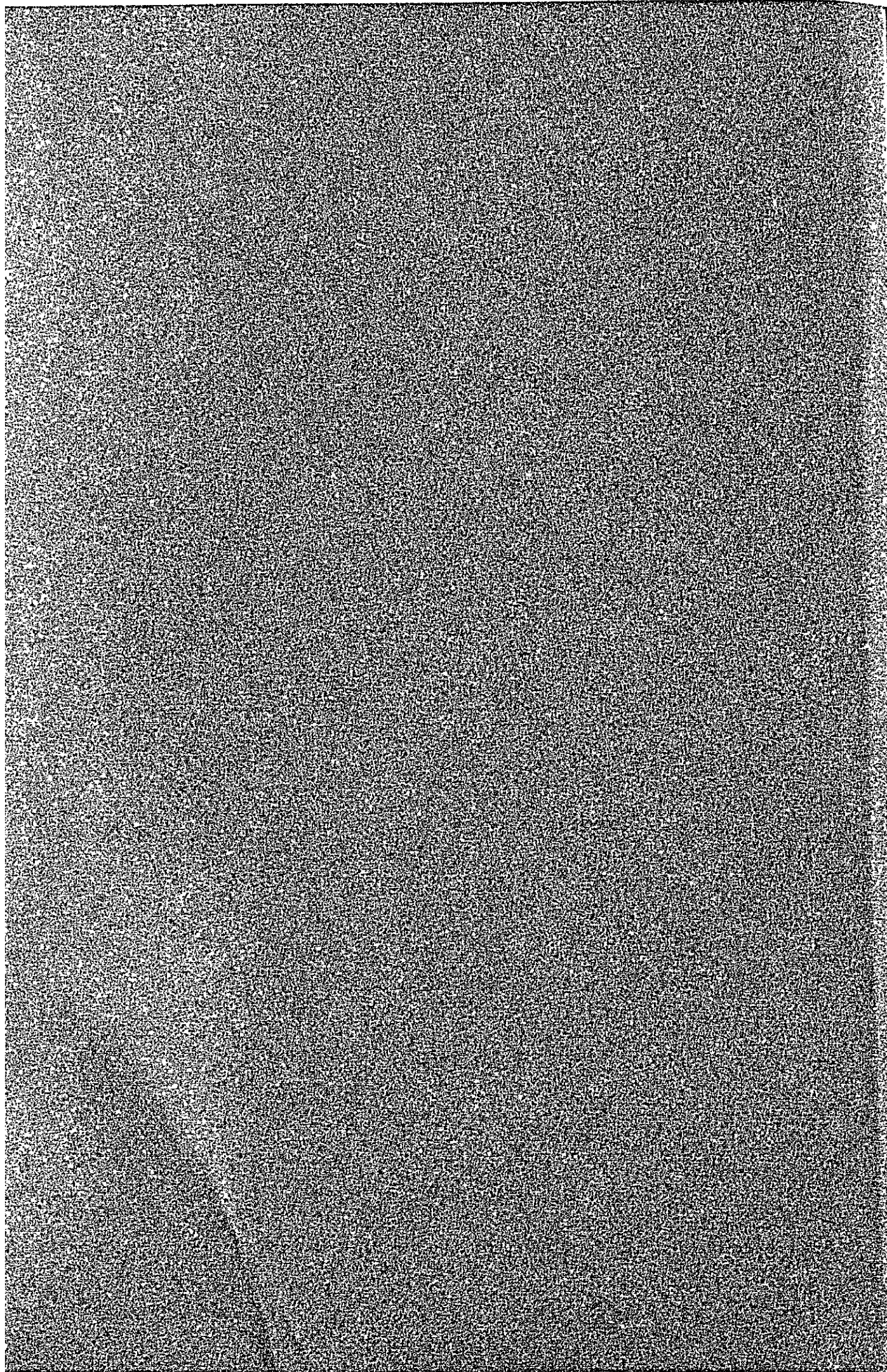


**CHAPTER V**  
**PROJECT IMPLEMENTATION**





**CHAPTER V**  
**PROJECT IMPLEMENTATION**

**5.1 Introduction**

Project implementation is divided into two phases: construction phase and production phase. The construction phase consists of two periods: preparatory period and construction period. Provision of necessary services for technical extension and agricultural credits are inevitable for successful results in the project.

**5.1.1 Construction Schedule**

**(1) Preparatory Work**

Work to be undertaken during preparatory period are:

1. Completion of topographic map in the project area,
2. Preparing of tender documents including specifications and detailed design, and
3. Evaluation of Tender.

Evaluation of tender is to be finalized within 6 months after completion of tender documents.

**(2) Construction Work**

Selection of the contractor for construction is to be made by international tender. Construction is to commence in the second year after the accomplishment of preparatory work and to be completed within 42 months. Facilities are to be constructed in the following order:

- 1) Main Farm road as using construction road,
- 2) Bridge crossing over the Pamplonita River and driving canal,
- 3) Main drainage canal and main irrigation canal, and
- 4) Secondary drainage canal and secondary irrigation canal.

Construction of driving canal and irrigation canals is only applicable in the Plan III.

Detailed construction schedule has to be determined during preparatory work considering the existing conditions and interrelationship of works to minimize construction cost.

**(3) Procurement of Equipment and Machinery for operation and Maintenance**

Equipment and machinery are to be utilized for Operation and maintenance of the project. Procurement of these items is to commence

in the fourth year and completed within the fifth project year.

(4) Construction of Building

Necessary buildings are field inspector house and garages for operation and maintenance of machinery. Construction of these buildings is to commence 36 month after the commencement of preparatory work.

(5) Construction Supervision

Construction supervision is to be undertaken by the consultant with sufficient experience and capability in the same type of project. Major areas to be supervised are schedule control, quality control and safety control.

(6) Technical Transfer

During construction period, the consultant will undertake the transfer of technology to the Colombian government officers in the related fields of the project.

The overall construction schedule is summarized in Fig. 5-1.

