

to be US\$ 300 per year for general farms (PERTT, Tarija 1990). Consequently, the benefit of the object farm to be reclaimed due to erosion control is regarded as US\$ 3,850,000/year (refer to ANNEX J).

7.2.2 Project Expenses

(1) Project costs

The costs necessary for carrying out the project are the cost of construction works, the cost for operation and maintenance of projected facilities, the replacement cost of equipment, the consultant fee and the above-mentioned agricultural production cost (Increment). Of these, the cost of construction works is estimated to be total of US\$ 15,185,000, including the consultant fee. It is disbursed as follows depending on the work schedule:

	Unit: US\$ 1,000		
	F/C	L/C	Total
1st year	298	194	492
2nd year	1,622	1,110	2,732
3rd year	3,718	3,851	7,569
4th year	2,084	2,308	4,392
Total	7,722	7,463	15,185

Refer to ANNEX I for detailed project costs

(2) Operation and Maintenance costs

Necessary costs per year for operation and maintenance after completion of the project are estimated to be US\$ 127,800 at the 1st fiscal year (5th year after completion of the project) and US\$ 73,800 at the 2nd fiscal year (6th year after completion of the project). (Refer to the clause of Operation and Maintenance in this report.)

(3) Replacement cost of equipment

Since the service lives of the following equipment are shorter than the projected life of the project, their replacement is necessary as described below:

	Unit: US\$ 1,000	
Item	Service life	Replacement cost
Gate for dam	30 years	332.5
Gate for canal	30 years	22.3
Total	-	354.8

7.2.3 Financial Internal Rate of Return

Based on the benefit and cost of project implementation, financial internal rate of return (FIRR) is calculated by financial prices of the project to be 8.9% as shown in Table 7.2.1 assuming its projected life as 50 years.

7.3 Economic Evaluation

7.3.1 Project Benefits

The project benefit calculated by economic prices is regarded as the same as that calculated by financial prices because there is little difference between the economic and the financial prices.

Agricultural production benefit	US\$ 1,982,000/year
Reduction of transportation cost	US\$ 8,370/year
Benefit by erosion control	US\$ 3,850/year

7.3.2 Project Expenses

(1) Project cost

The project cost required in each year, calculated by economic prices, is as follows:

Unit: US\$ 1,000			
Year	F/C	L/C	Total
1st year	298	194	492
2nd year	1,414	930	2,344
3rd year	3,021	3,184	6,205
4th year	1,714	1,943	3,657
Total	6,447	6,251	12,698

(2) Operation and maintenance cost

Costs per year necessary for operation and maintenance are estimated to be US\$ 127,800 for the 1st fiscal year and US\$ 73,800 each for the 2nd and subsequent fiscal years.

(3) Replacement cost of equipment

The replacement cost of equipment, calculated by economic prices, is as follows:

Unit: US\$ 1,000		
Item	Service life	Replacement cost
Gate for dam	30 years	266.0
Gate for canal	30 years	17.8
Total	-	283.8

7.3.3 Economic Internal Rate of Return

The economic internal rate of return (EIRR), calculated based on the projected life of 50 years, is 10.2 % as shown in Table 7.3.1.

Taking into account variation of the project expenses and successive diminution of the project benefits, a sensitivity analysis of each case mentioned below was carried out. Besides, B/C ratio with discount rate of 10% is calculated at 1.02 as shown in Table 7.3.2.

Item	EIRR
(1) 10 % increase of the projected cost	9.5 %
(2) 1 year delay of construction period	9.7 %
(3) 10 % decrease of agricultural produce benefit	9.0 %
(4) combined case of (1) and (3)	8.3 %
(5) 10 % decrease of the projected cost	11.0 %
(6) 10 % increase of agricultural produce benefit	11.4 %

7.4 Financial Analysis

7.4.1 Disbursement Schedule

The yearly disbursement schedule of the project costs including the price contingency is as follows:

