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An Evaluation of the Productive Infrastructure Rehabilitation Project in St. Lucia and St. Vincent, West Indies

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EXECUTIVE SUMMARY

OVERALL JUSTIFICATIONS

In view of the basic importance of the road system for the economy and society of St. Lucia and St. Vincent, and the disastrous state of disrepair into which those systems had fallen (partly because of the precarious state of the islands' public finances), this evaluation fully supports the priority given by the U.S. Agency for International Development to the rehabilitation of public roads in St. Lucia and St. Vincent through the Productive Infrastructure Rehabilitation (PIR) Project.

The justifications for choosing to rehabilitate feeder roads, in addition to a few strategic secondary roads, in St. Lucia for a total of 130 miles are clearer than those that led to the selection of 14 miles of secondary roads for rehabilitation in particular locations centered on the Vigie Highway in southeastern St. Vincent, although review of the latter's benefit/cost ratio indicates a very high rate of return. Obviously, the respective choices were closely related to the local institutional capability for road construction as well as to the wise decision of the Regional Development Office for the Caribbean (RDO/C) to employ the force account system, rather than contractors, in both cases. Also, use of the Crown Agent as manager in St. Lucia appears to have been fully justified, especially since only one expatriate employee was involved.

PURPOSE

The PIR project had two explicit purposes: to increase production and productivity (in agriculture, essentially), and to improve access between production areas and consumption and export centers. Achievement of both purposes must be measured in conventional economic terms, that is, the extent to which the investment in road rehabilitation can be shown to have benefited the economy by having made possible (a) greater production of goods for which a demand existed and lowering their cost of production and marketing, and (b) a larger flow of traffic as well as savings in vehicle operating costs. Both types of benefits must, in the final analysis, be related to the costs of the project.

IMPACT

Owing to the short time allotted to the evaluation, the lack of project-specific base-line and follow-up data as well as of any meaningful general statistical series, the fact that road investments typically have a delayed impact, and that the project was not completed, some of the answers are tentative, incomplete, and based largely on personal judgment and inferences rather than on facts and figures. Moreover, the bulk of the short-term benefit had to be sought in the banana export industry, the islands' economic backbone and the only one with both guaranteed demand and guaranteed supply. But measurement of the quantitative contribution of the road rehabilitation to sharply higher banana production and exports and farmer incomes since 1982 -- in addition to lack of data -- is muddied by the rapid spread of field packing precisely in the same years, and by the effects and aftereffects of Hurricane Allen in 1980 and a severe blow-down in 1983.

Nonetheless, discussions with local experts, superficial case studies along the road segments concerned, and review of such hard data as could be utilized, lead to the following conclusions:

1. In St. Vincent, the impact on agricultural production and productivity was slight because the road sections concerned did not in general provide access to hitherto inaccessible areas with larger production potential; the adjacent areas -- known as St. Vincent's breadbasket -- were already intensively cultivated. Field packing was the more important factor here. However, one road segment had already become impassable for trucks and several others were in danger of becoming impassable; hence, one can argue that failure to execute the project at this time would have led to serious economic losses in the near future. Finally, the internal rate of return, reviewed on the basis of benefits accruing from assumed savings in vehicle operating costs and of actual costs, was about 40 percent over a 20-year period -- over 50 percent above the project paper estimate, assuming normal maintenance expenditures and despite the project's substantial cost overruns.

2. In St. Lucia, rehabilitation of the feeder roads has had a more evident impact on banana growers, even though perhaps not in the way, and to the extent, expected by the original project analysis. There is substantial evidence that rehabilitation of feeder roads, and of connecting secondary roads, has been one main incentive (along with stable prices and substantial premiums from field packing and related practices) for the sizable production increases in many areas, through acreage expansion; replanting, including temporarily abandoned fields; and more intensive cultivation, in particular, greater

use of fertilizer after the bags no longer needed to be head-carried from the nearest passable road. However, with the attainment of virtually 100 percent field packing by mid-1985, benefits in terms of lower rejection rates as a result transport bruising are difficult to attribute to road rehabilitation. The reasons are that:

- Small trucks will call even on very bad roads;
- Proper field packing and load securing, coupled with low speeds, avoids any tangible bruising from the roads for both small and large trucks;
- Where the condition of the feeder track keeps even small trucks away, producers will head-carry the field-packed bananas to where they can be loaded; and
- Road quality is reflected only in overall trucking rates to the extent that these are based on vehicle operating costs; truckers do not discriminate in the rates they charge to farmers or to the Banana Growers Associations for specific bad road segments or for specific improvements.

A few sample reviews of benefit/cost ratios of feeder and secondary road segments, based on a great deal of guesswork, indicate internal rates of return of 18-45 percent (under the same assumptions as for St. Vincent, plus the estimated gross value of new banana production). The Caribbean Development Bank's (CDB) minimum acceptable internal rate of return for investment in feeder road rehabilitation is 14 percent.

OUTPUTS

The project paper calls for two kinds of output: accomplishment of the construction objectives (presumably at the projected cost), and support to the creation of a permanent capacity for road maintenance. The construction objectives are being met, despite some initial delays and substantial cost overruns in St. Vincent. The latter were to a large extent the result of over-optimistic design assumptions regarding institutional capacity, equipment availability and rental costs, and reliability of crushed stone supply.

The output objective of support to the creation of a permanent capacity for road maintenance was designed to help overcome the problem of inadequately maintained roads on both islands, a problem that had led to the road conditions addressed by the construction objective in the first place. Judging from the condition of project and non-project roads, including CDB-financed feeder roads in St. Lucia completed as recently as 1981,

maintenance is still not adequately carried out in either island. Although official budget and expenditure data indicate that the project agreement covenants are being adhered to in formal, fiscal terms, there are reasons to doubt that funds ostensibly earmarked for maintenance are in fact used fully for that purpose. Moreover, responsible technical officials assert that the real need for funds for maintenance is at least double the budget figure in St. Vincent, and three times the current budget in St. Lucia, even though the nominal allocation there is about twice that of St. Vincent.

The principal unplanned effect (as regards the original project paper -- the Amendment No. 1 does contemplate it) was the apparent increase in new banana plantings. This effect is judged not to be necessarily a net benefit in view of the probable negative environmental impact on some of the steep hillsides where virgin forest land is destroyed in the process. The arguments are complex and in the final analysis beyond the technical capability of the evaluation team. Moreover, it is arguable whether simple feeder road rehabilitation on old alignments is an important contributory factor to either benefits or environmental costs. However, in future projects more than a negative initial determination would be appropriate.

LESSONS LEARNED

Concerning Project Design and Implementation

1. Ideally, appraisal of a road project of any kind on these small (geographically as well as economically) islands should be based on an analysis of the entire system, rather than of more-or-less isolated segments. The basis for such an analysis, it is understood, now exists in St. Lucia in the form of a complete inventory and multi-year plan.

2. Analysis should include transport rate structure and setting.

3. Existence of a detailed, up-to-date land capability and use survey is an essential input to the system analysis; AID should help promote and fund these surveys. Moreover, far greater attention should be paid to environmental issues, and not only in connection with road construction. Thorough environmental assessments covering land and water resources and certain aspects of pollution are recommended for all the islands.

4. Thorough engineering and institutional analyses must be completed prior to final project design, and their results taken into consideration unless they are explicitly shown to be inappropriate or irrelevant.

5. The force account method of construction should continue to be preferred, even at the risk of delays and cost overruns, to help create a local institutional base and avoid the cost of displacing equipment from overseas, including neighboring islands.

6. Road maintenance is the single most important issue uncovered by the evaluation. Reliance on project agreement covenants and on marginal technical assistance and training in this respect is illusory; and distinction between investment and recurrent costs in road reconstruction, rehabilitation, and maintenance is a fiscal artifice. For the future, the evaluation team recommends that AID should.

- Include maintenance in project funding, but on a declining contribution scale;
- Ensure effective technical and financial monitoring of maintenance performance;
- Finance procurement of basic equipment, for exclusive use of maintenance unit;
- Develop cost-effective routine maintenance systems with local participation; and
- Assuming all the above is ensured, provide appropriate technical assistance for planning and execution.

Study of -- and possible participation in -- the projected maintenance project in Dominica, sponsored jointly by the European Development Fund, British Development Divison, and the CDB, is suggested.

7. Consideration should also be given to insistence on the use of crushed stone or gravel surfaces on some feeder roads with low traffic loads (and excepting steep grades) in place of hard surface, as a cost-saving measure.

8. Interest was encountered in St. Vincent in a feasibility study of coastal transport as a low-cost complement to road transport. It is suggested that pre-feasibility studies be commissioned for several islands that might include inter-island marine transport, and on the basis of which feasibility studies might then be called for.

9. In the interest of cost effectiveness, as well as to avoid overburdening the islands' small economies and bureaucracies with assistance missions and projects, it is strongly recommended that inter-donor consultation and collaboration be maximized in a number of ways, including joint

road systems analyses and construction and maintenance projects; joint environmental assessments; and, if appropriate, a joint study of marine transport.

Concerning Evaluations

1. The nature and scope of the exercise should be unequivocally defined, and the financial and institutional resources made commensurate (or vice versa).

2. Meticulous preparation of documentation and data bases prior to arrival of an evaluation mission can be cost effective.

3. Especially where no base-line or follow-up data exist, a preliminary visit by the team leader would be highly useful.

4. In-depth evaluations should, in general, not be expected in the absence of base-line and follow-up data.

5. Provision should be made in the project for funding host country participation in the evaluation, and the host country institutions should be alerted, with adequate notice, to the arrival of the evaluation mission.

The evaluators have also drawn some lessons from this exercise for the possible benefit of future teams operating under similar constraints:

1. Spend more time on site and less having discussions and collecting and reading documentation at RDO/C.

2. Refrain from making last-minute quantitative surveys with doubtful statistical representativity and little time for analysis. Rather, spend more time with those who know the local realities.

3. Distribute yourselves as much as possible, comparing notes every evening.

4. Try to do the economic analysis on project components (such as, road segments) that were used for this purpose for project analysis, provided they were well chosen initially.