## 5.2 Project Cost

Project cost is classified into two categories: construction cost and operation and maintenance cost. Construction cost includes cost of preparatory work and cost for construction supervision. Operation and maintenance cost starts from the fifth year of the commencement of preparatory work.

### 5.2.1 Construction Cost

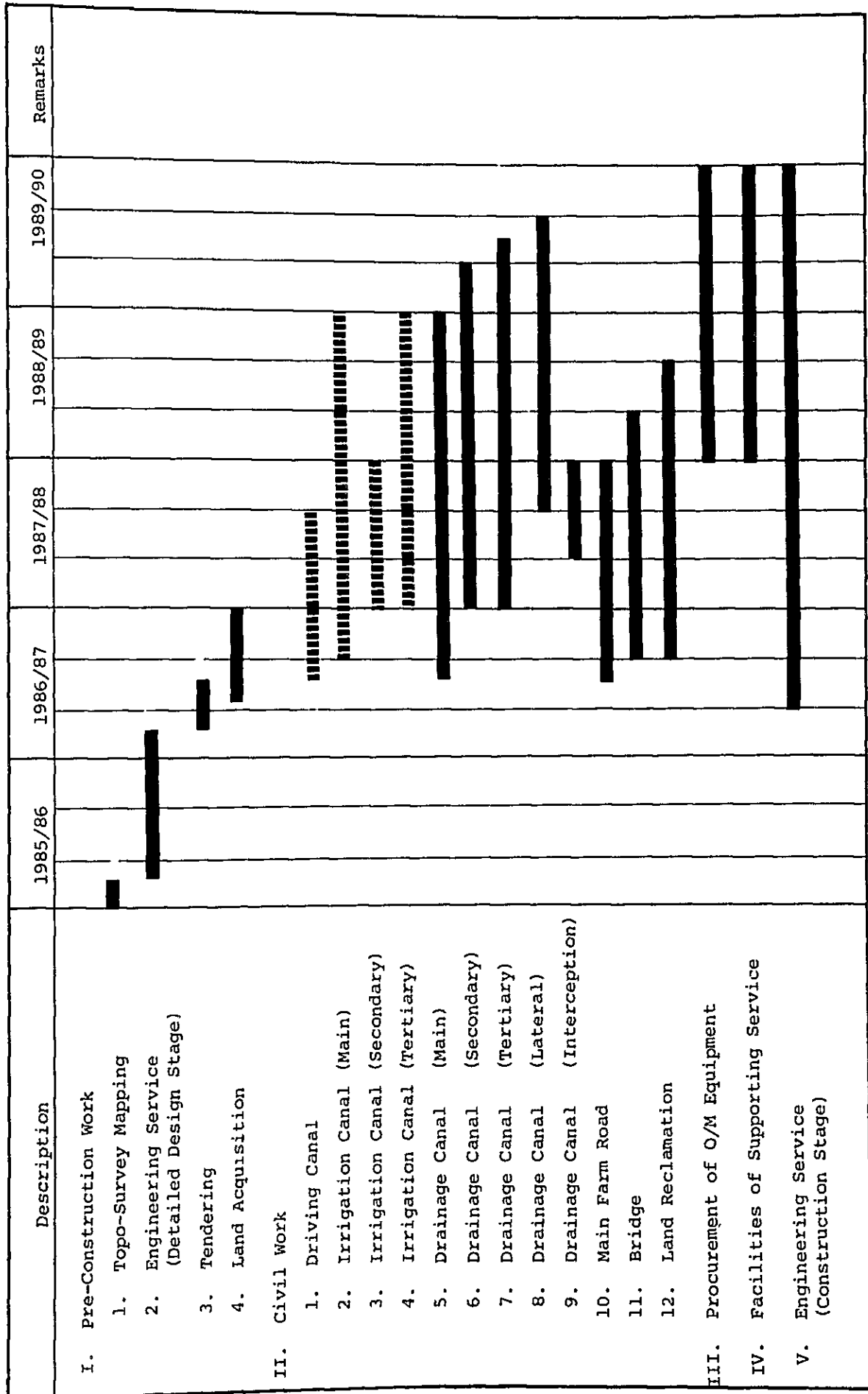
Estimated construction cost for each Plan is summarized in Table 5-1.

Table 5-1 Summary of Construction Cost Unit 10<sup>3</sup>COL\$ (10<sup>3</sup>US\$)

Plan	Foreign Portion	Local Portion	Total	Foreign Local Ratio	
				Foreign	Local
I	1,263,037 (15,788)	827,244 (10,341)	2,090,281 (26,129)	60%	40%
II	1,494,782 (18,685)	932,898 (11,661)	2,427,680 (30,346)	62%	38%
III	1,786,904 (22,336)	1,311,620 (16,395)	3,098,524 (38,731)	58%	42%

Note: Exchange Rate 1US\$ = 80 COL\$

The breakdown of the above estimate is shown in Table 5-2.



■ Plan I, II and III

■■■■■■■■■■ Plan III only

Fig. 5-1 Implementation Schedule

Table 5-2 Construction Cost for Each Work Division

Unit: 10<sup>3</sup> Col \$

Description	Plan I	Plan II	Plan III
I. Preparatory Work	10,770	13,715	14,852
II. Irrigation Canals	-	-	274,725
III. Drainage Canals	600,211	794,887	872,107
IV. Farm Road	83,003	83,003	83,003
V. Bridge	155,616	155,616	155,616
VI. Land Reclamation	68,575	68,575	68,575
Sub-Total (I - VI)	918,175	1,115,796	1,467,878
VII. O/M Equipment	57,184	70,320	91,768
VIII. Supporting Service	750	750	6,000
IX. Administration Cost	37,480	33,480	33,480
X. Engineering Services	273,602	273,602	291,762
Sub-Total (I - X)	1,283,191	1,493,948	1,890,888
XI. Physical Contingency	128,318	149,394	189,088
Sub-Total (I - XI)	1,411,509	1,643,342	2,079,976
XII. Price Escalation	678,772	784,338	1,018,548
Grand-Total	2,090,281	2,427,680	3,098,524

The summary of the disbursement schedule by each plan is shown in Table 5-3.

