipments, levels of production techniques, materials, sizes of demand, etc. From this reason it is essential to select appropriate hand tools if a hand tool manufacturing company or hand tool industry is to be successful for its operation in El Salvador. The reasons are stated below for selecting wrenches as the major product for the hand tool manufacturing company in El Salvador.

(1) Wrenches are one of the most basic hand tools and are indispensable for mechanization and industrialization of economies. Demand for wrenches ranges widely from industrial production, maintenance, and repair to educational materials and household usages. Demand for wrenches tends to increase as industrial output increases.

(2) Manufacturing processes of wrenches may be classified into three major

Open-End Wrenches

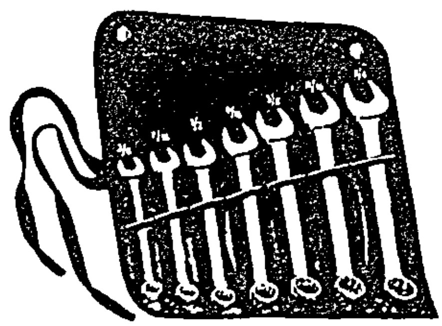
Forged from the finest alloy steel. Nickel chrome plated. Both ends at standard 15° angle for working in confined areas.



Open-End Wrench Sets

Combination Wrenches

Made of top quality alloy steel, nickel chrome plated. Open and 12-point box ends have the same size openings on each wrench. Open ends at standard 15° angle for working in confined areas. Box ends have 15° angle offset to provide clearance over obstructions.



Combination Wrench Sets

Figure IV-3-1 Example of Wrenches

Source: The JICA Mission

processes; the rough preparation process (forging, cutting, stamping, etc.), the heat treatment process, and the finishing process (grinding and plating). Each major process can be separated (is possible to establish as a related industry) but also can be grouped within one plant site. That is, production processes of wrenches have divisibility of capital investment. Also, by integrating each process into one manufacturing process, a continuous operation from raw materials to finished products can be established without having access to related industries and without requiring large initial investment.

(3) Manufacturing processes and equipments mentioned above such as forging, heat treatment, plating, etc. are essential techniques and equipments for the promotion of industrialization of the El Salvadorian economy. Nursing these technicians as well as techniques seems indispensable.

(4) Hand tool industry has been historically labor-intensive. High labor intensiveness indicates the product with relatively high value added and high demand for labor. Also, in the region where labor is relatively abundant labor-intensive products may have a competitive edge in the world market due to the law of comparative advantage.

(5) On the other hand, labor intensiveness tends to induce labor-saving techniques due to increasing wage costs. Automation in equipment machinery has been accelarated recently. The automation of equipment machinery is a necessary condition to maintain quality of products of mass production. At the same time the automation replaces experience and skills which can be acquired only by many years' hard work. The simplified production technique by automation, thus, enables for even unskilled labors to participate in production process with training for a very short period. In hand tool industry, the same trend is clearly observed, and it renders an favorable condition for economies which have few skilled laborers.

(6) Japanese wrench manufacturing industry has built up the techniques to produce the highest quality wrenches in the world so technical and management assistance from Japanese wrench makers will enable the wrench manufacturing company in El Salvador to produce wrenches in good quality.

(7) About one-half of wrenches produced in Japan has been exported. Among the total exports of wrenches 50 to 60% is shipped to North American markets (US and Canada). In the import market of wrenches in the US Japanese products have 60-70% market share. Also, domestic demand for hand tools in the US is estimated to increase 15 to 18% p.a.

(8) Therefore, even if domestic demand for wrenches in El Salvador is found to be too small, it is possible for the wrench manufacturing company in El Salvador to aim at the wrench market in the US from the beginning of production with assistance from Japanese makers (In reality, it seems inevitable for the wrench maker in El Salvador to depend on exports of its products to the US market. For this details are given in the section of demand estimates below). This is to say that establishing a wrench maker in El Salvador seems to correspond to the national policy of import substitution and export promotion.

(9) In examining a possibility of exportation to the US market a possibility of utilizing preferential tariff rates of the US can be considered if a production site is located in El Salvador and if value added of products exceeds 35%. One computation shows that about 11% differentials in prices may be brought forth due to the utilization of the US preferential tariff rates. This certainly leads to strengthen the international competitive edge of wrenches made in El Salvador.

(10) Japanese wrench makers have been using the relatively low wages of labor. However, the recent shortage of supply of labor in Japan has pushed the wage rate upwards and made it difficult to expand domestic production facilities in parrelle to the increase in domestic and foreign demand. Also, a persuit for merits derived from economies of scale, some say, has reached the limit technically. Under these conditions Japanese wrench makers have begun to contemplate possibilities of production overseas.

Thus, if it is assumed that the wrench maker in El Salvador shall be established under the technical and managerial supervision of Japanese makers, the future prospect of the wrench maker in El Salvador seems to be under favorable conditions. However, it is quite a different matter whether the wrench manufacturer actually achieves any profit or not. In the following sections the profitability of the wrench manufacturing project shall be analyzed.

3) Demand Estimates for Wrenches

(1) E1 Salvador Domestic Market and CACM

As the result of the field investigation conducted in CACM countries, it was confirmed that hand tools manufactured in the region were limited to farming tools such as machetes, hoes, plows, etc. and almost all other kinds of hand tools have been imported from the outside of the CACM region. Thus, demand for hand tools in the region may be estimated from import data. Recent situations of hand tools (HERRAMIENTAS DE MANO, PARA ARTESANOS) imports of E1 Salvador and CACM countries are listed in Table IV-3-1 and IV-3-2. As see from Tables, markets for hand tools have been favorably

Table IV-3-1 Imports of Hand Tools[1] in E1 Salvador for Selected Years

Year / Countries Imported from	1969 Weight (ton)	1969 Value (US$1,000)	1971 Weight (ton)	1971 Value (US$1,000)	1975 Weight (ton)	1975 Value (US$1,000)
USA	-	-	60	378.0	94	881.6
MEXICO	-	-	2	3.6	3	12.4
E.GERMANY	-	-	94	198.8	88	342.4
SPAIN	-	-	25	43.2	52	264.4
JAPAN	-	-	34	65.2	17	40.8
OTHERS	-	-	32	99.2	52	285.6
Total	162	501.6	247	788.0	306	1,827.2

Source: MINISTERIO DE ECONOMICA, ANUARIO ESTADISTICO, various issues.

Note 1: NAUCA 699-12-02

Table IV-3-2 Imports of Hand Tools[1] to CACM for Selected Years in 1,000 CAPESOS[2]

	1965	1969	1971
Including Intra-Regional Trade	3,942	4,163	5,671
Excluding Intra-Regional Trade	3,925	4,024	5,388

Source: SIECA, COMERCIO EXTERIOR DECENTROAMERICA, various issues.
Note 1: NAUCA 699-12-02
Note 2: 1,000 CAPESOS = US$1,000, CIF priced

expanding. However, these data are the sum of all hand tools so data for detail items such as wrenches are not listed. In order to supplement the lack of their data, Japanese export data of wrenches to E1 Salvador and CACM countires were checked. They are presented in Table IV-3-3.

Table IV-3-3 Exports of Wrenches from Japan to E1 Salvador and to CACM for Selected Years

(F.O.B. priced)

	1969		1971		1975	
	Weight (ton)	Value (US$1,000)	Weight (ton)	Value (US$1,000)	Weight (ton)	Value (US$1,000)
E1 Salvador	1.7	3.3	2.5	6.7	1	3.3
CACM	20.0	36.7	17.1	43.3	17	70.0

Source: Ministry of Finance, Monthly Statistics of Japanese Foreign Trade, Various Issues.

Table 4-3-3 shows the actual value of Japanese exports to these countries so they may be substituted for estimating the minimum demand for wrenches if a wrench maker is to be established in E1 Salvador to market its products in these countries. Of course, it is obviously dangerous to draw any conclusions on the market size from Japanese exports data alone since other countries may also export wrenches to the region. However, considering all information gathered so far it seems inevitable to draw a conclusion that the market of

Central American countries for wrenches is too small to built a wrench manufacturing plant in El Salvador on the expectation of a successful operation. It seems obvious that the profitability of the wrench maker in El Salvador will not be so good as hoped for so long as the target markets are limited to El Salvador and other CACM countires.

(2) Estimates for North American Markets

According to data presented by the All Japan Machinist Hand Tool Manufacturer's Association total exports of wrenches from Japan to the world amounted to US$48,667 thousands in 1975, approximately half of which, that is US$23,333 thousands, were shared by North American markets (US shared US$20,000 thousands, 90%, and the rest of them came from Canada). Since the total exports of all hand tools from Japan amounted at US$81,000 thousands and the North American share was US$40,000 thousands (The US, US$35,000 thousands) in the same year, the significance of the North American wrench market for Japanese hand tools industry may be pointed out from these data. The related data of the North American market are shown in Table IV-3-4.

Table IV-3-4 Exports of Hand Tools from Japan, 1969-1975 in millions of US dollars

	1975	(%)	1974	1973	1972	1971	1970	1969	Annual Average Rate of Growth(%)
Exports Total	81.15	(100.0)	74.52	64.47	55.69	48.62	46.36	36.03	37.5
North Ameria	40.34	(49.7)	38.20	36.51	35.97	28.06	28.14	22.36	30.0
U.S.A.	35.01	(43.1)	29.48	30.76	30.80	24.39	24.52	19.15	30.5
Spanners & Wrenches, Total	48.53	(100.0)	44.32	39.02	32.61	26.47	24.09	18.08	44.7
North America	23.31	(48.3)	16.65	19.36	19.01	13.51	13.09	9.72	40.0
U.S.A.	30.34	(41.9)	22.23	23.18	22.23	15.65	15.19	11.67	29.0

Source: National Hand Tools Industrial Cooperative.

Table IV-3-4 simply indicates the significance of the role to be played by Japanese wrench makers to help establishing a wrench maker in El Salvador through managerial and technical assistance. The center of the issue is how Japanese wrench makers are going to face the rapidly increasing North American market, which is large in the absolute size and may expand at the rate of 15-18% p.a. To consider this problem, the following simplified calculation may be obtained, comparing production expansion capacility of Japanese wrench makers with the increase in demand of North American wrench market. The comparison is shown in Table IV-3-5. In Table IV-3-5, taking as the starting point US$23,300 thousands of 1975's total value of wrench exports so North American market, the increase in demand for Japanese wrenches in the market is estimated in two cases to 1985: One case is to assume that the rate of increase in the market aize is 15% p.a., while the other 5% p.a. Figures of the third row are the difference between figures in the first row and 23,300. That is to say, the figures in the row (3) indicate the size of production capacity to be expanded by Japanese wrench manufactures in Japan if Japanese wrench makers are to keep up with the expansion of the North American wrench market for each year at the rate of 5% p.a. With the trial calculations shown in the Table, it is necessary for Japanese wrench makers to expend their production capacity by US$14,667 thousands by 1985. This means that the present production capacity of Japanese wrench makers must be increased by 60% by 1985.

Table IV-3-5 Estimations of Export Markets in North America, 1975-1985

(in Millions of US dollars)

		1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
(1)	Annual Rate of Growth 15%	23.30	26.80	30.80	35.43	40.77	46.87	53.90	61.97	71.27	81.97	94.27
(2)	Annual Rate of Growth 5%	23.30	24.47	25.70	26.97	28.33	29.73	31.23	32.80	34.50	36.13	37.97
(3)	(2) - 23.3	0.00	1.17	2.40	3.67	5.03	6.43	7.93	9.5	11.20	12.83	14.67

Source: JICA Mission

However, one should carefully note that the results of the simplified calculation shown above are based on the assumption that the rate of increase in the North American market is 5% p.a. and that the base figure of the calculation was taken from that of 1975. From Table IV-3-4, it is easy to understand that the world wide demand for wrenches has been increasing faster that of the North American market. Also, as far as the base figure of 1975 is concerned, it was the year in the middle of the recession in the US after the oil shock of 1973. For these reasons, it is quite possible that the figure US$14,667 thousands may be considerably understimated. Thus, the figure US$14,667 thousands may not indicate even the minimum requirement for production capacity expansion for

Japanese wrench makers. For example, with the annual growth rate 15% of the North American market, the estimated capacity expension is US$71,000 thousands, which is three times as large as the current production capacity in Japan. Under these conditions, if wrenches produced in El Salvador with assistance by Japanese makers could be exported to the North American market, they would relieve some pressure from Japanese wrench makers on the required production capacity expansion and, at the same time, Japanese wrench makers may be able to retain the market share in the North American market.

From these reasons the size of the North American wrench market that the wrench maker in El Salvador could share is estimated 7.5% to 15% of the Japanese annual incremental export market in the North America. Thus, demand in the North American market for wrenches made in El Salvador is estimated to range US$1,100 thousands to US$2,200 thousands by 1985. The results of the estimation are given in Table IV-3-6. In the Table, the case of the 7.5% share is disignated as the lower limit of the market size and the case of the 15% share as the upper limit. These two limits are maintained throughout this section unless otherwise indicate.

Table IV-3-6 Estimation of Sizes of Markets for a Plant Manufacturing Wrenches in El Salvador, 1979[1] - 1985

(in 1,000 US dollars)

	1979	1980	1981	1982	1983	1984	1985
(1)[2] Market Size, 15%	750.0	950.0	1,200.0	1,450.0	1,700.0	1,950.0	2,200.0
(2)[3] Market Size, 7.5%	376.7	476.7	600.0	726.7	850.0	976.7	1,100.0

Source: Table IV-3-5
Note 1: The estimated year for the start of production.
Note 2: Market sizes, which are assumed to be 15% of (3) of Table IV-3-5.
Note 3: Market sizes, which are assumed to be 7.5% of (3) of Table IV-3-5.

4) Plant and Equipment Investment

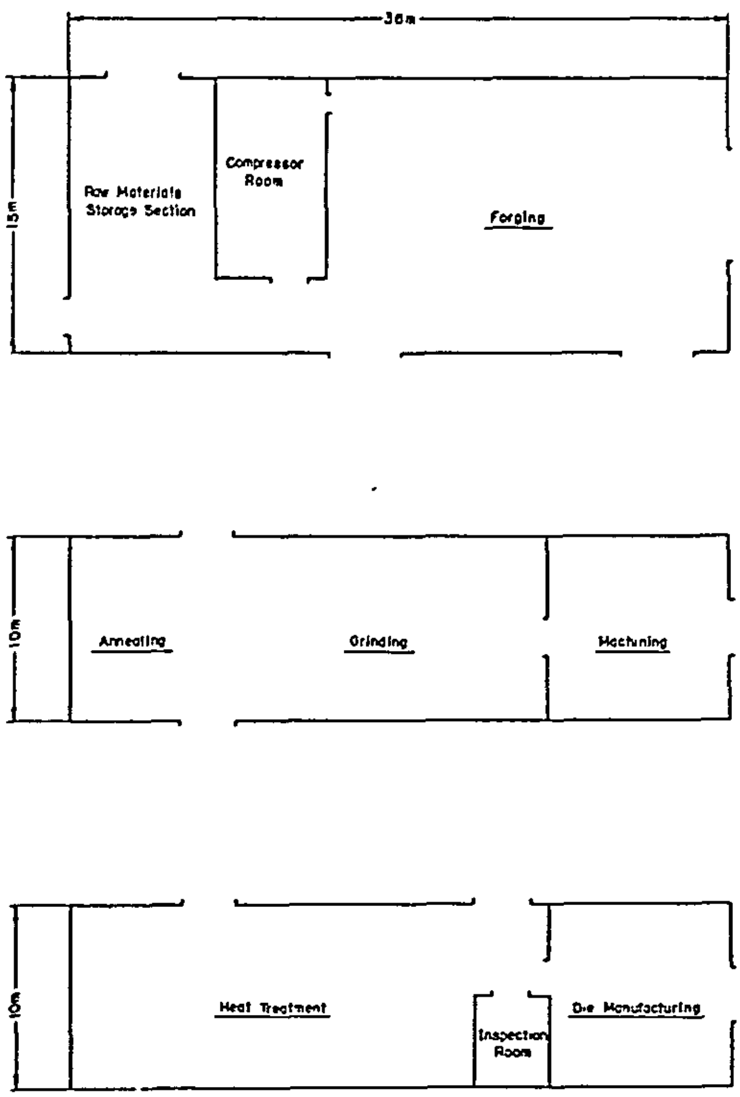
(1) A Selection of the Plant Site

Various conditions must be generally considered when a selection of plant site is made such as conditions on production process, supply conditions to consumers, etc. In the case of wrench manufacturing, however, no special consideration seems necessary for the selection of the plant site if social overhead capital is available to some satisfactory extent, except noise and vibration pollution caused by production process. Therefore, the plant site can be chosen from places wherever ordinary factories may be established excluding heavily populated areas in the city. The particular plant site should be located somewhere in the area between Santa Ana and San Salvador as discussed in the previous chapter. The area for the plant site is estimated some 3,000m^2, and the price of land is estimated US$ 6 per m^2 so US$18 thousands are required to purchase land for the plant site.

The plant site   3,000m^2 @US$6/$m^2$ US$18 thousands

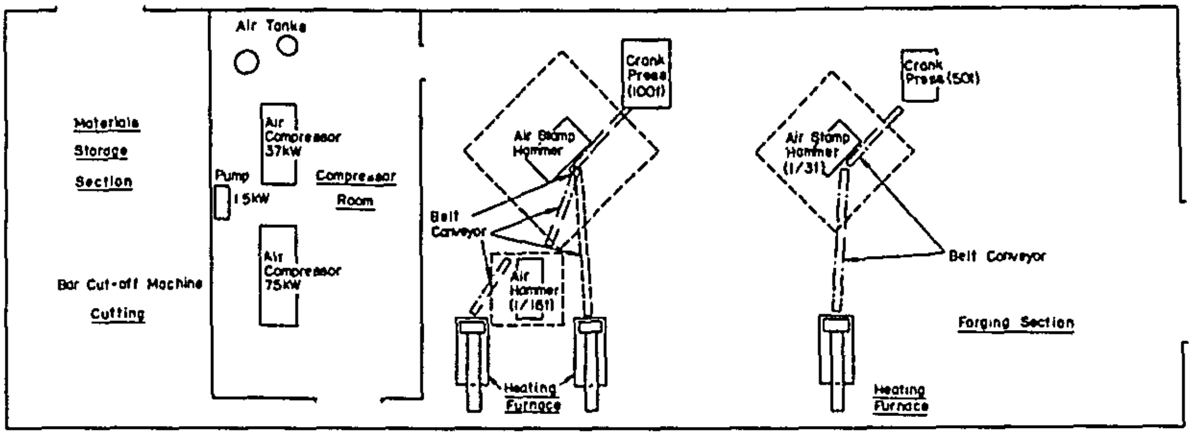
(2) Construction Costs of Building and Auxiliary Facilities

Fig. IV-3-2 is the basic sketch for the plant to manufacture wrenches.