CHAPTER ONE

EVALUATION METHOD

The stated purpose of this evaluation for the U.S. Agency for International Development was to:

> assess the effectiveness of the PIR (Productive Infrastructure Rehabilitation) Project in St. Lucia and St. Vincent in satisfying the purpose and achieving the goals as stated at the outset of the project, i.e., to increase per capita incomes . . . [and] productivity, particularly in the agricultural sector, and to provide dependable access by road from productive areas to major population centers and ports.

In addition, the statement of work listed a series of economic, social, institutional, and environmental impacts as well as an assessment of engineering aspects that, it was understood in discussions with personnel from the Regional Development Office for the Caribbean (RDO/C), were to be covered to the extent that time and resources permitted. The statement of work specified that the "report format will closely follow that of AID's Project Evaluation Summary (PES)."

In accordance with Section VI E of the project paper (PP), this is to be considered the final project evaluation. However, Amendment No. 2 PP (p.13) states that "an in-depth interim evaluation" was to be "carried out in mid 1985 and a final evaluation before PACD." In discussions prior to and during this evaluation, personnel of RDO/C also emphasized their expectations of an in-depth evaluation that would primarily provide guidelines for further, similar projects in the region (or for alternatives) and for future project evaluation efforts insofar as method and approach are concerned.

AID contracted with Development Alternatives, Inc. (DAI) to provide a three-person team, comprising Eric Shearer, agricultural economist and team leader; Alec Hansen, transport economist; and C.C. Donato, roads engineer. The contract was for 83 person-days, including travel time. The two economists were to spend 30 person-days each in the field; only 18 person-days were originally allotted to the engineer, but three additional days were subsequently granted.

The team arrived in Barbados on Sunday, July 21, 1985. The economists spent the first week collecting and studying all relevant available documentation and reports and interviewing personnel of RDO/C and other donors, such as the Caribbean Development Bank (CDB) and the British Development Division (BDD), which had also funded road improvement projects. (The CDB appeared most reluctant to release documentation, and there was virtually no institutional memory in the BDD). The agricultural advisor of the European Development Fund (EDF) was not available owing to travel and leave schedules, and the engineer had been transferred to Antigua and had no relevant information. In sum, none of the other donors appeared to have performed or commissioned any meaningful evaluations of road projects.

On Monday, July 29, the team met with officers of the RDO/C to discuss evaluation methodology prior to leaving for the St. Vincent and St. Lucia. Since the team felt that it had insufficient knowledge of local conditions, and no base-line data were available, the discussion centered mostly on the principal issues that the team proposed to explore and on some working hypotheses. It was agreed that the investigative method would have to be developed locally and would be informal and unstructured in view of the lack of base-line data and of systematic, evaluation-oriented follow-up data; the time limitation; and that the earliest road sections completed under

the project were only two years old. It was pointed out that, as stated in AID's published evaluation of the Honduras rural roads project, the impact from road work is typically of a long-term nature.

The team departed Barbados for St. Vincent on Tuesday, July 30; Monday, August 5, a national holiday in the eastern Caribbean states, was used to travel to St. Lucia, from where the team returned to Barbados on Sunday, August 11. Thus, the team's visits to each island comprised only four official working days, although personnel of the Banana Growers Association (BGA) in both places gave generously of their time on Saturdays.

In addition to personnel from the respective BGAs, team members interviewed officials of the following public and private institutions and non-governmental organizations (NGOs):

- In both islands: Ministry of Communications and Works (MCW), Ministry of Planning and Finance, and Ministry of Agriculture.
- In St. Vincent, in addition: General Manager, Geest Company (the sole buyers and shippers of Eastern Caribbean bananas); the coordinator of the Organization for Rural Development, an NGO, who made possible a field trip on Sunday to the relatively inaccessible north end of the island; the managers of the Agricultural Marketing and Agricultural Development corporations; and the leader of the Ronco Consulting Corporation team implementing AID's new agricultural project.
- In St. Lucia, in addition: the General Manager of the Windward Islands Banana Association (WINBAN).

Aside from such readily available routine data as project costs, local government budgets, and banana exports, the team had no access to any data prepared in advance of the its arrival (despite the Amendment No. 2 PP, p.13), nor were any found to be available regarding project impact. Even traffic counts for

St. Lucia had not been commissioned; those that were requested through the resident project manager, who is on a personal services contract (PSC), became available only during the writing of this report.

The evaluation team's engineer inspected the entire 14 miles of project roads in St. Vincent, as well as a sample of secondary and feeder roads (including some financed earlier by the CDB) in the northern and east-central regions of St. Lucia. With the one exception noted below, the economists limited their field visits and interviews in St. Vincent to the areas of influence of the project roads (all of the collector roads and main highways); in St. Lucia, they visited to the northern and east-central regions, where the bulk of the project's road rehabilitation had taken place. The economists also traveled the entire length of the Windward Highway in St. Vincent, up to and beyond its end at Georgetown, to the village of Fancy at the northern tip, from where they walked several miles along what can best be described as goat tracks.

Field interviews in St. Vincent were based on targets of opportunity among farmers, truckers, and road workers. Most cases were farmer-workers, and some were farmer-worker-truckers. However, a small sample of road workers on the last project section being completed were surveyed with a brief questionnaire to learn their employment status prior to their being hired on the project. Field interviews in St. Lucia were equally targets of opportunity, but a questionnaire was prepared to obtain a minimum set of consistent information (the questionnaire had to be simplified from two pages to one page the second day). The economists, with the help of the BGA extensionists who accompanied them, interviewed 38 people located along an informal sample of Phase I, II, and III project feeder roads and along older feeder roads improved with CDB funds. Some of those interviewed were also located along secondary or collector roads

improved by the project. In addition, the transport economist collected data from 15 farmers who volunteered their BGA passbooks containing weekly or biweekly banana delivery figures from before the road improvement; these data were supplemented by BGA computer printouts for 1982-1984.[1] The agricultural economist obtained passbook data for two growers, only one of whom grew bananas before 1982.

The extensionists (from the Ministry of Agriculture and BGA in St. Vincent and BGA in St. Lucia) who accompanied the economists provided valuable information and insights during the field investigations.

In sum, the method used was based largely on personal judgment regarding observed phenomena and their relation to the issues that had been tentatively identified and others that emerged from the team's contacts and observations during the site visits. Moreover, there was no opportunity to double-check some facts and opinions, much less to discuss with informants the conclusions that emerged during report writing.

The method employed for reviewing benefit/cost estimates for the project on the basis of the information and data obtained in the informal, unstructured manner outlined above is explained in Chapter Five.

The team's preliminary findings and conclusions were discussed with RDO/C personnel on August 12 and 13. The engineer departed on August 14. A draft report was presented to RDO/C on August 22, and RDO/C comments were discussed on August 23. The economists departed Barbados on August 24.

NOTES

1 These data were contained in a complete printout of banana deliveries by each grower for those years, with subtotals by districts, that the team contracted with the St. Lucia BGA. Computerization began in 1982. Limitations of BGA data are discussed in Chapter Five.

CHAPTER TWO

EXOGENOUS FACTORS AND ASSUMPTIONS

Two kinds of explicit and implicit assumptions underlie design and approval of the project: those governing attainment of the outputs -- per se and at the projected cost -- and those affecting the desired impact. The former deal essentially with the engineering and institutional aspects of project implementation, whereas the latter affect project goals and purposes. The two types of assumptions will be discussed separately.

For both islands, project outputs concerned rehabilitation of selected roads and improved road maintenance capability. Their attainment was explicitly conditioned on the assumptions of adequate availability of laborers and skilled personnel, and of materials and equipment within time and cost limits.

The availability of labor (skilled, semi-skilled, and unskilled) on both islands was adequate, as a result of the high rates of unemployment and underemployment. However, the number of available trained professional and supervisory staff was inadequate. This was a constraint on both islands. The project design was over-optimistic in this regard; thus, the project did not provide the level and type of short-term technical assistance required to overcome this constraint. Moreover, most of the short-term technical assistance that the project was designed to provide was not implemented, apparently because not enough personnel who could be trained were available. This was a problem particularly in St. Vincent, where the situation was aggravated by the death of the AID-contracted construction engineer.

Concerning construction timeliness and costs, the assumption about the availability of personnel and equipment were more realistic in St. Lucia, where prior analysis had indicated that

the MCW's capacity to carry out the task directly was inadequate, and that the government finding schemes (GFS) could not be relied on for equipment. As a result, decisions were made to have the MCW channel the force account construction management through the institution of the Crown Agent (even though only one of the three members of the Crown Agent management team was not a St. Lucian) and to allow the agent to contract equipment and personnel according to his best judgment.

In St. Vincent, however, the institutional assumptions with regard to construction outputs were over-optimistic, as indicated by the delays and cost overruns in implementing a relatively simple project involving 12 (later augmented to 14) miles of primary and secondary roads. Nevertheless, two exogenous factors (although it is not certain how exogenous the second factor should be considered) contributed to the problem in St. Vincent: the death of the construction engineer, and the replacement of the chief engineer of the MCW. The problems with unavailable equipment, however, can be ascribed to unrealistic assumptions regarding rock crushing capacity and the appropriateness of relying -- partially or wholly, as the case may be -- on equipment rented from the GFS.

Institutional and technical details concerning the problems related to construction outputs will be found in Chapter Four.

The lack of explicit assumptions regarding the capacity of the project to improve the capability of the host government institutions to maintain the respective road systems effectively are considered to be serious because of the long-term implications for the duration of the useful life of the project's roads as well as for the countries' road systems in general. Lack of success in this area cannot be attributed in either case to unpredictable factors.

In retrospect, implicit reliance on project agreement covenants and provision of marginal technical assistance proved insufficient. Political decision makers cannot be relied on to allocate sufficient budget funds to recurrent expenditures for road maintenance in the face of the growing budget squeeze, or to respect the integrity of these allocations according to technical priorities.