Year	Unit: US\$ 1,000		
	F/C	L/C	Total
1st year	307	200	507
2nd year	1,719	1,177	2,896
3rd year	3,940	4,165	8,105
4th year	2,218	2,550	4,768
Total	8,184	8,092	16,276

7.4.2 Repayment Schedule of the Project Cost

Foreign currency portion of the project costs is financed by international funds and the local currency portion is allocated by the Bolivian government. The repayment schedule of the foreign currency portion is estimated according to the condition listed below:

Annual interest : 6.0 %
 Unredeemed period : 5 years
 Repayment period : 20 years (interest and capital paid in equal installments)

Calculation results is as follows. The maximum amount of the foreign currency repayment including the interest is US\$ 852,000 per year.

Unit: US\$ 1,000

Fiscal Year	Foreign Currency	Accumulative	1st year Disburs.	2nd year Disburs.	3rd year Disburs.	4th year Disburs.	Total Disburs.
1	298	298	22				22
2	1,622	1,920	22	122			144
3	3,615	5,535	22	122	271		415
4	1,980	7,515	22	122	271	149	564
5			34	122	271	149	576
6			34	184	271	149	638
7			34	184	410	149	777
8			34	184	410	224	852
9			34	184	410	224	852
10			34	184	410	224	852
11			34	184	410	224	852
12			34	184	410	224	852
13			34	184	410	224	852
14			34	184	410	224	852
15			34	184	410	224	852
16			34	184	410	224	852
17			34	184	410	224	852
18			34	184	410	224	852
19			34	184	410	224	852
20				184	410	224	818
					410	224	634
						224	224
						224	224
Total			598	3,248	7,234	3,956	15,036

7.4.3 Financial Analysis of the Farmer

Considering a case in which agricultural management is carried out in accordance with the proposed cropping pattern (rainy season :4 ha, dry season :1.75 ha) after completion of the project, the financial analysis of the farmer was tentatively made. Conditions of the project cost repayment and agricultural finance in the analysis is as follows:

(1) Repayment of the project cost

The repayment amount of the project cost is US\$ 14,917,000 in total including key structures related to agricultural development (except the cost for on-farm facilities) and rural infrastructures. Repayment condition is as follows:

Repayment of project cost

- unredeemable for 3 years after completion of construction
- repayment over 20 years
- interest and capital paid in in equal installments
- interest of 6 % per annum

Operation and maintenance cost

- costs estimated on the basis of the operation and maintenance plan

Agricultural loan

interest of 13.8 % per annum

repayment period 1 year for annual crops and 7 years for perennial crops

(2) Cost for on-farm facilities

Expenses for the land reclamation of each farmer, including the physical contingency, are US\$ 268,000 in total. The loan of the construction cost and repayment conditions are same as those for the project cost repayment.

(3) Operation and maintenance cost

The operation and maintenance cost, defined by dividing the mentioned above in the operation and maintenance plan into a ratio proportional to the landholding of each farmer, is collected from each farmer as the water charge.

The results of the financial analysis for farmer are shown in Table 7.4.1, where the short-term loan for agricultural management keeps a balance in the black, and the burden of the repayment of the construction cost and the operation and maintenance cost is tolerable. Consequently, it is indicated that each farmer can get along relying only on his agricultural income after completion of the project, and future investment to the agricultural activities is feasible.

7.5 Effect on Social Economy

With the implementation of the project, following the indirect socio-economic effects (benefits) can be generated adding to the measurable direct benefits mentioned above. This is expected to result in activation and promotion of the rural community.

(1) Increase in employment opportunity

The construction works results in the employment of a total of 5,000 laborers over 4 years with the implementation of the project. Also, the projected increase in agricultural laborers necessary for agricultural production is about 300 persons per year for each farm household, and about 45,000 persons per year in the total projected areas (refer to Annex E. 4.1).

The growth rate of populations engaged in economic activities in Tarija Department, up to the year 2,000, is 4.7% per year. The employed population is assumed to increase by about 70,000 persons compared with the present state. Measures for employment demands of increasing young laborers are pointed out as a serious problem in the future. From such a

point of view, the implementation of the project effectively absorbs the residual labor force and secures employment, creating a large impact upon the regional economy.