Source : The JICA Mission

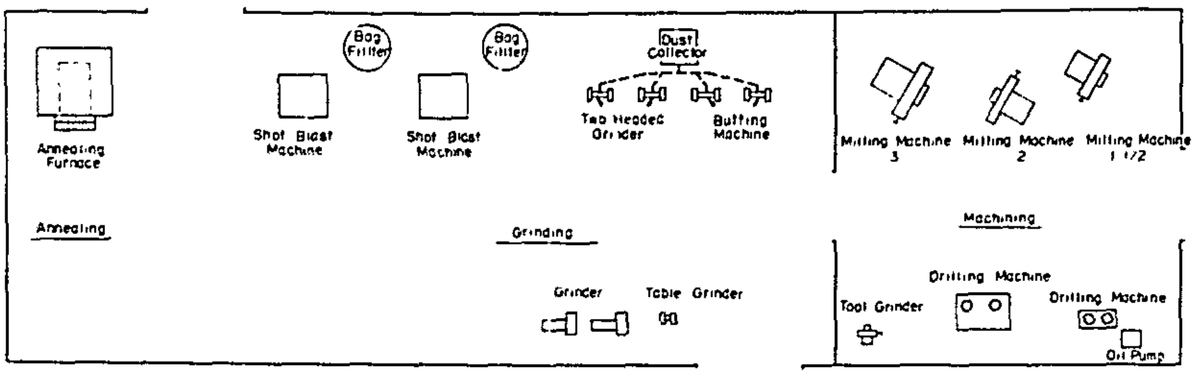
Figure IV-3-2 (1)   A Wrench Manufacturing Plant Layout



Source The JICA Mission

Figure IV-3-2 (2) A Wrench Manufacturing Plant Layout

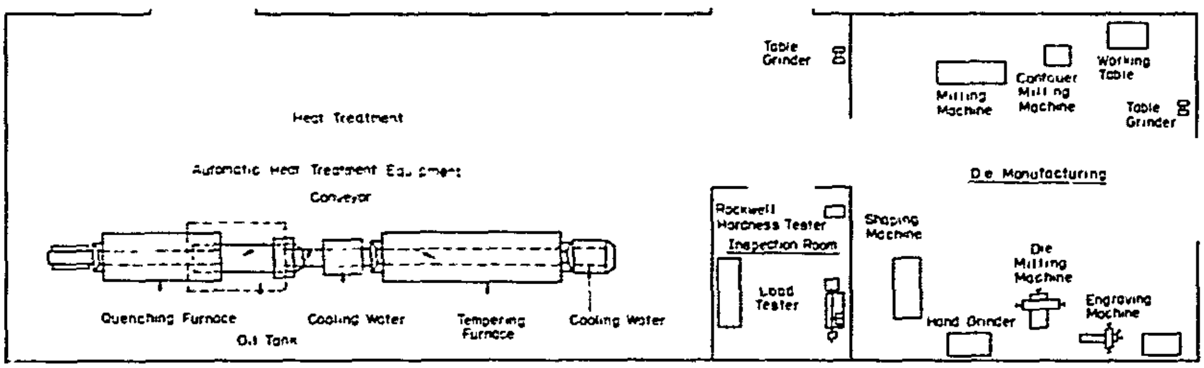
Storage and Forging Sections



Source The JICA Mission

Figure IV-3-2 (3) A Wrench Manufacturing Plant Layout

Grinding and Machining Sections



Source The JICA Mission

Figure IV-3-2 (4) A Wrench Manufacturing Plant Layout

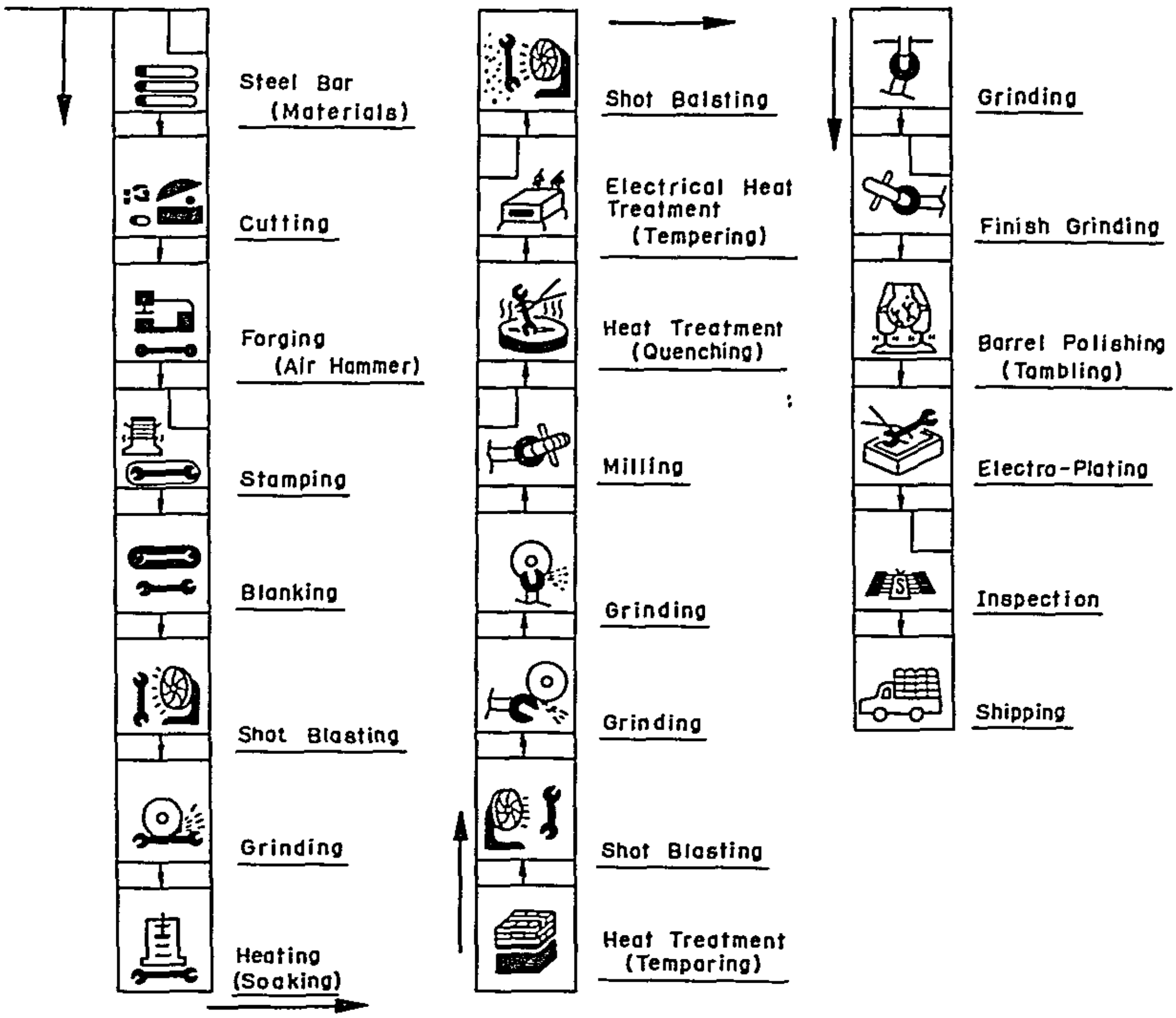
Heat Treatment and Die Manufacturing Sections

The plant as a whole requires about 1,600m^2 floor space including rooms for plating and office space. Construction cost estimates for buildings and auxiliary facilities such as paved roads within the site, fences, pipes for water supply and sewage, electricity wiring, etc. run approximately US$58 per m^2 so total construction costs are estimated US$92.8 thousands.

Construction Costs 1,600m^2 floor space US$58/m^2 US$92.8 thousands

(3) Machinery Equipment Investment

A basic flow chart of manufacturing processes of wrenches is presented in Fig. IV-3-3. Manufacturing processes may be divided into three major groups;



Source : National Handtools Industrial Cooperative

Figure IV-3-3 Manufacturing Process for Wrenches the first group may be called the rough preparation process, the second the heat treatment process, and the third the finishing process. Important jobs at the rough preparation process are various types of die forging processes. At this stage raw materials, namely, bars of Chromium Molybdenum Steel are cut in specified lengths, which are forged and molded by using dies. After this stage, heat-treatment starts. Traditionally quenching and tempering have been the most important process of making wrenches in order to control quality of products and these techniques depended on skills of long-experienced laborers. However, recently the completely automated heat-treatment machinery has been developed so quality contol is maintained only by operating machines. Without the completely automated heat-treatment machinery, it is almost impossible for anyone to master heat-treatment techniques within a short period of time. But the automated machine is one of the reasons that a wrench manufacturing plant with maintained quality seems possible in El Salvador.

As mentioned before, especially when the US market is aimed, a certain level of quality in products is a necessary condition, the significance of which has been often mentioned by dealers and retail stores in the US. After heat-treatment, the plating and the finishing processes begin. The problem arises from the plating process and the inspection process. Plating may not be needed if wrenches are marketed within the El Salvadorian domestic market. However, if the US market becomes the main target for marketing, plating is the indispensable process. The problem is a treatment of waste-water created in the plating process. The significance of sufficiently equipped effluent treatment must be provided after one has seen many cases of precedents of water pollution cased by the plating process in advanced countries. Though the completely automated plating equipment has been developed, it is not totally reliable so that because of the significance of water treatment for plating a semi-automated plating equipment is planned to be installed while the water-treatment equipment is independently attached to the plating equipment.

After plating, quality control must be maintained since the major market is in the US. For maintaining quality control a set of inspection equipments must be installed in order to check the quality of products.

Equipment facilities needed for the wrench manufacturing plant are listed in Table IV-3-7. With these facilities production capacity can range from

Table IV-3-7 Estimated Costs of Equipments

(in 1,000 US dollars)

	F.O.B. Prices	C.F.[1]	C.I.F.[2]
Froging Process Equipment	280.87	14.19	295.07
Heat Treatment Equipment	33.33	2.67	86.00
Dice Manufacturing Equipment	28.33	0.87	29.20
Grinding Equipment	195.57	16.39	211.97
Water Treatment Equipment	206.00	15.74	221.73
Inspection Equipment	5.33	0.16	5.50
Transport Equipment	13.33	0.57	13.90
Audiliary Equipment	33.67	0.98	34.63
Total	862.27	52.30	914.57

Source: The JICA MISSION
Note 1: Insurance and freight, which are from YOKOHAMA to ACAJUTLA
Note 2: Insurance is estimated as 2% of C. F.

US$1 to 2 millions worth of output per year. It is assumed that equipment installation will be finished by the end of 1978 and that actual production will start at the beginning of 1979.

(4) Working Capital

When production starts, working capital is required as liquidity at hand for inventory control of materials and products, payment of wages, credit sales, etc. Though it is generally a complicated matter to determine how much working capital is needed for a smooth operation and cannot be determined uniformaly, the amount of working capital is determined as equivalent to maintain three months worth stocks of materials and wage payments for three months. At the same time, the total amount of working capital is assumed to be financed by private financial institutions in El Salvador as a short-term loan. In this case the interest rate is set to be 13% p.a. In this particular project of wrench manufacturing the initial working capital is estimated to be somewhere between US$6,666 - US$13,333 thousands.

(5) Total Initial Investment

From various investment estimates given above, the total initial investment expenditures will look like figures presented in Table IV-3-8.

Table IV-3-8 Estimated Investment Expenditures for the Wrench Plant

(in 1,000 US dollars and in 1977 prices)

Land Purchase	80.0
Plant Construction	58.0
Machinery and Equipment [1]	960.3
Contigency Fund [2]	57.3
Working Capital	133.3
Total	1,226.9

Source: The JICA MISSION
Note 1: Figures of Machinery and Equipment include domestic transport and installation costs.
Note 2: Contingency for construction of plants

In the Table costs for contingency accounts for US$5,666 thousands. This is for an increase in costs of construction due to a delay in construction periods, unexpected break down of machinery, etc. In the section below where profitability of the operation is examined, it is assumed that contingency costs have been actually used up for some reasons. The investment expenditures which are subject to depreciation computation are totalled to US$109,333 thousands.

5) Operation Schedules

(1) Estimations of Output

Production is scheduled to start in 1979 after the construction of the production plant. Though production may start in 1979, a full scale production may be delayed further. This provision should be included into the production schedule. Since the wrench plant is designed for the integrated production of wrenches, namely, from raw materials to finished products, each manufacturing process must be operated smoothly side by side. In order to achieve the overall smooth operation it requires time for adjustment. Particularly where skilled labors are scarce such as in El Salvador, extra time requirement should be given for production adjustment. In this project extra time requirement is estimated a few years.

It is not an extraordinary thing for any new production operation to except a few loosing years in the beginning period of production. Nonetheless, it is also very important to estimate how many years it should take for the production operation to come out net profits. For this reason, appropriate production schedules are required. At the same time, problems may be pointed out as to the feasibility of wrench production in El Salvador when profitability of the operation is examined based on various production schedules.

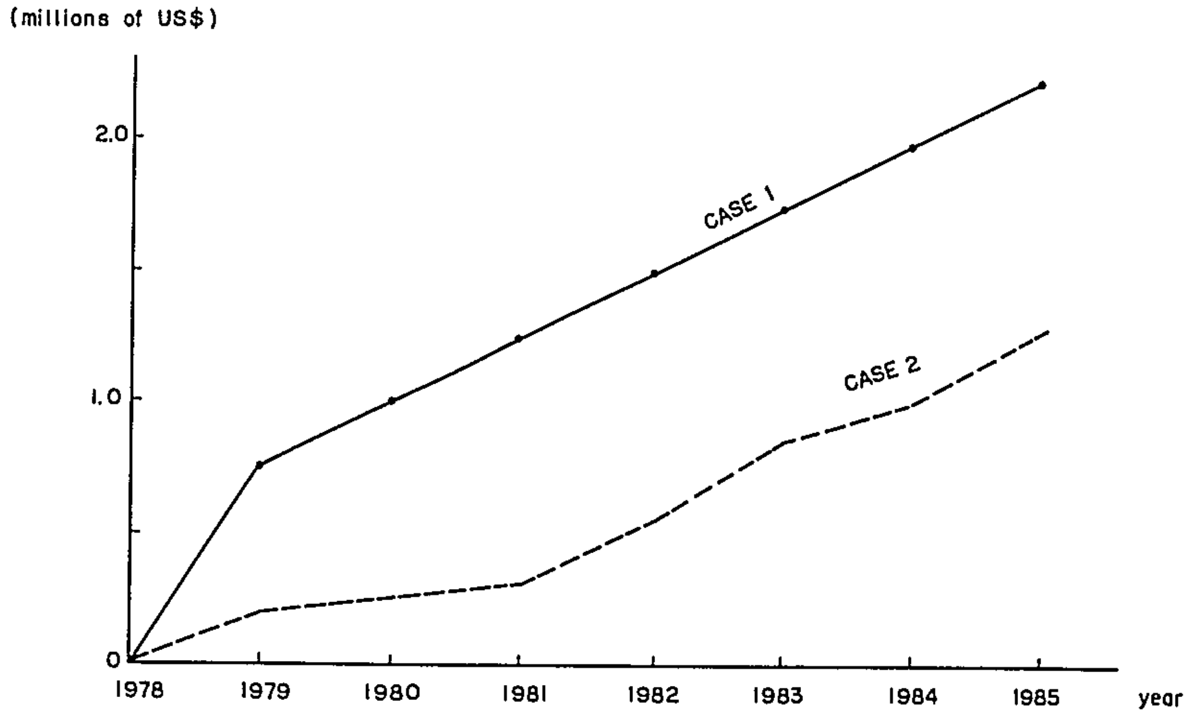
For this project all the wrench products produced in El Salvador are assumed to be exported to the US. Thus, demand estimates of the US wrench market become an important decision factor for the full scale production. In reality it is quite difficult to pinpoint the exact time schedule when to start the full scale production. Thus, optimistic and pessimistic cases may be considered. In examining these two cases, the timing of the full scale production may be assumed to lie somewhere between the two extreme cases. As the optimistic view, the full scale production is assumed to start from the very beginning of production, namely, in 1979. The production output is also considered to correspond to demand estimated of the US market which were given in Table IV-3-5. The pessimistic view is such that from 1979 to the first half of 1982 production output is assumed to be half of estimated demand of the US market. From the second half of 1982 the full scale production is scheduled to take place. These are summarized in Table IV-3-9 and Figure IV-3-4.

Table IV-3-9 Estimated Annual Production Schedules

(in 1,000 US dollars)

	1979	1980	1981	1982	1983	1984	1985
Case 1	750	950	1,200	1,450	1,700	1,950	2,200
Case 2	190	240	300	546.7	850	976.7	1,100

Source: Table IV-3-6



Source : Table IV-3-9

Figure IV-3-4 Estimated Annual Production Schedules

(2) Major Production Costs

(a) Raw Materials

Raw materials of wrenches are special steel, a Chromium Molybdenum steel. As the Chromium Molybdenum steel is not produced in El Salvador, they must be imported. The other materials which must be imported are chemicals used for the plating process and others.

(b) Labor Costs

The allocation of labor to each production process, an office, and management positions are presented in Table IV-3-10. Except managerial positions hourly wage rates are assumed. 40 hours per week are set as

Table IV-3-10 Estimated Labor Requirement

	Total	Sub-total	Skilled Labor	Unskilled Labor
Mangement	4			
Production Line	51			
Forging		12	5	7
Heat Treatment		4	1	3
Die Manufacturing		4	1	3
Grinding		4	1	3
Plating		6	1	5
Water Treatment		2	1	1
Inspection		3	1	3
Transportation		4	1	3
Miscellaneous		12		12
Sales Force	3			
Office Workers	6		1	5
Sub-total			13	44
Total	64			

Source: The JICA mission

the standard weekly working hours, and annually 38 weeks are assumed for actual labor. The number of working weeks is calculated from the information that about 260 days are average annual working days of laborers in El Salvador. The working days of labor in El Salvador are much less than these of laborers in other countries, but this is the working tradition in El Salvador, which cannot be changed overnight. Also, the wage rates of white-collars are better than those of blue-collars, which has been traditionally practiced in El Salvador. Table IV-3-11 below indicates total wage and salary payments when full scale production is in progress: otherwise,

Table IV-3-11 Estimated Wage Payment

(in US dollar)

	Annual Total Payment	Annual Wage Payments	No. of Workers	Average Wage $/h
Management	96,000		4	
Production Line	75,240			
Skilled Labor		45,600	12	2.5
Unskilled Labor		20,640	39	0.5
Sales Force	6,080	6,080	3	1.3
Office Workers				
Skilled Labor		6,080	1	4.0
Unskilled Labor		8,867	5	1.7
Total	192,267		64	

Source: The JICA mission

wages and salaries may be reduced or even the number of laborers may be reduced. In this wages and salaries, bonus payments are not included. However, bonus payments have been practiced in El Salvador so if conditions allow, bonus payments should be included. Also, as production increases, labor productivity may increase. If so, wage rates should increase accordingly. From these reasons, wages and salaries payments are assumed to increase 4% p.a. in real term.

(c) Technical Assistance Fees

Considering the conditions of industrial locations of El Salvador, one expects that the timing of full scale production depends on whether appropriate technical assistance is available before and after the opening of production. In this report it is assumed that technical assistance is provided by a Japanese wrench maker. The term "technical assistance" includes on the job training both in El Salvador and in Japan. The training experts are to be dispatched to El Salvador. For the training in Japan about 10 El Salvadorians should be selected to visit Japan. Costs incurred by training must be born by the wrench maker in El Salvador. In addition approximately US$83 thousands worth technical asistance fees are expected to be paid by the El Salvadorian wrench manufacturer. They are to be paid by the five equal annual installment payments. The amount of technical fees is the figure estimated by experts in Hand Tool industry in Japan. Costs incurred by training may be later substituted by the aids from either UN organizations or official technical assistance treaties. Thus, the actual amount of costs of training is not included in the computation.

(d) Depreciation, Fringe Benefit Payments and Other Costs

- o The rate of depreciation is set forth as 10% of fixed assets.
- o Fringe benefits such as workers compensations are legally set forth as 14% of total wage payments.
- o The rates of interest are assumed to be 8% p.a. for the long-term loans and 13% p.a. for the short-term loans.
- o Corporate income tax is also legally set forth.
- o Other costs are computed, based on costs structures observed at Japanese wrench manufacturers.

(3) Estimated Profit and Loss Statements

Tables IV-3-12 and IV-3-13 are the estimated profit and loss statements of the wrench manufacturing company in El Salvador, based on the information given above. Table IV-3-12 shows the case (1) where full scale production starts from the opening of the plant in 1979, whereas Table IV-3-13 indicates the case (2) where the production schedule is such that until the first half of 1982 production faces difficulty.