The maintenance issue, which the evaluation team considers to be the key issue in this exercise, is dealt with in detail in Chapters Four, Seven, and Eight.

Analysis of the assumptions underlying the PP's first project purpose -- increased output and productivity -- is more complex: first, it is too early in project implementation to speak of end of project status; second, the required indicators were not available; and third, most of the assumptions were implicit, although some can be found in the text of the PP.

The implicit assumptions underlying the achievement of the second project purpose -- "provide dependable access by road from productive areas to major population centers and their ports" -- would seem to be only that the roads concerned had those characteristics. All roads improved by the project met the first purpose -- increased output and productivity. The second purpose, however, will be largely a function of the maintenance that these roads will receive in the immediate future, thus tying the explicit assumption under this heading to the explicit and implicit ones for improved road maintenance capability.

CHAPTER THREE

INPUTS

ST. LUCIA

In St. Lucia, problems with the availability and timeliness of inputs were minor. The major problem was of casual origin: the ship transporting the two bitumen distributors capsized en route.

The project falls under the MCW umbrella, but the construction work is administered by a Crown Agent contracted specifically to direct the construction of the project's roads. However, two of the three managers employed by the Crown Agent are St. Lucians. Interviews with project workers at all levels indicate that they possessed a good knowledge of their job requirements. Progress under the Crown Agent's guidance has been steady, and the work is proceeding on schedule.

A review of cost accounting procedures and progress reporting indicates that the project administration is handled well. Records were up-to-date and easily available for inspection. The project's equipment is being used effectively, and few delays are experienced because of equipment shut down, indicating effective maintenance.

The permanent staff of the MCW's Roadworks Division at present consists of 1 chief engineer and 2 assistant engineers, 4 road supervisors, and 15 road foremen. Thirty technician/timekeepers are hired and paid on a daily basis. Of the two assistant engineer positions, one had been vacant for some time; the senior assistant, who has been a British expatriate paid by the Overseas Development Administration for the past two and one-half years, was about to depart. No replacements are in sight.

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No national counterpart trainee was working with the ODA engineer. Thus, top management capability will be seriously constrained for some time.

ST. VINCENT

In St. Vincent, in contrast, several endogenous input problems are held responsible for the initial output delays and cost overruns. (The death of the resident PSC construction engineer occurred late in project implementation.) The project-endogenous problems are deemed to be mainly the result of three erroneous assumptions in the project design (these were not corrected during implementation). Lack of construction skills in the host country institution was also partially responsible; it is not clear whether and to what extent more intensive technical assistance could have helped overcome this constraint sooner. The three design assumptions in question, and the problems that resulted, are that:

- Key road construction equipment, such as a motor-grader, would be available.

  In fact, the GFS has the only two graders on the island. One had been down so long that the project was unable to use it. The other grader had broken down so often that it was unavailable for extended periods. Thus, leveling and distribution of the stone base frequently had to be accomplished by hand spreading.

- Procurement of a hydraulic impactor for the quarry operation would increase crushed stone production.

  In fact, the limited capacity of the existing primary crusher caused a shortage of supply to the secondary crushers that could not be overcome by the addition of an impactor. This situation, compounded by the sale of crushed stone from the GFS quarry to the public, caused frequent shortages of crushed stone of appropriate size for the project; it also led to frequent work stoppages and idle truck time, which was particularly serious in the case of GFS trucks.

The Morrison-Maierle report foresaw this blockage and suggested that consideration be given to the procurement of a larger capacity primary crusher and choke feed. Moreover, some relief might have been obtained through using existing equipment in double shifts to stockpile crushed stone specifically for project needs.

- GFS trucks rented for hauling would deliver materials such as crushed stone to the job site efficiently and cost effectively.

  In fact, experience showed this not to be the case, whereas privately hired trucks were more dependable and cost effective, for reasons known to the MCW and RDO/C.

As regards the host country implementing institution, the Wilbur Smith report of January 1985 describes in detail the institutional makeup of the MCW. The findings of that report are considered appropriate.[1]

Briefly, the MCW is the agency responsible for planning, programming, constructing, and maintaining all public roads. The Central Statistical Office (CSO) is directly responsible for the technical administration of all road projects. The AID-financed Vigie Highway project is under the supervision of a graduate MCW project engineer. The AID project officer monitors the disbursement of funds and progress of the work, basically through a resident PSC project manager.

Interviews with MCW technical and supervisory personnel assigned to the job, as well as with semi-skilled workers, indicate that they are responsible, diligent, and willing to learn. The 14 miles of contiguous work did not require additional staffing, except perhaps a soils technician with equipment to monitor construction quality control.

Construction costs for the various sections of the project roads are shown in Table III-1. Aside from avoidance of the overruns attributed to the design assumptions discussed above --

TABLE III - 1: CONSTRUCTION COSTS IN ST. VINCENT
(in 1,000's of US$)

ROAD SEGMENT	FAR COST	ACTUAL COST TOTAL	ACTUAL COST PER MILE	OVERRUN (PERCENT)
MILES 1 & 2	233	352	176	51
MILES 3 & 4	305	289	145	-9
MILES 5 & 6	272	258	129	-5
MILES 7 - 10	477	518	120	9
MILES 11 & 12	312	300	150	-4
MILES 13 & 14	300	300 *	150 *	-
TOTAL	1,899	2,017	141	6

* -- projected

and the assumed increases in subsequent fixed amount reimbursement (FAR) bases -- introduction of better records and controls by MCW might have reduced costs by another 10 percent below the average reimbursed cost per mile.

INSTITUTIONAL INPUTS

The PP calls for improvement of the MCW's road maintenance capability in both countries; six months of short-term expertise were to be provided in various areas of transport planning, as well as assistance in maintenance standards (among others). A maintenance and transport specialist was to have been financed for two months. This short-term technical assistance was never implemented, perhaps because technical assistance funds had been tied up in the long-term contracts. However, a reportedly successful training course was organized in St. Lucia in mid-1984 for participants from both islands, with the PSC project manager and the Crown Agent's chief engineer serving as trainers.

This training was not by itself able to enhance the MCW's performance in this field. Nonetheless, the departing senior assistant engineer in St. Lucia declared that MCW does, in fact, currently have the capacity to manage and execute a limited amount of road construction and suggested that future donor projects take this into consideration.

A general institutional issue raised by RDO/C in the pre-evaluation discussions is the appropriateness of the choice of construction arrangement in each island. One concern was over the choice of force account versus contracting. The lack of appropriate local contractors and the sizable additional cost (up to one-third) of mobilization for a foreign contractor (plus the a priori exclusion of third country contractors), viewed against the modest size and relative simplicity of the construction task

in both countries, made the force account system a wise choice. The choice of force account construction also responded to AID's objective of creating employment; according to the CDB, the ratio of labor to total construction cost tends to drop from 40 percent in the case of force account to 25 percent when contractors are used. (A representative of another donor questioned the wisdom of AID-financed road construction on other Caribbean islands being carried out by U.S. contractors, rather than helping to build indigenous capacity.)

The other concern was with the employment of the local MCW, as in St. Vincent, versus the use of a Crown Agent as intermediary, as in St. Lucia. The local institutional conditions existing at the time the project was designed and implementation began, coupled with the nature of the construction, fully justified the method selected in each case.[2]

In any event, retrospective assessment regarding these institutional factors must generally bow to the judgment of those responsible for project design and implementation. It must be assumed that their decisions were made as a function of the tradeoffs, at that time, of efficient implementation in the short run versus the longer-term institution building inherent in development projects.

NOTES

1 Wilbur Smith and Associates, May 1985.

2 The CDB also implements its feeder road program in St. Lucia through the Crown Agent.

CHAPTER FOUR

OUTPUTS

Two outputs of the project are identified in the Logical Framework: rehabilitation of selected roads and improved road maintenance capability.

CONSTRUCTION

At this time of this evaluation, all road construction funded under the original project and Amendment No. 1 had been completed on both islands. In St. Vincent, work was proceeding on the last one and one-half miles of the additional two miles of secondary road that had been added by Amendment No. 2; in St. Lucia, less than 10 miles of Phase III's 23 additional miles remained to be completed.

The total construction output, to be completed before the end of 1985, will correspond essentially to that provided in the original project and its two amendments, that is, rehabilitation of 14 miles of primary and secondary roads in St. Vincent, including culverts and bridges as required, and 81 miles of feeder roads and tracks and 52 miles of primary roads plus two bridges, in St. Lucia.

The following is a brief assessment of the construction on each island, within the framework of its total road network and the general road conditions and characteristics.

St. Vincent

The St. Vincent national road network comprises approximately 166 miles of paved highways and secondary roads and 250 miles of unpaved roads of which about 70 miles are considered tracks and trails.

Drainage is generally inadequate, and many of the roads sh some sign of deterioration, ranging from potholes to subsurfa structural failures. Most bridges are in fair condition but a typically single laned. In the mountainous areas, the horizont and vertical alignment is poor, with the result that sig distance is short.

The evaluation team inspected the entire 14 miles of proje roads to ascertain the adequacy of design and quality construction. The team also visited roads financed by the CD The project roads vary in width from 12 to 24 feet and follow t original alignment with some slight adjustments to improve sig distance and reduce excessive grades. The wearing surfa receives bituminous surface treatment over a compacted 6-in crushed stone base over the entire width of the roadwa Generally, there are no shoulders. Drainage is provided by si ditches and transverse drains.

At the time of the evaluation team's visit, only one a one-half miles of roads remained to be constructed. Althou time did not permit an in-depth assessment of the constructi procedures and quality of the completed work, some observatio are offered below.

The completed project roads are generally of fair a acceptable quality. No visible signs of surface distress drainage defects were noted during the field visits, but t uniformity of the surface texture could be greatly improve Stop-and-start construction joints are evident; these a probably due to the inexperience of the asphalt crew, althou some joints may be attributed to interruptions caused by t weather, material and equipment shortages, and the need to mai tain traffic flow during construction.