(2) Stable supply of agricultural products

The average nutritional intake per capita is 2,200 kcal/day in Tarija Department, but it is extremely low (less than 1,500 kcal/day) in the projected area. Since the food intake per capita is influenced by variations of the food supply depending on the yearly agricultural production, in order to achieve the standard nutrition intake (2,800 kcal/day) hereafter, establishment of a stable supply system of agricultural products in the projected area and the department is essential.

The increase in agricultural products in the projected area with the implementation of the project, combined with the extension of agricultural production due to the San Jacinto and the Guadarquivir projects, contributes to increase the agricultural product supply rates: wheat 22%, corn 67%, potatoes 50%, and beans 150%.

(3) Living standard improvement and reduction of regional gap through improvement of farmers' income

As shown in the result of financial analysis of farmers, the implementation of the project enables farmers' income to increase 7 to 8 times. It also enables farmers' economic residue, which has not been experienced previously, to be realized. The improved farmers' income contributes to improve the living standards of farmers, minimizing the social gap between farmers in the projected area and in advanced agricultural districts.

Furthermore, in addition to the above-mentioned effects due to the improvement of agriculture and agricultural management, the improvement of the living environment induced by well-arranged rural facilities contributes to the welfare of inhabitants in this district and its periphery.

7. 6 Environmental Assessment

7.6.1 Problem

From an environmental point of view, the regional problem in the present projected area and its peripheral district mainly contains elements concerned with the natural environment. Regarding elements concerned with living and health, some problems are present, but they are within the scope to be improved by self-reliance efforts of inhabitants or under proper guidance. Problems in the present projected area are as

follows:

- Decrease in available lands through progressed soil erosion.
- Decrease in water retention of the river basin due to deteriorated forests.
- Reduction of vegetative covering due to overpasturage or indiscriminate pasturage.
- Affects on inhabitants' health due to undeveloped residential environment.

Environmental influence due to the carrying-out the project is restricted to the natural environmental elements, because the project is concerned with agricultural development. Main impacts on the environment by the project implementation are considered to be as follows:

- Lowering of riverbed in the downstream area due to dam construction.
- Change of micro-meteorology and ecology due to reservoir construction.
- Progressed soil erosion due to insufficient management after irrigation is installed.
- Noise, dust, and effluent caused by vehicle passage during the construction work.

7.6.2 Discussion of Environmental Conservation

Measures for conservation of the regional environment in the project are as follows:

- On lands where soil erosion is progressing, farmers' steady management of farm land, e.g., tree-planting around a reservoir which is installed along the canal and bringing waste land into cultivation, is programmed based on an engineering activity point of view. Also, appropriate water management can prevent soil erosion caused by the technical irrigation introduced by the project. To cope with this, farmers will be instructed the appropriate manner of irrigation practice by the operation and maintenance organization in the project. An intensive program can be established to prevent the soil erosion; however, taking into consideration of burden of the expenses and the yield benefit, more practical measures for soil erosion, such as the above-mentioned tractable process in the agricultural development program, are recommended for adoption.
- In association with preservation of the river basin, the forest does not include the objective areas of development, despite retaining their function. Also, there is a possibility of creating such forest around the reservoir by the proposed dam

construction.

- The stored water volume in the dam plan corresponds to about 11% of annual run-off of rivers. In the rainy season, the run-off of downstream reach of river from the dam site after the dam installation is kept almost the same as that before the dam installation. However, sand and pebbles, which had previously flowed downstream, will remain in place after the dam installation, inevitably resulting in a lowered riverbed in the downstream reaches. Accordingly, measurements of these lowered levels of riverbed and necessary measures for bank protection as well as careful protection of agricultural lands located in a flat riverbed area by the operation and maintenance organization of the project must be taken for the environmental protection.
- To adjust the residential environment, a potable water facility and health center facility are to be improved by the project. Moreover, adjustment of their living environment by farmers' self-reliance efforts is applicable for reasons of increased income of farmers through the agriculture development.
- The deterioration of the environment caused during the construction works of the project, the executing body of the project will control the contractor during the course of construction.