Table IV-3-12 Profit and Loss Statement (Case I) (in 1,000 US dollars)

	1979			1980			1981			1982			1983			1984			1985		
Revenue	190.0			240.0			300.00			546.67			850.0			976.67			1,100.00		
Less																					
Operating Expenses	277.82			321.76			372.09			534.02			694.87			755.05					
Materials		70.0			88.42			110.52			20.139			297.48			341.81		805.85	363.40	
Materials			64.52			81.50			101.88			185.65			274.23			315.09			354.88
Others			5.47			6.91			8.64			15.74			23.26			26.72			8.52
Personnel Expenditure		141.35			158.42			173.27			20.140			224.92			233.92			243.27	
Technical Assistance Fees		16.67			16.67			16.67			16.67			16.67			0			0	
Sales Expenditure		9.12			11.52			14.40			26.24			38.76			44.53			50.16	
Advertising			1.14			1.44			1.80			3.28			4.85			5.57			6.27
Travelling			0.76			0.96			1.20			2.19			3.23			3.71			4.18
Communications			0.57			0.72			0.90			1.64			2.42			2.78			3.14
Others			6.65			8.40			10.50			19.13			28.26			32.47			36.58
Others		40.69			48.35			57.23			88.33			119.04			44.53			149.01	
Maintenance			1.32			1.92			2.40			4.37			6.46			7.42			8.36
Utilities			3.04			3.84			4.80			8.75			12.92			14.85			16.72
Insurance			0.57			0.72			0.90			1.64			2.42			2.78			3.14
Employee's Benefits			19.79			21.95			24.23			28.20			30.21			32.75			34.06
Office Supplies			1.33			1.68			2.10			3.83			5.65			6.49			7.32
Office Operating Expenses			3.61			4.56			5.70			10.39			15.34			17.62			19.86
Direct & Indirect Taxes			0.95			1.20			1.50			2.73			4.04			4.64			5.23
Others			9.98			12.48			15.60			28.43			41.89			48.24			54.34
Gross Profit	87.82			81.76			72.09			12.64			153.13			221.60			294.15		
Less																					
Depreciation & Interest Payments	160.0			172.15			173.86			177.12			174.49			173.98			174.99		
Depreciation		72.69			109.36			109.36			109.36			109.36			109.36			109.36	
Interests		50.61			62.79			64.50			67.76			65.13			54.62			65.63	
Long-Term Loans			43.74			54.88			55.27			54.67			48.15			43.74			43.74
Short-Term Loans			6.87			7.97			9.22			13.09			16.98			20.88			21.88
Net Profit Before Tax	247.80			253.91	253.91		245.95			164.48			21.37			47.62			119.16		
Less																					
Income Tax	0					0				0			0			9.97			15.27		
Net Profit After Tax	247.80			253.91	253.91		245.95			164.48			21.37			37.65			103.99		

Source: The JICA Mission

Table IV-3-13 Profit and Loss Statement (Case 2) (in 1,000 US dollars)

	1979			1980			1981			1982			1983			1984			1985		
Revenue	750.0			933.3			1,200.0			1,450			1,700			1,950			2,200		
Less																					
Operating Expenses	610.8			716.7			853.83			988.3			1,121.8			1,258.49			1,377.5		
Materials		262.3			232.5			420.0			507.5			595.0			682.5			770.0	
Materials			242.0			306.5			387.1			467.8			548.5			629.11			709.8
Others			20.55			26.0			32.8			39.7			46.5			53.4			60.2
Personnel Expenditure		192.3			200.0			208.0			216.27			224.92			233.9			243.3	
Technical Assistance Fees		16.7			16.7			16.7			16.7			16.7			16.7			16.7	
Sales Expenditure		34.2			43.3			54.72			64.6			77.5			88.92			100.3	
Advertising			1.3			5.4			6.84			8.3			9.69			11.1			12.54
Travelling			2.85			3.6			4.56			5.51			6.46			7.41			8.36
Communications			2.2			2.7			3.42			4.1			4.8			5.6			6.27
Others			24.9			31.6			39.9			48.2			52.5			64.8			73.15
Others		105.29			127.3			154.5			181.8			207.7			236.5			264.0	
Maintenance			5.7			7.2			9.12			11.02			12.92			14.82			16.72
Utilities			11.4			14.4			18.24			22.04			25.84			29.64			33.44
Insurance			2.1			2.7			3.42			4.1			4.8			5.6			6.27
Employee's Benefits			26.9			28.0			29.1			30.3			30.0[illegible]			32.75			34.1
Office Supplies			5.0			6.3			7.98			9.6			11.3			13.0			14.6
Office Operating Expenses			13.5			17.1			21.66			26.2			30.7			35.2			39.7
Direct & Indirect Taxes			3.6			4.5			5.7			6.9			8.1			9.3			10.5
Others			37.05			46.9			59.28			71.6			53.98			96.33			108.7
Gross Profit	139.1			230.3			346.17			461.7			578.2			691.51			822.5		
Less Depreciation & Interests Payments	170.2			172.6			175.68			178.6			181.9			182.89			188.2		
Depreciation		109.4			109.4			109.4			109.4			109.4			109.4			109.4	
Interests		60.69			63.2			66.3			69.4			72.6			73.5			78.8	
Long-Term Loans			43.7			43.7			43.7			43.7			43.7			43.7			43.7
Short-Term Loans			16.9			19.5			22.6			25.69			28.8			29.8			35.1
Net Profit Before Tax	30.96			37.7			170.49			282.9			336.3			508.62			634.3		
Less																					
Income Tax	0			6.1			23.0			39.83			56.84			79.1			97.9		
Net Profit After Tax	30.96			31.6			147.5			243.1			339.4			429.5					

Source: The JICA Mission

In each Table the profit and loss statement is prepared annually so on continuous relation is assumed between consecutive years.

6) An Examination of Profitability

(1) Net Profit after Tax

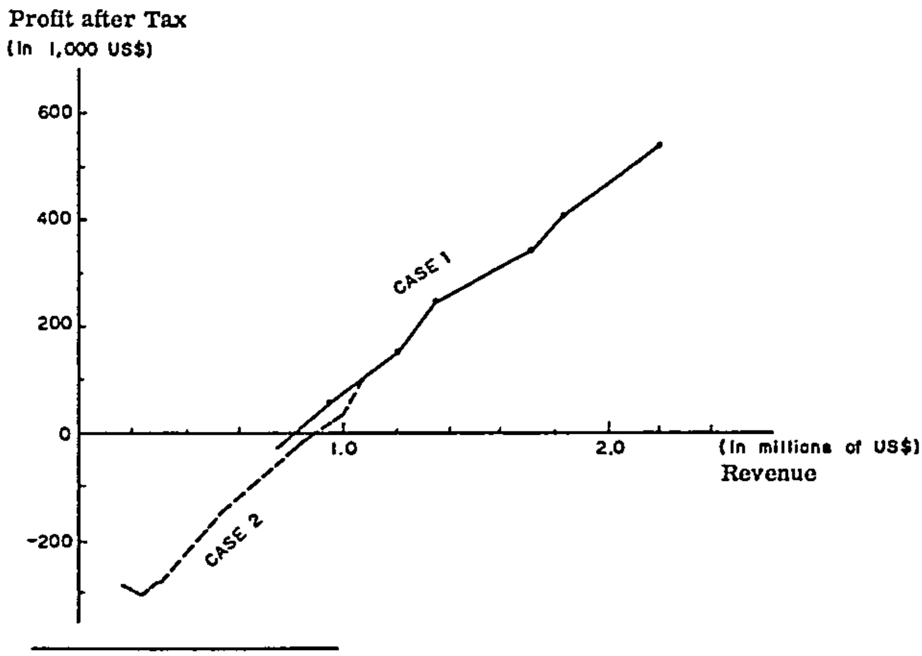
The comparison between revenue and net profit after tax for the two cases is listed in the following Table IV-3-14. The results of the comparison are also presented in Figure IV-3-5 where the revenue is measured on the horizontal axis and the net profit after tax on the vertical axis. As can be seen from the

Table IV-3-14 Estimated Profit and Loss Statements

(in 1,000 US dollars)

		1979	1980	1981	1982	1983	1984	1985
Case 1	Revenue	750.0	950.0	1,200.0	1,450.0	1,700.0	1,850.0	2,200.0
	Profit[1]	31	51.7	147.5	243.0	339.8	408.6	536.3
Case 2	Revenue	190.0	240.0	300.0	546.7	850.0	976.7	1,100.0
	Profit (Loss)	246.7[2]	253.9[2]	246.0[2]	163.3[2]	21.4[2]	37.7[1]	100.9[1]

Source: Table IV-4-12,13
Note 1: Profit after corporations' income tax.
Note 2: indicated loss.



Source: Table IV-4-14

Figure IV-3-5 Trends of Profit and Loss

Figure, the wrench manufacturing company must have revenue, ranging from US$600 thousands to 1 million, in order to make a positive net profit after tax as a private firm. In other words, it becomes the urgent problem for the wrench makes in El Salvador as to how soon it can reach the level of revenue of the specified range for profitability.

(2) DCF Analysis

Generally capital investment on a certain project raises a condition concerning the efficiency of investment. The condition is that there must be certain amount of returns on investment. Let investment be I, the rate of interest in the capital market be r, the periods in which the project are scheduled to last be n. Then the sum S of the principal and the interest payments after n years may be expressed as follows:

$$S = I \cdot (1 + r)^n \qquad \ldots \qquad (1)$$

The condition of capital investment is such that the sum of the principal and the interest payments S must be recovered by the end of the nth year. Conversely, S means to the investment project manager the total cost of raising the investment funds. Therefore, the responsibility of the manager is to produce the sum of profits equal to S, which becomes a necessary condition for the investment project. Thus, if R_i is designated as profits of the ith year ($i = 0, \ldots, n$) and TR as the sum of the profits for n years,

$$TR = R_0 (1 + r)^n + R_1 (1 + r)^{n-1} + \ldots + R_n (1 + r)^0 \qquad \ldots \qquad (2)$$

The efficienty of the investment project can be derived from comparing Eq. (1) and (2). Lte the accumulated net profit of the project be NP, then

$$NP = TR - S \qquad \ldots \qquad (3)$$

Eq. (3) shows, assuming that the project continues for n years, the final financial result of the project. TR is the accumulated profits whereas S is the accumulated investment cost for n years. Thus, if NP is equal to zero, profits and costs of this project balance. This guarantees the efficiency of investment. If NP is positive, this investment results in net positive profits even if the total investment funds are raised in the capital market with the going rate of interest of r. In other works, if NP is positive, the rate of returns on the investment becomes greater than the market rate of r. Conversely, if NP is negative, the rate of returns on investment becomes smaller than the going rate of the interest rate in the capital market. Thus, investment efficiency becomes doubtful. The investment funds to be raised should move to some other projects which may bring forth the rate of returns on investment equal to or greater than r.

Eq. (3) aims at the evaluation of the investment efficiency at the end of the nth year. However, the evaluation of the investment project should be done hopefully before actual investment may take place. Thus, dividing both sides of Eq. (3) by $(1 + r)^n$ and substitute Eqs. (1) and (2), the following equation can be obtained:

$$\frac{NP}{(1+r)^n} = -I + R_0 + \frac{R_1}{(1+r)} \cdots\cdots\cdots\cdots + \frac{R_n}{(1+r)^n} \quad \cdots \qquad (4)$$

Eq. (4) indicates the discounted values of a stream of profits so Eq. (4) is generally called the net discounted present value of returns (NDPV). Using Eq. (4) for the evaluation of investment sufficiency, it is called Discounted Cash Flow (DCF) analysis.

The first problem concerning DCF analysis is the definition of profits R. In accounting, profits are derived by subtracting depreciation costs as well as interest costs. However, from Eqs. (1), (2) and (3) it is apparent that to subtract depreciation costs and interest rates is a clear case of double accounting. Accordingly, profits in DCF analysis is equivalent to the difference between gross profits in accounting and taxes such as corporate income tax and sales tax. Depreciation charges and interest payment have to be included in R. The annual flow of profits thus obtained is called cash flow and to discount cash flow at the present value is the case of DCF analysis.

The second problem of DCF analysis is the market rate of interest of r. Up to Eq. (4) it has been argued that there exists such an interest called the market rate of interest. This "market rate of interest" generally means the opportunity costs of investment. However, in developing countries where financial markets have not been well developed, it is quite difficult to choose an interest rate which may represent the opportunity cost of financial funds. In this report, the rate of interest for the short-term is assumed 8% p.a. while the rate of interest for the long-term is assumed 13% p.a. However, considering uncertainties and risks in the future and shortages in financial funds, the market rate of interest was decided as 15% p.a. for DCF analysis. Thus, 15% p.a. is used as the discount rate in this report.

As a special case of the discount rate, there is a rate called an internal rate of returns (IRR). IRR is the discount rate which equalizes costs of raising investment funds to total profits. In other words, to seek IRR, let the left hand side of Eq. (4) be zero and solve Eq. (4) in terms of r. The r thus obtained is IRR. IRR can be greater or smaller than or equal to the market rate of interest.

As is obvious, the efficiency of investment may be also decided by comparing IRR with r which is assumed to be the market rate of interest. If IRR is smaller than r, the investment does not have enough returns so investment funds should be allocated to some other projects, and vice versa.

Based on the information given above, DCF analysis was applied to the wrench manufacturing project in El Salvador. The results are shown in Tables IV-3-15 and IV-3-16. Table IV-3-15 corresponds to the case (1) discussed in the previous section and Table IV-3-16 to the case (2), respectively.

Table IV 3-15 DCF Analysis for the Case (1)

	1979	1980	1981	1982	1983	1984	1985
Revenue	750.00	950.00	1200.00	1450.00	1700.00	1950.00	2200.00
Costs	610.00	719.00	855.00	988.00	1121.00	1242.00	1377.00
Materials	2262.00	332.00	420.00	507.00	595.00	682.00	770.00
Personnel Exp.	192.00	200.00	208.00	216.00	225.00	234.00	243.00
Technical Fees	17.00	17.00	17.00	17.00	17.00	0.0	0.0
Sales Exp.	34.00	43.00	55.00	66.00	76.00	89.00	100.00
Others	105.00	127.00	155.00	182.00	208.00	237.00	264.00
Gross Profit	140.00	231.00	345.00	462.00	579.00	708.00	823.00
Depreciation	109.40	109.40	109.40	109.40	109.40	109.40	109.40
Interest Payment	60.72	63.26	66.38	69.47	72.62	75.74	78.89
Long-Term Loans	43.76	43.76	43.76	43.76	43.76	43.76	43.76
Short-Term Loans	16.96	19.50	22.62	25.71	28.86	31.98	35.13
Profit Before Tax	-30.12	58.34	169.22	283.13	396.98	522.66	634.71
Corp. Income Tax	0.0	1.46	4.23	7.08	9.92	13.07	15.87
Net Profit	-30.12	56.88	164.99	276.05	387.06	509.79	618.84
Dividends	0.0	11.38	33.00	55.21	77.41	101.96	123.77
Retained Earnings	-30.12	45.51	131.99	220.84	309.64	407.83	495.07
Cash Flow	140.00	229.54	340.77	454.92	569.08	694.93	807.13

DCF Analysis

Discount Rate is 15.00%
Initial Investment is 1094.00
Discounted Net Present Value (DNPV) is 572.27
Internal Rate of Return (IRR) is 26.67%
DNPV at IRR is 0.98

Source: The JICA Mission

Table IV-3-16 DCF Analysis for the Case (2)

	1979	1980	1981	1982	1983	1984	1985
Revenue	190.00	240.00	300.00	547.00	850.00	977.00	1100.00
Costs	278.00	322.00	372.00	498.00	601.00	711.00	805.00
Materials	70.00	88.00	111.00	166.00	201.00	297.00	363.00
Personnel Exp.	141.00	157.00	173.00	201.00	225.00	234.00	243.00
Technical Fees	17.00	17.00	17.00	17.00	17.00	0.0	0.0
Sales Exp.	9.00	12.00	14.00	26.00	39.00	45.00	50.00
Others	41.00	48.00	57.00	88.00	119.00	135.00	149.00
Gross Profit	-88.00	-82.00	-72.00	49.00	249.00	266.00	295.00
Depreciation	109.40	109.40	109.40	109.40	109.40	109.10	109.10
Interest Payment	52.83	53.93	55.20	57.90	59.81	63.23	65.
Long Term Loans	43.76	43.76	43.76	43.76	43.76	43.76	43.76
Profit Before Tax	-250.23	-25	-236.60	-118.30	79.79	93.37	119.91
Corp. Income Tax	0.0	0.0	0.0	0.0	1.99	2.33	3.00
Net Profit	-250.23	-245.33	-236.60	-118.30	77.79	91.04	116.94
Dividends	0.0	0.0	0.0	0.0	15.56	18.21	23.39
Retained Earnings	-250.23	-245.33	-236.60	-118.30	62.23	72.83	93.55
Cash Flow	-88.00	-82.00	-72.00	49.00	247.01	263.67	292.00

DCF Analysis

Discount Rate is 15.00%
Initial Investment is 1094.00
Discounted Net Present Value (DNPV) is -905.28
Internal Rate of Return (IRR) is -0.00%
DNPV at IRR is -488.90

Source: The JICA Mission

From Table IV-3-15, the following observations may be obtained:

o Even with the 15% p.a. discount rate DNPV becomes positive so the project, even borrowing funds with a 15% p.a. interest rate, will pay off by itself.

o IRR is 25.1% p.a. so the returns on investment is 25.1% at the maximum.

From Table IV-3-16, DNPV becomes negative. Thus, financial-wise the project does not have merits for investment.

(3) Sensitivity Analysis

In DCF analysis discussed above, the discount rate is given as a parameter and other cost conditions are assumed to be known beforehand. However, if the project continues at least till 1985, there are some uncertainties. Thus, the conclusions obtained above for the project may not be held until 1985. In order to make it sure that profitability as well as investment efficiency are as good as predicted, one more step may be considered. This is called sensitivity analysis. In sensitivity analysis major cost items are selected to measure the effects of changes in these items on profitability as well as investment of the project. Major cost items selected in thie report are: (1) costs of raw materials, (2) wages of labor, (3) the rate of depreciation allowance, (4) the short- and long-term interest rates, and (5) corporate income tax rates. These items are changed within presumably appropriate ranges and the effects of the changes of these items on IRR or DNPV are computed and listed in the following Table IV-3-17.

Table IV-3-17 Sensitivity Analysis

	Change in DNPV[1] (%)	Change in IRR[2] (%)
1. Increase in Cost of Materials by 15%	-52	-20
2. Increase in Personnel Expenditure by 15%	-24	-10
3. Increase in Depreciation Rate by 100%	10	4
4. Increase in Interest Rates by 50%	4	1
5. Increase in Tax Rates by 100%	-30	-11

Source: The JICA mission
Note 1: The original DNPV US$479,000
Note 2: The original IRR 25.1%

From Table IV-3-17, the strongest effect on profitability of the project is seen to be caused by costs of materials. This result is somewhat predicted since costs of materials share about 35% of the total costs. An 15% increase in prices of materials causes a 52% decrease in DNPV at the 15% p.a. discount rate. Especially in this case where all materials are assumed to be imported this condition should be taken into account seriously. In other words, there are many factors which would affect the price of materials to increase such as transportation costs, production costs of materials, and other inflationary causes. If they happen, prices of materials would be increased easily by 15%. Thus, to control the prices of materials becomes one of the key factors for a successful operation of the project.

Increase in labor costs by 15% seems to have also a significant effect. However, labor costs have been calculated by already including an annual 4% increase so the effect of 15% increase in labor costs mean 19.6% annual increase labor costs. Also, as production continues, labor productivity may also increase to offset partially a 20% increase in labor costs. From these reasons, increase in labor costs does not have significant effects as thought at the first sight.

Increase in corporate tax rates has almost the same effect as that of labor costs. This means, however, that even if tax rates may be doubled in the near future the profitability of the project seems guaranteed.

It can be seen from the Table that the effects of changes in the rates of depreciation and interest tend to increase profitability of the project. These results are expected since increases in these rates reduce the amount of taxable profits, which in turn reduce corporate income tax and increase the profits R of DCF analysis. However, profits in terms of accounting will naturally decrease.

7) Problems of the Wrench Manufacturing Firm in El Salvador

It seems to be the conclusion of the project that establishing a wrench maker in El Salvador may result in sufficient profitability and returns on investment. However, one should bear in mind that the conclusion is based on many conditions. Among these conditions perhaps the most significant one is the assumption of smooth transfer of wrench manufacturing technologies to El Salvador. In the case (2) discussed above the longer the time requirement to full scale production the more doubtful the profitability of the project. The smooth technological transfer is also required because the major market set for the project is the US market. If technological transfer is carried out successfully with Japanese technical assistance and quality of products are quite similar to those made in Japan, it is possible to sell products of El Salvador with the distribution net works of Japanese products in the US. Otherwise one must think of difficulties to market the products made in El Salvador, since the products will face been competition from those made in Korea, Taiwan, Singapore and so on. Thus, before and alter the opening of production some detailed plants for technical training must be drawn. After the beginning of production to secure materials is also a significant factor to affect the profitability of the project.

4. Compressor (for Refrigerator) Manufacturing Industry

1) Types of Compressors

(1) Types of Compressors Currently Used in CACM Countries

There are two refrigerator assembly companies (INDECA and PRADO) in El Salvador. However, compressors which are considered as the heart of refrigerators are not produced in El Salvador and are all imported. Estimated imported quantities of compressors in El Salvador are shown in Table IV-4-1.

Table IV-4-1 Estimated Import of Compressors in El Salvador in 1977

	Units
Total Imports	35,000
Imports by INDECA	20,000
Imports by PRADO	15,000
Imports from Japan	15,000
75W - 125W	10,000
140W - 175W	5,000

Source: The JICA Mission

Table IV-4-1 indicates that compressors used in El Salvador is a small size of 100 W or so, which in turn indicates that refrigerators to be assembled in El Salvador are also of a small type.