Preparation of the sub-base to receive the crushed stone base can also be improved. In the ongoing work on the last one and one-half miles, much effort was expended in filling potholes and leveling uneven areas, but little attention was paid to correcting some obvious soft areas that appeared in the form of cracked asphalt surface ("alligator cracking"). This type of defect strongly suggests that the subsurface soil-bearing capacity is questionable.

The labor component of about 40 percent of construction costs is normal for the type of rehabilitation work under way. Ditching and drainage work is carried out mostly by mini-contracts that utilize a high percentage of hand labor.

Based on past construction experience, the MCW had developed cost projections of road construction for the project area. These estimates were generally accepted by AID for use in the FAR system.

Cost breakdown data by specific components of work items were unavailable to permit assessing the accuracy of cost estimates for project FAR prices. The overall costs per mile of road estimated for use in the FAR system, when judged against the cost of other than project road rehabilitation work performed under similar conditions, appear to be normal for St. Vincent. The use of bitumen in the surface treatment of the roads accounts for some 50 percent of material costs and 20 percent of total construction costs.

St. Lucia

The St. Lucia national road network consists of approximately 330 miles of paved roads and 170 miles of unpaved roads. The paved roads are a mixture of highways, secondary or collector

roads, and feeder roads serving primarily agricultural areas. None of the types of road follows any specific design or cross section. They vary in width from 10 to 20 feet. Occasionally, a well-built feeder road becomes a collector road because of its smoother surface, compared with the rougher surface of a collector or secondary road, or because the feeder road happens to shorten a given distance. The project design contemplated the rehabilitation of both major roads and feeder roads. Comments and observations on design and construction will be made separately for each category.

Secondary or Collector Roads

The rehabilitation work on the secondary roads in St. Lucia followed the existing alignment. As in St. Vincent, the vertical and horizontal alignments make for short sight distances.

In general, the rehabilitation work resulted in a good road, with the exception of one section of the Castries/Dennery Highway, specifically, the first nine miles out of Castries. The visible signs of deterioration of this section range from surface cracking to settlement, caused, no doubt, by structural failure in the subgrade. The rehabilitation applied to this road was only cosmetic; it did not correct the root causes of the road's original failure. Hence, a higher than normal rate of maintenance will be required to keep this piece of road in adequate service condition.

Feeder Roads

The sample of feeder roads improved under the project that the evaluation team inspected was also found to be of good quality, with a few exceptions. Some of the feeder roads rehabilitated during the project's first phase (as well as many completed in earlier years with CDB funds) showed signs of

stress, owing mainly to lack of maintenance but perhaps also to the use of an inappropriate base source. Although the project design specifies a crushed stone base, in some instances a base material known as tiff was used instead of crushed stone.

Examination of the tiff disclosed that the material varied considerably by source. One source, of a deep red color, contains a high percentage of relatively hard stone fragments but with some fine plastic material. This material makes a good base, provided it is well selected and properly blended to reduce plasticity. The production cost should be less than for crushed stone.

Another type of very soft tiff, yellow in color, was also used. The gradation of this material falls within the specified limits, but the hardness and durability of the stone particles are questioned. Use of this material as base may well lead to its breaking down under traffic, thus compromising the strength and integrity of the pavement structure.

There seems to have been some uncertainty about what specifications were to govern recent construction. In fact, tiff continued to be used with some frequency in place of the specified crushed stone.

Review of material tests made during construction indicates that the specifications are generally being met and that the Crown Agent is aware of the importance of quality control.

Costs

The cost estimated for use in the FAR system was developed by MCW and the Crown Agent by taking a section of road to be rehabilitated and doing a quantity survey of all items of work to

be performed. The results served as a basis for establishing cost estimates for road improvements. Although overruns have averaged 18 percent during the life of the project, the construction cost appears to be realistic. The overruns were reportedly caused in part by ad hoc work requested by the MCW outside the project, such as special drainage. The total amount of the overruns was equivalent to about one-third of the government's annual road maintenance budget. Labor costs are estimated for St. Lucia, too, at about 40 percent of total.

MAINTENANCE

There was no evidence on either island that the MCW's capacity for road maintenance, the second project output, had been substantially enhanced.

St. Vincent

In St. Vincent, the greatest and most obvious problem of the existing roads, including the project roads, is the lack of maintenance. No significant road maintenance was evident during field visits. Practically all ditches, as well as many culverts, were in need of cleaning. The lack of ongoing maintenance work was no doubt related to the fact that FY 1985 budget funds for maintenance had, as usual, been exhausted by May, and that, unlike in previous years, no advances against FY 1986 had been authorized.

In the opinion of authoritative MCW staff, the budget funds nominally allocated for 1985-1986 for maintenance work represent only 45 percent of actual need; these funds would presumably suffice for low-cost, routine maintenance, such as filling pot-holes, cutting grass, and cleaning ditches and culverts, but generally not for serious long-term measures such as removing

soft spots and replenishing bituminous surface material lost through attrition. Funds nominally expended by the MCW for road maintenance since 1982 are as follows:[1]

Fiscal Year	Paved Roads (360 miles)	Unpaved Roads (254 miles)	Total
	(million EC$)		
82/83	2.10	.61	2.71
83/84	2.85	.85	3.70
84/85	3.10	.60	3.70
85/86	2.60 *	.55 *	3.15 *

* -- Budgeted

It was not possible to trace the allocated funds to expenditure on particular road segments, or to obtain a breakdown according to specific maintenance activities (for example, cleaning or patching). This leaves open the possibility that only a fraction of the funds allocated for maintenance were used for that purpose.

Beyond the formal commitment under the project agreement covenant (see below), MCW officials assert that the current budget allocation for maintenance represents only 45 percent of the minimum believed to be necessary to maintain road systems at an adequate level of service without serious deterioration. This estimate is considered conservative.

The EC$2.6 million 1985-1986 budget for maintaining the paved roads is equivalent to an average of EC$7,200 per mile. The 55 percent asserted shortfall indicates a requirement for an average of EC$16,500 per mile, for an annual total of nearly EC$6 million at 1985 prices using standard maintenance methods.

St. Lucia

The amounts nominally spent on maintenance in St. Lucia are nearly double the sums allocated for this purpose in St. Vincent, which has a comparable topography and a road network of similar length. However, there was ample visual evidence of insufficient maintenance of the feeder roads, and no maintenance activities were observed during three days of field travel in St. Lucia, perhaps because the budget year had just begun and new funds had not yet become available. Nominal maintenance expenditures since were as follows:

Fiscal Year	Million EC$
82/83	7.113
83/84	5.257
84/85	5.489
85/86	5.486 (budgeted)

Covenants

The covenants for both project agreements provided that expenditures for road maintenance during the life of the project were to be at least equal to the average for the local FY 1981 and 1982. The PP does not contain base-line data for this commitment. However, implementation letters No. 2 for both countries set that base line at EC$4.5 million for St. Vincent and EC$6.96 million for St. Lucia.

A review of the actual expenditures in St. Vincent during FY 1981 and 1982 shows that the figures in the implementation letter should have been nearer one-half of the amounts shown. For St. Lucia, only budget data are available for the base years, and these average 81 percent of the figure given in the implementation letter. In any case, against these revised bases, both

countries have fulfilled the covenants through FY 1985 in formal, fiscal terms. However, there is little visual evidence in either country that the sums budgeted or nominally expended for maintenance were in fact used for that purpose. If substantial diversion took place, no amount of technical assistance designed to enhance the MCW's capability for maintenance would make any difference in actual performance.

Suggestions for more cost-effective approaches are offered in Chapter Eight. Comparative benefit/cost estimates for alternative scenarios of maintenance levels are also provided.

NOTE

1 US$1 = $EC2.7 (Eastern Caribbean dollar)

CHAPTER FIVE

IMPACT: BENEFICIARIES AND BENEFIT/COST ANALYSIS

INTRODUCTION

The impact evaluation of a road rehabilitation project ought to start from the premise that a road is not a road unless it can be used to transport goods and people on vehicles without substantial damage to any of the three. Furthermore, the need for a rigorous benefit/cost assessment is mitigated by the assumption that the mere existence, and use, of a road or track is prima facie evidence of its economic and social utility. Obversely, it can be argued that a basic road network in serviceable condition is the fundamental infrastructure need of any economy, that is, one without which no other public or private investments in a modern or modernizing economy will take place.

If these premises are accepted, RDO/C's choice of the deteriorated road system for investment of economic support funds (ESF) grants, along with several other external donors and lenders (EDF, BDD, and CDB) can be justified. The islands' public budgets for recurrent expenditures were so constrained that even road maintenance funds were inadequate -- the fundamental cause of the conditions to which the AID project addressed itself -- and their investment budgets were already funded almost totally by official external capital.

This chapter evaluates the project's impact on its two stated purposes: increasing per capita incomes and productivity, and providing dependable access by road between productive areas and population centers and ports. In view of the limitations outlined in Chapter One, the second impact is of course more evident and easier to measure than the first (even though hard

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data could not be obtained in either case, except for traffic counts). Thus, much of the impact evaluation is based on inferences derived from subjective opinions, personal observation, and proxy indicators.

First, the macro-economic context and impact will be discussed; second, the impact of improved access at the farm and farmer level in terms of incomes and productivity will be assessed. Estimates and surmises will then be presented concerning changes in traffic flows and savings in vehicle operating costs (VOC). Finally, the available data and some revised assumptions will be combined in an attempt to review the economic rate of return of individual segments of the project.

Except for general traffic flow increase and VOC savings, (and the relaxation of the foreign exchange constraint implicit whenever foreign currency is provided to cover local expenditures), all macro- and micro-economic benefits from this project are assumed to accrue to the banana sector. Bananas are, and will be for the foreseeable future, the mainstay of the islands' agricultural sectors in terms of value added, employment, and net export earnings. In fact, there was little tangible evidence that investments other than in bananas have occurred as a result of PIR road improvements in the last few years, either in terms of agricultural alternatives or in non-agricultural activities.