The above estimated construction cost is based on the following assumptions:

1. Exchange rate is fixed as follows:  
US\$1 = COL\$80 = Yen 240
2. Construction is to be undertaken by a selected contractor with the necessary construction machinery.
3. Estimated purchase price of construction machinery for depreciation includes the sum of CIF Baranquilla cost, import duty (25% of FOB in Japan) and local inland transport to the Project area.
4. Price of construction material which will be imported are estimated based on CIF Baranquilla and local transport. Import duty of these material is exempted.
5. Price of labour and local material is based on market prices in July, 1983.
6. Administration cost is estimated as 10%-15% of the total construction cost.
7. Physical contingency is estimated as 10% of construction cost and administration cost. Price contingency for the local portion is estimated at 20% and for the foreign portion at 8%.

Table 5-3 Summary of Annual Disbursement Schedule

Unit: 10<sup>3</sup> COL \$ (10<sup>3</sup> US\$)

Project Year	Plan I				Plan II				Plan III			
	F/C	L/C	Total	Per-centage	F/C	L/C	Total	Per-centage	F/C	L/C	Total	Per-centage
1985/1986	49,407 (618)	11,479	60,886	2.9	49,407 (618)	11,479	60,886	2.5	49,407 (618)	11,479	60,886	2.0
1986/1987	147,426 (1,843)	94,068	241,494	11.6	163,209 (2,040)	104,234	267,443	11.0	208,931 (2,612)	190,179	399,110	12.9
1987/1988	390,458 (4,881)	337,993	728,451	34.8	488,916 (6,111)	380,658	869,574	35.8	596,031 (7,450)	525,820	1,121,851	36.2
1988/1989	439,763 (5,497)	259,882	699,645	33.5	517,960 (6,475)	296,142	814,102	33.5	620,150 (7,752)	408,880	1,029,030	33.2
1989/1990	235,983 (2,950)	123,822	359,805	17.2	275,290 (3,441)	140,385	415,675	17.2	312,385 (3,905)	175,262	487,647	15.7
Total	1,263,037 (15,789)	827,244	2,090,281	100.0	1,494,782 (8,685)	932,898	2,427,680	100.0	1,786,904 (22,336)	1,311,620	3,098,524	100.0

NOTE: Exchange Rate 1 US\$ = 80 COL \$



### 5.2.2 Operation and Maintenance Cost

Operation and maintenance cost is estimated as shown in Table 5-4.

**Table 5-4 Annual Operation and Maintenance Cost**

(COL\$)

	Plan I	Plan II	Plan III
Operation of Machinery	17,883,000	21,507,000	29,146,000
Civil Work	1,788,000	2,151,000	2,915,000
Administration	3,344,000	4,022,000	5,450,000
Total	23,015,000	27,680,000	37,511,000

The cost incurred for each organization of operation and maintenance has to be met by beneficiaries. For administration cost of the regional office, 17% of operation and maintenance cost is to be added to the operation and maintenance charge to the beneficiary farmers. Further details are given in Appendix Table 7-2-13.

### 5.3 Project Execution

Project execution is divided into two phases: construction phase and operation & maintenance phase. Since the nature of this project is land improvement, responsibility in the both phases, falls on HIMAT. However, close coordination with related public institutions is indispensable for successful project execution since this project involves complex agricultural aspects.

#### 5.3.1 Execution Organization in Construction Phase

It is HIMAT procedure for the regional office to have responsibility for construction of a land improvement project placed within the territory or locate a project office when the project site is located at a remote place from the responsible regional office.

Since the 9th region office is located at Cinera near by the project area, the operations section of the office will function as the project office for construction of works under Regional Director of HIMAT.

Almost half of the project area has been managed by INCORA in their immigration project. Furthermore, since the project has to be consistent with regional development policy, HIMAT should maintain close coordination with these offices. For this purpose, it is proposed to organize an advisory organ for the project consisting of members from the Regional Government, INCORA and MOPT.

In order to assist and coordinate HIMAT and the contractor during execution of construction, a consultant is employed. Considering the required volume of work, the necessary man-months by the consultant are proposed as shown below.

Plan	Completion of Tender Documents			Construction and Supervision		
	Foreign Portion	Local Portion	Total	Foreign Portion	Local Portion	Total
I, II	85	40	125	170	150	320
III	95	40	135	175	200	375

Proposed executing organization is illustrated in Fig. 5-2.