Data concerning the usage of compressors in other countries except Costa Rica could not be obtained even at the field investigation. Estimated import figures of compressors in Costa Rica look like those shown in Table IV-4-2.

Table IV-4-2 Estimated Import of Compressors in Costa Rica in 1977

	Units.
Total Imports	30,000
Imports by Atlas	20,000
Imports by Recasa	10,000
Imports from Japan	30,000
75W - 125W	26,000
140W - 175W	4,000

Source: The JICA Mission

(2) Types and Specifications of Compressors in the Future

Changes in the type of compressors in the future are closely related to changes in demand for refrigerators. If the standard size of 400 m^3 refrigerators commonly used in the US become in demand in the area, capacity of compressors must be enlarged. However, as the average income levels of Costa Rica or El Salvador are not expected to rise sharply in a short period of time, the size of refrigerators currently demanded in these countries will not change drastically. Thus, if an assembly plant for the empressors is to be built in El Salvador, the major product will be the compressors with about 125 W output.

2) Production Scale

(1) Demand Estimates for Compressors in El Salvador and Costa Rica

Demand for the compressors may be classified into two groups; one is demand for compressors to be built into new refregirators. The other kind of demand is derived from necessity to replace old compressors already built in the old refrigerators. Demand estimates for compressors are listed in Table IV-4-3 according to the type of demand, countries and specifications.

Table IV-4-3 Estimated Demand for Compressors

		1980	1981	1982	1983	1984	1985
Demand for New Products	El Salvador	45,000	47,000	49,000	51,000	53,000	55,000
	Costa Rica	40,000	41,000	42,000	43,000	44,000	45,000
Demand for Service Exchange		15,000	16,000	17,000	18,000	19,000	20,000
Total		100,000	104,000	108,000	112,000	116,000	120,000
Classification by Types	75W-125W	75,000	76,000	77,000	78,000	79,000	80,000
	140W-175W	25,000	28,000	31,000	33,000	37,000	40,000

Source: The JICA Mission

The figures in Table IV-4-3 are based on the information given by Table IV-4-2 and on estimate imported compressors with 125 W or so. Though there should be some differences in these figures since they are estimated, it should be born in mind that demand for the compressors in 1985 barely reaches 120 thousands units. On the other hand, it is said that economies of scale in production of the compressor can be obtained by the minimum output of 1,200 thousand units.

The sum of demand for the compressors in El Salvador and Costa Rica is only one-tenth of the minimum output requirement for an economical operation. The smallness in size of demand for the compressor may become the major reason for the unsuccessful operation for the proposed project.

(2) Possibilities of Exportation of the Compressors to the Outside of the CACM Region

The compressor is the most important part of the refrigerator. Also, the compressor is built and fixed into the refrigerator by welding so it is not easy to take it out from the refrigerator nor to replace it once it is attached. Thus, makers of the refrigerator seek reliable suppliers or manufacturers of the compressor. Accordingly, the compressor as a product must have high quality so usually a close relation is established between the compressor supplier and the refrigerator maker. From these reasons, it should take a considerable amount of time for any compressor maker in El Salvador to establish its brand image on the product even though it produces high quality products. Thus, even if quality and price of the product are the same, it faces a tough job to elbow through the existing close relationship already established between the compressor maker and the refrigerator maker.

In a case when the product is in high quality but the price may be higher or equal to, the preferential tariff treatment of the US may be considered. However, to utilize the preferential tariff treatment of the US may not be so easy as it looks. First, as mentioned above, it is difficult to break into the established relationship between the compressor supplier and the refrigerator manufacturer. Second, the type of the compressor to be assembled in El Salvador is different from the compressor usually demanded by the refrigerator makers in the US for the standard size of 400 m^3. The capacity of the compressor supposed to be producted in El Salvador has 125 W or so which is suitable for the refrigerator of the size somewhere between 120 and 177 m^3. The compressor should be technically made differently if they are to be exported to the US. Third, it is not only El Salvador but also other countries which can use the US preferential tariff treatment. In developing countries where production of the compressors have already started, the competition with these products become a big problem. From these reasons, it seems almost impossible for the compressor maker in El Salvador to export its product to the outside of the CACM region.

(3) Production Scale

The information given above indicates the appropriate production scale of the compressor in El Salvador, which is shown in Table IV-4-4. Considering domestic demand for the compressor in El Salvador, about one-half of the output must be exported to Costa Rica.

Table IV-4-4 Estimated Production Quantities

	1980	1981	1982	1983	1984	1985
Output	40,000	70,000	100,000	120,000	120,000	120,000

Source: The JICA Mission

3) Types of Production

(1) Types of Production

Continuous production (CDP) of the compressor from raw materials to the finished goods requires high technical skills of machining so it seems quite difficult to establish this type of production facilities in El Salvador from the biginning. Therefore, production starts with SKD, shifts to CKD, and finally should become CDP.

(2) Production Schedules

In order to determine production schedules the problem is to find the length of time required in order to shift the type of production from CKD to SKD and to CDP. From overseas experiences of a Japanese compressor maker it should take about five years before CDP can be in operation after production started with SKD. The production schedule is shown in Table IV-4-5. Without saying the shift of types of production shown in Table IV-4-5 is clearly based on the assumption that technological transfer will be carried out smoothly.

Table IV-4-5 Production Schedule

	1980	1981	1982	1983	1984	1985
Annual Output	40,000	70,000	100,000	120,000	120,000	120,000
Schedule 1[1] (SKD)	——→					
Schedule 2[2] (CKD)	——	——→				
Schedule 3[3] (CKD)	——	——	——→			
Schedule 4[4] (CKD)	——	——	——	——→		
Schedule 5[5] (CKD)	——	——	——	——	——→	
Schedule 6[6] (CDP) (Complete Production)	——	——	——	——	——	——→

Source: The JICA Mission

Note 1: Schedule 1 indicates SKD, which includes processes of assembly, welding and curing.
2: Shell-Press welding is added to the assembly process.
3: Machining is partially added to the assembly process.
4: Machining is further added to the assembly process.
5: Manufacturing of electric motors is added to the assembly process.
6: Total production.

4) Plant and Equipment Investment

(1) Plant Site and Plant Building

Plant should be constructed with the anticipation of the 1985 production scale so land for the plant site is estimated to require some 16,000 m^2 and plant building should be constructed to have a floor space of 7,475 m^2. Auxiliary facilities such as fences, roads, sewages, etc. should be constructed together.

(2) Utilities and Equipment

Electrical wiring and piping of gas and water supply will be included in the plant construction costs.

Equipment will be continuously added to the production line since production will shift from SKD to CKD and to the completely continuous production. The total equipments required are listed in the following Table IV-4-6.

Table IV-4-6 Estimated Equipments

(in US$1,000 CIF priced plus installation fees)

Production Schedule[1]	Manufacturing Process	Equipment Expenditures
Schedule 1	Assembly Line	492.41
	Welding, Curing and Inspection	907.85
Schedule 2	Shell-press Welding Line	1,686.22
Schedule 3	Block Processing Line	951.61
	Upper Bearing Line	251.27
	Cylinder Head Line	155.21
	Jigs and Inspection Tools	413.61
Schedule 4	Crank Shaft Processing Line	918.89
	Piston and Pistonpin Processing Line	455.07
	Control Plate Processing Line	298.22
	Valve Plate Processing Line	151.36
Schedule 5	Motor Processing Line	1,722.59
Total		8,404.32

Source: The JICA Mission

Note 1: Production schedules in this table correspond to these presented in Table IV-4-5.

(3) Investment Schedule

Plant and equipment investment expenditures are shown in Table IV-4-7. The sum of expenditures for five years is estimated to reach about US$12 millions. Since investment expenditures will be spread to five years, the recovery period of investment should become longer and investment efficiency is expected to have a tendency to get worse.

5) Personnel Planning

(1) Labor Requirement

Based on the information obtained so far, labor requirement may be shown as in Table IV-4-8. In the Table both these hired in El Salvador and these sent

Table IV-4-7 Estimated Investment Expenditures and Investment Plan

(in US$1,000)

	1979[1]	1980	1981	1982	1983	1984
Land[2]	249.60					249.60
Building[3]	1,184.80					1,184.80
Auxiliary Equipment	218.51					218.42
Wiring, Piping, etc.	1,285.00	169.00	177.50	182.50	172.50	1,986.50
Equipments	1,400.27	1,686.22	1,771.70	1,823.55	1,722.59	8,404.32
Total	4,338.18	1,855.22	1,949.20	2,006.05	1,895.09	12,043.64

Source: The JICA Mission

Note 1: Each year indicates the periods when actual investment taken place so increases in production capacity should be realized in the next year.

2: Estimated price of land is 15.6 US$/$m^2$ and it is estimated to obtain 16,000 m^2.

3: Estimated floor space in the plant is 7,475 m^2.

Table IV-4-8 Estimated Labor Requirement

	1980	1981	1982	1983	1984	1985
Annual Output	40,000	70,000	100,000	120,000	120,000	120,000
Technical Assistance	3	3	3	3	4	4
Managers	2	2	2	3	3	3
Skilled Labor	2	4	5	6	8	8
Unskilled Labor	26	40	60	93	116	116
Sales Force	0	0	1	2	2	2
Office Workers	3	3	4	5	6	6
Total	33	49	72	109	135	135

Source: The JICA Mission

from Japan for technical assistance are shown but figures in total indicate only those hired in El Salvador. What matters here is the number of labor employed, namely, 135 in all. On the other hand, investment totals to US$12 millions. This suggests that compressor manufacturing industry is quite capital intensive and that productivity of capital may be lowered due to the insufficient demand projected. Investment equipment proposed in this report have capacity of two shifts of labor, but only one shift of 135 laborers is scheduled. Yet, it takes the proposed amount of equipment investment to produce merely 120 thousands units of compressors.

(2) Labor Costs

Based on the labor requirement given above, labor costs are calculated and presented in Table IV-4-9.

Table IV-4-9 Estimated Wages and Salaries

(in US$1,000)

	1980	1981	1982	1983	1984	1985
Technical Assistance	120.0	160.0	200.0	200.0	240.0	240.0
Managers	28.9	28.9	28.9	43.3	43.3	43.3
Skilled Labor	11.1	22.1	27.7	33.2	44.3	44.3
Unskilled Labor	81.3	125.1	187.6	290.8	362.7	362.7
Sales Force	0	0	4.2	8.3	8.3	8.3
Office Workers	9.4	9.4	12.5	16.9	18.8	18.8
Total	250.7	345.5	460.9	592.5	717.4	717.4

Source: The JICA Mission

6) Cost Accounting

Cost accounting of the compressors assembled and produced in El Salvador is tried and the results are shown in Table IV-4-10. In the Table the item "Initial Payment" is a part of technical assistance fees (royalty), which is separated from the running royalty. Also, labor costs listed in Table IV-4-10 include those of labors only directly engaged in production so the listed labor costs are lower than those listed in Table IV-4-9. Conversely, the estimated delivery price at factory

Table IV-4-10 Cost Estimates (in US$1,000)

	1980	1981	1982	1983	1984
Output	40,000	70,000	100,000	120,000	120,000
Direct Materials	1,027.5	1,631.0	2,107.0	2,409.2	1,744.8
Direct Labor Costs	81.3	125.1	187.6	290.8	362.7
Direct Expenses	5.3	18.6	40.0	60.0	80.0
Direct Labor Costs	165.4	219.8	270.9	281.9	338.5
Indirect Expenses	6.7	21.0	43.3	68.0	88.0
Depreciation	314.1	499.6	694.5	895.1	1,084.6
Interest	418.1	470.2	600.8	719.0	815.1
Technical Fees	108.8	165.0	218.0	260.8	249.6
Initial Payment	3.7	6.5	9.3	11.2	11.2
Training Fees	3.3	5.8	8.3	10.0	10.0
Production Costs	1,800.9	3,162.7	4,179.8	5,006.0	4,784.5
Estimated Unit Price *	58.8	49.7	46.0	45.9	43.8

Source: The JICA Mission
* : US$/unit

is raised by 10% of costs of include these unaccounted costs. Training fees indicate costs of training of labor in Japan.

From the cost accounting given above, the delivery price at factory runs about US$44 per unit in 1985, which is approximately 60% higher than the currently prevailing international price of the compressor, US$27 per unit. This result throws a doubt about the feasibility of the compressor plant in El Salvador.

7) Problems of Technical Assistance

(1) Technical Assistance

When technical assistance is contracted for the compressor firm in El Salvador, it will be provided along with drawing, specifications, operation manuals, etc. At the same time guidance will be provided with respect to inspection procedure and the methods to reclaim rejected parts. Also, technicians with limited numbers will be dispatched to El Salvador for limited periods.

(2) Dispatch of Technicians

If the general level of skills of laborers in El Salvador is considered, technical assistance must be continued in El Salvador. Thus, dispatching limited numbers of technicians within limited time should be included in technical assistance programs. In this project the following plan may be considered with respect to dispatching technical experts to El Salvador:

Table IV-4-11 Dispatch Schedule of Technical Experts

	men per year
1. Experts required to stay for a long period	
Plant management (production and quality control)	1
Machining and other process experts	2
Motor related experts	1
2. Experts required to stay for a short period	
For each new production line one expert for 6-12 months	2

Source: The JICA Mission

(3) On the Job Training in Japan

It seems insufficient for technical assistance programs only to dispatch technical experts to El Salvador. Some personnels should be sent to Japan for the training on the job. In compressor manufacturing training periods seem rather short. As a method of training, man-to-man on the job seems the best way for the training. The following are the processes which require key operators to be trained in Japan.

Table IV-4-12 On the Job Training in Japan

Job Specification	No. of Trainees	Period of Training (Months)
Assembly Line	1	2-3
Shell Press Welding, Curing	1	"
Inspection, Quality Control	1	"
Machining	2	"
Press	1	"
Electric Motor Assembly	2	"
Total	8	

Source: The JICA Mission

(4) Technical Agreement and Royalty

The mere technical agreement does not seem sufficient for smooth technological transfer. On the job training both in El Salvador and in Japan may be required for positing in production line to managirial positions. At the same time experts for technical and managirial training should be given some authority to control training programs.

For these various kinds of technical assistance royalty must be paid. Royalty may be divided into the initial payment and the running royalty. The running royalty is estimated as 5% of the total revenue, while the initial payment is expected to the US$100 thousands.

8) An Examination of Profitability

Profitability of the compressor producing company in El Salvador and investment efficiency are summarized in Table IV-4-13. In order to prepare the Table the estimated prices at factory shown in Table IV-4-10 were used. Therefore, the results of five years operation turn out to be quite favorable. However, if DCF analysis is applied to the case, DNPV becomes negative with the discount rate of 15% p.a. and IRR is also negative. This is to say that investment efficiency of the project seems unfavorable.

Table IV-4-13 DCF Analysis for Compressor Manufacturing Company

(in US$1,000)

	1980	1981	1982	1983	1984	1985
Revenue	2,351.00	3,479.00	4,600.00	5,508.00	5,260.00	5,260.00
Costs	1,400.00	2,193.00	2,885.00	3,392.00	2,885.00	2,909.00
Materials	1,027.00	1,631.00	2,107.00	2,409.00	1,745.00	1,745.00
Personnel Exp.	245.00	345.00	458.00	573.00	701.00	729.00
Technical Fees	116.00	177.00	236.00	282.00	271.00	261.00
Sales Exp.	7.00	11.00	17.00	20.00	27.00	33.00
Others	5.00	29.00	67.00	108.00	141.00	141.00
Gross Profit	951.00	1,286.00	1,715.00	2,116.00	2,375.00	2,351.00
Depreciation	433.80	619.30	256.83	226.28	212.13	21.21
Interest Payment	217.07	314.15	188.30	189.61	166.56	91.10
Long Term Loans	173.52	247.72	102.73	90.51	84.85	8.49
Short Term Loans	43.55	66.43	85.57	99.12	81.70	82.61
Profit Before Tax	300.13	352.55	1,269.87	1,700.08	1,996.32	2,238.69
Corp. Income Tax	7.50	8.81	31.75	42.50	49.91	55.97
Net Profit	292.63	343.74	1,238.12	1,657.58	1,946.41	2,182.72
Dividends	58.53	68.75	247.62	331.52	389.28	436.54
Retained Earnings	234.10	274.99	990.49	1,326.06	1,557.13	1,746.18
Cash Flow	943.50	1,277.19	1,683.25	2,073.50	2,325.09	2,295.03

DCF Analysis
Discount Rate is 15.00%
Total Investment is 12,043.00
Discounted Net Present Value (DNPV) is -3,600.55
Internal Rate of Return (IRR) is -0.00%
DNPV at IRR is -1,468.23

Source: The JICA Mission

If one compares the result of the profitability analysis with the result of investment efficiency, there seems to be a contradiction. However, there is no contradiction between the two. The reason why the investment efficiency is so low is because investment was spread into five years. The longer the investment period, the longer it takes to recover investment funds. However, in this report only five years are taken for the analysis, which are not sufficient to analyze the investment efficiency completely. Thus, the problem is apparently whether or not the projected good profitability of the compressor firm is based on any realistic conditions.

As seen from Table IV-4-14 below, the projected high profitability of the compressor firm is primarily due to the fact that the factory delivery price was set up to cover the production costs. Thus, the prices are higher by 60% to 120% than these prevailing in the international compressor market.

Table IV-4-14 Comparison Between Estimated Break-Even Price and Market Prices of Compressors

(in US$)

	1980	1981	1982	1983	1984	1985
(1) Estimated Price	58.8	50.0	46.0	45.9	43.8	43.8
(2) Market Price	26.7	26.7	26.7	26.7	26.7	26.7
Ratio (1)/(2)	2.20	1.86	1.73	1.72	1.64	1.64

Source: The JICA Mission

This indicates that production efficiency of the compressor firm in El Salvador is quite low. Conversely, the unit prices are too high. Also, even with these prices there is another assumption that technological transfer will be actually carried out smoothly. The condition may not be realized so easily. From these conditions the feasibility of the compressor plant in El Salvador seems rather doubtful.

9) Other Problems

(1) Economic Conditions

It is the minimum condition for the compressor maker to produce the compressors which have international competitiveness in price and quality because they are internationally traded goods. However, in case of the projected compressor manufacturing in El Salvador prices will be quite higher than the prevailing price so the products will be less competitive in the international market. There are three basic conditions which make the price higher:

1) Production scale is small in size. Appropriate production output is said to be 1-2 million units per year, but the projected output is about 100 thousands units.
2) Production starts with CKD but is scheduled to shift to CDP, continuous production of the compressor from raw materials to finished goods, in a rather short period of time.
3) Related industries have not been well developed. Thus, materials and parts have to be imported from overseas, especially casting items, which are the main parts of the compressor.

(2) Problems of Quality

The compressor is the most vital part of the refrigerator. Thus, quality control is an imperative job for the compressor makers. With the level of skills of labor in El Salvador, quality requirement necessarily raises its costs and hence price.

(3) Problem of Service

Compressor makers are required to provide not only the compressors but also know-how of drawi ng designs of refrigerators. Accordingly, in the distributional channel of the compressor this kind of service is added so price will alos have to increase.

V. IMPACTS OF DEVELOPMENT AND DEVELOPMENT STRATEGIES

V. IMPACTS OF DEVELOPMENT AND DEVELOPMENT STRATEGIES

1. Impacts of Development

1) Measurement of Impacts of Development

In the preceding chapter possibilities of developing four specified industries in El Salvador were examined at the micro level and the profitability of each case planned was analyzed. In this chapter the effects of development of these four industries in El Salvador will be analized at the macro level.

When a brand new industry is established in an economy, the new industry will, in general, affect social and economic affairs of the economy directly and indirectly. As favorate factors among the effects caused by the new industry the followings may be considered:

- Foreign exchange savings due to import substitution
- Foreign exchange earnings due to exportation of the new product and capital inflows for investment
- Introduction of new technology and technological transfer
- Increase in employment opportunity
- Increase in income, consumption, and saving
- Increase in tax revenues
- Investment multiplier effects due to the introduction of a new industry
- Development of infrastructure
- Linkage effects on existing industries

The introduction of new industries may not produce only favorate results but also unfavorate results as well:

- Foreign exchange outflows due to importation of capital equipments and raw materials (including parts)
- Foreign exchange outflows due to the payments of royalty, remittance, etc.
- Tendencies to create monopoly and monopsony
- Various kinds of pollusions
- Unbalanced distribution of resources

Of course, these favorable or unfavorable factors are determined by the kind of the new industry, the investment amount, production scales, the existing national economic policies, etc. Though these factors may occur, the magnitude of each factor cannot be determined straightforwardly, and also not all of them necessarily occur. Therefore, in this chapter, the term "effects of development" may be used in such a way that it indicates the net effects after subtracting unfavorable effects from favorable effects.