The reasons for the continued farmer preference for bananas are clear: satisfactory net earnings and a guaranteed market. Most other lines of production in the islands at this time do not offer secure markets, and production costs are so high that they are not competitive with imports (despite protection) or in the export market.

However, the potential exists for improved regional integration as a result of connector and, particularly, primary road rehabilitation: an in-depth study (performed by Halcrow-Fox, but unavailable to the evaluation team) of the impact of reconstruction of the West Coast Highway in St. Lucia presumably focuses on these long-range effects. But aside from increased market opportunity for vehicle owners-operators (public transport vans and trucks), and one furniture maker in St. Lucia who located next to an improved road, these impacts have not been observed or reported.

Because the nature of the construction outputs, in terms of the class of roads and their relative geographic dispersion, differed greatly between the two islands, each is analyzed separately.

MACROECONOMIC CONTEXT

St. Vincent

In St. Vincent, the average annual expenditure of AID grant funds from the project was equivalent to approximately 6 percent of the government's average investment expenditures in FY 1983 and 1984. These expenditures in turn, are about 80 percent funded from official external capital; average annual project expenditures were also about 1 percent of gross domestic product (GDP) and payments for labor were about 0.3 percent of GDP. The 14 miles of rehabilitated roads represented 8 percent of the country's paved road network. The project is located in the middle of a region that is usually referred to as the island's breadbasket.

St. Lucia

In St. Lucia, in contrast, the macro impact of project expenditures was much greater: average annual expenditure amounted to about 13 percent of average government investment expenditure in FY 1983 and 1984 and 3 percent of GDP; labor payments were equivalent to more than 1 percent of GDP. The 130 miles of rehabilitated feeder roads represent about 40 percent of the island's pre-project paved roads and 27 percent of the total road and trails network.

Banana production for export had recovered satisfactorily by 1981 from the effects of Hurricane Allen, and stayed nearly constant in 1982. Production rose another 27 percent in 1983, and an additional 19 percent in 1984, to a record 148 million pounds. The outlook for 1985 is for a new record.

There are no recent data on acreage of bananas or any other crop in St. Lucia. The first agricultural census in 13 years is scheduled for October 1985. Small banana growers tend not to think in terms of acres; many even find it impossible to remember the number of plants.

There does not seem to be any correlation between fertilizer sales and banana production on a national level. There is no district breakdown of fertilizer sales, as there is for production. Otherwise, an attempt could have been made to relate the variations in regional output to fertilizer consumption.

INCOMES AND PRODUCTIVITY

St. Vincent

Owing to the nature of the roads rehabilitated by the project in St. Vincent, no short-term impact on farmer incomes or productivity could be determined or inferred. The rapid conversion to packing bananas in the field (beginning in 1982, reaching an estimated 95 percent of growers by mid-1985) prevents any meaningful analysis of the effect of the primary and secondary road improvement in St. Vincent. This is because the roads in question, although admittedly badly deteriorated in part, could be -- and were -- used by trucks carrying bananas from the packing plants to the port even before the project. All bananas were packed in cartons ready for ocean transport even before the project (some in the field and the rest in packing plants located in the production areas). According to BGA officials, there was no evidence of significant bruising damage from transport even over the deteriorated roads because the trucks were driven carefully and the loads well tied down. Moreover, the rapid expansion of field packing has put more money into the pockets of growers because of the premiums granted for field packing and for the protective operations that generally precede field packing, mostly deflowering and sleeving. These premiums can add as much as 40 percent to the base price, and are unrelated to the road improvement.

Furthermore, truck haulage from the packing plant (where even field-packed bananas are assembled and reloaded) to the port is based solely on distance. Truckers do not attempt to add -- nor would the BGA accept -- surcharges for bad roads. Thus, there has not been any cash benefit to growers from improved

roads (except to the small minority who are also truck drivers), either directly or indirectly through an increase in the BGA's net earnings.

It could be argued that without the project the road conditions would have deteriorated so badly that they could no longer be negotiated by the banana trucks in year X, at which time there would have been a substantial without-project loss. But this would assume unrealistically that MCW would not have intervened with emergency maintenance measures designed to keep the roads truckworthy.

St. Lucia

The only direct measure that could be used in principle as a proxy for incomes and productivity in St. Lucia is the quantity of bananas delivered by each grower each year in relation to the date of completion of the rehabilitation of the feeder road on or near which the farm is located. The price is uniform, and input/output relations are assumed to be uniform. However, the rapid advent of field packing also makes it difficult to determine, with any degree of analytic confidence, what proportion of any given change in output and/or income and productivity should be attributed to the improvement of the feeder road per se. Nevertheless, in an attempt to arrive at a reasonable judgment, the team combined rudimentary statistical analyses of banana deliveries along feeder roads in the general area of Dennery with interviews of a small number of farmers and truckers in that area and around Monchy, informed opinions of local experts, and the team members' observations.

First, a number of points were established that, while impossible to quantify at this time, showed not only that the rehabilitation of the roads is of substantial benefit to the

neighboring population but also that the selection made jointly by the government and AID of both feeder and secondary roads responded to real economic priorities in terms of their potential for producing higher incomes. Indeed, there is strong evidence that -- at least in the areas studied -- the road project also had positive distributional impact by favoring areas where small growers predominate and making it possible to create field packing groups among small growers.[1]

One reason why it is not possible to separate the benefits of feeder roads from those of field packing is that they tend to be synergistic, even though one can exist without the other. That is, there are instances where individual field packing takes place and the boxes are carried by head to the nearest passable road, or small trucks can be contracted that are willing to negotiate the unimproved or deteriorated trail. (That there may have been instances where stems or field boxes were delivered to inland buying depots [IBD] over improved roads or unimproved trails is immaterial today because field packing has reached virtually 100 percent.)

Road improvement alone can represent a tangible benefit for the small individual field packer in terms of saving time in not having to carry the product on his or her head or reducing the proportion of rejects at the IBD as a result of bruising caused by transport on roads, or both. But group field boxing typically depends on an access road in decent condition for both trucks and BGA extension agents; its added benefit for small growers is that they can depend on shipping their bananas weekly or fortnightly at the exact time when the bananas are ready to be cut for export, because the truck calls regularly. In addition, the cost of transport per box goes down because the trucks (which charge per trip, not by weight) tend to leave the group packing shed

fully -- rather than partially -- loaded and, if they can load a full pallet, they can avoid the IBD and proceed directly to the port. The saving in transport cost accrues to the grower.

It is significant that, despite the obvious and immediate cash-flow effect of field packing, growers in several places along feeder roads in the Monchy area unanimously chose road improvement over field boxing, the two hypothetical and mutually exclusive alternatives. There was also agreement that the improvement of the feeder road to allow motorized traffic increased demand for fertilizer (leading to higher yields) because farmers are reluctant to carry sacks of fertilizer on their heads for more than the short distance from the truck to the banana patch. Moreover, there is no extra trucking charge for the short additional distance along the feeder road. (In the Monchy area, farmers pay a flat EC$2 transport charge per bag.)

BGA representatives estimate that before the general adoption of field packing, 20-25 percent of the bananas leaving the farm were rejected at the packing plant or at the wharf. However, they assert that the increase in deliveries in 1984 was due mainly to the improvement of the roads.

BENEFIT/COST ANALYSIS[2]

St. Vincent

Road rehabilitation in St. Vincent was confined to connector or secondary roads. Many farmers carry bananas and other produce to the side of these roads, but none of the roads can be classified as feeder roads. Also, in contrast with St. Lucia, only one stretch of road in the St. Vincent project had deterior-

ated to the point that truckers refused to pick up bananas. Any benefits from the new road must therefore be derived from lower vehicle operating costs or time savings.

Vehicle Operating Costs:

The PP refers to a study conducted by the British Transport and Road Research Laboratory (TRRL) in 1979 in St. Vincent to quantify the benefits of the improved road surface. The TRRL team, in turn, directly measured road roughness before and after road rehabilitation, but operating cost savings were estimated from formulas that were developed by TRRL in Kenya in 1975. These studies appear to have been professionally conducted and the estimates are robust; a follow-up study by TRRL in 1982 refined the formulas, taking account of conditions on St. Vincent and St. Lucia. Application of the new formulas to the original PP analysis did not result in any significant revision in the estimates for VOC savings. (An adjustment reported in the 1985 Amendment No. 2, however, inappropriately revised the savings estimates upward on the basis of fuel price increases: reductions in road roughness affect spare part and tire consumption, and labor costs on vehicle maintenance, but not fuel or oil consumption.)

Based on the 1982 study, a decrease in roughness from 7,000 mm per km to 4,000 mm per km results in a saving of US$0.08 per mile for all types of vehicles. This represents a reduction in costs of 42 percent for passenger cars and 27 percent for trucks. In the absence of usable VOC records, this method of estimating VOC savings seems appropriate; for greater accuracy, a bumpmeter would have to be run over representative roads to ensure that the improvements on PIR roads correspond to the changes recorded for the roads analyzed in the TRRL study.

Time Savings:

Contrary to the assumption made in the PP, the PIR project appears to have resulted in significant time savings. Although banana transport trucks do not report taking advantage of the higher average speeds to make more frequent roundtrips, passenger transport vehicles (minivans) appear to be able to do so. This decreases the time cost to public transport users, thereby increasing the demand for transport. In view of the well-established tendency for islanders to prefer combining a city job with a farming or rural job, this de facto improvement in the level of public transport service is a significant social benefit of the project.[3] Without some measure of the magnitude of the change, or the associated increase in bus- owner entrepreneurship, this benefit cannot be incorporated into the formal benefit/cost exercise -- but it must not be ignored.

Vigie Highway

Table V-1 presents a recalculation of the internal rate of return for the 6-mile Vigie Highway segment, which may be compared to the one in the PP.

