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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

SUMMARY AUDIT OF COSTA RICA FIRST HIGHWAY PROJECT

October 20, 1972

Programming and Budgeting Department
Operations Evaluation Division

PREFACE

The summary audit of the first highway project in Costa Rica (Loan 229/Credit 10) is the first of its type to be carried out by the Operations Evaluation Division. As a technique of post evaluation, the summary audit is the simplest being tested by the Division, designed to answer the question: were the principal physical objectives of the project attained and, if not, why not? To the extent possible, partial answers or impressions are also sought as to whether or not Bank institution-building objectives were met and whether or not the lending activity itself might have been improved.

The first Bank-supported highway project in Costa Rica was chosen for summary audit from the group of Bank/IDA projects for which disbursements ended in FY1968. The interim period of five years is considered adequate for the project's outcome to be fairly fully visible, although much of the benefits should still lie in the future.

To prepare the audit relevant Bank files and documents were briefly reviewed and the project was discussed with staff who had been involved. The Bank stopped receiving information on the project early in 1969, since disbursements had been completed. A one-week mission was undertaken to update data and to gather impressions about the project from the Costa Rican Highway Department.

The considerable assistance provided by the staff of the Costa Rican Highway Department is gratefully acknowledged.

Note: Currency Equivalent
US\$ 1 = 6.6 Colones (¢)
(From 1961 to 1971)

SUMMARY

Loan-299 and Credit-10, approved concurrently in 1961 in amounts of US\$ 5.5 million each, were extended to Costa Rica to finance the foreign exchange costs of a US\$ 13.2 million highway project--including 640 km of improvement works and 31 km of new construction. In addition, provisions were included for the purchase of maintenance equipment and for consultant services for supervision of construction/improvement works and for assistance to the Highway Department in implementing improved administrative and maintenance procedures.

With investment roughly the same as projected, the length of highways constructed or improved amounted to only half that planned in the original project and the period of implementation was twice as long. Nonetheless, the project was economically sound: an approximate "first year" rate of return calculated for 25 roads on which works were completed and comparable to planned was 27% as compared to the 23% originally estimated for the full project, and a check using more up-to-date internal rate of return procedures, allowing for the time dimension, confirmed that the project very largely fulfilled Bank economic criteria. Cost overruns, averaging 75% on the 25 road sections, were compensated by an increase in direct benefits (120% higher than expected), mainly the result of traffic growth more rapid than forecast. However, it is not clear that all the roads retained in the program were of higher priority than those that were dropped--and possibly some others.

Delays in implementation of the construction/improvement works which were eventually completed under the project averaged some 3-4 years and were largely due to:

- (a) Inadequately detailed engineering studies prior to start of the project;
- (b) over-extension of Highway Department financial resources;
- (c) failure to attract foreign contractors and insufficient capacity of local contractors.

Cost overruns resulted from the delays themselves and from the additional works found necessary to bring the roads up to the standards planned.

The maintenance equipment was purchased at about the expected cost between 1963 and 1965 and is still in use. Consultant services were satisfactory, although progress in the improvement of maintenance was slow.

The most important lesson of this audit has to do with Bank flexibility. The Bank should have been more flexible in its approach when major deviations from appraisal estimates began to occur. Probably the project should have been reappraised after three years to verify its continuing priority. Supplementary financing could have been considered and supervision missions should have played a more active role in project modification. The Bank might also usefully have designed more detailed terms of reference for the consultant in regard to maintenance, including specific implementation targets which could have been periodically reviewed against performance.

SUMMARY AUDIT OF FIRST COSTA RICA HIGHWAY PROJECT

The Project

In December 1958, the Government of Costa Rica began to plan a comprehensive program for highway construction, improvement and maintenance. Financial assistance was requested from the Bank and a mission was sent to Costa Rica in December 1959. The project took shape during 1960, with further Bank missions, and final details were supplied to the Bank in the first half of 1961. Loan Agreement 299-CR and Credit Agreement 10-CR were concluded October 13, 1961. The loan and credit, each in the amount of US\$ 5.5 million, were to finance the foreign exchange costs of a three-year highway program. The original closing date was April 30, 1965, but the final disbursement was made in FY1968 -- after two postponements of the closing date.

The project comprised the first stage of a seven-year National Highway Program (the Plan Vial), and consisted of three parts for which estimated and actual costs are presented below:

| | Estimates | | | Actual | | |
|---|---------------------|------------------------|--------------------|---------------|------------------------|-----------------|
| | Total Cost | | For. | Total Cost | | For. |
| | ¢ (mln) | (US\$ mln) (equiv.) | (US\$) (mln) | ¢ (mln) | (US\$ mln) (equiv.) | (US\$) (mln) |
| Part A - Highway Construction/ <u>Improvement</u> | | | | | | |
| <u>Original Program</u> | | | | | | |
| Improvement of 54 roads (640 km) and construc- tion of 3 new roads (31 km) | 87.70 ^{a/} | 13.20 ^{a/} | 7.20 ^{a/} | | | |
| <u>Final Program</u> | | | | | | |
| Improvement of 32 roads (314 km) and construc- tion of 2 new roads (39 km) | | | | 86.33 | 13.08 | 6.58 |
| Part B - Purchase of mechanical equipment, spare parts and materials for high- way construction and maintenance, and sur- veying equipment | 20.46 | 3.10 | 3.10 | 18.81 | 2.85 | 2.85 |
| Part C - Consulting services | 1.98 | 0.30 | 0.30 | 4.09 | 0.62 | 0.62 |
| Additional contingency | <u>2.64</u> | <u>0.40</u> | <u>0.40</u> | | | |
| Total | <u>112.78</u> | <u>17.00</u> | <u>11.00</u> | <u>109.23</u> | <u>16.55</u> | <u>10.05</u> |