2) Impacts on Foreign Exchanges

(1) Foreign Exchange Savings due to Import Substitution

Problems of foreign exchanges have been pointed out by Chenery's Gap theory and others as one of the most important bottlenecks of development and growth of economies in developing countries. The problems are that capital equipments needed for economic development in these countries must be imported and that foreign exchange earnings must depend on exports of income-inelastic primary products. Thus, the foreign exchanges in these countries have been chronically in unfavorable situations. It is a known fact that from this reason Prebish and others have insisted to bring up import substitution industries as the important national economic policy in order to save foreign exchanges.

The specified four industries among the metal-mechanical industry are new to the El Salvadorian economy so if these industries grew in El Salvador import substitution may be realized. These effects are listed in Table V-1-1 for each of the four industries. The figures in the Table are prepared, based on the estimates of imports of each product.

The total imports in El Salvador reached US$0.5 billion in 1975 and are expected to rise to US$1 billion in 1980. From this condition and the results shown in Table V-1-1, it may be concluded that the specified four industries do not show particular characteristics of being import substitute industries.

(2) Foreign Exchange Earnings due to Exportation

After new industries are established and domestic demand is met, possibilities of export of products may appear. As indicated in the previous chapter, the

Table V-1-1 Estimate Foreign Exchanges Possibly Saved because of Import Substitution

(in US$1,000)

	1980	1981	1982	1983	1984	1985	Total
Industry I[1]	12	16	21	27	35	45	156
Industry II[2]	227	230	233	236	239	241	1,406
Industry III[3]	272	299	329	362	398	438	2,098
Industry IV[4]	1,067	1,467	1,534	1,600	1,667	1,734	9,069
Total	1,578	2,012	2,117	2,225	2,339	2,458	12,729

Source: The JICA Mission

Note 1: Wrench manufacturing industry
2: Farm tractor manufacturing industry
3: WHM manufacturing industry
4: Compressor manufacturing industry

US market is considered for wrenches and CACM is considered for the products of other three industries. If foreign market demand is as estimated, expected foreign exchanges gained by exports of the four industries are shown in Table V-1-2.

Table V-1-2 Foreign Exchanges Earnings due to Exportations in New Industries

(in US$1,000)

	1980	1981	1982	1983	1984	1985	Total
Industry I[1]	750	950	1,200	1,450	1,950	2,200	8,500
Industry II[1]	1,798	2,035	2,272	2,509	2,751	2,981	14,346
Industry III[1]	1,634	1,733	1,832	1,931	2,030	2,129	11,289
Industry IV[1]	0	400	1,133	1,600	1,534	1,467	6,134
Total	4,182	5,118	6,437	7,490	8,265	8,777	40,359

Source: The JICA Mission

Note 1: Notations are the same as of Table V-1-1.

The total exports of El Salvador in 1975 was about US$500 millions. The expected export earnings of the four industries are about US$40 millions. For this reason only it can not be concluded that the four industries will become top foreign exchange earning industries in El Salvador. However, foreign exchange reserves of El Salvador were only US$100 millions in 1975 so the estimated earnings of foreign exchanges by the four industries may be considered as significant.

(3) Foreign Exchange Outflows due to Production Activities

When firms start production, foreign exchanges may be affected in various forms. For example, if foreign firms invest in El Salvador inflows of capital invested may occur. On the other hand, outflows of foreign exchanges may be observed because of imports of raw materials and parts, payments of royalty, remittance of profits, etc. The net effects on foreign exchanges due to production activities of the four industries are summarized in Table V-1-3. In preparing

Table V-1-3 Outflows and Inflows of Foreign Exchanges

(in US$1,000)

	1979	1980	1981	1982	1983	1984	1985	Total
Industry I [1]								
Capital inflows	547							547
Equip. imports	-915							-915
Materials	-212	-332	-420	-507	-595	-682	-770	-3,518
Technical fees	-17	-17	-17	-17	-17	0	0	-85
Remittance	0	0	-17	-34	-68	-167	-167	-453
Sub-total	-597	-349	-454	-558	-580	-849	-937	-4,424
Industry II [1]								
Capital inflows	218							218
Equip. imports	-346				-338			-684
Materials		-1,712	-1,925	-2,129	-2,333	-2,542	-2,739	-13,380
Technical fees		-78	-78	-78	-78	-78	-78	-468
Remittance		0	0	0	0	0	0	0
Sub-total	-128	-1,790	-2,003	-2,207	-2,749	-2,620	-2,817	-14,314
Industry III [1]								
Capital inflows	234							234
Equip. imports	-339							-339
Materials		-1,313	-1,400	-1,489	-1,580	-1,673	-1,769	-9,224
Technical fees		-26	-28	-30	-32	-34	-36	-186
Remittance		0	0	0	0	0	0	0
Sub-total	-105	-1,339	-1,428	-1,519	-1,612	-1,707	-1,805	-9,515
Industry IV [1]								
Capital inflows	2,169	928	975	1,003	948			6,023
Equip. imports	-2,685	-1,855	-1,949	-2,006	-1,895		0	-10,390
Materials		-1,027	-1,631	-2,107	-2,409	-1,745	-1,745	-10,664
Technical fees		-116	-177	-236	-282	-271	-261	-1,343
Remittance		-59	-69	-248	-332	-389	-437	-1,534
Sub-total	-516	-2,129	-2,851	-3,594	-3,970	-2,409	-2,443	-17,908
Total	-1,346	-5,607	-6,736	-7,878	-8,911	-7,585	-8,002	-46,161

Source: The JICA Mission Note 1: Notations are the same as of Table V-1-1.

Table V-1-3, it is assumed that all materials and parts are imported and that repayments of the principal of capital investment will not take place during the periods for the analysis.

(4) The Summary of Foreign Exhange Problems

The summary of foreign exchange flows is shown in Table V-1-4, based on the information given above concerning the various effects of the introduction of the four industries into El Salvador on foreign exchange earnings.

Table V-1-4 Estimated Changes in Foreign Exchanges

(in US$1,000)

	1979	1980	1981	1982	1983	1984	1985	Total
Industry I [1]								
Impact substitution		12	16	21	27	35	45	156
Export earnings		750	950	1,200	1,450	1,950	2,200	8,500
Other flows	-597	-349	-454	-558	-580	-849	-937	-4,424
Sub-total	-597	413	512	663	897	1,136	1,308	4,232
Industry II [1]								
Import substitution		227	230	233	236	239	241	1,406
Export earnings		1,798	2,035	2,272	2,509	2,751	2,981	11,346
Other flows	-128	-1,790	-2,003	-2,207	-2,749	-2,620	-2,817	-14,314
Sub-total	-128	235	262	298	-4	370	405	1,438
Industry III [1]								
Import substitution		272	299	329	362	398	438	2,098
Export earnings		1,634	1,733	1,832	1,931	2,030	2,129	11,289
Other flows	-105	-1,339	-1,425	-1,519	-1,612	-1,707	-1,805	-9,515
Sub-total	-105	567	604	642	681	721	762	3,872
Industry IV [1]								
Import substitution		1,576	2,012	2,117	2,225	2,339	2,458	12,729
Export earnings		4,152	5,118	6,437	7,490	8,265	8,777	40,269
Other flows	-516	-2,129	-2,851	-3,594	-3,970	-2,409	-2,443	-17,912
Sub-total	-517	3,631	4,279	4,960	5,745	8,190	8,792	35,086

Source: The JICA Mission Note 1: Notations are the same as of Table V-1-1.

The figures in Table V-1-4 show that as far as expected results of the introduction of the new industries into El Salvador are concerned, the results seem quite favorable to El Salvadorean foreign exchange situations. However, without saying that the favorable results are due to the expected exportation rather than the characteristic of import substitution. Thus, if the estimated foreign market demand is based on loose calculations or is met by insufficient supply of goods by some reasons, the favorable results of the Table may be changed quite easily. Again, the three industries excluding wrench industry resulted in red figures as the results of the projected production operation. This dichotomy, on the one hand the failure as the provate enterprises and on the other, the successful contribution to the economy, may shed some light on the future course of the national economic policy of El Salvador.

The introduction of the new industries affects not only foreign exchange situation but other economic factors as well. In the next section the problems of employment and related matters are discussed.

3) Problems of Employment

One of the basic problems facing developing countries is unemployment (known as well as disguised). Especially in countries where population grows at a rapid rate the problem of unemployment has become a serious problem. Up to now it has been considered that unemployment could be effectively solved by rapid industrialization of the economies. However, quite contrary to what was expected with industrialization policies, rapid industrialization attempts have had a tendency to increase unemployment in these countries. The reasons may be explained as follows: First of all, industrialization starts around urban areas so it draws people from rural areas. This is called the dual structure in developing countries. Secondly, since the national economic development policy has emphasized the significance of industrial sector, terms of trade between industrial goods and agricultual goods have become rapidly deteriorating against agricultual goods. This phenomenon has lead agricultual sector to stagnate. The stagnation of the agriculture reduces agricultural outputs so on the one hand food stuff has to be imported and on the other unemployment (known as well as disguised) increases. Imports of food-stuff drain scarce foreign exchange reserves, which further stagnates economic activities for both agricultural and industrial sectors. The dualistic social and economic structure brings unstable political climates and at the same time population keeps moving into urban area. The movement of people from the rural areas to the urban areas is not the same as increasing mobility of people. It rather accelerates formation of slums in urban area. This kind of industrialization has not been accepted any longer as the prevailing national economic policies. However, the basic problem still exists with respect to increasing unemployment.

It is evident that a plan to introduce the new industries into El Salvador has an objective to cope with the unemployment problem in El Salvador. The projected number of labor to be employed by the four industries in shown in Table V-1-5.

Table V-1-5 Estimated Increase in Employment by New Industries in 1980

Industry I	60
Industry II	46
Industry III	89
Industry IV	131

Source: The JICA Mission

Note : Notations of Industry are the same as of Table V-1-1.

The figures shown in Table V-1-5 are those directly employed by the four new industries. However, the introduction of the new industries affects employment not only directly related to the industries but also indirectly ralated, through industrial linkager effects, the investment multiplier effect due to the new construction, the income multiplier effect due to the increase in income of those directly and indirectly employed, etc. Thus, the employment effects of the introduction of the new industries should be much larger than just those shown in Table V-1-5.

However, one may have a feeling that the those figures shown in Table V-1-5 be too small to cope effectively with the unemployment problem that El Salvador is estimated to have, namely, approximately a few hundred thousands unemployed. Of course, the proposed new industries can not provide a perfectly satisfactory answer for the problem, but one can not help feeling some questions about whether the introduction of the new industries should be contemplated from the more positive view for solving the unemployment problems.

There may be two points for the questions. One is a technical point and the other is the point already raised in relation to the industrialization policy. Already El Salvador's capital, San Salvador, is heavily populated. Under this condition to establich a large-scale modern industry should require a careful assessment. The technical point may have two implications. The first implication is that the general level of skills of labor in El Salvador is low so sufficient skilled labors are not available for a large-scale industry. The second implication of the technical point would be as follows: technological improvement and development have been mainly performed in developed nations. One of the characteristics of the technological improvement and development is that the objective of the trends is focused on the labor-saving ideas. Thus, utilizing these capital equipments does not require so many laborers as used to be.

On the other hand, the four industries examined in this report are export-oriented. In the export market if these industries are to compete with the same industries of developed countries, quality of the products must be secured. For this purpose it is necessary to depend on the newly developed techniques of production and devices for quality control, which are basically labor-saving oriented.

This dilemma is one of the most serious problems that developing nations must face if they intend to industrialize their economies while try to reduce unemployment. These reasons may have appeared as the small number of employment projected by the four industries.

4) Problems of Technology Transfer

Skills required for each industry for the three industries are listed in Table V-1-6. The common factor for these listed skills is that these skills are very basic

Table V-1-6 A List of Basic Skills Required for Each New Industry[1]

	Type of Skill	Length of Training (in months)
Wrench Manufacturing Industry	Forging	6-12
	Heat Treatment	6
	Grinding	6
	Plating	6-12
	Water Treatment	6
	Die Manufacturing	12-24
	Inspection	6
Farm Tractor Manufacturing Industry	Milling	[illegible]-12
	Boring	5-12
	Drilling	5-12
	Pressing	5-12
	Welding	5-12
	Grinding	6
	Die Manufacturing	12-24
WHM Manufacturing Industry	Pressing	[illegible]-12
	Welding	5-12
	Drilling	6
	Tapping	6-12
	Automatic Lathing	6-12
	Gear Cutting	6-12
	Die Manufacturing	12-24

Source: The JICA Mission

Note 1: It is assumed that El Salvadorians receive training both in Japan and in El Salvador.
Skills required for compressor manufacturing are similar to those required in other three industries.

for industrialization (although some of them may become obsolete due to technological break-throughs). These listed skills are not those of the most advanced so they do not seem to impress much. However, since these skills are so basic to the metal-mechanical industry, these skills must be acquired by labor in El Salvador by all means if the metal-mechanical industry is to grow in El Salvador. For this purpose the introduction of the new industries may be of great help for industrialization of El Salvador.

From Table V-1-6, the training periods can be seen as fairly short. The reason for the short training periods is due to the fact that the training periods are calculated, based on Japanese labors and that labor-saving innovations and inventions have been developed in these industries. When labor-saving innovations and inventions are directly applied to machinery and equipments, automation is in order. By automation, what laborers require to learn is not the skills to make products but the skills to operate machines and equipments. It does not take a long period of time to learn how to operate machines and equipments. This is the reason why the training periods are scheduled to be so short. However, the price of the short period of training is the small number of laborers required to operate machines and operators.

The above Table lists the training period for each process of each industry. If those trained according to the schedule do their, jobs, the continuous operation should be successful. However, it does not necessarily follow in that order. Thus, in order to maintain the smoothe production process a person who knows each process must be appointed. And to train personnels at this position it obviously takes a long time For this reason as well as to supplement the managerial personnel some experts should be dispatched to El Salvador for some time after the opening of production.

5) Linkage Effects on Related Industries

After the new industry is established, a close connection with the related industries is required if it can be operated successfully from production to sales to gain profits. In the production process raw materials and parts are needed so those supply industries may be affected by the new industry through the increase in demand for materials and parts. The increase in demand for products increase outputs of the raw materials and parts supply industries so it is possible to have an increase in productive efficiency in these supply industries. At the same time when the product of the new industry such as the farming tractor is sold to the customer, the customer may increase its output as well as productive efficiency with using the tractor. Productive efficiency of the customer may increase because the product, repair parts, and repair services may be more readily available by the domestic production than importation.

After production begins, financial management is required over inventory control, capital budgeting, etc. For this financial management demand for service provided by financial institutes may increase. Also demand for transportation service may increase in order to ship products. In order to distribute its products demand for service provided by the distributional network may increase. In these ways the introduction of the new industry may create linkage effects on related industries. Of course, these linkage effects are in principle potential. In developing countries linkage affects may not be expected simply because of the non-existence of related industries. Thus, the introduction of the new industry may help pointing out where the bottleneck lies in the economy.

6) Adverse Impacts of Development

One should bear in mind that development brings forth not only favorable effects but also adverse impacts. An example of adverse impacts of rapid industrialization policies have been already discussed.

As other possible adverse impacts, industrial pollutions, monopolistic or monopsonic firms, unbalanced distribution of domestic resources, etc. may be considered

Industrial pollutions possibly caused by the four specified industries are limited to the wrench manufacturing process: noise and vibration due to the forging process and waste water of the plating process. As to waste water of the plating process sufficient water treatment equipments are included into the investment plan so no serious problems are expected to arise. Also, noise and vibration pollutions can be avoided if the plant site is carefully selected outside of heavily populated areas. Thus, possible pollutions which may be caused by the four industries should be solved fairly easily.

Adverse impacts other than pollutions are possibilities of monopolistic firms, unbalanced distribution of domestic productive resources, etc. However, whether these can be identified as adverse impacts or not depends heavily on the economic policies of the El Salvador government so any superficial assessment should be avoided. Thus, in this report some of the characteristics of these effects are discussed below.

In developing countries when the new firm is established with the modern capital equipments, this firm has a strong tendency to monopolize the market. It has been often pointed that the monopolistic firm has a disturbing effect on the resource allocation. But the establishment of the new firm, the new industry may be disirable if the new industry is desired by the national government for economic development, irrespectively of whether the firm has monopolistic power or not. This is precisely the argument for infant industry. For infant industry protection should be given in some forms; Monopolizing the market may be one of them.

This report is, intending to analyze the possibility of the metal-mechanical industry in El Salvador, naturally based on the contention of industrialization. However, one of the most vital questions developing nations face is the scare resource allocation between industrial sector and agricultural sector. As an ideal theory, both industrial and agricultural sector should be promoted and developed at a rapid rate. However, due to the scarcity of resource available, development of the two sectors at a papid rate seems almost impossible. Alternative ideas are to sacrifice one of the two sectors. The choice seems to be determined politically.

2. Evaluation of Development

The evaluation of development of the four industries in El Salvador is summarized in Table V-2-1. For each industry the summary is given below.

Table V-2-1 Evaluation of Development of Metal-Mechanical Industries in El Salvador

	Wrench	Farm Tractor	WHM	Compressor
(1) Results of micro analysis				
Profitability	Good	Not Good	Not Good	Not Good
(2) Results of macro analysis				
Foreign exchanges	Good	Fair	Fair	Fair
Technology transfer	Good	Good	Good	Good
Employment	Fiar	Fiar	Fiar	Fair
Income	Good	Good	Good	Good
Linkage effects	Fair	Good	Good	Good
Industrial Pollutions	Fair	Good	Good	Good
Monopolistic trends	Possible	Possible	Possible	Possible
Distributional effects	Possible	Possible	Possible	Possible
(3) Development or not	Recommended	Conditional	Conditional	Conditional

Source: The JICA Mission

- Hand Tool Manufacturing Industry (Industry I in Table V-2-1): Recommended. A possibility of development exists both for the national economy as well as for the private firm.
- Farming Tractor Manufacturing Industry (Industry II in Table V-2-1): Conditional. For the private firm a possibility of securing profits does not seem bright. However, development of the industry may result in favorable impacts on the national economy. Thus, some kind of policy implementations by the national government may be required.
- Electric Meter Manufacturing Industry (Industry III in Table V-2-1): Conditional. The result are similar to those tractor industry above. There is a key assumption that the type of meters shall be intergrated into one kind so in reality development of this industry may face difficulties.
- Compressor Manufacturing Industry (Industry IV in Table V-2-1): Conditional. Development of this industry at a private level seems difficult. Promoting the development may require some political decisions.

3. Development Strategies

1) Factors of Development of the Metal-Mechnical Industry

Many factors must be fulfilled before the Salvadorean economy will become the export oriented economy such as those of Hongkong, Singapore, and Taiwan. From the past examples, the following factors listed in Table V-3-1 may be considered.

Table V-3-1 General Factors of Economic Development

Endogenous Factors

(1) High educational levels and abundant labor supply

(2) Fairly homogeneous social structure

(3) Commercial capital and its accumulation and expansion to industrial investment

(4) Construction of Infrastructure

(5) Preferential treatments in various institutional forms

Exogenous Factors

(1) Political stability

(2) Foreign economic aids, foreign capital inflows, and technological transfer

(3) Liberalization of trade (free zones) and utilization of the preferential tariff system

(4) Favorable world economic environments

Source : The JICA Mission

Examinings those Asian countries which are export-oriented, it can be seen that these factors mentioned in the Table have been met and that these countries really developed from the latter half of the 1960's to the beginning of the 1970's. It is obvious that especially exogenous factors had a great impact. From now on the growth of the world economy may slow down so the external economic environments for El Salvador may become severe. Thus, for El Salvador it seems necessary to achieve political stability domestically as well as in the common market area, on the one hand, and, on the other hand, to implement policies to increase international competitiveness by inviting foreign capital and foreign technology.

Disadvantages of exogenous factors can be compensated by improving endogenous factors such as intensifying job training, reinforcing infrastructure, simplifying foreign capital entry, etc. In addition to these improvements, creation of the homogeneous society by various methods such as land reforms and others, development of the domestic market, industrial investment, financed through capital accumulation in agricultural or commercial sector, etc. have proven to be important for Taiwan and Korea to have sucessfully developed thier economy.