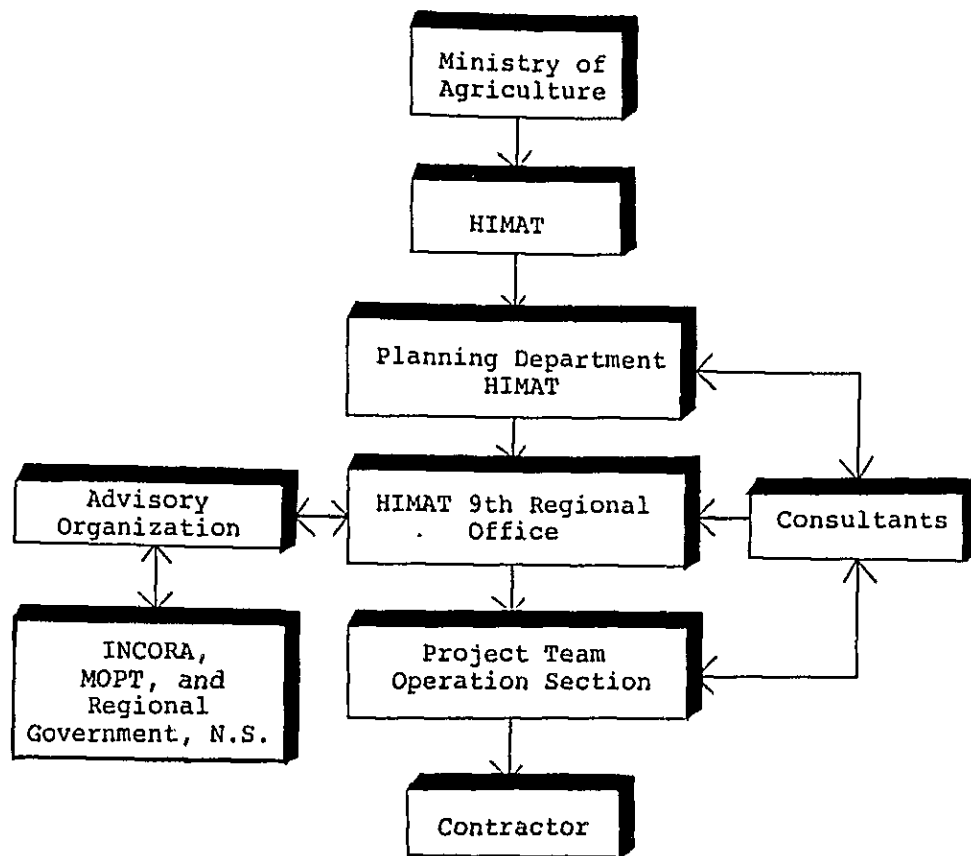


Fig. 5-2 Organization in Construction Stage

### 5.3.2 Executing Organization for Operation & Maintenance

HIMAT is responsible for operation & maintenance of the project. The conservation section of the regional office undertakes this function. This section is responsible for general operation & maintenance of all projects in the region. In addition, a specific section for operation & maintenance is organized for each project under the conservation section.

Personnel and equipment necessary for operation & maintenance of the project is proposed below.

Personnel	Plan I	Plan II	Plan III
Officer in Charge	1	1	1
Civil Engineer	2	2	3
Assistant Engineer	4	4	6
Secretary	3	3	3
Water Controller	-	-	4
Drivers	4	4	6
Operators	6	7	10
Assistant Operators	4	5	6
Total	24	26	39

Some of the proposed personnel may serve concurrently for the Zulia Project.

Considering the type of facilities, volume of operation & maintenance work, the following machinery is proposed:

Machinery	Capacity	Required Quantity			Purpose
		Plan I	Plan II	Plan III	
Bulldozer	15 t	1	1	1	Road repair. Removal of dredged earth
Back Hoe	0.6 m <sup>3</sup>	1	1	2	Dredging, loading earth
Motor Grader	3.7 m	1	1	1	Road repair
Drag Line	0.6-0.8 m <sup>3</sup>	1	2	2	Dredging of main canal. Earth loading
Dump Truck		2	2	4	Transport of earth and material

For promotion of agricultural production, various kinds of technical extension and agricultural credit services are necessary in addition to provision of operation & maintenance services for drainage and irrigation facilities.

It is, therefore, recommended that HIMAT as a leading institute needs to coordinate its activities with related public institutes including Regional Government. For this purpose an advisory organ is to be set up. In The Republic, an association of benefiting farmers is to be incorporated. Close coordination between HIMAT,

advisory organ, related institutes and beneficiaries' association is required indispensably for successful project results.

Proposed organization for operation & maintenance is illustrated in Fig. 5-3.

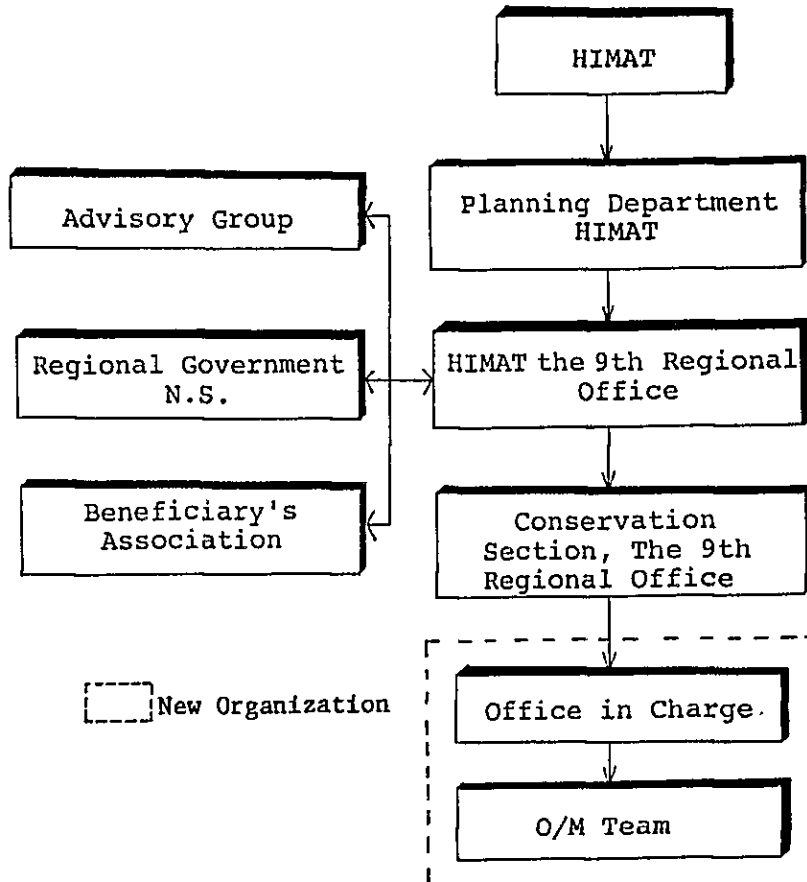


Fig. 5-3 Organization in O & M Stage

### 5.3.3 Supporting Services for Agriculture

#### (1) Agricultural Credits

When the project is implemented, agricultural credits will be required. The type of credits will differ according to the credit amount, interest rate, period and purpose. Generally speaking, credits for Parceleros will be granted by INCORA and for Particulares by Caja Agraria.

HIMAT is in position to make the necessary arrangements with related institutes to meet the future requirements for the principal credit. Further details of agricultural credits are shown in Appendix Table 6-9-1.