a/ Including 15% construction contingency allowance

The major objective of the project, accounting for more than three-quarters of projected costs, was the improvement of 54 roads which, according to the appraisal report, were in poor condition and built to inadequate standards for actual and future traffic volumes. It was assumed that two-thirds of the improvement works would be undertaken by contractors and that about one-half of the contract works would be awarded to foreign firms after international competitive bidding. The improvement works were justified in terms of expected savings in vehicle operating costs and in road maintenance costs; a "first year rate of return" was estimated for each of the roads based on cumulative costs of improvement works (undiscounted) and 1963 road user and maintenance savings.^{1/} Returns ranged from 8.0% to 92.0%. The major new road, Tres Equis-Siquirres, was justified as a necessary link between Siquirres and the rest of the country due to the poor condition of the existing railway. Two smaller new roads, to be located in the San Jose suburbs, were necessary to relieve urban traffic congestion.

In a supplementary letter to the Loan/Credit Documents, Costa Rica agreed that the U.S. Bureau of Public Roads (BPR) would provide technical assistance for the implementation of construction/improvement works, development of a highway maintenance organization, improvement of the cost accounting system of the Highway Department, and preparation of feasibility studies for future highway projects. Among Loan/Credit conditions, a particularly important covenant (Section 5.09 of Loan Agreement, Section 4.07 of Credit Agreement) stated that the Bank/IDA project would receive priority in the application of local currency funds and that funds would be made available for the adequate maintenance of the entire highway system.

The Loan/Credit became effective only on May 2, 1962, seven months after signing, due to delay in the preparation of requisite legal opinions by the Costa Rican Government. Disbursements began in 1963. Table 1 (following text) shows that major disbursements under Part A -- construction/improvement -- were made in the period 1966-1967, after the original closing date, due to delays in implementation. At the time of the final closing date (December 30, 1967) US\$ 950,000 -- mainly the undisbursed balance under Part A -- was cancelled from the Credit account.

Only 25 roads totalling 266 km were improved and two roads totalling 39 km constructed with Bank/IDA financing -- 260 km by contract at a cost of ¢65.6 million and 45 km by force account at a cost of ¢16.3 million. During the Loan period, an additional 48 km were improved by force account without Bank/IDA reimbursement, and to much lower standards than originally planned, at a cost of ¢4.4 million. To date, only a few improvement works with a total cost of about ¢5.0 million have been carried out on the remaining 318 original km, of which 140 km had been officially dropped from the final revised project in 1965 at the request of

^{1/} The roads were expected to be completed between 1962 and 1964. 1963 was chosen as the middle year.

the Highway Department. Two of the three planned new roads were constructed, Tres Equis-Siquirres and Radial-Zapote. The third, Circunvalacion, was deleted from the project. Table 2 (following text) shows the actual period of construction, means of execution, length, traffic and cost for each project road section. In sum, with investment roughly the same as estimated, highway construction and improvement financed by the Bank amounted to only half that planned in the original project and the period of implementation was twice as long.

The quality of the construction and improvement works under Part A was satisfactory. Maintenance on roads improved or constructed under the project has been adequate and all are now in good condition with one exception, Villa Colon-Puriscal, where the contract work was poor and slides have occurred. (Bidding for a ¢2.0 million contract for repairs has recently begun.) All roads dropped from the program are in poor condition, and still need reconstruction.

Delays

The bulk of actual construction/improvement works were completed after the original project closing date, between 1966 and 1968. Works scheduled for completion by the end of 1962 were delayed by an average of about 3.8 years; delays averaged 3.8 and 2.5 years respectively for those of the roads planned for completion in 1963 and 1964 which were actually improved under the project. Major reasons for delay were:

- (a) Lack of detailed engineering studies prior to loan signature, further complicated by the slow build-up of the BPR consulting staff;
- (b) over-extension of Highway Department financial resources. The local currency shortage was acute during the early years of project implementation, and in spite of the "priority" covenant previously mentioned, work was simultaneously undertaken on the San Jose-San Ramon Highway, and from 1965 on, on an IDB-assisted Feeder Road Project. The total amount of local currency provided for these two projects was equivalent to US\$ 8.5 million;
- (c) failure to attract foreign contractors, due to the relatively small scale of project works, and insufficient capacity of local contractors. Only one foreign contractor, Rawcon of Texas, showed interest and was awarded two contracts for a total of 25 km of works.