Two-day traffic counts, performed during the week of August 12, indicate that the growth of road use is greater than expected. At the base of the Vigie Highway, the smoothed average daily traffic (ADT) is 2,623, whereas at the Mesopotamia Bridge (about the 6-mile mark), the corresponding figure is 1,177 vehicles per day. When calculating benefits from the road, the team took the average of these numbers so that its 1985 entry for ADT is 1,900, and the corresponding 1983 figure is revised downward from 1,600 (as used in the PP) to 1,262. This implies a

Table V-1: St Vincent -- Vigie Highway Cost Benefit Analysis

Calendar Year		Average Daily Traffic	Economic Costs: Construction (actual*)	Economic Costs: Maintenance (projected)	Economic Benefits: VOC Savings	Economic Benefits: Net Benefits
			US$			
1983	0	1,476	379,613		0	-379613
1984	1	1,619	379,613	30,000	141,781	-267832
1985	2	1,761		30,000	308,527	278527
1986	3	1,849		60,000	323,954	263954
1987	4	1,942		60,000	340,151	280151
1988	5	2,039		60,000	357,159	297159
1989	6	2,141		60,000	375,017	315017
1990	7	2,248		60,000	393,768	333768
1991	8	2,360		300,000	413,456	113456
1992	9	2,478		30,000	434,129	404129
1993	10	2,602		30,000	455,835	425835
1994	11	2,732		60,000	478,627	418627
1995	12	2,868		60,000	502,558	442558
1996	13	3,012		60,000	527,686	467686
1997	14	3,163		60,000	554,071	494071
1998	15	3,321		300,000	581,774	281774
1999	16	3,487		30,000	610,863	580863
2000	17	3,661		30,000	641,406	611406
2001	18	3,844		60,000	673,476	613476
2002	19	4,036		60,000	707,150	647150
					Salvage Value:	88900

IRR = 37 percent

rate of growth of traffic of 26 percent per year, most of which can be attributed to traffic diversion. Vehicle registration data for St. Vincent indicate that normal annual traffic growth is higher than previously estimated (the PP "conservatively estimated" growth "at 3 percent per year"), and is projected at 5 percent per year for 1985-2002.

VEHICLES ON REGISTER IN ST. VINCENT

Year	Total All Vehicles	Growth
1979	6,116	
1980	6,433	4%
1981	6,918	8%
1982	7,559	10%
1983	8,341	10%
1984	8,400 *	1%

Source: St. Vincent CSO Digest of Statistics for 1983,
* -- Provided verbally by CSO

VOC savings have been estimated at US$0.08 per mile. No production savings have been assumed; with the advent of field packing, damage to fruit as a result of the condition of secondary roads is considered negligible.

Despite the absence of damage reduction benefits, the internal rate of return for the project is estimated at 38 percent, compared with the 28 percent return projected in the PP. The increase in the internal rate of return maybe attributed mainly to the lower actual construction cost.

Other Roads

Traffic volumes on the other PIR roads in St. Vincent are considerably lower than on the Vigie Highway. The nature of their impact is also qualitatively different.

The 4-mile New Prospect-Biabou road connects the Windward Highway with the Mesopotamia region, and rendered passable a road that was formerly difficult in dry weather and impassable on wet days -- about one day in four. Banana farmers situated on the upper one-third of this road segment could not depend on truckers to deliver inputs or, worse, to pick up bananas on designated days. For some farmers, this meant that they walked an additional mile with their loads -- a severe disincentive in this terrain. Nevertheless, most of the remaining road rehabilitated under the project was passable before the project.

Drivers of pick-up trucks have reported that the trip from South Union to Kingstown takes 30 minutes less using the new road. Heavier trucks traveling from Georgetown to Kingstown are likely to use the Windward Highway despite the potential time savings, as the Vigie Highway route has steeper grades. For lighter traffic, however, the possibility exists that much of it will be diverted to the newly rehabilitated road. Future traffic counts should reveal, as early as in one year, whether significant diversion has taken place. This analysis would be hampered, however, by the apparent lack of historical traffic counts on the Windward Highway.

If the market for transportation services were competitive, VOC savings would have been passed on to farmers, representing an increased incentive to produce bananas and other crops. However, transport rates for bananas are set by the BGA according to a flat rate per mile, and rate increases, usually initiated by drivers' requests for compensation for increases in the cost of fuel and tires, apply to all destinations proportionately: no mechanism exists to allow rates to adjust to the change in real costs. The BGA estimates that 90 percent of the truckers are farmers, but these are probably middle- and upper-income farmers; the poorer farmers cannot afford their own transport. Thus, the

quantifiable benefits of the project will accrue mainly to farmers and non-farmers who operate vehicles; and the benefit spread to small farmers is limited by institutional factors.

Future Projects

The Marriaqua region, where some PIR road rehabilitation took place, is St. Vincent's primary banana region, with 60 percent of all production. In particular, the Greiggs/Lauders area, near the 11th mile of the project, has recently been converted from a large estate to an area of smallholders, and banana output has increased sharply. Numerous deteriorated feeder roads and tracks penetrate into banana lands that are less intensively cultivated because they are inaccessible by motor vehicle. Having prevented the connector roads in this region from becoming impassable, there is an opportunity to generate more traffic for these roads by rehabilitating feeder roads as well. The CDB has lent funds to rehabilitate and construct feeder roads, at least two of which are in this region.

BGA extensionists at the Greiggs packing plant estimated that bananas carried over a badly rutted feeder track on pick-up trucks were subject to a rejection rate of 5-10 percent (no records are kept of damage at this stage) when carried in field boxes (plastic tubs) or improperly field packed.

Whether BGA initiatives continue to insulate a greater percentage of bananas from transport damage, improved access to fields that are at present up to an hour's walk from the road should result in substantial new production of bananas and other crops.

St. Lucia

Morne Panache Feeder Road

A case study was done of the Morne Panache Feeder Road and the surrounding areas. This road segment is situated in the heart of the Dennery Region, one of St. Lucia's most productive banana areas. Twenty-five farmers were surveyed in the field, and 20 more were identified for statistical analysis, with the assistance of the local BGA Officer. Several truckers and other BGA personnel were also interviewed, and five farms up to 15 minutes walk from the road were visited.

The survey form was designed to determine:

- BGA passbook identification number;
- Sex of head of household;
- Location of farm and residence;
- Vehicle ownership;
- Destination of output (port or boxing depot);
- Effect of rainy weather on pick-up location; and
- Earnings from crops other than bananas.

In effect, only the first and third items were tabulated, along with information from the BGA computer records giving banana sales from 1982 to 1984; the other items were useful to confirm working hypotheses but were not formally tabulated.

Three road segments are of interest in understanding the impact of the Morne Panache Road:

- Morne Panache Road -- a 2-mile PIR segment completed in March 1983, connecting to the Castries Highway. The road is marginally trafficable in dry weather, and impassable during rain, that is, 30 percent of the time. The dry season coincides with low banana production.

- Bois Joli Road -- a 1-mile feeder road rehabilitated by CDB in 1981 that feeds into the top of Morne Panache Road. Before the improvement of Morne Panache, farmers used the eastern extension of the Bois Joli Road, which leads into Dennery. This road has been nearly impassable for some time, so the Morne Panache rehabilitation provided easier access to this area. (The remainder of the Bois Joli Road has been included in phase III of the PIR project.)

- Pais Perdu Area -- a one-half mile road segment that runs west from the southern end of Morne Panache Road, along a level ridge into a rich banana area. These farmers have benefited from the Morne Panache road. Although the St. Joseph-Pillet Road, rehabilitated through PIR in January 1985, is now used by these farmers for commuting from Dennery, the Morne Panache segment still reduces the trip to and from Castries by about 8 miles.

Benefits

Two categories of benefits were deemed appropriate for the computation of the economic rate of return: VOC savings for existing users, and net value of new production generated by the road improvement.

Traffic counts for Morne Panache Road before the rehabilitation were not available, but traffic on neighboring roads is comparable, and the St. Joseph-Pillet ADT of 98 was used as a base. Its assumed that, without rehabilitation of the road, traffic would have grown at a normal annual rate of 5 percent and that the existing users are the only ones to whom VOC savings can be properly attributed. The VOC savings for new traffic generated by the road improvement are themselves part of the incentive to increase economic activity, and thus are implicitly accounted for in the new production category.

An estimate of the new production generated by the road was obtained by analyzing the growth in output for the sample of farmers in the area of influence of Morne Panache Road, and relating it to the growth of a control group (see Annex B). The farmers in the sample belong to BGA districts 31, 32, 33, and 34, and the total growth in output of these four districts combined was used as a proxy for the growth in output of the Morne Panache farmers.

The trend in output in the Dennery Region is distinct from that of the island as a whole (see text table below). The low growth rate in 1984 was a result of the localized blow down at the end of 1983. The better performance of the Morne Panache sample compared with the four-district average can well be attributed to the road improvement, which took place in early 1983.

GROWTH RATES IN BANANA PRODUCTION

Area	1982-83	1983-84	
St. Lucia Total	1.27	1.19	
Dennery Region			
District 31	1.73	1.06	
District 32	1.49	1.15	
District 33	1.33	1.09	
District 34	1.42	1.02	
4-District Average	1.50	1.08	(control)
Morne Panache Sample	1.48	1.21	

In fact, before the road improvement, the growth of production of the sample group from 1982 to 1983 was almost identical to the four-district average. Thus, the effect of the new road can be estimated to be a differential increase of banana output of 13 percent (1.21-1.08). For a sub-sample of the Morne

Panache farmers, passbook data for the first half of 1985 were available. Although their analysis may be complicated by the seasonal variation in output, the growth rate from 1984 to 1985 showed an additional increase of 9 percent, which may be attributed to the improved road. On the assumption that output growth as a result of improved access can be expected to taper off over the years, a total increase in production on this account is projected at 3 percent in the third year; for the fourth year and beyond, the cumulative total of 25 percent over the base is maintained for each year in which the road remains in good condition. (It is perhaps more than a coincidence that the 1980 CDB Appraisal Report projects a 25-percent increase in banana production at Bois Joli as a result of its road project -- a datum that was discovered only after the above analysis was completed.)

Although the impact of new roads is normally thought to operate over a long period, behavioral elements in St. Lucia may reduce this effect. Attempts to analyze older CDB roads to assess the long-term impact of feeder roads were frustrated by lack of time and institutional memory.