## (2) Extension Services

It is necessary to provide farmers with extension services to obtain successful project results. The agriculture and livestock development section (Seccion de Desarrollo Agropecuario) in the 9th Regional Office of HIMAT will coordinate with related public institutions like INCORA and ICA for promotion of extension services.

When agricultural mechanization will be introduced for irrigated grain crops, SENA should be in position to provide farmers with training and education necessary for mechanization.

For successful marketing of agricultural products, IDEMA is requested to provide the project with the necessary services for transport and marketing of products.

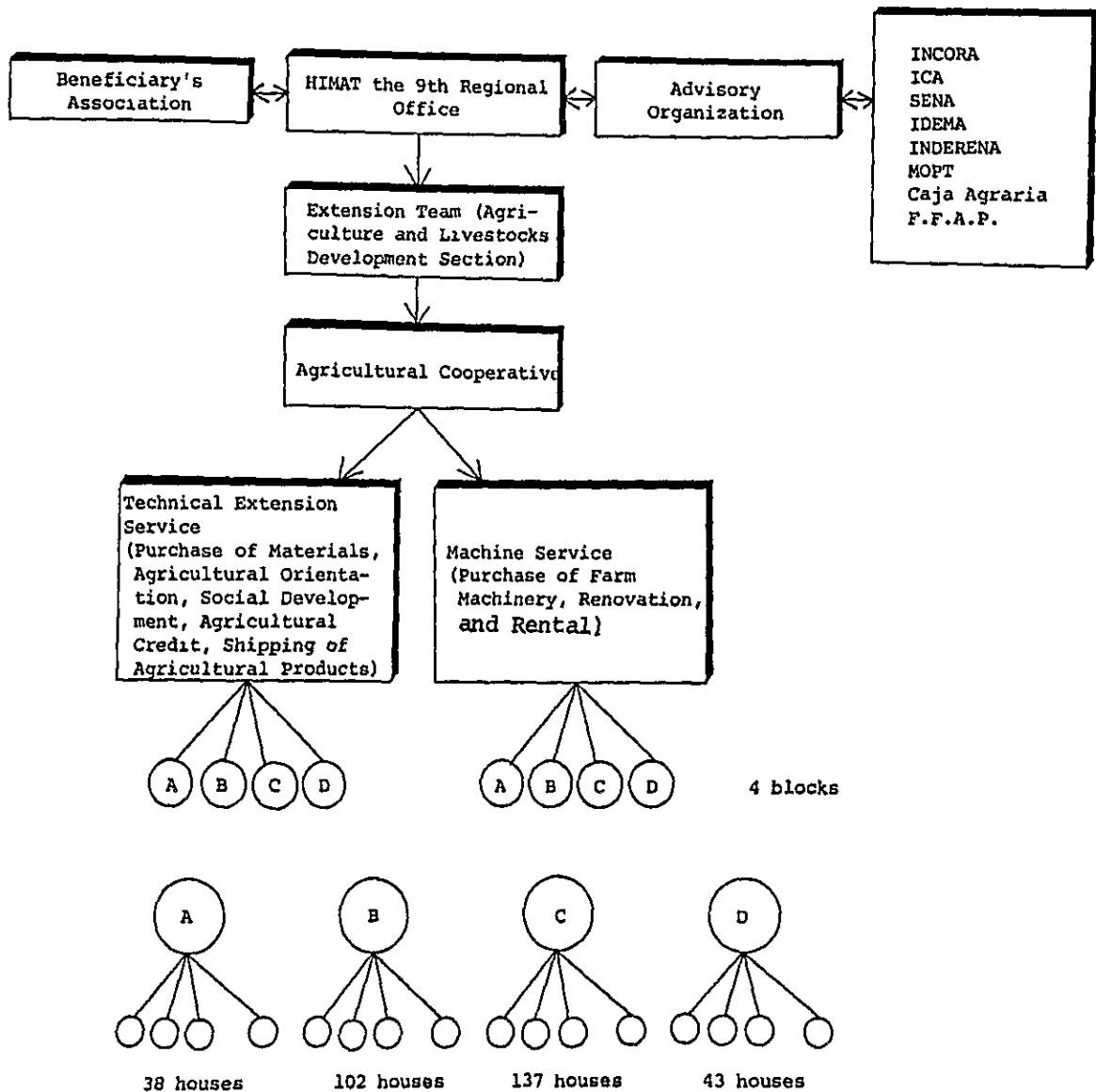
## (3) Farmer's Cooperative

The project area is classified into four zones according to the spatial conditions relating to the agricultural system in each classified zone (Section 3.7). It is, therefore, proposed to organize a farmer's cooperative for each classified zone in addition to the beneficiaries' association of the project.

The farmer's cooperative will function in two areas with close cooperation of related public institutes: promotion technical extension services and agricultural mechanization.

The promotion of technical extension services will be made for supply of material and equipment for agricultural production, assistance for farming, improvement of farm level infrastructure, agricultural credits and collection of products. The promotion of agricultural mechanization includes assistance for farmers to purchase agricultural machinery as well as repair and rental services for agricultural machinery. For this purpose, cooperation with the conservation section of HIMAT will be required. Close coordination will also be necessary between the farmers' cooperative and the agriculture and livestock development section of the HIMAT Regional Office.

In addition, farmer's attitude toward improvement of agricultural system is another important factor for the project to consider. The inter-relationship of these organizations and public institutions in the project is illustrated in Fig. 5-4.