Costs

The total cost of the construction/improvement works was ¢86.33 million -- close to the original estimate of ¢87.70 million -- but with works

completed on only 53% of the original 670 project km. Cost overruns were considerable averaging about 75% in terms of current prices for those roads -- a total of 25 -- improved to standards comparable to those planned at the time of appraisal. These 25 roads showed the following overrun distribution:

| <u>% Cost Overrun</u> | <u>Number of Roads</u> | <u>Investments (¢ millions)</u> | |
|-----------------------|------------------------|---------------------------------|---------------|
| | | <u>Est.</u> | <u>Actual</u> |
| 0 | 2 | 5.0 | 2.3 |
| 0 - 50 | 6 | 11.7 | 15.3 |
| 50 - 100 | 6 | 13.6 | 26.0 |
| 100 - 200 | 6 | 7.8 | 19.5 |
| 200 - 300 | 2 | 0.7 | 2.4 |
| Over 300 | 3 | 0.8 | 3.9 |
| | <u>25</u> | <u>39.6</u> | <u>69.4</u> |

For the two new roads the combined overrun was 90%, though combined length increased by 35%, mainly due to extension of the new road, Siquirres-Tres Equis, to Pavones.

Cost overruns on construction and improvement were largely due to:

- (a) Underestimation of the quantity of physical works required to bring roads up to standards planned, due to the sketchy nature of original engineering data;
- (b) delays in construction and improvement works. (During the years 1962-1968 unit construction costs averaged annual increases of about 3%.)

Analysis of Costs and Benefits

At the time of appraisal it was estimated that road traffic in Costa Rica would increase 3 to 4% annually;^{1/} however, the actual growth rate was much higher -- about 10% per year between 1961 and 1971.^{2/} This rapid growth of road traffic paralleled a steady economic growth of about 6% per year. As seen from Table 2, traffic on the project roads grew far more rapidly than expected -- in general the increase being faster for light vehicles than heavy^{3/} -- largely because many of the improved roads were in the vicinity of the urban zone of San Jose (see map at end of audit).

^{1/} The estimate of traffic increase appears to have been based on past trends in the total number of motor vehicles registered in Costa Rica. Their annual rate of growth had declined sharply from 15-20% in the early 1950s to 5-7% in the late 1950s. The average growth from 1950 to 1960 was 13% per year compared with an economic growth of 7%.

^{2/} Vehicle-km increased from 239 million in 1961 to 597 million in 1970; passenger-km from 957 to 2,146 million; ton-km from 216 to 517 million; total number of vehicles from 26,423 to about 69,347 (Source: Ministry of Transportation - Planning Department).

^{3/} Light vehicles include passenger cars and light trucks (panels and pickups). Heavy vehicles include buses and trucks other than panels and pickups.

For each of the 25 project roads improved to standards comparable to those contemplated during appraisal, "first year (1971) rates of return" have been calculated using the method of the Appraisal Report and are shown in Table 3 (following text). Actual construction costs, actual 1971 traffic (for light and heavy vehicles) and the actual improved length of each road were taken into account in calculating 1971 road user savings, and the actual improved length was considered for 1971 maintenance savings. 1971 data were used to calculate the "first year rate of return" in order to make use of the most recent traffic information. By not allowing for the time dimension this tended to yield an exaggerated rate of return, possibly slightly compensated by the fact that it was necessary to use 1963 estimates of road user costs per km on improved and unimproved roads.

Actual savings alone appear to justify the entire project investment with a first year return (in 1971) of 27% as compared to the appraisal estimate for 1963 of 23% for the original 54 roads to be improved.^{1/} Cost overruns (75%) on the 25 roads were compensated by the important increase (120% higher than expected) of the direct benefits for these roads, mainly a result of the rapid traffic increase.

Today, the Bank justifies most highway projects by use of internal rates of return. For the 7 roads with the lowest first year rates of return on Table 3, internal rates of return have been calculated.^{2/} The results of this test confirm the general economic validity of improvement investments, with the exception of San Joaquin-Santa Barbara (Priority No. 5), as seen below:

| | | | | | | | |
|-----------------------|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Priority No. | 5 | 25 | 53 | 56 | 34 | 2 | 32 |
| First Year ROR (1971) | $\frac{9}{9}$ | $\frac{13}{13}$ | $\frac{14}{14}$ | $\frac{14}{14}$ | $\frac{15}{15}$ | $\frac{16}{16}$ | $\frac{19}{19}$ |
| IRR (%) | 5 | 11 | 10 | 13 | 15 | 10 | 15 |

No quantification of direct benefits for the new road construction was attempted by the Appraisal Mission and there is no quantitative information available on the indirect benefits of the major new road, Pavones-Siquirres, though according to Highway Department officials both the road improvements and new construction have had very little impact on agricultural development.

On the positive side, the project undoubtedly contributed to the build-up of the local contracting industry. The IDB-financed feeder road project has benefited greatly from this development.

^{1/} Total 1971 savings for the 25 roads was ¢22.9 million as compared with the ¢20.8 million estimated 1963 savings for the original 54 roads. Total project investment was ¢86.3 million opposed to the original ¢87.7 million estimate.