Among the endogenous factors the followings may be considered for implementation in El Salvador for her development:

(1) Preferential treatments in finance.

(2) Improvement of institutes and organizations for economic aid.

(3) Preferential treatments in tariff and domestic tax systems.

(4) Preferential treatments in infrastructures.

(5) An extension of industrial linkages and improvement of related industries.

(6) Improvements of technological transfer and foreign capital entry.

(7) Training manpower.

(8) Expanding markets.

(9) Technical inovations and development.

(1) Financial Considerations

In El Salvador capital in commercial sector has not been sufficiently assumulated yet. Accordingly investment for industrial development remains at a low level.

If one considers this fact, it is evident that the official finance has a significant role in industrial development. In the field of finance the following points should be considered:

- Financial assistance to direct investment in El Salvador by private financial organizations or INSAFI.
- Provision of official funds for the long-term loans with low interest rates for importing large-scale machinery and equipments. Loans from the international financial organizations such as WB, IDB, CABEI, etc.
- Official guarantees and interest payments assistance for foreign raised capital.
- The medium and short term official loans with low interest rates for importing medium to small-scale machinery.
- Official assistance (loans with low interest rates or subsides) for research and development of domestically produced machineries.
- Financial assistance to develop the domestic market for the large-scale machinery with deferred payment arrangements.
- Official financial assistance for feasibility studies for projects concerned with metal mechanical industrialization.
- Preferential treatments on exports financing.

Average foreign direct investment in the metal-mechanical industry has amounted to US$3 millions in El Salvador. If the half of the investment capital is to be raised in El Salvador, an average US$1.5 millions capital funds must be financed for each project in El Salvador. If INSAFI or private firms forms joint-ventures with foreign capital and equity participation should take the above formula, it should encourage foreign investment if financing in El Salvador can be obtained with the 6 % p.a. interest rate.

Provision of official funds for the large-sized machines shall be made for purchasing the plant equipments such as forging, casting, and machine tools. Including these existing old vintage machines in El Salvador, funds should be available with lower interest rates than currently prevailing rates, namely, 8 % p.a. through financial intermediary agencies and 10 % p.a. for the users.

Financing research and development for the project to manufacture machinery domestically in El Salvador may be sufficiently covered by flexibly applying "The Financial System for Investigation and Research for Agriculture and Manufacturing" in existence. Some other systems such as tax exemptions of investment in R & D and government subsidies may be examined after development has progressed sufficiently. A financing system to promote the domestic production of large-scale machines is not required at present but may be needed when development has reached to a certain level where the economy begins to produce capital goods like machinery.

The government should take the lead in financial assistance for the feasibility studies of the industrial projects regardless of the sources of financial funds, official or external (loans from foreign countries and technical cooperations). But INSAFI or some other organizations must control the whole system to avoid wasteful investments.

Financing systems for export promotion will do as they are. But the interest rate seems rather high (9 percent for agents and 11 percent for users) and the term may be shortened from 180 days to 90 days.

(2) Development of Supporting Systems and Organizations

(a) Development of the information and (b) development of related official organizations are important in this category and both are interrelated to each other.

(a) Information services

- Development of the industral census:

  Expansions of Boletin Estadistico Industrial and preparation of the statistics of production, shipping, and inventory; preparation of the manufacturing census by firm.

- Preparation of the input-output table:

  Making out input-output table on the basis of raw materials, production output, shipment of manufactured goods in manufacturing industry.

- Preparation of the census of machines and equipments.
- Collection of the technological information.
- Collection and classification of the information of metal-mechanical industry abroad, its products, techiniques, and the catalogues of machines.
- Collection of the industrial standard of metal-mechanical industry abroad:

  . Collection and classification of the US standards (ASTM, AISI, SAE, ASME, NEMA, etc.), the European ones (BS, DIN, NF, etc.), Japanese one (JIS), and international ones (ISO and IEC).

To make out the industrial census, it is necessary to establish the formats of census and to have them liable to report correctly at the time of reporting. It is more usable if the census is separated to the census of manufactures and the industrial production statistics. In the coding system of ISIC (CIIU) fugures currently in use have only five digits, which account for only industry groups so it is more desirable to use the seven digits in the industrial production statistics to indicate products.

The input-output table need not be prepared right now, but it is desirable to be made by 1980 as production statistics of whole industry in El Salvador is expected to be developed. The table will be useful in case of measuring resources necessary to attain the target (investment and manpower) and linkage effects.

The census of machines and equipments should be conducted so as to use existing equipments effectively and to make new investment more efficiently in case the metal-mechanical industry is newly developed. Especially if machine tools, which will be imported in large quantities from now on, are classiffed according to uses, industrial sectors, regions, and the size of the factory, estimates can be made as to the number of machines needed for industrialization, the utilization rate, etc. In this census as well as in the industrial census, it is necessary to have them obliged to correctly report and to make collected data reliable.

To get the technological information it is good to utilize the accumulated data of ICAITI at first. But it is more convenient to have the Information Centers in El Salvador geographically. The center for the metal-mechanical industry which will be explained below will be established together with the documentation center.

It must be decided as to whether El Salvador should establish the industrial standard by herself or the one in common among CACM countries: adding to this, it must be also determined as to whether to adopt the US standard or the one which is used in Europe and Japan. Considering the trade and technological tie-ups with the US, it is more proper to choose the US standard. But the US herself has plans to change her system into the metric standard and has already applied the metric standard to some exporting goods. So from the long run viewpoint, El Salvador should adopt the metric standards, especially the one similar to ISO (International Organization for Standardization). If they do not apply the common standard at least for the whole metal-mechanical industry, it will cause much troubles as domestic production of parts proceeds. In Japan after they rearranged the adjusted old industrial standards and established JIS (Japanese Industrial Standards) in 1949, metal-mechanical industries made a great development in the 1950's and the 1960's, which resulted in strengthening export competitiveness. As it takes a long time to unify the industrial standards in Central American countries as a whole, practical ways should be sought to unify the industrial standards between principal partners on the basis of bilateral agreements when mutual free trade is realized. Then as the result, other countries may follow the precedent.

(b) Development of Official Organizations

- The center of metal-mechanical technology:

  The center is aimed at the collection of the technological information to make the imformation available throughout El Salvador, research and development of machining technology, quality inspection and quality guarantee of material and product, design of machines and production of test products, training skilled labors and reeducation of these already employed, and technical consultation.

- The patent office

- Export promotion and marketing research organizations:

  Marketing research for exported goods; export related information services; and management of the free zone.

- Promotion of industrial location and the establishment of the regulatory agency:

  Construction and management of industrial estates; development of industrial infrastructure; prevension of pollutions; promotion of decentralized industrialization.

- Industrial standards and productivity improvement promoting systems:

  Establishment of industrial standards; diffusion of quality maintenance methods; the introduction and diffusion of production control methods (process control, operation research, costs control).

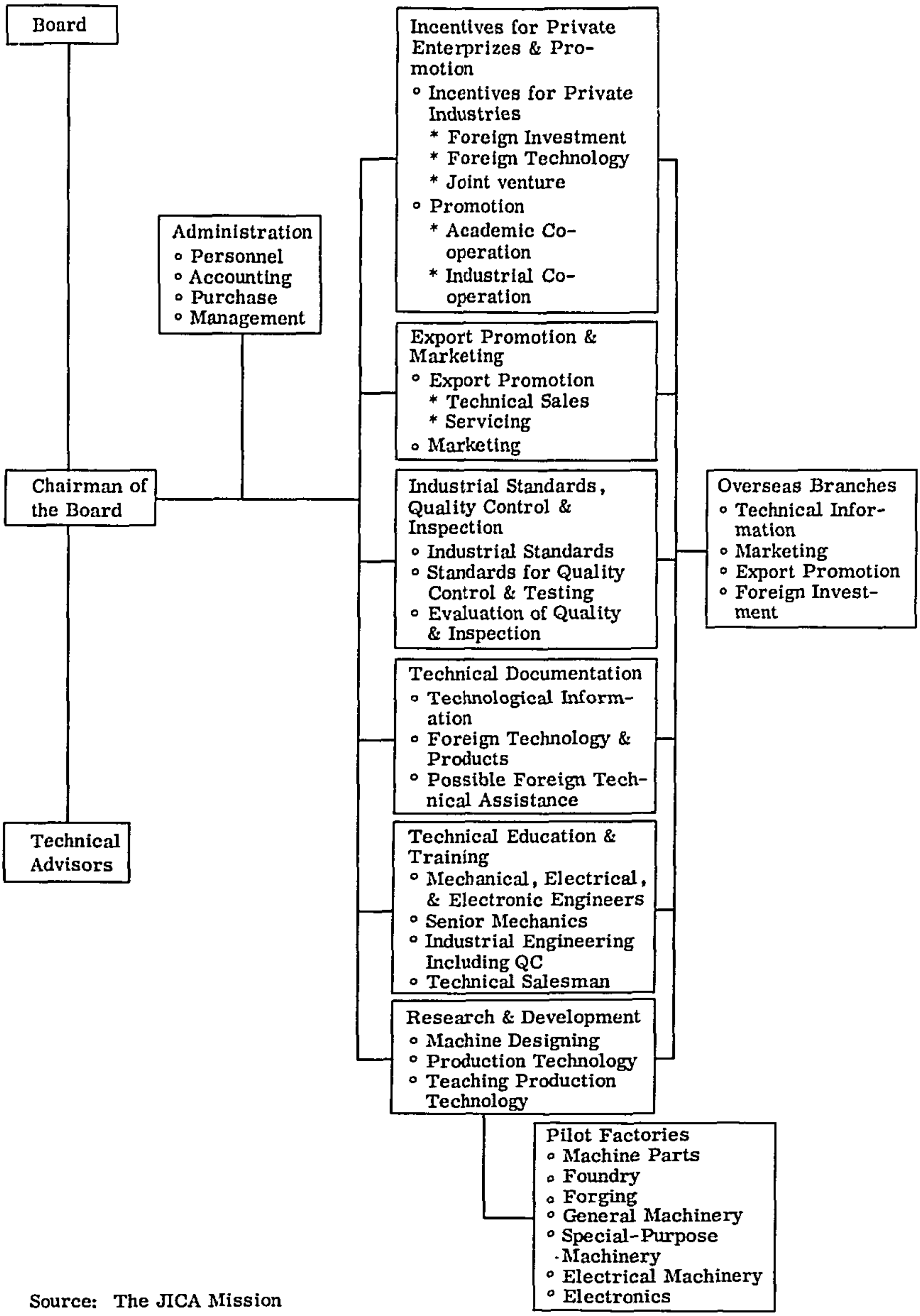
The Center for the Metal-Mechanical Industry is different from existing Institute of Technology and it reduces vocational training factors as much as possible. It has the same function as CENAP or UCI, but it emphasizes the technological aspect. Especially it has the characteristics of the examination of quality of products on each manufacturer's request or training engineers at a high level. Its final object is to have El Salvador design and to produce machinery by herself.

The current Patent, Trademark and Copyright Bureau will sufficiently control industrial proprietorship, but if possible, it is desirable to have a common system in Central American Countries.

ISCE should conduct export promotion and market research by giving a fair consideration on the characteristics of metal-mechanical products.

The existing organizations to promote and regulate industrial location are Ministerio de Planificacion and Ministerio de Economia. The government should take the lead in developing industrial estates and let some organization, for example INSAFI, take the charge of it. Most industrial estates in El Salvador except the free zone are managed by private firms but from the viewpoints of localization of industrialization, development of infrastructure, and prevension of pollutions the governmental agencies should construct and manage them as a part of the national economic development plan.

As for the industrial standards, an official institute like Institute de Normas Industriales is needed. As for productivity improvement, CENAP has its function, but it should also control quality and production. Conversely, it is possible to have INI control them. Functions of these official institutes are somewhat different according to their objects; whether to deal with industrialization as a whole or just the metal-mechanical sector. If they are to deal with the entire industrialization, they tend to run short of funds and man power. If they are to deal with only the metal-mechanical sector, it will exert an undesirable impacts on the other industrial sectors. The example of the center with general functions is shown in Fig. V-3-1.



Source: The JICA Mission

Figure V-3-1 An Example of a Development Center for the Metal-Mechanical Industry

(3) Preferential Treatments to Develop Infrastructure

- Construction and sales of industrial estates by the government or public agencies.
- Securing public utilities such as electricity and water supply.
- Expansion of storage facilities.
- Expansion of residences, hospitals, and recreation facilities.
- Improvement of administrative services: authorization of investment; registrations of firms; authorization of acquisition of land; authorization of construction of factories; authorization of exports and imports; inspection of exports and communication services.

The construction of industrial estates should be condusted by the governmental or public agencies as mentioned before. Because the scale and the location of industrial estates constitute parts of the industrial policy, the regional development policy, and the policy of decentralizing industries to local areas by the government, the disordered construction of industrial estates by private firms will cause some troubles in the future in the area of transportation, water supply, interrelations among industry groups, and pollutions. When the industrial estates are to be constructed, there is a choice as to the type of estates either single industry group oriented, for example the metal-mechanical industry, or many industry groups oriented. Considering the relation among industry groups, this report recommends the former type.

As to electricity and water supply, no problem is expected of electricity, but there is some uncertainty about water supply depending on locations. Particularly water for the industrial usage depends upon pumping up underground water and in some areas the water level has fallen down. So it is desirable to supply water to industrial estates collectively. As to electricity the discounted rates are available in the free zones in Taiwan, but as the level of the rate is not so high in El Salvador, the discount policy will not be a great incentive.

Such services as to expand warehouse facilities to store materials and parts imported with no or low custom duties, or to store goods to be exported outside of the region should be conducted by the government or public agencies as well as private firms. At least they should promote containerization.

It is required to construct residences for workers, hospitals, schools, and recreation facilities near the industrial estates. Currently these facilities are being constructed near the San Bartolo free zone. When the industrial estates are constructed in the future, they should take it into consideration to develop such infrastructure.

Administrative services are very important as invisible infrastructure. The offices which give authorizations to firms at the process of establishment of firms (authorizations of investment, registration, acquisition of eatates, construction of factories, etc.) should be integrated into one office as much as possible. It is convenient if the operation services for imports and exports (authorization of imports and exports, inspection of exportations etc.) are done within the industrial estates as well as the free zones.

(4) Development of Related Industrial Linkages

In the metal-mechanical industry the production process runs from raw materials to finished goods including parts and intermediate products. In the complicated process inter-industrial relations can be observed. With the appropriate combination of the production process as well as inter-industrial relations costs of production may be reduced, idle capacity of some industries may be utilized, and technical levels may be raised due to inter-industrial technology transfer.

Material industries are little developed in El Salvador and in CACM countries. Moreover iron & steel (ordinary steel and special steels), non-ferrous metals and plastics are difficult to be produced domestically in the near future. Thus, distributors with financial capacity should have a large stock of imported materials and supply them steadly.

Metal shaping has already been performed widely in El Salvador. However, the metal shaping is included in the production process of the firms to produce finished goods so it seems very rare for the firms to subcontract the metal shaping job to outside companies. According to the interviews conducted by the local survey term of this report, disuniformity of quality as well as delays in the delivery date were found to be some of the discontents of those who place the orders of the shaping jobs. On the other hand, the metal shaping companies have complaints that orders are small in size and infrequent.

To strengthen the metal shaping subsector, some methods can be listed as follows.

(a) Promotion of investment in the metal shaping industry in existence such as to promote new investment by SARTI, IMSA, IMACASA, etc. and to activate the industry to receive orders from the clients.

(b) Establishment of the Center for metal-mechanical technology, where they master technology and produce some of the metal-mechanical products.

Whatever the methods may be, such firms or organizations in the metal shaping should produce products with proper quality at reasonable costs.

Other related industries are galvanizing and plating, heat treatment, manufacturing dies and moulds, and manufacturing jigs and tools. Heat treatment is usually included in the production process. Manufacturing jigs and tools will depend on imports for the time being. But domestic galvanizing, plating and manufacturing dies and moulds should be strengthened.

The idea of industrial linkages is necessary for considering efficient development of the metal-mechanical industry. However, as mentioned above, related industries are little developed and the existing metal-mechanical industry has not yet matured, so it will be better not to insist this idea, otherwise development might be delayed. The practical idea of industrial linkage is shown in the following groupings:

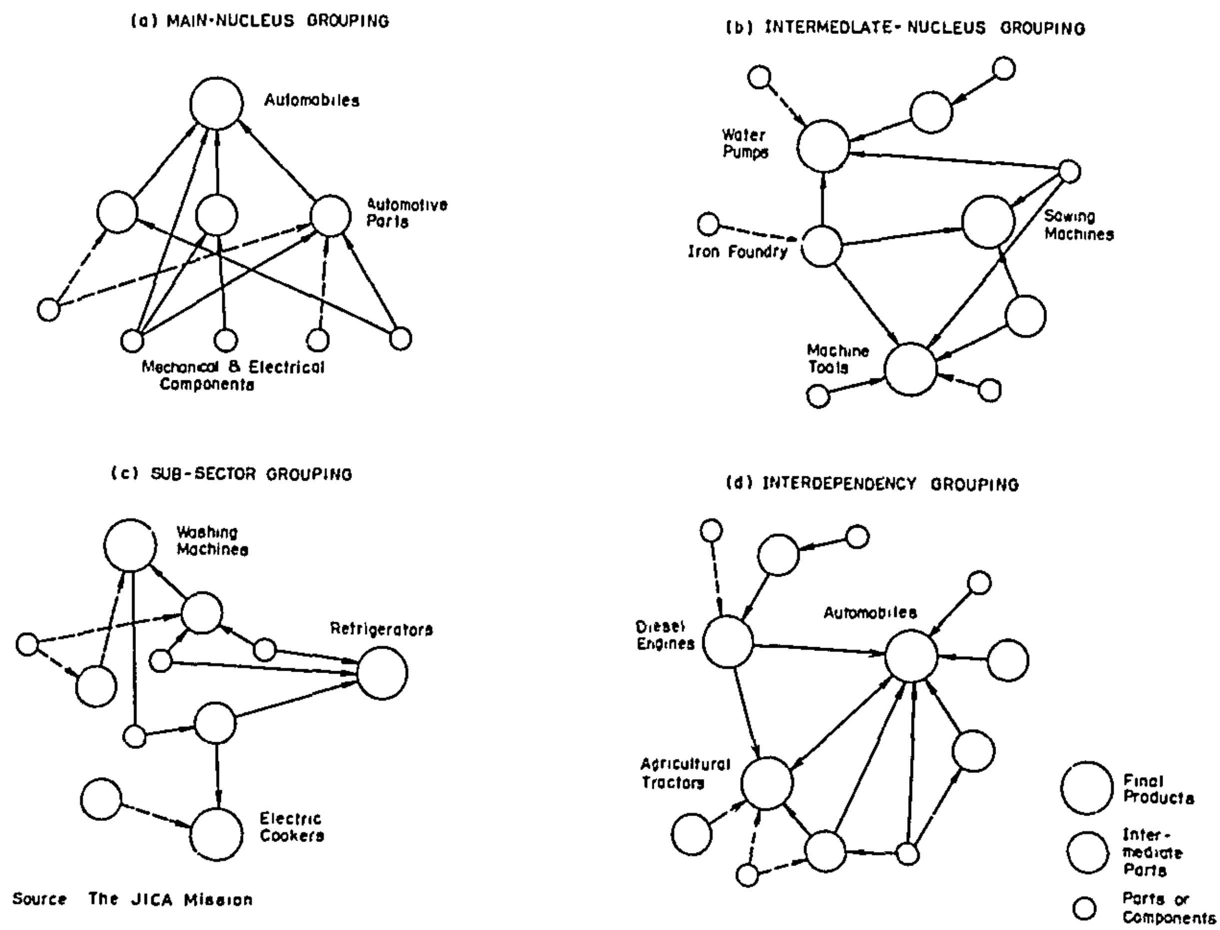
(a) The first case is to group subsectors of one industry into geographically close locations when these subsectors are horizontally related such as automobile parts and assembly, or electronics parts and assembly of radios and television.

(b) The second case is to group subsectors of the metal-mechanical industry centering around principal intermediate shapes such as casting (pumps, machin tools, sewing machines, etc.).

(c) The third case is to group a similar type of subsectors to one place such as electric home appliances (white goods group), electronic parts, etc.

(d) The fourth case is to group sectors which may use entirely different materials but may use finishied goods interchangeably such as diesel engines, farm tractors, automobile assembly, etc.