7.6.3 Others

Due to the dam construction of the project, two farm households and 7.7 ha of present cultivated areas will be submerged in the reservoir areas. These farm households and cultivated areas will be compensated by the cost for land acquisition and compensation described in the project cost.

Table 7.2.1 Financial Internal Rate of Return(F. I. R. R)

(Unit: US\$)

YEAR	PROJECT COSTS					INCR. PROD. VALUE	PROJECT RETURN
	CONSTRUCT- ION COST	REPLACE- MENT COST	O & M COSTS	INCR. PROD. COST	TOTAL		
1	492,000	0	0	0	492,000	0	-492,000
2	2,732,000	0	0	0	2,732,000	0	-2,732,000
3	7,569,000	0	0	0	7,569,000	0	-7,569,000
4	4,392,000	0	0	0	4,392,000	0	-4,392,000
5	0	0	1,278,000	613,000	1,891,000	715,087	-1,175,913
6	0	0	73,800	613,000	686,800	953,561	266,761
7	0	0	73,800	613,000	686,800	2,040,546	1,353,746
8	0	0	73,800	613,000	686,800	2,607,220	1,920,420
9	0	0	73,800	613,000	686,800	2,607,220	1,920,420
10	0	0	73,800	613,000	686,800	2,607,220	1,920,420
11	0	0	73,800	613,000	686,800	2,607,220	1,920,420
12	0	0	73,800	613,000	686,800	2,607,220	1,920,420
13	0	0	73,800	613,000	686,800	2,607,220	1,920,420
14	0	0	73,800	613,000	686,800	2,607,220	1,920,420
15	0	0	73,800	613,000	686,800	2,607,220	1,920,420
16	0	0	73,800	613,000	686,800	2,607,220	1,920,420
17	0	0	73,800	613,000	686,800	2,607,220	1,920,420
18	0	0	73,800	613,000	686,800	2,607,220	1,920,420
19	0	0	73,800	613,000	686,800	2,607,220	1,920,420
20	0	0	73,800	613,000	686,800	2,607,220	1,920,420
21	0	0	73,800	613,000	686,800	2,607,220	1,920,420
22	0	0	73,800	613,000	686,800	2,607,220	1,920,420
23	0	0	73,800	613,000	686,800	2,607,220	1,920,420
24	0	0	73,800	613,000	686,800	2,607,220	1,920,420
25	0	0	73,800	613,000	686,800	2,607,220	1,920,420
26	0	0	73,800	613,000	686,800	2,607,220	1,920,420
27	0	0	73,800	613,000	686,800	2,607,220	1,920,420
28	0	0	73,800	613,000	686,800	2,607,220	1,920,420
29	0	0	73,800	613,000	686,800	2,607,220	1,920,420
30	0	354,800	73,800	613,000	1,041,600	2,607,220	1,565,620
31	0	0	73,800	613,000	686,800	2,607,220	1,920,420
32	0	0	73,800	613,000	686,800	2,607,220	1,920,420
33	0	0	73,800	613,000	686,800	2,607,220	1,920,420
34	0	0	73,800	613,000	686,800	2,607,220	1,920,420
35	0	0	73,800	613,000	686,800	2,607,220	1,920,420
36	0	0	73,800	613,000	686,800	2,607,220	1,920,420
37	0	0	73,800	613,000	686,800	2,607,220	1,920,420
38	0	0	73,800	613,000	686,800	2,607,220	1,920,420
39	0	0	73,800	613,000	686,800	2,607,220	1,920,420
40	0	0	73,800	613,000	686,800	2,607,220	1,920,420
41	0	0	73,800	613,000	686,800	2,607,220	1,920,420
42	0	0	73,800	613,000	686,800	2,607,220	1,920,420
43	0	0	73,800	613,000	686,800	2,607,220	1,920,420
44	0	0	73,800	613,000	686,800	2,607,220	1,920,420
45	0	0	73,800	613,000	686,800	2,607,220	1,920,420
46	0	0	73,800	613,000	686,800	2,607,220	1,920,420
47	0	0	73,800	613,000	686,800	2,607,220	1,920,420
48	0	0	73,800	613,000	686,800	2,607,220	1,920,420
49	0	0	73,800	613,000	686,800	2,607,220	1,920,420
50	0	0	73,800	613,000	686,800	2,607,220	1,920,420
TOTAL	15,185,000	354,800	4,599,000	28,198,000	48,336,800	15,819,654	87,482,854