^{2/} Assuming a 15-year economic life of each road and a 6% annual increase in traffic after 1972.

Maintenance

Most of the Loan/Credit funds under Part B of the project were to be used to purchase maintenance equipment and spare parts for the Highway Department. The equipment was purchased between 1963 and 1965, at about the expected cost, and is still in use.

Road maintenance, barely existent at the time the Loan and Credit Agreements were signed, has improved. All project roads have been satisfactorily maintained although maintenance for the rest of the system remains inadequate. Annual budget allocations for highway maintenance have averaged about ₡6,150/km annually since 1963. Under normal Costa Rican conditions (including heavy rains and typical vehicle overloading) this amount of expenditure on maintenance would be satisfactory, but costs are high due to use of old equipment with high operating and repair costs, generally poor standards of roads not designed to support present traffic and some diversion of funds and equipment to other uses such as force account construction.

In 1969 US AID extended a US\$ 7.0 million loan (mainly for new equipment) to assist in financing a US\$ 10.5 million maintenance improvement program. With this program, the opportunity for improving maintenance procedures in Costa Rica has increased.

Consultants

BPR consultants were retained to provide technical assistance throughout project implementation. On the whole they did a good job, though, as already mentioned, there was some delay in staff build-up. The final cost of the consultants' services was US\$ 620,000 -- twice as much as projected -- due to the prolonged implementation period. The consultants were principally involved with the supervision of construction/improvement works on the project roads. They also assisted in the revision of methods used to cost force account items and in the preparation of feasibility studies for roads to be included in a second stage of the Plan Vial^{1/} and for the Siquirres-Limon Highway, for which an IBRD Loan was made in 1970. The relevant supplementary letter to the 1961 Loan and Credit Agreements stated that the consultants were also to assist in the preparation and execution of a program of highway maintenance but they completed a report on maintenance, including major recommendations, only in 1968. The US AID-financed maintenance program is the response to those recommendations, although different consultants, Capital Engineering and Salas, are implementing the project.

^{1/} The second stage of the Plan Vial was not undertaken due to a switch in Government priorities to construction of new major highways. Presently, plans are again underway for the implementation of a second phase of the Plan Vial.

One of the most positive contributions of the consultants, and of the project itself, was the transfer of knowledge to the Highway Department. Experience gained through implementation of the Bank/IDA project has enabled the Department, in recent years, to design roads and supervise works without assistance, although consultant's services are still necessary for more complicated or newer types of projects, such as the Siquirres-Limon Highway. The Highway Department also now has effective contracting procedures.

Project Adjustments

The Loan/Credit condition calling for priority in the application of funds was somewhat rigid considering the prolonged period of project implementation. The Bank succeeded in persuading the IDB and the Government to delay undertaking the feeder road project until 1965 but, as noted previously in the section on delays, another highway project was also undertaken during implementation of the Bank/IDA project.

During project execution Supervision Missions of some one-two weeks were carried out by one or two staff members on an average of once a year. The timing and frequency of the missions appears to have been satisfactory except at the time when major project adjustments became necessary, but their scope and composition seem to have been too narrow. From the supervision reports it appears that efforts were largely limited to reporting on the progress of project works. As it became evident that the full original 670 km project could not be carried out by the final closing date nor within the limits of financing provided by the Loan and Credit, the Highway Department, in agreement with the Bank, chose to delete some roads from its program entirely and to relegate others to force account financing -- without reimbursement. According to Highway Department staff, the criteria used to delete project roads were priority order as established at the time of Appraisal (listed in Table 2) and actual traffic. No roads were dropped from the first 14 priorities, all included in the First Year Program. For the Second Year Program, 1971 average daily traffic (ADT) on the group of roads improved was about equal to that on the group of roads dropped; however, for the Third Year Program, 1971 average daily traffic was 25% less on the group improved than on the group dropped, as shown below:

| | <u>Roads Improved to Standards Planned</u> | | <u>Roads not Improved</u> | |
|---------------------|--|-----------------|---------------------------|-----------------|
| | <u>No. of Roads</u> | <u>1971 ADT</u> | <u>No. of Roads</u> | <u>1971 ADT</u> |
| Second Year Program | 6 | 1,230 | 8 | 1,222 |
| Third Year Program | 9 | 488 | 15 | 663 |

Early in 1961 the Government of Costa Rica asked the IDB to consider financing five feeder roads included in the work program for the Plan Vial but not accepted for the upcoming Bank project on grounds that engineering and feasibility studies were not sufficiently advanced. The Bank suggested that four of the roads be further investigated by consultants under the first Bank project and that the fifth, actually comprising several road sections in the Nicoya Peninsula, be considered by the IDB. This suggestion launched the planning stage for the larger IDB feeder road project begun in 1965.

While the Bank did not reject the idea of financing the feeder roads, it appears that the mainly reconstruction program chosen for a first Bank project was preferred partly due to the greater ease of quantifying direct economic benefits. This summary audit does not permit to answer the question whether the construction/improvement program adopted was the highway project of highest priority in 1961. The priority of the project actually executed, three or four years late, is quite another question, but also unanswerable within the scope of this study, although some doubts arise from the more rapid traffic increases that have occurred on some of the roads which have remained unimproved, as noted above.