The above four groups are presented in Fig. V-3-2 below.



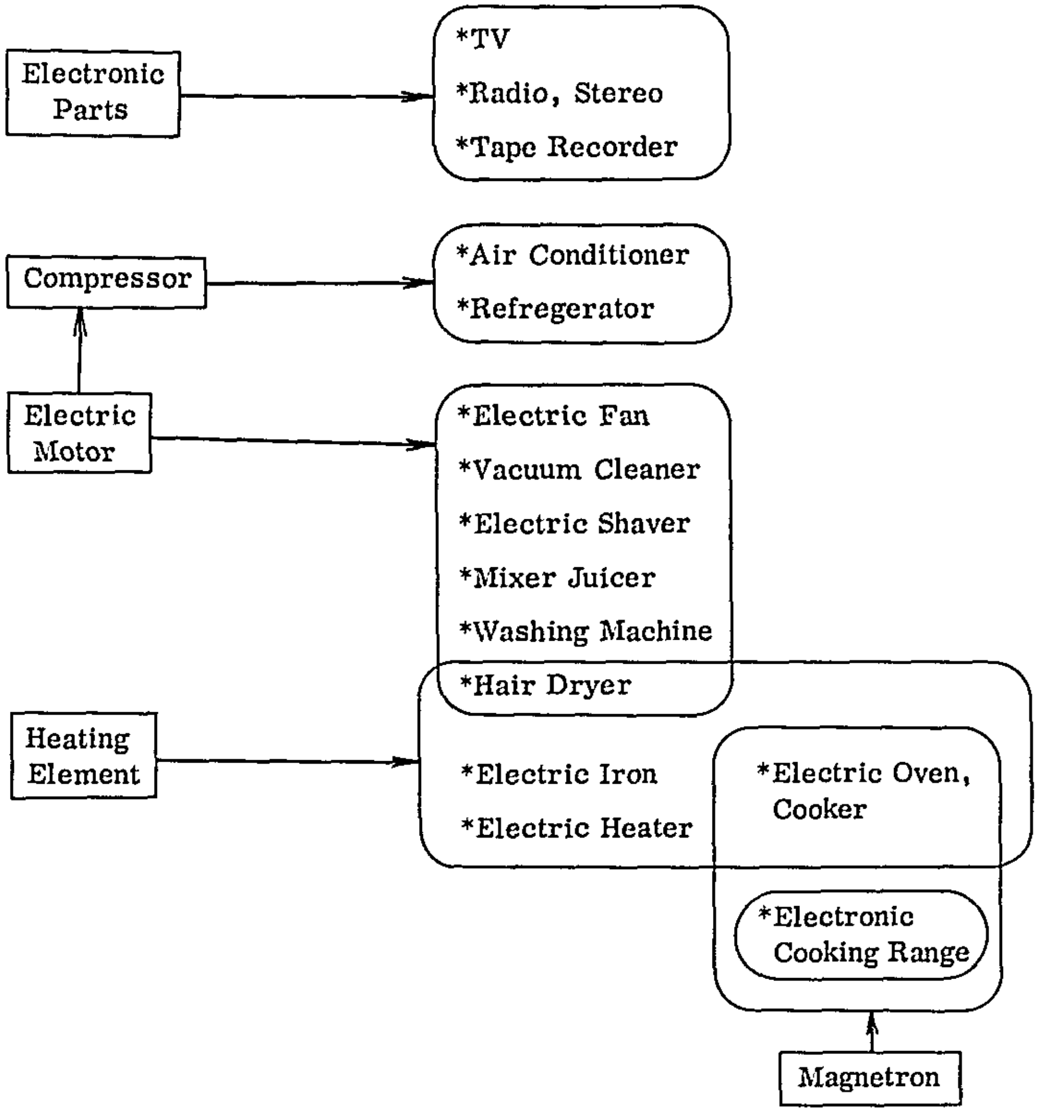
Source The JICA Mission

Figure V-3-2 Examples of Industrial Linkages for the Metal-Mechanical Industry

Under the present conditions of El Salvador, the group (a) can not be adopted. The group (b) is easy to plan but the market for the final products may not be necessarily large enough. The most desirable is to gather as similar subsectors as possible to promote interdependence among final products like the group (d). Fig. V-3-3 shows an example of grouping electric home appliances. To produce similar products at a single firm or to locate the firms that produce similar products in the neighbouring areas will increase productivity and enhance improvement of quality and development in the future.

(5) Promotion of the Introduction of Foreign Investment and Technology

- Relaxation of the restrictions foreign participation in investment
- Flexible management of the restrictions on employment of foreigners
- Relaxation of the restrictions on remittance of capital, profits, and royalties
- Agreements for guaranting foreign investment



Source: The JICA Mission

Figure V-3-3 Grouping Household Electric Appliances

The metal-mechanical industry belongs to free entry industry groups under the industrial integration plan of SIECA so it receives no restriction. As for the foreign capital participation, it will raise no problem, even of the ratio of domestic capital exceed more then fifty percent. But in a case that foreign firms want to supply only technology rather than direct investment, the reactions of El Salvador will be of great importance.

The restriction on employment of foreigners that ninety percent of employees should consist of Salvadoreans and eighty-five percent of wages should be payed to Salvadoreans causes few problems, if the exception are considered as well. With respect to the length of stay of technicians (five years are the limit for foreign technicians, and during the five years El Salvadorians must be trained in order to replace foreign technicians), however, flexibility is desired for the each industry group. Especially in the case of joint ventures with foreign firms, without sufficient technological training at the operation starting time, quality of products may decline, the brand image may get worse, and troubles concerning marketing products will arise afterwards. In the case of joint ventures with Japanese firms, the problem of language may delay the training of Salvadoreans. All of these require the flexible management of the stay of foreign technicians.

The existing system for remittance of capital and profits of foreign investment in El Salvador seems unrestricted compared with those in other Latin American countries so it should not hinder foreign firms from making investment. But if the common foreign investment policy in CACM countries proposed by SIECA takes effect, the ceiling of profits remittance will be introduced so the incentive of investment should decrease. The existing rate of tax on profits, dividends, and royalty, thirty-eight percent, seems appropriate But if the SIECA plan is admitted, the rate may be changed to the highest rate currently in effects among CACM countries. There seems to be no restriction on the royalty rate presently so it will be better to set up the rate case by case according to the technological levels of manufacturing, employment, the size of investment, and exports to the outside of the CACM area rather than setting up the unified ceiling. For in order to promote technology transfer from foreign countries, the royalty rate should be kept at higher levels in assembly industries.

The investment guarantee agreement, which is in effect only with the U. S. at present, should be extented to encompass other developed countries including Japan.

In conslusion, the existing foreign investment policies of El Salvador hardly restricts the introduction of foreign investment into the metal-mechanical industry. However, the prospect of the policies does contain some unstable elements such as the SIECA plan. It may be necessary for El Salvador to indicate that if the SIECA plan would be adopted, though would not be as it is, the policy in its application should aim at industrialization of CACM countries, after adjustment periods, on the basis of cooperative tones with foreign investment.

(6) Development of Manpower

The fields which need development of manpower are as follows:

- Training of high level engineers of metal-mechanical related industries.
- Establishment of the systems of on-the-job training and skill qualification.
- Preparation of skills inventory data and estimation and planning of manpower.

One of the big bottlenecks against development of the metal-mechanical industry is the lack of high-level engineers - engineers of mechanical design, production and management. Such methods as shown below should be actively taken for the training of these engineers:

- Expansion of the departments of engineering and management in National and Catholic Universities in El Salvador.
- Educating students in developed countries at the expense of the government.
- Establishment of the center for the metal-mechanical industry
- On the Job Training (OJT) at joint ventures with foreign firms.

It is necessary to make an OJT system including education of high level of technicians. The concrete methods are:

- Deduction of the OJT costs from corporate income and grants of official subsidies.
- Imposition of a duty on foreign technicians to train El Salvadorian technicians and workers at foreign firms in return for the admission of the long-term stay of foreign technicians.
- Enforcement of skill qualification in common to the whole country in the field of metal-mechanical technology such as welding and sheet metal

working to encourge competition among firms.

Skills inventory system is useful for the preparation of a future plan of the metal-mechanical industry. Registration of technicians will show if manpower is sufficient in each industry group and at the same time it will offer data for the judgement at the time of preparation of a future training plan According to the research of the United Nations the number of employees and operating machine tools in the metal-mechanical industry depends on the industrial level of nations (Table V-3-2). These data and other survey data indicate that demand for manpower shown in Table V-3-3 rises in proportion to the level of the metal-mechanical industry in developing countries. If El Salvador produce 100 percent of metal-mechanical products domestically, 40,000 to 80,000 workers will be employed based on the foregoing theory. Moreover if they assign 5 percent of products to export, 100,000 workers will be employed, although this argument is only applicable for the countries with the sizable markets. For the time being, it will be possible to expect to employ 20,000 workers in the metal-mechanical industry in El Salvador.

Table V-3-2 Labor-Capital Ratios in the Metal-Mechanical Industry

	U.S.A.	U.S.S.R.	Britain*	W.Germany	France	Italy	Japan	Brazil	Chile
No. of Worker vs No. of Operating Machine Tools	2.1	1.9	2.8	1.9	2.2	1.6	1.8	2.3	3.6

Source: UN

* Due to out-dated machine tools

Table V-3-3 The Level of Industrialization and Required Labor in the Metal-Mechanical Industry

		Level 1	Level 2
(1) Manpower Requirement in Metal-Mechanical Industry	Men per Million Population	10,000 - 20,000	25,000 - 30,000
(2) Constitution of the Required Capacity			
∘ Managers, Senior Engineers	%	5	8-9
∘ Foremen, Senior Technicians	%	5	5
∘ Factory Workers	%	90	84-86
∘ Office Workers	%	Small	1-2
(3) Export Ratio	%	0 (self-sufficiency 100%)	5%

Source: UN

(7) Expansion of Marketing Activities

- Marketing research for export promotion.
- Expansion of distribution systems and service networks.

Purchase of the metal-mechanical product is very much sensitive to the brand. Every time technical innovation occurs, new or improved products must be introduced. Some exported products compete with not only the products of developed countries but also those of other developing countries. It is necessary to have the information of the markets for exported goods on time so as to take countermeasures. The methods of merketing research for exported goods are as follows:

(a) Collection of the information by way of joint ventures with foreign firms.

(b) Collection of the information by CENAFE or ISCE.

(c) Appointment of Commerce Attachs at the embassies in countries where the products are exported.

(d) Bringing up trading companies specialized in exportation.

Among these four methods (b) should be implemented first. By implementing (b), understandings can be obtained as to the current conditions of export markets, the analysis of distributional costs, units of trading, situations of user industries, trading customs at the export destination, etc. On the basis of the understandings of these factors it is possible to draw the final goals and the objective evaluation methods for the prices and quality of products to be produced in El Salvador.

In the case of Japan, for collecting the information, the official organization (JETRO-Japan External Trade Organization), Japan Machinery Export Association, and many other marketing research groups including trading companies have acted very effectively.

The distribution system in El Salvador centers around San Salvador and it will be expanded into such cities like Santa Ana and San Miguel as income of local areas increases. But as the land is small and roads are sufficiently developed, there is little need to construct so many marketing centers. It is more important to improve the distributional networks inside of the CACM region. As one of the methods to realize this, the utilization of the distributional networks established by the multinational corporations may be considered since they have branches or subsidiaries within the CACM region.

(8) Technological Innovation, Research and Development

- Official aids for R&D
- Organizations of research associations for development of specified technology
- Setting up the objectives for technological development

Technology in the metal-mechanical industry does not need to be developed in El Salvador at this very moment, because it can be transferred and implanted from developed countries. But it is necessary to make efforts for improvement and development in the process of transfer and implantation.

Official aids for R&D means financing, subsidies, and R&D by official organizations. These have been already explained in the sections (1) and (2).

Research and development objectives are preferably selected among firms with similar interest and to be managed by common funds and official subsidies. Themes are listed up below:

- Establishment of the industrial standards.
- Research and diffusion of production and management techniques suitable for El Salvador.
- Production of dies & molds and techniques of their usages.
- Packing and transportation techniques for the products.

2) Concrete Ideas for Development of the Metal-Mechanical Industry

(1) Development Schedules for Selected Industries

In this section some methodology will be presented in rather concrete forms with respect to development of industries in El Salvador which were already selected in Chapter II of this report (Cf. Table II-2-10). Industries in Table II-2-11 may be regrouped as shown in Table V-3-4. A brief explanation of each

Table V-3-4

Classification of Selected Industries

	Classification	NAUCA Code of Selected Industries
I	Simple Parts & Components	699-07-01
II	Complicared Parts & Components	699-29-02, 721-04-04
III	Simple Products	699-12-02, 716-15-01, 699-05-03
IV	Intermediate Products	716-13-18
V	Assembled Products of Low Level	699-18-01, 02, 03, 699-22-02, 716-04-00, 721-01-02, 721-01-04, 721-01-05, 721-07-00, 721-12-04
VI	Assembled Products of High Level	711-05-01, 712-02-01, 713-01-00, 716-12-01, 721-08-01

Source: Table II-2-11

group is given as follows:

I. Simple parts & components:

Some have been produced in El Salvador, but they have not reached the international levels in quality and productivity. So it is necessary for the existing industries to improve productivity by equipment investment and to increase quality such as the degree of precision:

II. Complicated parts & components:

Some of mechanical or electronic parts industry will be able to start operation if there are enough users in El Salvador or in CACM and if they attain the economies of scale. Some products may be exported in the future to the outside of the CACM region.

III. Simple products:

Products which need no or very simple assembly. Some have already been produced in El Salvador. For the present they are promising products for exports to the outside of the region.

IV. Intermediate products:

Products which are supplied to other metal-mechanical industries, for example, dies & molds, cutting tools, or jigs. These are still immature in El Salvador.

V. Assembled products of low level:

Products which need little precision assembly. These products have already been produced in El Salvador and are expected to be exported to the outside of the area in the future.

VI. Assembled products of high levels:

Production of these products is a final objective of the development plan of the metal-mechanical industry. For the time being, SKD or CKD assembly should be taken for their production in El Salvador.

Table V-3-5 reflects development schedule of each product by group. After improvement of existing equipments and added investment, the selection of products to products to be produced, and the introduction of foreign technology, some industries may start production by 1980. Some of the products will be exported to CACM. But most of them will not be exported to the outside of CACM before 1985.

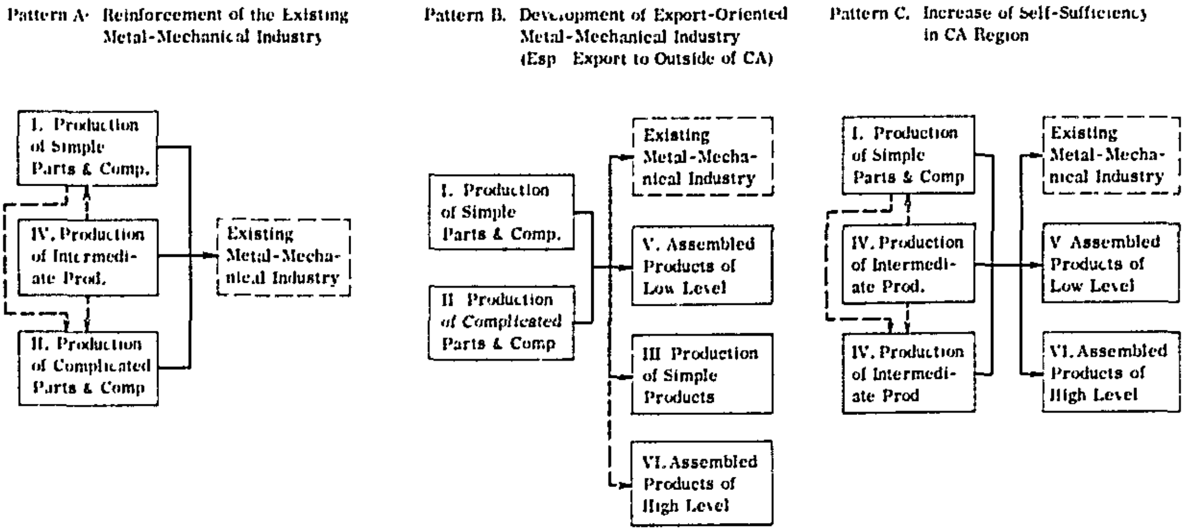
Table V-3-5 Development Schedules for Selected Industries

	NAUCA	Selected Industrial Sectors	1978	1980	1985
I	699-07-01	Nails, Bolts, Nuts, Washers, Rivets, Screws, etc.	• Modernization of the Existing Facilities	• Mass Production of the Ordinary-Grade Products	• Production of Special-Grade Products (High Tensile Grade, etc.)
II	699-29-02	Chains & their Parts of Metals		• Production of Ordinary-Grade Chains	• Export to the Outside of CACM
	721-04-04	Electronic Parts	• Selection of Product Lines • Introduction of Foreign Technology	• Production of the Selected Parts	• Exports to the Outside of CACM • Addition of New Product Lines
III	699-12-02	Machinist Hand Tools	• Selection of Product Lines • Introduction of Foreign Technology	• Production of the Selected Products • Export to USA	• Addition of New Product Lines
	716-15-01	Taps, Cocks, Valves & Similar Appliances	• Modernization of the Existing Facilities	• Export to USA • Addition of New Product Lines	
	699-05-03	Nets, Fences, & Gratings of Wire or Expanded Metal	• Modernization & Expansion of the Existing Facilities • Productionof Selected Product Lines		
IV	716-13-18	Moulds for Foundry, Glass & Plastics Forming, etc.	• Modernization & Expansion of the Existing Facilities • Introduction of Foreign Technology	• Introduction of New Machine Tools including Profile Milling Machines & Spark Cutting Machines	
V	699-18-01, 02, 03	Locks, Padlocks, Keys, Fittings for Doors, Windows, Furnitures, etc. of Metals	• Modernization of the Existing Facilities • Introduction of Foreign Technology	• Export to the Outside of CACM	
	699-22-02	Domestic Cooking Ranges & Ovens, Toasters, Non-Electrical	• Selection of Product Lines	• Production of the Selected Products	• Export to the Outside of CACM • Addition of New Product Lines
	716-04-00	Machine Tools for Working Wood, Cork, Plastics, etc.	• Selection of Product Lines • Introduction of Foreign Technology	• CKD Production of the Selected Products	• Increase of the Local Contents • Export to the Outside of CACM
	721-01-02	Electric Motors	• Selection of Sizes & Types • Introduction of Foreign Technology	• SKD Production (Wiring) or CKD Production	• Increase of Local Contents • Export to USA
	721-01-04	Transformers, except for Electronic Equipment	• Selection of Sizes & Types	• SKD or CKD Production • Export to Outside of CACM	• Increase of Local Contents
	721-01-05	Electrical Apparatus for Making & Breaking or Protecting Electrical Circuits	• Selection of Products Lines • Introduction of Foreign Technology	• Production of the Selected Articles with Higher Local Contents	• Addition of New Product Lines • Export to Outside of CACM
	721-07-00	Other Electrical Articles & Accessories for Automobiles	• Selection of Products Lines • Introduction of Foreign Technology	• Production of the Selected Articles • Export to USA	• Addition of New Product Lines
	721-12-04	Portable Electro-Mechanical Hand Tools	• Selection of Product Lines • Introduction of Foreign Technology	• SKD or CKD Assembly	• Increase of Local Contents
VI	711-05-01	Diesel & Semi-Diesel Engines	• Selection of Sizes & Types • Introduction of Foreign Technology	• SKD Assembly	• CKD Assembly & Increase of Local Contents
	712-02-01	Agricultural Machinery & Appliances for Harvesting Threshing & Sorting	• Selection of Product Lines • Introduction of Foreign Technology	• SKD or CKD Production	• Addition of New Product Lines of Salvadorean Design • Export to Outside of CACM
	713-01-00	Tractors	• Selection of Sizes & Types • Introduction of Foreign Technology	• SKD or CKD Production	• CKD Production & Increase of Local Contents
	721-08-01	Electrical Measuring Instruments & Meters	• Selection of Product Lines • Introduction of Foreign Technology	• SKD or CKD Production	• Increase of Local Contents • Addition of New Product Lines
	716-12-01	Air Conditioning Machines & Equipment	• Modernization of Existing Production Facilities	• CKD Production & Increase of Local Contents	• CKD Production of Compressors

Source: The JICA Mission

(2) Propositions for Development Patterns

Several patterns of development may be considered by the various combinations of industries selected by this report. These patterns are shown in Fig. V-3-4.