INTERNAL RATE OF RETURN (IRR) = 8.9%

Table 7.3.1 Economical Internal Rate of Return(E. I. R. R)

(Unit: US\$)

YEAR	PROJECT COSTS					INCR. PROD. VALUE	PROJECT RETURN
	CONSTRUCT- ION COST	REPLACE- MENT COST	O & M COSTS	INCR. PROD. COST	TOTAL		
1	492,000	0	0	0	492,000	0	-492,000
2	2,344,000	0	0	0	2,344,000	0	-2,344,000
3	6,205,000	0	0	0	6,205,000	0	-6,205,000
4	3,657,000	0	0	0	3,657,000	0	-3,657,000
5	0	0	1,278,000	613,000	1,891,000	715,087	-1,175,913
6	0	0	73,800	613,000	686,800	953,561	266,761
7	0	0	73,800	613,000	686,800	2,040,546	1,353,746
8	0	0	73,800	613,000	686,800	2,607,220	1,920,420
9	0	0	73,800	613,000	686,800	2,607,220	1,920,420
10	0	0	73,800	613,000	686,800	2,607,220	1,920,420
11	0	0	73,800	613,000	686,800	2,607,220	1,920,420
12	0	0	73,800	613,000	686,800	2,607,220	1,920,420
13	0	0	73,800	613,000	686,800	2,607,220	1,920,420
14	0	0	73,800	613,000	686,800	2,607,220	1,920,420
15	0	0	73,800	613,000	686,800	2,607,220	1,920,420
16	0	0	73,800	613,000	686,800	2,607,220	1,920,420
17	0	0	73,800	613,000	686,800	2,607,220	1,920,420
18	0	0	73,800	613,000	686,800	2,607,220	1,920,420
19	0	0	73,800	613,000	686,800	2,607,220	1,920,420
20	0	0	73,800	613,000	686,800	2,607,220	1,920,420
21	0	0	73,800	613,000	686,800	2,607,220	1,920,420
22	0	0	73,800	613,000	686,800	2,607,220	1,920,420
23	0	0	73,800	613,000	686,800	2,607,220	1,920,420
24	0	0	73,800	613,000	686,800	2,607,220	1,920,420
25	0	0	73,800	613,000	686,800	2,607,220	1,920,420
26	0	0	73,800	613,000	686,800	2,607,220	1,920,420
27	0	0	73,800	613,000	686,800	2,607,220	1,920,420
28	0	0	73,800	613,000	686,800	2,607,220	1,920,420
29	0	0	73,800	613,000	686,800	2,607,220	1,920,420
30	0	283,800	73,800	613,000	970,600	2,607,220	1,636,620
31	0	0	73,800	613,000	686,800	2,607,220	1,920,420
32	0	0	73,800	613,000	686,800	2,607,220	1,920,420
33	0	0	73,800	613,000	686,800	2,607,220	1,920,420
34	0	0	73,800	613,000	686,800	2,607,220	1,920,420
35	0	0	73,800	613,000	686,800	2,607,220	1,920,420
36	0	0	73,800	613,000	686,800	2,607,220	1,920,420
37	0	0	73,800	613,000	686,800	2,607,220	1,920,420
38	0	0	73,800	613,000	686,800	2,607,220	1,920,420
39	0	0	73,800	613,000	686,800	2,607,220	1,920,420
40	0	0	73,800	613,000	686,800	2,607,220	1,920,420
41	0	0	73,800	613,000	686,800	2,607,220	1,920,420
42	0	0	73,800	613,000	686,800	2,607,220	1,920,420
43	0	0	73,800	613,000	686,800	2,607,220	1,920,420
44	0	0	73,800	613,000	686,800	2,607,220	1,920,420
45	0	0	73,800	613,000	686,800	2,607,220	1,920,420
46	0	0	73,800	613,000	686,800	2,607,220	1,920,420
47	0	0	73,800	613,000	686,800	2,607,220	1,920,420
48	0	0	73,800	613,000	686,800	2,607,220	1,920,420
49	0	0	73,800	613,000	686,800	2,607,220	1,920,420
50	0	0	73,800	613,000	686,800	2,607,220	1,920,420
TOTAL	12,698,000	283,800	4,599,000	28,198,000	45,778,800	115,819,654	70,040,854