Lessons

Two main lessons for the Bank emerge from this summary audit:

1. Bank flexibility - As the project was in many ways a type of "highway program loan," the Bank should have been more flexible in its approach when major deviations from appraisal estimates began to occur. Probably the project should have been re-appraised after three years to verify its continuing priority. Supervision Missions should have played a more active role in project modification, by carefully considering possible major changes in the project or supplementary financing -- as opposed to simple deletion of project road sections.
2. Institution-Building - As assistance with development and implementation of an improved maintenance program were included among the consultant's responsibilities under the Loan Agreement, the Bank should have provided more detailed terms of reference including specific time-related targets in the maintenance field against which implementation could have been measured.

TABLE 1

COSTA RICA: FIRST HIGHWAY PROJECT
DISBURSEMENTS SCHEDULE: EXPECTED VS. ACTUAL

(US\$ million)

| <u>Year</u> | <u>Construction/Improvement</u> | | <u>Equipment</u> | | <u>Consultants</u> | | <u>Contingency (Expected)</u> |
|-------------|---------------------------------|---------------|------------------|---------------|--------------------|--------------------------|-----------------------------------|
| | <u>Expected</u> | <u>Actual</u> | <u>Expected</u> | <u>Actual</u> | <u>Expected</u> | <u>Actual</u> | |
| 1962 | 1.40 | | 2.50 | | 0.10 | | 0.20 |
| 1963 | 2.40 | 0.50 | 0.60 | 1.38 | 0.10 | | 0.10 |
| 1964 | 3.40 | 0.79 | | 0.88 | 0.10 | | 0.10 |
| 1965 | | 1.47 | | 0.56 | | | |
| 1966 | | 1.65 | | 0.03 | | | |
| 1967 | | 2.17 | | | | | |
| Total | <u>7.20</u> | <u>6.58</u> | <u>3.10</u> | <u>2.85</u> | <u>0.30</u> | <u>0.62^{a/}</u> | <u>0.40</u> |

a/ Disbursed in approximately equal portions over the six year period.

Source: Appraisal Reports TO-294a; PTR-26
Final Revision of List of Goods.