The Bois Joli Road is an interesting case, although impact analysis is complicated by the adjacent PIR work. Nevertheless, the road is nearly impassable only four years after it was rehabilitated by the CDB, and farmers already hesitate to use it during the current rainy season. It is perhaps because of their well-founded fear that these road projects are only medium-term improvements that few farmers in this area have chosen to live on their farms; some 80 percent of the sample group live along the Castries-Dennery Highway, in the town of Aux Lyons some miles away, and in Dennery itself. The long-term impact of the feeder road improvements is conditional on the public perception of the government's ability to provide maintenance.

For the benefit/cost analysis, the 25-percent increase in production attributed to the PIR project is applied to each of the 96 farms estimated by the BGA to fall within the area of influence of the Morne Panache Road (this includes the Bois Joli and Pais Perdu farms). In the absence of more precise data, the base production of these farms is assumed equal to the 1983 average for all farms in the four-district control group, which is 16,000 lbs per year per farm. Thus, new production for each farm is 2,080 lbs in the first year (13 percent of 16,000 lbs), 3,520 lbs in the second year, and 4,000 lbs each year thereafter (25 percent of base production). The gross value of new production is estimated at US$0.085 per lb (the 1984 farm-gate price with average packing bonuses), a reasonble proxy for gross returns from marginal production. The aggregate gross income generated from the project levels off at US$32,600 per year for the economic life of the road.

Costs

The costs used to calculate the economic return are derived from actual construction costs, adjusted for the shadow value of labor, plus MCW estimates of the expenditures necessary to maintain feeder roads adequately. (A sensitivity analysis illustrating the effect of lower levels of maintenance expenditures is found in Chapter Eight.)

Table V-2 shows an estimated internal rate of return for the Morne Panache Feeder Road of 14 percent.

Choc-Babonneau Connector Road

The PP presents economic analyses of three road segments in St. Lucia, only one of which evaluation team members visited. The road from Choc to Babonneau is a major conduit of all traffic

Table V-2: St Lucia -- Morne Panache Feeder Road Cost Benefit Analysis

Calendar Year		Average Daily Traffic	Economic Costs: Construction (actual*)	Economic Costs: Maintenance (projected)	Economic Benefits: VOC Savings	Economic Benefits: New Production	Net Benefits
			US$				
1983	0	98	163,770	4,000	0	0	-167770
1984	1	103		4,000	6,009	16,973	18982
1985	2	108		6,400	6,310	28,723	28633
1986	3	113		6,400	6,625	32,640	32865
1987	4	119		6,400	6,957	32,640	33197
1988	5	125		6,400	7,304	32,640	33544
1989	6	131		50,000	7,670	32,640	-9690
1990	7	138		4,000	8,053	32,640	36693
1991	8	145		4,000	8,456	32,640	37096
1992	9	152		6,400	8,879	32,640	35119
1993	10	160		6,400	9,322	32,640	35562
1994	11	168		6,400	9,789	32,640	36029
1995	12	176		6,400	10,278	32,640	36518
1996	13	185		50,000	10,792	32,640	-6568
1997	14	194		4,000	11,332	32,640	39972
1998	15	204		4,000	11,898	32,640	40538
Salvage Value							16,377

Economic rate of return: 14 percent

* Adjusted for shadow value of labor:
economic cost is 79.5% of actual (not FAR) cost

from the northeast side of the island into Castries. Average daily traffic has incrased from 528 vehicles before PIR to 1,451 vehicles in August 1985. A substantial portion of this traffic is diverted from other, more direct connectors that are currently in an advanced stage of deterioration; traffic is projected to decline by 25 percent in 1986 when the Gessneau-Triocher-Marchand segment, which also feeds into Castries, is completed.

Considering only VOC savings on this high-traffic volume, the internal rate of return on this road segment is 40 percent (Table V-3), well above the 18 percent forecast in the PP. This is partly explained by the unforeseen growth in traffic volume, and the lower construction cost per mile. The Choc-Babonneau section was only lightly rehabilitated (mainly resurfaced), whereas the PP computed the internal rate of return including a thorough rehabilitation of the Babonneau-Marquis segment, which was not undertaken.

This high rate of return may be only fiction if the road does not hold up as expected. An MCW engineer expressed dissatisfaction with the behavior of the base on this road; in view of the low expenditure per mile (US$61,000) on rehabilitation, it is possible that the road will not stand up to the heavy traffic, which would imply that the projected maintenance requirements shown in Table V-3 are too low.

Other Roads

The main highway segments rehabilitated in the PIR project are not analyzed for economic return, because the regional integration benefits would properly require a systems analysis and traffic counts were not available for the only segment that the team visited (Castries-Dennery). Nevertheless, a few comments are in order.

Table V-3: St Lucia -- Choc Babonneau Connector Road Cost/Benefit Analysis

Calendar Year		Average Daily Traffic	Economic Costs: Construction (actual*)	Economic Costs: Maintenance (projected)	Economic Benefits: VOC Savings	Economic Benefits: Net Benefits
			US$			
1983	0	528	179,670	18,500	0	-198170
1984	1	792		18,500	85,524	67024
1985	2	1,451		44,400	156,766	112366
1986	3	1,143		44,400	123,453	79053
1987	4	1,200		44,400	129,626	85226
1988	5	1,260		179,670	136,107	-43563
1989	6	1,323		18,500	142,913	124413
1990	7	1,389		44,400	150,058	105658
1991	8	1,458		44,400	157,561	113161
1992	9	1,531		44,400	165,439	121039
1993	10	1,608		179,670	173,711	-5959
1994	11	1,688		18,500	182,397	163897
1995	12	1,773		44,400	191,517	147117
1996	13	1,861		44,400	201,092	156692
1997	14	1,954		44,400	211,147	166747
1998	15	2,052		44,400	221,704	177304
Salvage Value						17967

Economic rate of return: 40 percent

* Adjusted for shadow value of labor:
economic cost is 79.5% of actual (not FAR) cost

It appears that these rehabilitations were not undertaken to last, but were intensive maintenance intended to delay the complete deterioration of these economically vital roads for a few more years. Thus, even the 15-year flow of benefits assumed in the Vieux Fort-Soufriere economic analysis in the PP is too long -- 5 years is more appropriate. In view of the high traffic volumes on these segments, the rate of return was satisfactory (the 1981 World Bank report on road maintenance indicates that economic return on road construction projects averages 24 percent, whereas it is over 40 percent for maintenance projects). However, achievement of the project goal of enhancing the island's institutional capability to establish proper maintenance procedures may be questioned.

Impact on Women

The impact of the project on women does not appear to differ substantially from its impact on men. Women were observed to participate in every stage of production and marketing, except driving laden vehicles to market. Women are sure to appreciate, as much as their male counterparts, the shorter distances that they must carry their produce on their heads. Moreover, the improved access should facilitate the activities of hucksters, who are usually female, but the team did not uncover hard evidence of this.

Women heads of household constitute one quarter of the Morne Panache sample (and 40 percent of the New Prospect-Biabou baseline study in St. Vincent); the mean gross banana income of the former is slightly lower than the overall average. To the extent that the project benefits smallholders, women will gain more than proportionately, and vice versa.

Transport Sector

Although in St. Vincent transporters are paid by the BGA at fixed rates, in St. Lucia the transporters are more exposed to market pressure. St. Lucian farmers (or field pack groups) are required to pay for their own banana delivery to the wharf if their weekly output exceeds 36 boxes.[4] The BGA's reimbursement rate of EC$0.08 per box per mile is usually sufficient to cover transportation charges if the farm is far from the Castries and Vieux Fort wharves, but it makes up only about one-half the shipment cost from farms that are closer in. Truckers must cover the costs of loading and unloading; these do not vary with distance, so transport rates do not rise proportionately with distance.

Farmers who produce enough to ship directly to the wharf report that it is well worth their while to purchase a pick-up truck and deliver their own bananas. These farmers can also supplement their income by transporting other farmers' bananas; besides, most live beyond walking distance of their farm and can thus use the truck to commute. VOC savings and access benefits from the project accrue fully to these trucker-farmers.

Smaller farmers do not benefit from VOC savings directly (by operating a vehicle) or indirectly (through lower transport charges). Their bananas are delivered to inland boxing depots by roving truckers whom the BGA pays by the box. These farmers' only tangible benefit from the project accrues in the form of shorter walking distances when carrying inputs and outputs on their heads.

The smaller farmers in the Morne Panache sample showed higher growth rates in banana output than larger farmers. Whether this distributional effect is due to the road -- a plausible

hypothesis if most of the formerly inaccessible lands were smaller holdings -- or a general phenomenon in the area seems a suitable issue to pursue with follow-up research.

A FINAL NOTE ON IMPACT

The economic impact of the PIR project is more akin to a maintenance project than a construction project. Where badly deteriorated roads, with obvious social utility either in terms of VOC savings or improved access to farming areas, have been rehabilitated, the investments are justified. This result is consistent with the general finding that maintenance projects carry a higher return than construction projects.[5]

Nevertheless, it is not clear that AID would be justified in concentrating in the future solely on projects that yield the (easily quantifiable) VOC savings, to the detriment of projects that are designed specifically to promote agricultural and industrial development. First, although benefits from feeder road rehabilitation are more difficult to evaluate, the evaluation team is not confident that overall long-term benefits are lower, and would discourage analysis from focusing on the numerical results alone (the 14 percent internal rate of return for the only feeder road studies is a minimum figure, as time savings and possible long-run production benefits have not been included; nor is the feeder road chosen necessarily representative).

Second, although VOC savings are substantial, in the generally less-than-competitive transport markets found in the two countries, savings are not passed on to the consumers of transport services, but accrue largely to owners of vehicles; the poorest segments of the population will never own vehicles, but they would benefit directly from proper maintenance of feeder

roads. Third, the approach taken on St. Lucia, which may or may not be indicative of the procedure on future projects, is to give major connector roads a largely palliative treatment designed to extend the trafficability of the road by a few years, rather than to rehabilitate the base and provide the MCW with a road that can be maintained. The feeder roads appear to have been more thoroughly rehabilitated (probably because there was no other choice), and these roads will on the whole have a more permanent impact, with proper maintenance.