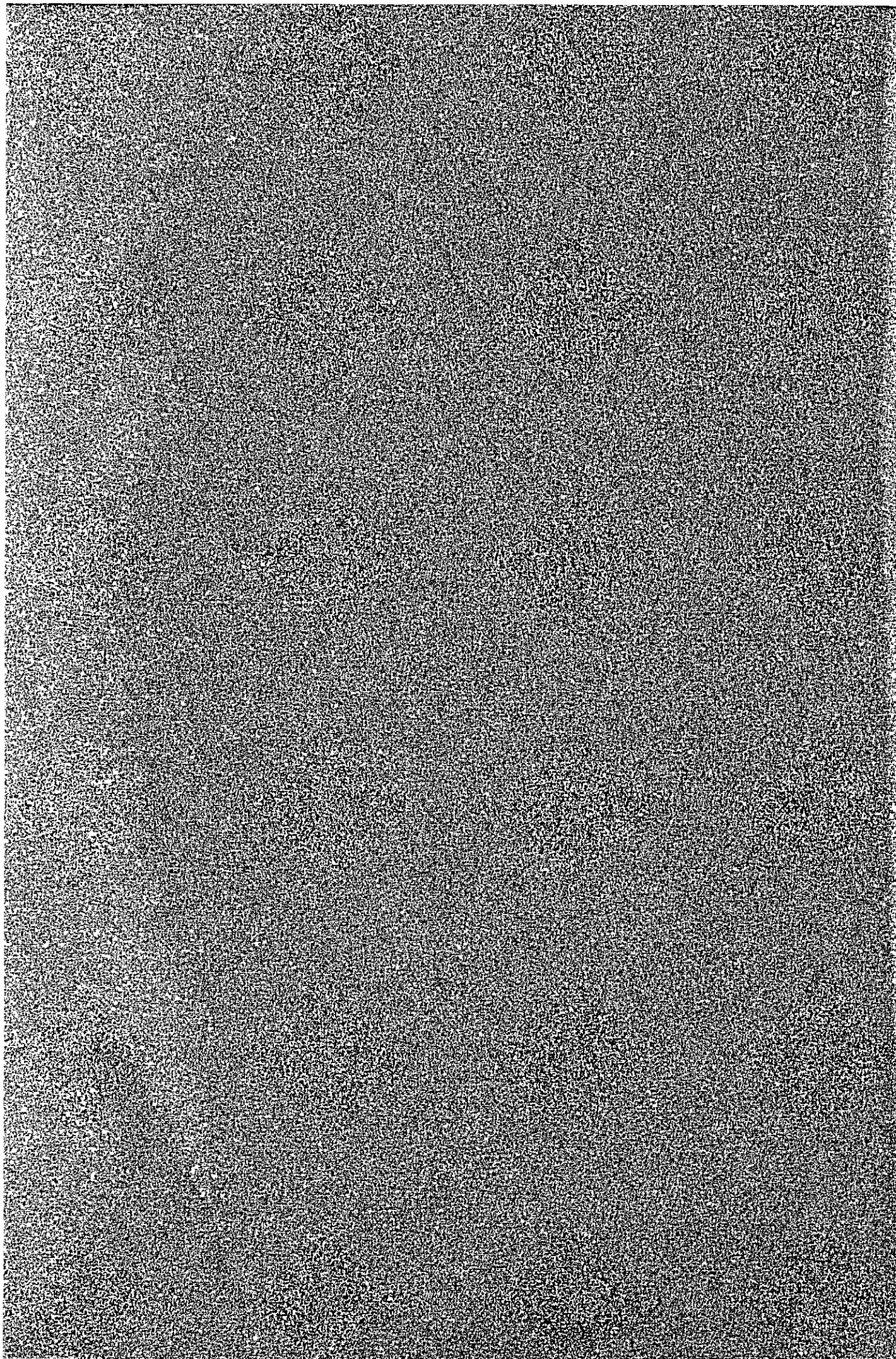


**Fig. 5-4** Agricultural Extension Service and Beneficiary's Association



**CHAPTER VI**  
**PROJECT EVALUATION**







## CHAPTER VI

### PROJECT EVALUATIONS

In order to determine the most optimum development plan for the project, the project evaluations are made in this Chapter on economic and financial aspects of the project. Considering certain factors affecting the project a sensitivity analysis is also made, together with the socio-economic evaluation.

#### 6.1 Project Benefit

The project benefit is estimated as the difference in net production value between with project and without project. Net production value derived as gross production value less production cost. The gross production value is estimated based on the farm gate price of crops. The production cost does not include the transportation costs.

Assumptions are made to estimate the incremental benefit before mature stage of the project as shown below:

1. Incremental net production value of beef cattle, existing cacao and cultivated crops is proportional to the increase of area improved. When construction is completed incremental net production value increases to 80% of the proposed net production value. Two years after completion of construction, the incremental net production value will reach 100%.
2. Extension of cacao area will start in the second year from commencement of construction at the rate of one third of the proposed extension area. Extension will be completed within three years. Harvesting will commence in the fifth year from planting. The incremental net production value in the first harvest is taken as 80% of the proposed production value. 100% of the net production value will be obtained in the third year from the first harvest.
3. Incremental net production value in the without project case will increase to 1.2 times of the present net production value by the eighth year from the commencement of the project and remain at a constant level thereafter.

The variation of incremental net production value is illustrated in Fig. 6-1.