TABLE 2

COSTA RICA: FIRST HIGHWAY PROJECT
ROAD WORKS AND TRAFFIC: 1971 ACTUALS vs. APPRAISAL ESTIMATES

| Original Priority (No.) | Name of Road and Expected Year of Execution | Actual Period of Construction or Reconstruction | Actual Means of Execution ^{d/} | Distance (Km) | | Cost (\$millions) | | Traffic (v. p. d.) | | | | % Actual/Estimated | | | |
|-------------------------------|--|--|---|----------------------|----------------|------------------------------------|--------------------|-------------------------|--------------------|----------------------------------|-----------|--------------------|------|------------------|------------------|
| | | | | Original Estimate | Actual 1971 | Original Estimate ^{e/} | Actual 1971 | Est. 1971 ^{h/} | Light Act. 1971 | Heavy Est. 1971 ^{i/} | Act. 1971 | Km. | Cost | Light Traffic | Heavy Traffic |
| First Year 1962 | | | | | | | | | | | | | | | |
| 1 | San Jose-Sto. Domingo-Pirro | 63-65 | F,X | 9.9 | 11.1 | 2.00 | 1.6 | 2744 | 6429 | 819 | 1230 | 112 | 80 | 234 | 150 |
| 2 | Alajuela-San Isidro | 63-66 | F | 8.4 | 8.1 | 0.47 | 2.47 | 521 | 634 | 281 | 222 | 96 | 525 | 122 | 79 |
| 3 | San Jose-Guadalupe-Rancho Redondo | 63-65 | F,X | 16.4 | 11.7 | 1.89 | 2.49 | 1299 | 4816 | 700 | 1344 | 71 | 132 | 370 | 192 |
| 4 | Sabana-Pavas | 63-65 | C, ^g | 4.5 | 4.1 | 0.40 | 0.98 | 1057 | 2598 | 521 | 687 | 91 | 245 | 246 | 132 |
| 5 | San Joaquin-Sta. Barbara | 63-66 | F | 5.0 | 3.79 | 0.46 | 1.54 ^{e/} | 658 | 430 | 355 | 170 | 76 | 334 | 65 | 49 |
| 6 | Y Griega-San Antonio | 64-66 | C | 3.8 | 3.1 | 0.52 | 1.32 | 1184 | 4098 | 394 | 911 | 82 | 254 | 346 | 231 |
| 7 | Curridabat-San Antonio | 63-66 | C,F | 2.3 | 1.6 | 0.18 | 0.28 | 220 | 606 | 70 | 496 | 70 | 156 | 275 | 708 |
| 8 | Desamparados-Acosta | 64-69 | C, ^g | 22.8 | 22.60 | 2.39 | 6.15 ^{e/} | 1121 | 164 | 351 | 99 | 257 | 335 | 224 | 109 |
| 9 | San Jose-Paso Ancho | 65-65 | X | 1.9 | 1.85 | 0.56 | 0.16 | 1043 | 2747 | 562 | 615 | 97 | 30 | 263 | 109 |
| 10 | Curridabat-Tres Rios | 63-65 | F | 5.8 | 1.5 | 3.74 | 1.04 | 2551 | 4424 | 1374 | 1807 | 26 | 28 | 173 | 132 |
| 11 | Zapote-Curridabat | 61-62 | F | 2.1 | 2.0 | 0.32 | 0.38 | 2320 | 3314 | 442 | 960 | 95 | 119 | 143 | 217 |
| 12 | Tres Equis-Siquirres | 63-65 | C,F ^{g/} | 27.3 | 36.49 | 4.20 | 7.46 | | 167 | 239 | 133 | 178 | | | |
| 13 | Radial-Zapote | 64-68 | C | 1.3 | 2.38 | 1.23 | 2.73 | | 4545 | 798 | 183 | 222 | | | |
| 14 | Liberia-Guardia | 63-66 | C | 18.7 | 18.3 | 1.70 | 3.16 | 128 | 680 | 109 | 320 | 98 | 186 | 531 | 294 |
| Second Year 1963 | | | | | | | | | | | | | | | |
| 15 | Fuentes Lourdes | | (F) ^{d/} | 2.0 | | 0.22 | | 4121 | 6375 | 499 | 2003 | | | 449 | 401 |
| 16 | San Sebastian-San Juan de Dos Rios | | F | 3.7 | | 0.36 | | 350 | 2737 | 445 | 772 | | | 782 | 173 |
| 17 | San Jose-Villa Colon | 66-69 | F | 18.4 | 9.02 | 2.18 | 2.57 | 1610 | 1869 | 454 | 447 | 49 | 118 | 116 | 98 |
| 18 | Laguna-Ciudad Quesada | | (X) | 24.0 | | 1.44 | | 313 | 371 | 371 | 147 | | | 118 | 173 |
| 19 | La Marina-Pital | | (X) | 17.1 | | 1.48 | | 103 | 206 | 68 | 144 | | | 200 | 212 |
| 20 | Cartago-Volcan-Irazu | 65-67 | C | 29.1 | 6.4 | 0.54 | 1.44 | 239 | 354 | 129 | 167 | | | 148 | 129 |
| 21 | Interamericana-Las Juntas | 65-67 | C | 6.4 | 20.0 | 1.76 | 3.46 | 120 | 142 | 51 | 65 | 100 | 267 | 118 | 127 |
| 22 | San Josecito-Atenas | 64-67 | C | 15.9 | | 1.76 | | 341 | 715 | 133 | 286 | 126 | 196 | 210 | 215 |
| 23 | Uruca-Incurvables | | X | 3.3 | 19.0 | 0.47 | 2.63 | 1085 | 5590 | 362 | 2283 | | | 515 | 631 |
| 24 | Cartago-Cervantes | 66-71 | F | 13.9 | 2.17 | 1.23 | 1.23 | 500 | 575 | 285 | 125 | 100 | 110 | 165 | 119 |