INTERNAL RATE OF RETURN (IRR) = 10.2%

Table 7.3.2 Estimation of B/C and N.P.V (Economic)

(Unit: US\$)

Year	Project Cost	Incr. Prod. Benefit	Project Return	P.V. (Dis. Rate = 10%)	
				P. Cost	Incr. Benefit
1	492,000	0	-492,000	447,273	0
2	2,344,000	0	-2,344,000	1,937,190	0
3	6,205,000	0	-6,205,000	4,661,908	0
4	3,657,000	0	-3,657,000	2,497,780	0
5	1,891,000	715,087	-1,175,913	1,174,162	444,013
6	686,800	953,561	266,761	387,681	538,260
7	686,800	2,040,546	1,353,746	352,437	1,047,123
8	686,800	2,607,220	1,920,420	320,397	1,216,287
9	686,800	2,607,220	1,920,420	291,270	1,105,716
10	686,800	2,607,220	1,920,420	264,791	1,005,196
11	686,800	2,607,220	1,920,420	240,719	913,815
12	686,800	2,607,220	1,920,420	218,836	830,741
13	686,800	2,607,220	1,920,420	198,941	755,219
14	686,800	2,607,220	1,920,420	180,856	686,563
15	686,800	2,607,220	1,920,420	164,414	624,148
16	686,800	2,607,220	1,920,420	149,468	567,407
17	686,800	2,607,220	1,920,420	135,880	515,825
18	686,800	2,607,220	1,920,420	123,527	468,931
19	686,800	2,607,220	1,920,420	112,297	426,301
20	686,800	2,607,220	1,920,420	102,088	387,547
21	686,800	2,607,220	1,920,420	92,808	352,315
22	686,800	2,607,220	1,920,420	84,371	320,286
23	686,800	2,607,220	1,920,420	76,701	291,170
24	686,800	2,607,220	1,920,420	69,728	264,700
25	686,800	2,607,220	1,920,420	63,389	240,636
26	686,800	2,607,220	1,920,420	57,626	218,760
27	686,800	2,607,220	1,920,420	52,388	198,873
28	686,800	2,607,220	1,920,420	47,625	180,793
29	686,800	2,607,220	1,920,420	43,295	164,358
30	970,600	2,607,220	1,636,620	55,624	149,416
31	686,800	2,607,220	1,920,420	35,781	135,833
32	686,800	2,607,220	1,920,420	32,529	123,484
33	686,800	2,607,220	1,920,420	29,571	112,258
34	686,800	2,607,220	1,920,420	26,883	102,053
35	686,800	2,607,220	1,920,420	24,439	92,776
36	686,800	2,607,220	1,920,420	22,217	84,341
37	686,800	2,607,220	1,920,420	20,198	76,674
38	686,800	2,607,220	1,920,420	18,362	69,704
39	686,800	2,607,220	1,920,420	16,692	63,367
40	686,800	2,607,220	1,920,420	15,175	57,606
41	686,800	2,607,220	1,920,420	13,795	52,369
42	686,800	2,607,220	1,920,420	12,541	47,609
43	686,800	2,607,220	1,920,420	11,401	43,280
44	686,800	2,607,220	1,920,420	10,365	39,346
45	686,800	2,607,220	1,920,420	9,422	35,769
46	686,800	2,607,220	1,920,420	8,566	32,517
47	686,800	2,607,220	1,920,420	7,787	29,561
48	686,800	2,607,220	1,920,420	7,079	26,874
49	686,800	2,607,220	1,920,420	6,436	24,431
50	686,800	2,607,220	1,920,420	5,851	22,210
Total	45,778,800	115,819,654	70,040,854	14,940,560	15,186,460