Source: The JICA Mission

Figure V-3-4 Development Patterns of the Metal-Mechanical Industry in El Salvador

These patterns should not be considered as alternatives to each other but simply combinations of factors. They are nothing but ideas which should be given priority at a given point in time.

Pattern A aims at the expansion and the leveling-up of the existing metal-mechanical industry. If supply system and quality of parts and intermediate products (including casting products, dies and molds) are ensured, the rate of value added will rise and production of other assembled goods will become possible.

Pattern B aims at the realization of domestic production of parts, exports of simple-assembly products to the outside of the region. This type will have to be the leading one for the metal-mechanical industry in El Salvador in the 1980's. For the present time international competitiveness can be strengthened by the proper selection of products and markets.

Pattern C aims at import substitution in CACM countries. Pattern A is in a short-run and pattern B is in a long-run, while pattern C is in a medium-run. According to pattern C, production of intermediate products and that of assembled products of high levels by SKD or CKD proceed at the same time. This pattern shifts to pattern B after quality and productivity of parts and intermediate products are improved.

Fig. V-3-5 shows conceptionally the relative importance of these patterns. Most of the metal-mechanical industry will have to start production after 1980, raise the rate of self-sufficiency in CACM countries, and, with increasing international competitiveness, shift to the export oriented industries.

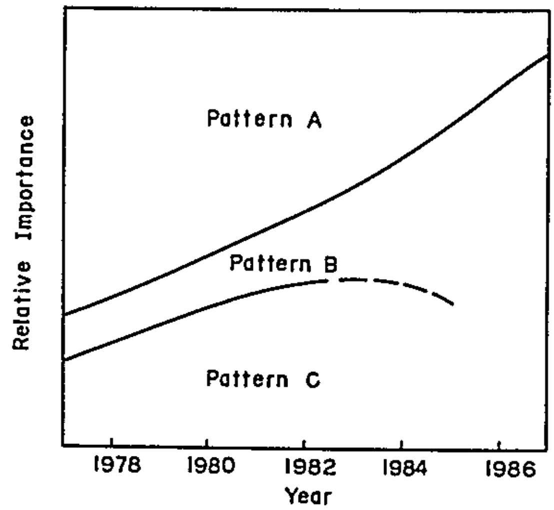


Figure V-3-5 The Future Trend of Development Pattern

3) Conditions for Successful Development

(1) Increases in Incentives for Foreign Investment and Technology Transfer

Foreign direct investment in El Salvador by foreign firms and technology transfer are important conditions for development of the metal mechanical industry in El Salvador. Thus, incentives should be increased in order to secure the inflows of direct investment and to promote technology transfer.

In order to do so several steps may be taken. These steps in rather concrete forms are described as follows:

- Perferential treatments on the tax system, especially the reduction or the exemption of direct taxes for some periods.
- The introduction of the accelerated depreciation systems.
- The introduction of the exemption system of the taxable income by export.
- The guarantee system for profits and capital remittance; flexible applications of the authorization of the royalty rates.

- The flexible application of the employment system of foreigners, especially managers and technicians.

(2) The Government Roles for Development

The followings are some of the conditions for successful development of the metal-mechanical industry in El Salvador, for which the government can play the major role:

- The long-run development financing with the comparatively low interest rates; development subsidy grant systems.
- The construction of industrial estates for the metal-mechanical industry; development of related infrastructure.
- The export-promoting policies and marketing research for exported goods and export financing systems.
- The unification and development of the industrial standards; The establishment of methods of testing qualities and standards.
- The collection of the technological information; The introduction of foreign firms and technology.
- The establishment of the development center for the metal-mechanical industry.

4) The Development Strategies for the Specified Four Industries

(1) The Establishment of the WHM Assembly Plant

Several conditions are required if the plant as a private business operation produces sufficient profits. These conditions are as follows:

a) The target market is the whole demand for WHM in CACM countries.

b) The type of WHM should be unified to the bottom connected type throughout CACM countries.

c) Factory prices should be arranged in such a way that the prices are up 25 percent of the most recent international tender price in El Salvador. Or the corresponding 25 percent increase in the unit price, for example, 20 percent increase in the unit price with the discount of 5 percent of costs of raw materials.

d) The assembly takes the form of CKD.

e) All the assembly parts should be imported without duty from Japan.

f) Production processes should have more processes than in Japan.

g) Sales and distributional networks should be utilized as they are.

h) Technological training and technology transfer should be done smoothly.

The relatively more important among these are a), b) and c). It is necessary to make great efforts to unify the specification of WHM within CACM countries. One way to implement this is to construct a WHM assembly plant with the joint investment of electric power companies of CACM countries. The price of WHM domestically produced must be at least 25 percent higher than that of imported products for the successful operation as a private company. The plant of WHM is feasible from the view point of the national economy.

Another way is to establish a small-scale assembly plant at the WHM inspection center of CEL and to enlarge the market from El Salvador to other countries. At the starting point, official supports are given but after the plant has gotten competitive power, it must be independent from the official support. In this case it is also necessary to have the electric power companies in other CACM countries unify the specifications of WHM.

(2) The Establishment of the Farm Tractor Assembly Plant

The important prerequisite conditions to ensure the profitable operation for the farm tractor assembly plant are as follows:

a) The target of market is a small-scale tractor market with engine of 12.5 HP among the entire farm tractor market in CACM countries.

b) SKD will be the production pattern.

c) All the parts and components should be imported without duty from Japan.

d) Productivity in El Salvador is counted as 60 to 70 percent of that in Japan.

e) The existing distributional networks should be utilized.

f) The introduction and transfer of technology should be done smoothly.

g) Prices at factory should be over 25% higher than the C.I.F. prices of the tractor.

As farm tractors are technology intensive products, the important conditions are a), b) and g). Thus, at the opening of production, SKD is necessary to keep quality at required levels. As the mechanical products produced in Central Latin America cannot be relied upon in general, maintaining quality at high level should be sufficiently taken care of.

As a result of the rise in the ex-factory price, the tractor with 12.5 HP engine, which is now sold at the price of US$2,700, must be sold over US$3,380. Thinking that the CIF price of an upper-class tractor of 25 HP engine is about US$4,000, there is concern that the market may shift to this type from the smaller size of 12.5 HP engine.

Dealers with distributional networks or joint ventures with foreign firms may take charge of development. From a long-run viewpoint, it seems more effective that domestic production of parts of tractors proceed along with development of automobile parts industry, because many parts are common to both industries.

(3) The Establishment of the Hand Tool Manufacturing Plant

The prerequisite conditions to ensure the profitable operation of the hand tool manufacturing plant are as follows:

a) The target market would be mainly the North American market.
b) Wrenches, combination as well as box type should be produced.
c) A continuous production from forging to plating should be done at the manufacturing factory.
d) Raw meterials should be imported without duty.
e) Technological training and technology transfer should be done smoothly and quality should be maintained.
f) The existing sales network for Japanese products in the North America could be utilized for the products made in El Salvador.

The important condition are a) and e). Fundamentally products of El Salvador must push their ways into the Japanese export market in the U.S. As mentioned before in the economic analysis of Chapter IV, the same level of quality as Japanese products must be ensured. As it is necessary to promote technology transfer, such incentives as the authorization of the high royalty rate should be introduced.

(4) The Establishment of the Compressor Assembly Plant for Refregirators

The prerequisite conditions to ensure profits to the compressor assembly plant are as follows:

a) The target market should be the makers of refrigerators in CACM countries, especially in El Salvador and in Costa Rica.

b) The type of compressors should be about 125 W for small-scale household refrigerators.

c) SKD assembly should be adopted in the first year and machining processes and production of parts in El Salvador should increase gradually and in the sixth year all parts and components be produced domestically.

d) All the imported parts used for SKD and other knockdown should be imported without duty.

e) The ex-factory price should be by 120 % higher than the C.I.F. prices at the operation starting point and by 60 % higher at the time complete domestic production has been achieved.

f) Technology transfer should proceed smoothly during six years before domestic production has been achieved.

The important conditions are c), e) and f). As compressors are parts themselves and their components are a few, it is necessary to invest continuously and raise the rate of domestic production in a short period so the ex-factory price inevitably be set at a high level. The estimated C.I.F. price now is about US$27. As the makers of refrigerators also exist in Costa Rica, it is necessary for both governments to make some arrangement about the distribution of compressors made within CACM countries.

ANNEX

INTERIM REPORT ON THE FEASIBILITY STUDY

FOR

DEVELOPMENT OF METAL-MECHANICAL INDUSTRIES

IN REPUBLIC OF EL SALVADOR

DECEMBER 16th., 1976

THE SURVEY TEAM

JAPAN INTERNATIONAL COOPERATION AGENCY

CONTENTS

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1. SURVEY SCHEDULE

The survey was conducted for the period from November 29th. to December 16th., 1976, by the member of the following eight specialists:

List of Mission Member

1. Mr. Ikuroh Ishikawa
   Project Manager
   Head of Team
   (Administration and Economic Development)

2. Mr. Tan Hashida
   Assistant to the Project Manager
   Senior Industrial Economist
   (Industrial Development and
   Industrial Project Analysis)

3. Mr. Saburoh Yuzawa
   Senior Economist
   (Economic Development and Analysis)

4. Mr. Saizoh Furuya
   Senior Mechanical Engineer
   (Industrial Development and Siting)

5. Mr. Tsuneo Watanabe
   Senior Industrial Economist
   (Industrial Project Analysis-Electrical)

6. Mr. Tomoyoshi Kariya
   Senior Industrial Economist
   (Industrial Project Analysis-Mechanical)

7. Mr. Takeshi Tsuji
   Planning Advisor
   (Official: Industry Machinery Division,
   Machinery and Information Industries Bureau,
   Ministry of International Trade and Industry)

8. Mr. Eiichi Seki
   Coordinator
   (Official: Industry Division, Mining & Industrial
   Planning and Survey Department,
   Japan International Cooperation Agency)

The work schedule is summarized in the following table:

SURVEY SCHEDULE

DATE		ITEMS
1976		
Nov. 29th.	Monday	Visits to CONAPLAN and INSAFI Discussion with the counterpart
Nov. 30th.	Tuesday	Visits to UNDP and Ministry of Agriculture Visits to private companies in San Salvador
Dec. 1st.	Wednesday	Visits to Acajutla and Santa Ana area Visits to Ministry of Labor and Public work Visits to private companies in San Salvador area
Dec. 2nd.	Thursday	Visits to private companies in San Salvador area
Dec. 3rd.	Friday	Visits to Ministry of Economy, CEL and ANDA Visits to private companies in San Salvador area
Dec. 6th.	Monday	Visit to Free Zone Visits to private companies in San Salvador area
Dec. 7th.	Tuesday	Visit to private companies in San Salvador area
Dec. 8th.	Wednesday	Visits to SIECA and ICAITI Visits to private companies in Guatemala City
Dec. 9th.	Thursday	Visit to Japanese Embassy in Guatemala City Interim meeting of the survey team (Messers Ishikawa, Watanabe and Kariya left to Japan)
Dec. 10th.	Friday	Visits to UNDP and ICAITI
Dec. 13th	Monday	Visit to National Technical School Visit to New Airport Site
Dec. 14th	Tuesday	Visit to Tenológico, S. A. Ministry of Economy and Bureau of Statistics Visits to private companies

DATE		ITEMS
1976		
Dec. 15th	Wednesday	Visits to private companies Final meeting of the survey team Discussion with Japanese Embassy in El Salvador
Dec. 16th	Thursday	Presentation of interim report to CONAPLAN and INSAFI

****

LIST OF PRIVATE COMPANIES VISITED

ACERO
ALCOA
ALDECA
Almacen Sagrera
ARCO

CAESS
Carlos Avilés
Casa Ama
Casa Castro
CEFESA
Centroamericana de Electrificación
CORINCA
COMSA

Fábrica Superior

HAZAMA-GUMI

IMACASA
IMASA
INCO
INDECA
INSINCA
ITOH C.
IUSA

National de El Salvador

OXIGASA

Salvador Machinery
Saquiro
Sumitomo

TELEVOX

****

2. METHODS OF APPROACH

Most of the survey time was devoted to collecting information by way of interviews with the government officials concerned and responsible people at private enterprises, sometimes visiting their manufacturing plants. Much published information was also collected for systematic data analysis, expected to take place in Japan.

The basic methods of approach of the survey are:

1. Market identification
2. Technology analysis - skills inventory and supporting industries
3. Analysis of managerial and sales-promotional capability

The item 3. and financial point of view are not necessarily looked into detail primarily due to lack of time.

The item 1. constitutes one of the most important part of our study, since market size and its potential determine basic feasibility of a project and thus influence competitiveness of its products. Technological capacity not only determines the industrial sectors to be adopted in El Salvador but also gives impact on quality of goods produced. By combining the above two factors, quantitative and qualitative indication of project pre-feasibility was estimated.

3. OBSERVED FACTS

3.1 Existing Market Situation

Estimated market size varies widely depending upon area considered, namely domestic, regional and international (outside-regional). Due to insufficient data available, the following examples of estimated market are not always very reliable.

TABLE 2

ESTIMATION OF MARKET SIZES

units/year

	EL SALVADOR	CENTRAL AMERICA
Electric Power Meter	15,000 - 20,000	80,000 - 100,000*
Water Meter	20,000	70,000 - 100,000*
Tractor for Agriculture	500 - 700	4,000 - 6,000
Compressor of Refrigerator**	20,000 - 30,000	80,000 - 100,000

* Depending projects taking place
** Including replacement

Depending upon market aimed, there are three types of siting metal-mechanical industries, namely:

a) Zone Franca - All products from this area are exported outside the Central America region.

b) Zona Libre - Most products from this area are exported outside the region, whereas the rest is for domestic and regional market.

c) Parque Industria - There is no distinction as to market of products from this area.

Industries located in a Zona Franca usually utilize such incentives as cheap labor cost and inexpensive raw materials imported custom-duty-free. Selection of industries or products is normally conducted by the leadership of multinational enterprises based upon their starategies of international market segmentation. Technological levels of industries located in a Zona Franca tend to be frozen at such levels as assembly of parts and semi-knocks-down (SKD), thus creating a "technological enclave" in a country. In the longer term, this would not contribute greatly to the industrialization of a host country.

In the case of metal-mechanical industries, which is expected to constitute a mainstay of Salvadorean industrialization, much preferred way of development is to locate them in ordinary Parque Industria to meet the domestic or regional demands. After accumulating abundant experience in operation and improving international competitiveners, export outside the Central America region becomes possible.

Among products considered in this study, production of only certain types of hand tools appears possible to be sited in Zona Franca.

3.2 Regional Market Consideration.

It is understood that more than 40% of value added is required for a product, if it needs to be protected from international competition within the Central American regional market. At this moment two prodcts could well be classified in this category among products considered.

a) Products meeting the requirement - hand tools for metal working, agricultural implements.

b) Products classified outside the category - electric power meters, (water meters), engines, compressors.

Regarding products classified outside the category, which certainly utilized the SKD or CKD process, export within the region, without doubt, would face stiff competition from products imported from outside. Bilateral agreement on free trade or, at least, restricted free trade (for example quota-system) for the products is required. The more desirable but ideal solution of this would be joint investment of countries concerned.

3.3 Observation on Infrastructures

Infrastructural aspects for developing metal-mechanical industry in El Salvador are summarized as follows:

a) Adequate - Electric power and telecommunications.

b) Inadequate - water supply, water drainage (sewage system) and industrial estates.

c) Depending upon location - road transportation, especially San Salvador area

Among those an industrial estate means predestinated area which is owned and is provided with necessary services by a public body including government agency.

3.4 Siting of Metal-Mechanical Industries

For siting of metal-mechanical industries in El Salvador, the following requirements are preferably met.

a) Availability of flat land

b) Easy access to Acajutla and San Salvador

c) Availability of water for industrial use

d) Comperatively mild climate

The existing corridor connecting San Salvador and Santa Ana and its neighboring area will provide a good basis for inland industrialization, since it meets all the above mentioned requirements.

Easy access to the port of Acajutla is identical with easy access to imported machinery and raw materials. Office workers and skilled labors, required for the development of the industry, are easily recruited in the proximity of San Slavador or Santa Ana. Mild climate in this region ensures high productivity of assembling in selected metal mechanical industries, otherwise airconditioning of whole building is required.

3.5 Technological Competence

Although high level of metal-mechanical technology is maintained at private sectors in El Salvador, the following advanced technologies must be introduced from the outside and continued effort to train skilled technicians will be required.

TABLE 3

ADVANCED TECHNOLOGIES IN NEED

TECHNOLOGIES	METAL-MECHANICAL SECTORS CONCERNED
a) Sand Mold Casting of Gray, Malleable and Ductile Iron	Engines, Compressors
b) Large-Scale Die Casting	Engines, Air Compressors
c) Closed Die Forging	Hand Tools, Engines, Compressors
d) Heat Treatment	Hand Tools, Agricultural Implements
e) Sheet Metal Working esp. Deep Drawing	Electric Power Meters, Regrigerating Compressors
f) Precision Machining	Engines, Electric Power Meters, Water Meters, Compressors (Die Manufacturing)
g) Precision Assembling	Engines, Compressors, Electric Power Meters
h) Glass Forming	Electric Power Meters

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In addition to the proposed transfer of technology, establishment of various laboratories including chemical analysis, metallurgical and mechanical testing and eigineering is urgently needed. Functions of these facilities are aimed not only at ensuring quality of products, but also at creating basis for industrial standards in future. Concept of a metal-mechanical industrial complex, as in conceived in Guatemala and Costa Rica, is important, since it could incorporate the above mentioned testing laborotories and engineering facilities in the vicinity of production lines. The integrated complex could facilitate greater use of domestically produced parts which are available at hand.

3.6 Sectorial Analysis

The following industrial sectors were examined in detail, because the Government of El Salvador has placed priority on these products for development.

a) Agricultural Implements

Potential market for agricultural implements drawn by tractors or animals are estimate to be 30,000 units/year. IMACASA in Santa Ana is already considering the production in this line in very near future. Due to relatively small initial market, the company appears well equipped with facilities as well as technologies. As for tractors for agricultural use, the models in production in Japan are comparatively small (20HP) and potential market for C.A. is too small, 1,000 - 2,000 units/year, to be assembled even on SKD basis at this moment.

b) Engines

Air-Cooled gasoline engines are gradually put out of use, primarily due to higher price, higher fuel cost and shorter lives of duration. Replacing these are diesel engines with small output (4-10HP). Estimation of existing market is not available. The most desirable type of initial production is SKD, gradually moving toward CKD and production of some parts.

c) Electric Power Meters

Apart from small existing market for all C.A. region, not exceeding 100,000 unit/year, there is a serious problem of disorder of employing varied specifications for the meters. For example, utility companies which are under strong foreign technological influence tend to use specific types, whereas those with independent operation purchase the meters through international tender. Under these circumstances, production and sales of electric powers memeters seems extremely difficult. Unification of the specifications throughout utility companies in Central America is most desirable before the meter production is started. One solution of this problem is joint investment in the production by utility companies or government agencies concerned. Technologically, manufacture of electric power meter belongs to precision machinery assembly and it is in this area much effort is needed to establish technology.

d) Compressors for Refregerators

The current level of market, less than 100,000 units/year, seems still inadequate for starting assembling. Through gradual expansion of refregerator manufacturing industry in El Salvador, SKD of compressors may become feasible in future.

Since manufacture of compressors for refrigerator requires electric motors, production of the both products in one plant would be desirable.

e) Hand Tools for Metal Working

Production of sophisticated cutting tools such as drill heads and reamers are regarded as long-term objectives. Hand tools including spanners and wrenches appear promising articles to be produced in

El Salvador at present, since their production process employs relatively simple metal working technologies.

Domestic and regional markets are obviously too small to justify large-scale production of a small number of lines of product. Major part of products are to be exported primarily to U.S., in which current imports from Japan could be replaced by those from El Salvador.

4. FUTURE PLAN OF STUDY

With gathered information, continued analysis will be conducted in Japan in the following fields of study:

a) Branch study - similar to those conducted by INSAFI and U.N. experts.

b) Selection of sectors or projects in metal-mechanical industry

c) Economic and financial analysis of project selected

d) Economic and social impacts analysis

When the draft of the final report is prepared, a representative of the survey team will be sent to El Salvador again to discuss about the results in much detail with counterparts and final touch of amendment will be made for the report.

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NOTICE: All figures appear in this interim report are subject to change during the course of study followed.