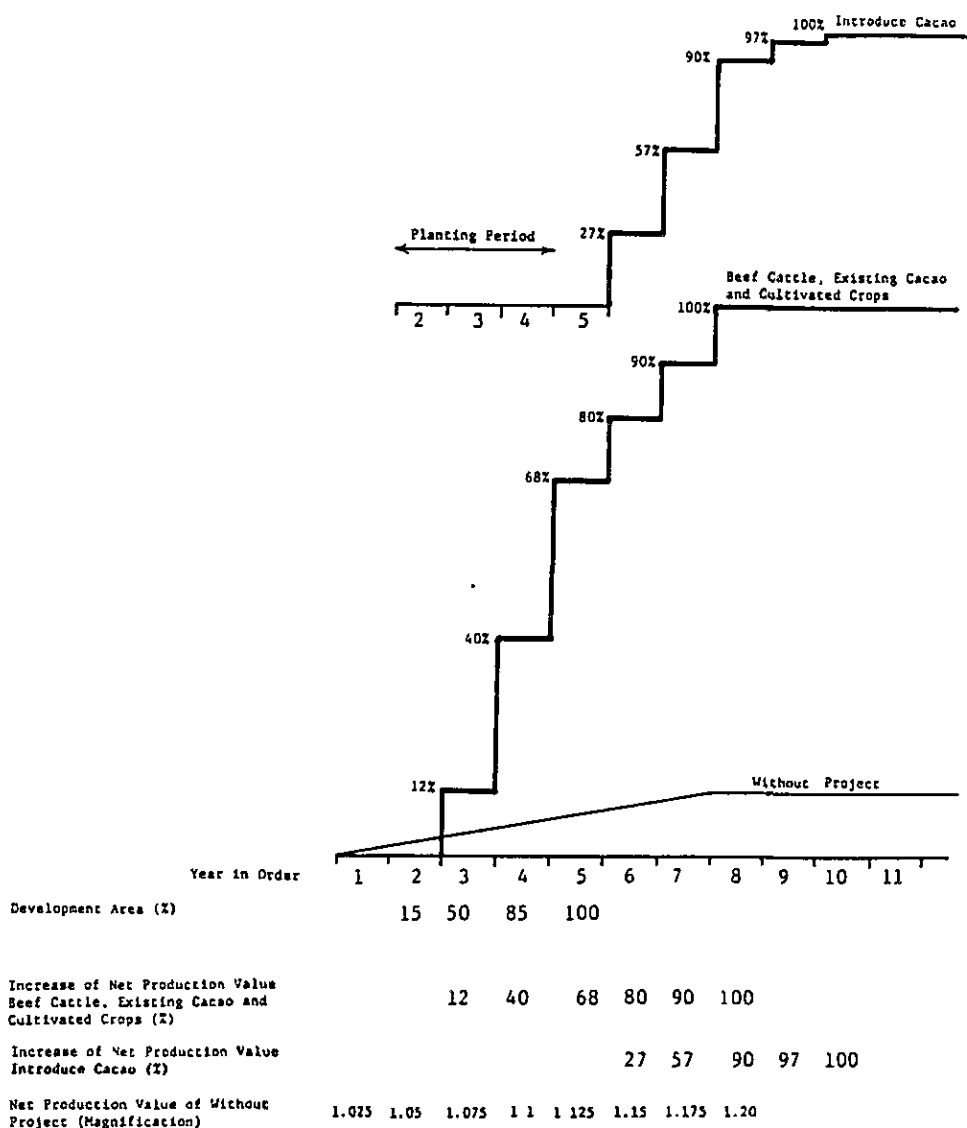
Based on the above assumptions the net production value and the project benefit at mature stage are summarized as shown in Table 6-1.

**Table 6-1 Net Production Value and Project Benefit**

(Unit: 10<sup>3</sup>COL\$)

	Present	Without Project	Plan I	Plan II	Plan III
Net Production Value	80,719	96,863	226,723	331,448	449,307
Project Benefit		-	129,860	234,585	352,444

The ratio of the project benefit among the three Plans is 1:1.8:2.7.



**Fig. 6-1 Increase of Net Production Value**

## 6.2 Economic Evaluation

The project life is defined 50 years including 18 month of preparatory work and 42 months of construction work. Economic evaluation consists of estimation of economic internal rate of return and sensitivity analysis based on economic prices.

Generally, economic prices are obtained by adjusting exchange rate for foreign currency and labour cost after removing transfer items such as administration cost, interest of agricultural credits and etc. from market prices. In The Republic, however since no significant distortion is observed in labour cost and exchange rate for foreign currency, the market price without correction is applied in the economic evaluation of the project.

### 6.2.1 Economic Internal Rate of Return (EIRR)

The economic construction cost, economic annual operation & maintenance cost and annual project benefit in each Plan are summarized in Table 6-2.

Table 6-2 Project Cost and Benefit

(Unit: 10<sup>3</sup> COL\$)

	Plan I	Plan II	Plan III
Construction Cost	1,374,682	1,606,514	2,043,149
Annual O/M Cost	19,671	23,658	32,061
Annual Benefit	129,860	234,585	352,444

EIRR is estimated as shown below:

<u>Development Plan</u>	<u>EIRR</u>
I	7.1%
II	11.1%
III	13.4%

The EIRR of the Plan III exceeds the opportunity cost of capital in The Republic (12%). According to this economic evaluation, the proposed Plan III has the highest priority among three Plans. When discount cash flow is made at the rate of 12%, the benefit cost ratio is estimated to be 1.12 and the net present value is COL\$ 207,927,000. Therefore, the feasibility of the Plan III is considered to be economically justified.

### 6.2.2 Sensitivity Analysis

Sensitivity analysis is undertaken for the Plan III since its feasibility is economically justified. For the sensitivity analysis attention is drawn to construction cost, gross production value and production cost. Results are summarized as shown below:

	EIRR
1. 10% increase in construction cost	12.3%
2. 10% decrease in gross production value	11.0%
3. 10% increase in production cost	12.4%

The increase of construction cost shows price escalation of construction material and delay of construction period. The decrease of gross production value involves decrease of farm gate price and decrease of gross production.

The order of economic effect from large to small to the project is gross production value, construction cost and production cost.

In the project area, about 15% of farms have tractors and other agricultural machinery. Large numbers of agricultural machinery (110 tractors, 24 combines, 2 bulldozers and other machinery) have been prepared in the Zulia Project. It is proposed, therefore, to utilize this machinery for agriculture in the project area. For this reason, the hire charge of agricultural machinery including depreciation, operation & maintenance cost is included in the production cost of crops. However, in order to make an economic evaluation of establishment of a mechanical center at HIMAT for hire services of agricultural machinery, sensitivity analysis is made based on the numbers and types of required machinery. Their purchase prices are shown in Table 6-3:

Table 6-3 Number of Farm Machinery and Purchase Cost

Year	2	3	4	5	Total
No. of Tractor	8	17	17	7	49
No. of Combine	2	4	5	;	12
Purchase Price (10 <sup>3</sup> COL\$)	30,660	63,620	69,750	22,230	186,260

As a result, when the above machinery purchase cost is included in the construction cost, project EIRR is estimated to be 12.4%.