| 25 | Ipis-San Isidro-Cascajal | 66-67 | F | 13.9 | | 1.90 | | 444 | 1392 | 224 | 534 | 16 | 98 | 288 | 238 |
| 26 | San Jose-Alajuelita | | C | 2.5 | | 1.90 | | 734 | 2283 | 450 | 690 | | | 311 | 153 |
| 27 | Alajuela-Carrisal | 64-65 | C | 11.2 | 9.19 | 1.05 | 1.20 | 95 | 336 | 63 | 121 | 82 | 105 | 354 | 192 |
| 28 | San Jose-Desamparados | 65-65 | X | 2.4 | 2.40 | 1.20 | 0.44 | 2740 | 6018 | 1349 | 1625 | 100 | 37 | 220 | 120 |
| 29 | San Jose-Curridabat | 65-65 | F,X | 4.8 | 2.3 | 2.57 | 0.92 | 2740 | 7553 | 1349 | 2354 | 48 | 36 | 276 | 174 |
| 30 | Lourdes-San Ramon de Tres Rios | | ^{e/} | 10.9 | | 1.29 | | 485 | 1168 | 153 | 292 | | | 241 | 191 |
| 31 | Circunvalacion (San Pedro-Guadalupe-Calle Blancos) | | ^{e/} | 2.5 | | 1.25 | | | | | | | | | |
| 32 | Guardia-Santa Cruz | 65-68 | C,F | 38.3 | 38.9 | 7.10 | 13.5 ^{e/} | 128 | 623 | 109 | 151 | 102 | 190 | 488 | 138 |
| Third Year 1964 | | | | | | | | | | | | | | | |
| 33 | Betania-Guadalupe | 64-65 | F | 1.7 | 1.7 | 0.13 | 0.60 | 1420 | 5573 | 473 | 689 | 100 | 462 | 392 | 146 |
| 34 | Interamericana-Miramar | 66-68 | C | 7.2 | 7.2 | 0.23 | 0.87 | 120 | 209 | 51 | 55 | 100 | 378 | 174 | 108 |
| 35 | La Argentina-Grecia | 64-66 | C | 7.9 | 7.8 | 0.93 | 1.04 | 126 | 219 | 84 | 108 | 99 | 112 | 174 | 128 |
| 36 | Naranjo-Laguna | | (X) | 21.0 | | 1.50 | | 313 | 370 | 147 | 216 | | | 118 | 147 |
| 37 | Ciudad Quesada-Florencia | | (X) | 9.7 | | 0.78 | | 100 | 391 | 150 | 192 | | | 391 | 128 |
| 38 | Florencia-Muelle de San Carlos | 66-68 | C | 14.9 | 14.4 | 2.04 | 4.05 | 87 | 157 | 71 | 113 | 97 | 198 | 180 | 159 |
| 39 | Cervantes-Turrialba | 71- ^{e/} | X | 22.0 | | 2.47 | | 375 | 584 | 230 | 308 | | | 156 | 134 |
| 40 | La Suiza-Moreavia | | | 9.4 | | 1.10 | | 105 | 157 | 105 | 178 | | | 150 | 170 |
| 41 | Ciudad Quesada-La Marina | | | 11.0 | | 1.20 | | 134 | 218 | 89 | 151 | | | 163 | 170 |
| 42 | Turrialba-Tres Equis | 63-67 | F | 19.7 | | 3.55 | 0.43 ^{h/} | 137 | 561 | 74 | 271 | | | 409 | 366 |
| 43 | Santa Barbara-Alajuela | 66-67 | C | 6.1 | 6.1 | 0.78 | 1.53 | 213 | 274 | 116 | 69 | 100 | 196 | 129 | 59 |
| 44 | San Jose-San Sebastian | | | 2.0 | | 0.49 | | 763 | 6080 | 467 | 1356 | | | 797 | 290 |
| 45 | Tibas-San Isidro | | (X) | 8.2 | | 0.99 | | 668 | 1184 | 200 | 283 | | | 177 | 142 |
| 46 | Desamparados-Patarra | | (X) | 5.6 | | 0.77 | | 335 | 804 | 164 | 151 | | | 264 | 92 |
| 47 | Zapote-San Francisco de Dos Rios | 64-66 | C | 1.0 | 1.02 | 0.18 | 0.86 | 389 | 3415 | 209 | 556 | 102 | 478 | 878 | 266 |
| 48 | Tibas-Llorente | | (X) | 2.2 | | 0.31 | | 530 | 1253 | 167 | 244 | | | 236 | 146 |
| 49 | Heredia-El Gallito | | (X) | 8.0 | | 0.88 | | 247 | 356 | 134 | 142 | | | 144 | 106 |
| 50 | Heredia-Vara Blanca | | (X) | 29.4 | | 4.50 | | 211 | 298 | 167 | 124 | | | 144 | 96 |
| 51 | Tilaran-Arenal | 64-64 | X | 15.0 | 15.0 | 1.86 | 0.50 | 39 | 176 | 26 | 50 | 100 | 27 | 451 | 192 |
| 52 | Vara Blanca-Poas | | (X) | 15.2 | | 0.90 | | 29 | 54 | 37 | 14 | | | 186 | 38 |
| 53 | Villa Colon-Puriscal | 65-68 | C | 16.0 | 18.0 | 1.76 | 4.48 | 142 | 290 | 95 | 167 | 113 | 254 | 204 | 176 |
| 54 | Atenas-San Mateo | | | 14.9 | | 2.57 | | 103 | 155 | 42 | 53 | | | 150 | 126 |
| 55 | Canas-Tilaran | 66-67 | C ^{e/} | 22.8 | 22.8 | 2.18 | 5.16 | 67 | 274 | 25 | 82 | 100 | 237 | 409 | 328 |
| 56 | Santa Cruz-Nicoya | 66-68 | C ^{e/} | 34.8 | 21.2 | 5.30 | 7.76 ^{e/} | 118 | 421 | 53 | 107 | 61 | 146 | 357 | 202 |
| 57 | San Francisco-Belen-El Coco | | | 9.7 | | 0.63 | | 462 | 493 | 248 | 143 | | | 107 | 58 |
| TOTALS | | | | 671.0 | 333.21 | 87.70 | 86.33 | | | | | | | | |