Net Present Value (Dis. Rate 10%) = US\$ 245,900
 B/C (Dis. Rate 10%) = 1.02

Table 7.4.1 Financial Analysis of Farm Household

Year	1	2	3	4	5	6	7	8	9	10	Unit:US\$
(1) Initial Fund	1,500.00	957.18	717.53	4,135.98	3,918.31	3,685.96	3,436.99	3,164.61	3,675.08	4,161.50	
Farm Credit (L)	3,232.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Farm Credit (S)	1,293.55	1,293.55	1,293.55	0.00	232.24	551.59	890.96	1,252.94	822.47	426.05	
(2) Sub Total	4,525.55	1,293.55	1,293.55	0.00	232.24	551.59	890.96	1,252.94	822.47	426.05	
Required Fund											
Production Cost	4,525.55	2,127.55	2,041.55	2,287.55	2,287.55	2,287.55	2,287.55	2,287.55	2,287.55	2,287.55	
Living Expenses	1,500.00	1,590.00	1,680.00	1,770.00	1,860.00	1,950.00	2,040.00	2,130.00	2,210.00	2,300.00	
(3) Sub Total	6,025.55	3,717.55	3,721.55	4,057.55	4,147.55	4,237.55	4,327.55	4,417.55	4,497.55	4,587.55	
(4) = (1)+(2)-(3)	0.00	1,466.82	1,710.47	78.43	0.00	0.00	0.00	0.00	0.00	0.00	
Farm Income	3,344.25	4,373.25	8,025.00	9,945.00	9,945.00	9,945.00	9,945.00	9,945.00	9,945.00	9,945.00	
(5) Sub Total	3,344.25	4,373.25	8,025.00	9,945.00	9,945.00	9,945.00	9,945.00	9,945.00	9,945.00	9,945.00	
Term-end											
Interest (L)	446.02	446.02	446.02	446.02	334.51	223.01	111.50	0.00	0.00	0.00	
Interest (S)	178.51	178.51	168.16	0.00	30.19	71.71	115.82	162.88	106.92	55.39	
Repayment (L)	0.00	0.00	0.00	808.00	808.00	808.00	808.00	808.00	808.00	808.00	
Repayment (S)	1,293.55	1,293.55	1,293.55	0.00	232.24	551.59	890.96	1,252.94	822.47	426.05	
O/M Cost	468.99	270.83	270.83	270.83	270.83	270.83	270.83	270.83	270.83	270.83	
Amortization				4,583.28	4,583.28	4,583.28	4,583.28	4,583.28	4,583.28	4,583.28	
(6) Sub Total	2,387.07	2,188.90	2,178.55	6,108.12	6,259.04	6,508.41	6,780.39	6,269.92	5,783.50	5,335.53	
(7) Balance	957.18	717.53	4,135.98	3,915.31	3,685.96	3,436.99	3,164.61	3,675.08	4,161.50	4,609.47	

CHAPTER 8 CONCLUSION AND RECOMMENDATION

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8.1 Conclusion

To establish the development program on agriculture and rural communities in the Santa Ana area, such items as present state of this district, problems, and possibility of development were surveyed and examined. As a result, the following conclusions were obtained:

(1) The Santa Ana area is located near an urban region of Tarija City, the largest market in the department, and is a place appropriate for profitable vine production. It is contributive not only for the unified development of Santa Ana area as well as Valle Central region, but also promotion of agriculture and rural communities in mid-mountain areas in Bolivia, extending intensive agricultural management of vine as a basic crop in said area. Prime objects of the regional development are: enlargement of the agricultural management scale of each farmer, formation of a producing center and, furthermore, establishment of the settlement condition by unified improving the production base and the living environment.