### 6.3 Financial Evaluation

The financial evaluation is made from the viewpoint of the cash flow in the household economy of benefiting farms, since all the cost of the project is met by beneficiaries in The Republic.

Repayment is assumed to be made in 15 years after the grace period of construction period with 20% interest rate. This condition can be modified depending on the nature of financing for the project.

Financial evaluation is made on the basis of the market prices.

#### 6.3.1 Construction Cost

The construction cost is divided into foreign portion and local portion. The investment schedule is shown in Table 6-4:

Table 6-4 Required Capital

(Unit: 10<sup>3</sup> COL\$)

Plan	Year	1	2	3	4	5	Total
I	Foreign Portion	49,407	147,426	390,458	439,763	235,983	1,263,037
	Local Portion	11,479	94,068	337,993	259,882	123,822	827,244
	Total	60,886	241,494	728,451	699,645	359,805	2,090,281
II	Foreign Portion	49,407	163,209	488,916	517,960	275,290	1,494,782
	Local Portion	11,479	104,234	380,658	296,142	140,385	932,898
	Total	60,886	267,443	869,574	814,102	415,675	2,427,680
III	Foreign Portion	49,407	208,931	596,031	620,150	312,385	1,786,904
	Local Portion	11,479	190,179	525,820	408,880	175,262	1,311,620
	Total	60,886	399,110	1,121,851	1,029,030	487,647	3,098,524

The foreign portion of the construction cost for each Plan is:

<u>Plan</u>	<u>Foreign Portion</u>
I	60%
II	62%
III	58%



For the financial evaluation interest rates and price escalation are assumed as shown below:

	Interest Rate (%/Year)	Price Escalation (%/Year)
Foreign Portion		
Case 1	8.0	8.0
Case 2	4.5	8.0
Local Portion		
Case 1	20	20
Case 2	18	20

Repayment condition are also assumed in two cases of different interest rate; 18% and 20% per year with 5 years grace period and 15 years term.

Based on the above assumptions, the amount of repayment required in each case is summarized as shown in Table 6-5.

**Table 6-5 Annual Repayment of Project Cost**

(Unit: 10<sup>3</sup> COL\$)

Financial Condition				Repayment Condition			
Foreign Portion		Local Portion		Interest	Plan I	Plan II	Plan III
Inter-est	Price Esca-lation	Inter-est	Price Esca-lation.				
8%	8%	20%	20%	20%	1,910	2,208	2,875
4.5%	8%	18%	20%	18%	1,642	-	-

### 6.3.2 Economic Surplus Value

The economic surplus value of an average farm obtained in Section 4.3.3 is inflated at the rate of 20% to estimate the economic surplus of a farm at sixth year from the commencement of the project as shown in Table 6-6:

**Table 6-6 Economic Surplus Value at the 6th Year**

(Unit: 10<sup>3</sup> COL\$)

	Plan I	Plan II	Plan III
Present	554	879	1,157
At the 6th year	1,654	2,625	3,455

### 6.3.3 Comparison of Repayment and Economic Surplus Value

In the Plan I, the economic surplus value is relatively small since there is limitation in net production value of the major crop; beef cattle raising. Therefore, in order to repay construction cost, investment conditions should be 4.5% interest rate for foreign portion and 8% annual price escalation and 18% interest rate for local portion. Repayment condition also should be reduced to 18% of interest rate with 5 years grace period and 15 years term.

In the Plan II, the economic surplus value increases to a certain extent since the farming system is improved by extension in cropping area for cacao and cultivated crops. For repayment of the cost, investment condition of foreign portion can be 8% interest rate with 8% annual price escalation.

## 6.4 Socio-Economic Impact

Land improvement increases agricultural production and also contributes significantly to reduction of the extension and the duration of land inundation which will contribute to prevention of breeding and extinction of insect pests and epidemic diseases like malaria. At the same time, improvement of the road network should accelerate provision of transportation services in the project area and provision of a bridge at Agua Clara should improve access to the national road for farm in the project area. In this respect, the Plan III may have the most advantage since a denser road network is proposed than in the other two Plans. Also irrigation water will be available in part for domestic purposes.

Introduction of new crops and improvement of agricultural techniques requires more labor which should produce more employment opportunity in the project area and in the surrounding area. This will indirectly affect on stabilization of people's livelihood through reduction of unemployment rate which has been increasing since devaluation of Venezuelan currency. In this respect, the Plan II and III have the most advantage because the newly required employed labor is estimated to be 1,031 men per year and 1,247 men per year, respectively.

In summary, the effects of this project are:

1. Increase in income through improvement of productivity,
2. Improvement of public health environment,

3. Improvement of social environment through provision of road network,
4. Improvement of living standard in the vicinity of the project area through producing employment opportunity, and
5. Stabilization of people's livelihood.

Finally, capital investment in the project area is itself an economic impact to the surrounding areas. The above effects are expected from the project with each development Plan.

## 6.5 Evaluation Summary

Through the evaluation of the each Plan, the Plan III is recommended since it has the highest EIRR and also financially it has high adaptability to the capital investment conditions of the foreign financial source.

The Plan I indicates smaller EIRR than the opportunity cost of capital in The Republic and capital investment conditions for external finance are limited. The standard repayment condition in The Republic is not applicable for the Plan I.

The Plan II has slightly smaller EIRR than the opportunity cost of capital in The Republic. Financially it can obtain external finance at the same conditions as the Plan III requires, however, the remaining economic surplus value after repayment is very small compared with the Plan III.

In the project formulation, the Venezuelan market, which used to be a large market place of the project area before devaluation of Venezuelan currency, is not accounted for. When it recovers its own economic activity, the Plan I and II cannot provide this market with sufficient supply since there is limitation in agricultural products and variety of products. The Plan III, however, may have wide adaptability for expansion of the market in future with its higher level of land improvement.





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