a/ 56% of work complete as of May 1972

b/ C - Contract, F - Force Account with reimbursement, X - Force account without reimbursement.

c/ New construction; all other work was reconstruction.

d/ Parentheses in this column indicate means of execution under revised project for road, where work has not yet been carried out. (priority roads listed with no entry under "Actual Means of Execution" were dropped officially from the revised program.)

e/ Work carried out by foreign contractor. (all other contract work was local).

f/ Includes 15% contingency allowance.

g/ Actual costs include bridge works which were not planned for at the time appraisal cost estimates were made.

h/ Work done included the building of one bridge, only.

i/ Estimated 1971 traffic data are based on the 1963 estimates presented in the Appraisal Report multiplied by an expected annual increase of 3.5% for the interim period.

TABLE 3

COSTA RICA: FIRST HIGHWAY PROJECT
ANNUAL DIRECT ECONOMIC BENEFITS OF ROAD IMPROVEMENTS: ACTUAL FOR 1971 vs. APPRAISAL ESTIMATES FOR 1963

| Original Priority No. | Name of Road and Expected Year of Execution | Annual Road User Savings | | | | Annual Maintenance Savings (\$000) | Total Annual Savings | | | % Return | |
|-----------------------------|---|--------------------------|--------|-------|--------|---|----------------------|--------|-------------------|--------------|----------------|
| | | Light (\$000) | | Heavy | | | Est. | Actual | % Actual/ Est. | 1963 Est. | 1971 Actual |
| | | Est. | Actual | Est. | Actual | | | | | | |
| <u>First Year 1962</u> | | | | | | | | | | | |
| 2 | Alajuela-San Isidro | 133 | 204 | 169 | 169 | 34 | 337 | 407 | 120 | 76 | 16 |
| 3 | San Jose-Guadalupe-Rancho Redondo | 532 | 1839 | 668 | 1200 | 49 | 1269 | 3088 | 243 | 71 | 124 |
| 4 | Sabana-Pavas | 105 | 312 | 122 | 194 | 17 | 246 | 523 | 213 | 68 | 53 |
| 5 | San Joaquin-Sta. Barbara | 100 | 65 | 128 | 61 | 16 | 249 | 142 | 57 | 58 | 9 |
| 6 | Y Griega-San Antonio | 136 | 507 | 103 | 257 | 13 | 255 | 777 | 305 | 52 | 59 |
| 7 | Curridabat-San Antonio | 41 | 101 | 30 | 191 | 5 | 79 | 297 | 376 | 48 | 107 |
| 8 | Desamparados-Acosta | 445 | 1978 | 501 | 1417 | 92 | 1037 | 3487 | 336 | 48 | 57 |
| 10 | Curridabat-Tres Rios | 205 | 122 | 242 | 109 | 6 | 471 | 237 | 50 | 13 | 23 |
| 11 | Zapote-Curridabat | 62 | 111 | 27 | 73 | 8 | 97 | 192 | 198 | 16 | 50 |
| 14 | Liberia-Guardia | 119 | 817 | 232 | 877 | 65 | 417 | 1759 | 340 | 27 | 56 |
| <u>Second Year 1963</u> | | | | | | | | | | | |
| 17 | San Jose-Villa Colon | 739 | 554 | 487 | 690 | 38 | 1303 | 1282 | 98 | 63 | 50 |
| 21 | Interamericana-Las Juntas | 89 | 139 | 88 | 147 | 22 | 199 | 308 | 155 | 41 | 21 |
| 22 | San Josecito-Atenas | 301 | 1047 | 275 | 981 | 78 | 638 | 2106 | 330 | 40 | 61 |
| 25 | Ipis-San Isidro-Cascajal | 128 | 77 | 137 | 69 | 9 | 324 | 155 | 48 | 27 | 13 |
| 27 | Alajuela-Carrizal | 68 | 260 | 104 | 215 | 32 | 211 | 507 | 240 | 22 | 46 |
| 32 | Guardia-Sta. Cruz | 245 | 1604 | 475 | 882 | 137 | 854 | 2623 | 307 | 13 | 19 |
| <u>Third Year 1964</u> | | | | | | | | | | | |
| 33 | Betania-Guadalupe | 46 | 237 | 56 | 107 | 7 | 109 | 351 | 322 | 87 | 58 |
| 34 | Interamericana-Miramar | 29 | 66 | 30 | 42 | 25 | 84 | 133 | 158 | 40 | 15 |
| 35 | La Argentina-Grecia | 118 | 266 | 183 | 306 | 28 | 329 | 600 | 182 | 39 | 58 |
| 38 | Florencia-Muelle de San Carlos | 144 | 332 | 276 | 559 | 50 | 472 | 941 | 199 | 26 | 23 |
| 43 | Sta. Barbara-Alajuela | 104 | 176 | 132 | 103 | 21 | 257 | 300 | 117 | 39 | 20 |
| 47 | Zapote-San Fco. de Dos Rios | 12 | 141 | 15 | 54 | 4 | 31 | 199 | 642 | 19 | 23 |
| 53 | Villa Colon-Puriscal | 76 | 228 | 122 | 317 | 63 | 254 | 608 | 239 | 16 | 14 |
| 55 | Canas-Tilaran | 115 | 618 | 99 | 428 | 80 | 294 | 1126 | 383 | 15 | 22 |
| 56 | Santa Cruz-Nicoya | 228 | 651 | 240 | 392 | 74 | 590 | 1117 | 189 | 12 | 14 |

Note on Methodology: In this table actual savings were derived directly from the 1963 estimated savings (Appraisal Report) taking into account changes in traffic and distance in km.

$$a/ \text{1963 estimated \% return} = \frac{\text{1963 est. total savings}}{\text{1963 est. total cost (as shown in Table 2)}}$$

$$b/ \text{1971 actual \% return} = \frac{\text{1971 actual total savings}}{\text{actual total cost (as shown in Table 2)}}$$

Source: Appraisal Report - TO 294a, Annex Table 1. (est. 1963 data)
Ministerio de Obras Publicas. (actual 1971 data)

COSTA RICA HIGHWAY NETWORK