(2) From the above-mentioned points of view, the following contents of the project are proposed for facilities to be improved in the projected area:

Improvement of irrigation facilities:

Objective area 1,090 ha,

Dam for water source (concrete gravity type, H=34.55 m,
V=2.9 MCM)

Sedimentation dam 5 places

Irrigation canal 30.2 km

Roads improvement:

9 routes and 20.2 km in total

Improvement of potable water facilities:

15 shallow wells.

Improvement of rural electrification:

Transmission line 20 km.

Improvement of medical facilities:

3 sites.

Improvement of educational facilities:

2 school buildings

Improvement of agriculture promotion center:

3 sites

(3) The investment necessary for implementation of above-mentioned project is estimated US\$ 15,185,000. The proposed

construction period including detailed design period, is 4 years.

- (4) Taking account of costs and anticipated benefit, the economic internal rate of return of the project is 10.2%. Even assuming any probable change of conditions, it will be within the range of 8.3 to 11.4 %.
- (5) According to the trial estimation, small-scale farmers, whose population percentage in the projected area is more than 90%, will increase their earning and income by 7 to 8 times after completion of the project.

With these facts, the project is justified economically, financially and socially.

8. 2 Recommendation

Based on the above-mentioned conclusion, it is desirable to start the project immediately. The Bolivian government should expedite the finance procedure necessary for the project implementation. In order to carry out the project smoothly, attention must be paid to the following points:

- (1) The beneficiaries in the projected area shall prepare the following to accept the project.
 - A cooperative system for implementation of the project is materialized and reinforced.
 - Preparation of land acquisition which is necessary for the project.
 - Confirmation of beneficiaries for irrigation.
 - Preparation of beneficiary's shares (funds used for terminal facility).
 - Materialization of the proposed producers' organization and examination of their operation funds.
- (2) Since the project is diversified, other organizations than the project executing agency are sometimes in charge of responsible management depending on the work process. Therefore, full coordination with these concerned organizations shall be taken so that the project can proceed smoothly and efficiently.
- (3) To realize the effect of the project immediately after implementation, indispensable agricultural management techniques, including the water control, shall be confirmed and promoted. Since the proposed supporting organization is not

newly organized but intends to cooperate with existing governmental organizations, organizations concerned should participate in the concrete supporting program from the beginning.

- (4) Although an aggressive program of preventive measures for soil erosion is not indicated in the project because of its correlation with cost, the preventive measures for soil erosion utilizing reservoir facilities along the canal, which are proposed in the project by the regional residents in support of PERTT, etc., are necessary for protection of the regional environment.
- (5) Since the projected area has many problems in common with those of other rural communities in mid-mountain areas of Bolivia, the policy indicated in the project formulation will be a model for similar regional development project hereafter.

APPENDIX

LIST OF ADVISORY COMMITTEE MEMBERS

Explanation on Inception Report and Interim Report

Mr. Masahiko Kameda Division Chief,
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Agriculture, Forestry and Fisheries
Planning and Survey Department
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Explanation on Draft Final Report

Mr. Atsushi Hanatani Technical Affairs Division,
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Team Leader	Mr. Yasuo Maeda	Ing. Ramón Colodro V. Ing. Carlos Torrico A.
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Meteorology, Hydrology & Dam Planning	Mr. Kazunari Nagata	Ing. Alberto Benítez Ing. Raul Orozco
Geology & Soil Mechanics	Mr. Kazuo Hasegawa	Ing. Hernan Villena
Agronomy	Mr. Yasuyuki Tsuda	Ing. Oscar Cáceres
Soil	Mr. Yuuki Matsuo	Ing. Oscar Cáceres
Rural Infrastructure	Mr. Yoshihiko Nishikawa	Ing. Pedro Dubravcic
Construction Planning & Cost Estimate	Mr. Michihiko Sakaki	Ing. Jaime Zenteno
Agro-Economy	Mr. Tetsuo Mizobe	Lic. José Auad
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1100