VOC savings in St. Lucia are not being passed on to growers on medium- and large-size farms, as these growers are forced to transport their bananas to the wharf themselves, or through the use of competitive truckers. The competitiveness of this market is a new feature, introduced two years ago, and is a trend to be encouraged; to the extent that field-packing groups continue to overcome organizational difficulties succesfully and manage to expand their numbers, VOC savings will also accure to lower-income farmers.

NOTES

1 A minimum truck load for direct hauling to the wharf is the equivalent of a pallet load from wharf to ship, variously defined as 72 and 80 boxes of 30 lbs. With average yields, a grower would have to harvest about 5 acres of bananas to ship this minimum every two weeks. That the vast majority of growers have less than 1 acre, and truckers charge by the trip rather than by ton per mile, has led to the establishment of the field-packing groups, whose main purpose is to assemble enough boxes to make up whole truck loads.

2 For methodological details, see Annex B.

3 See Brana-Shute, December 1980.

4 The size distribution of farms in St. Lucia is highly skewed. Although most bananas come from farms large enough to ship directly, the number of these farmers is small.

5 World Bank, 1981.

CHAPTER SIX

UNPLANNED EFFECTS

Only two kinds of unplanned effects of the project -- both potentially negative -- could be identified at this time: environmental impact, whose direct relation to the project may be debated, and the minor social impact from increased traffic accidents.

ENVIRONMENT[1]

The expansion of banana plantations by small growers onto steep hillsides in the volcanic islands of the Windwards -- which include St. Vincent and St. Lucia -- is a serious threat to their environment, particularly where bananas replace primary or secondary forest or other natural ground cover. Despite the relative stability of the volcanic soils and their apparent protection against direct rainfall damage afforded by the large leaves of the densely planted bananas, leaching and erosion from pure banana stands on slopes exceeding about 15 percent is thought to be considerable. Moreover, the soil's water retention capacity is diminished. The compact root systems of the banana do not act as soil stabilizers in the way that do those of most tree species. And the leaf configuration causes the rain to run off along the stem of the plant, thus accelerating -- rather than slowing -- nutrient leaching from the soil immediately surrounding the root.[2] This phenomenon is perhaps more related to production cost than to environmental concern, but the heavy leaching of chemical fertilizer and nematicide into downhill areas and streams can also cause environmental concern.

However, the soil erosion and water retention effects are obvious and, to some extent, immediate environmental concerns for two reasons. First, the likelihood exists of permanent soil degradation of the already too densely populated islands in

relation to their agricultural self-support potential. Second, there is a threat of future water shortages in view of the islands' total dependence on surface water. Deforestation on both islands started with the introduction of sugar manufacturing in the 18th century, requiring large quantities of firewood, and with a once lucrative export trade in charcoal. More recently, there has been accelerated encroachment of cropping (coconuts, bananas, field crops, and fruit trees) into forest land. The forest area of St. Lucia, for example, has already been reduced to 11 percent of the total land area; the island's chief forester believes that its topography ideally requires a forest cover of 45 percent.

In St. Vincent, a great deal of field cropping on very steep slopes is also evident (the island has hardly any level land). The people fortunately have a tradition of planting on the contour rather than up and down the hill; nevertheless, inadequate drainage and the absence of grass strips produce highly visible evidence of gully erosion in many places.

The rehabilitation of 14 miles of primary and secondary roads in a very restricted area of St. Vincent is difficult to relate to negative environmental effects such as those discussed above; little relation to expanded banana plantings or other cropping is claimed among the benefits. Not necessarily so in St. Lucia, where the rehabilitation of feeder (or access) roads and the conversion of tracks into motorable roads apparently lead farmers to clear more hillsides where virgin land is still available within reasonable walking distance of the newly improved road (see also Amendment No. 1 in the PP, p.35). The possible, and unplanned, negative environmental damage is thus the obverse of the equally unplanned project benefit represented by banana acreage expansion. Indeed, this phenomenon had not been contemplated in the original project design; there is no

reference to it in the PP. At the same time, the Environmental Threshold Decision in the PP makes a "negative determination" (that is, no prospective damage) entirely on the basis of considerations dealing with direct road construction effects, and of the fact that the project "consists of rehabilitation activities rather than new construction."

SOCIAL

The unplanned negative social effect has to do with the driving habits on both islands of those in trucks and minivans. Improvement of the road surface is leading drivers to exceed the speed limits that prudence would seem to dictate in view of the short sight distances and the lack of back-sloping or curves. No disaggregated statistics on traffic accidents before and after road improvement were obtained (project personnel probably could commission an analysis), but remarks to this effect were heard frequently. On one occasion, a woman head-of-family and banana grower expressed her concern over the safety of her children.

NOTES

1 See also World Bank, 1985, p. 24.

2 See Prins, p. 75.

CHAPTER SEVEN

LESSONS LEARNED

This chapter consists of two parts. The first section deals with lessons learned with respect to the design and implementation of road construction projects in the islands. The second section is concerned with the lessons learned -- for AID as well as for the contractor -- in the planning, design, and implementation of project evaluation in this field, and perhaps in others.

PROJECT DESIGN AND IMPLEMENTATION

Unless it is designed to address an emergency situation such as post-hurricane or seismic disaster reconstruction, a road construction project should be based on an analysis of the country's existing road network as a system. On these small islands, this analysis is a simple task that can be performed by a team of two expatriate experts, an engineer and a transport economist, assisted by the local institutions. The analysis should be preceded by a detailed inventory of the road system, including traffic counts, classification of the road segments by condition, and collection of data on population distribution and land capability and use. Information on actual and potential alternative traffic flows between producing areas and consumption and export centers should also be available for the analysis. The analysis itself should be designed to provide decision makers with a simple point system indicating the economic priority of each road and segment within the system as a whole, as well as the technical priority in terms of the nature of the construction (rehabilitation, reconstruction, bridging, realignment, widening, or even opening of a new road) and of the minimum specifications.

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Special emphasis should be placed on the kind of analysis that would indicate early on, for example, where today's feeder road will likely become (almost literally) tomorrow's connector road, and today's secondary road tomorrow's primary highway. This is suggested strongly by the experience in St. Vincent, where there is some question about the utility of the Vigie Highway as an alternate route to the southern end of the Windward Highway. In St. Lucia, however, it appears that a number of road segments officially classified as feeder roads are -- or have become -- important connections in the north-south or east-west routes (for example, the Choc-Babonneau and Monchy-Mongiraud segments).

Complete land use and capability surveys are also urgently needed for this purpose, especially on the volcanic islands with their broken topography and already dense populations. This recommendation relates as well to the environmental concerns discussed below. An interesting beginning could be made by basing a pilot analysis on the recently completed road inventory and plan of the St. Lucia MCW.

Project design analysis might also usefully include the transport rate structure and rate setting, including, in the case of the banana islands, the BGA's system for fixing transport rates and for reimbursing growers and grower-truckers for assumed transport costs. (This analysis could also produce valuable base-line data for future evaluations.)

Such infrastructure projects should, of course, be closely related to other AID projects as well as to other donor projects.

A thorough institutional-engineering evaluation should be completed and discussed with the host government before final decisions are made in the project design regarding the need for procurement of additional equipment, and the choice of the

institution that will control use and maintenance of this equipment during the life of the project, and the choice of implementing institution and construction mode. Both choices must be based on conscious and explicit understanding regarding the relative priority of the two main outputs: timely and cost-effective job completion, and creation of long-term institutional capability for planning, construction, and maintenance. In this latter context, the evaluation team completely agrees with the RDO/C's decision not to employ third country contractors in St. Vincent and St. Lucia, and it recommends that this policy be extended to the entire region, regardless of short-term considerations to the contrary. The possibilities for helping to create an inter-island indigenous contracting capability might be further investigated, bearing in mind the probable high cost entailed by sea transport of equipment and by lack of competition.

Far greater attention should be paid to environmental issues, including land use planning. There is no justification for pretending in these micro-ecosystems that a road construction project -- or any development project -- can be environmentally neutral. Environmental concerns cannot be dismissed because a project merely improves or rehabilitates existing roads and alignments. It is also disingenuous to ignore the possibility that rehabilitation of feeder roads may lead to ecologically questionable changes in land use. This possibility must be strongly suspected, of course, when new feeder or access roads are proposed, as may well happen in the future, particularly in St. Vincent. Even in the case of road rehabilitation along existing alignments, acreage under cultivation tends to undergo expansion, and the potential for environmental damage, although clearly less than in the case of new roads, exists. A donor institution engaged in development, irrespective of whether it is bilateral or multilateral, simply cannot afford to support short-

sighted host country politicians ready to sacrifice irreversible long-term resource conservation to short-term economic gains. Rather, the decision makers and their advisers must be helped to consider the relative benefits and costs.

To avoid internal conflicts and delays over individual projects, as well as in the interest of scientific validity and cost-effectiveness, RDO/C should consider contracting thorough environmental assessments of each island by a single qualified, independent institution with access to the required specialists.[1] The assessments should be preceded or accompanied by detailed land capability and use mapping. This survey should focus on water and soil conservation from the point of view of long-term optimum productive land use, combined with climatic considerations and with long-term surface water demand projections for household (including tourism), power generating, agricultural, and industrial use. In view of the high population density and the evidence of refuse pollution, this, as well as sewage disposal, should also be studied.

Consideration might be given to joining with other development institutions, such as the World Bank, UNEP, and the OAS, in this effort. Indeed, it would be advisable for RDO/C to familiarize itself in detail with the ongoing and proposed development-focused work of the OAS in this field. For example, upon return from the Caribbean, the evaluation team learned the following from the OAS:

- A resource strategy program has been under way in St. Lucia since 1981 with the Finance and Planning Ministry's Physical Planning Unit, including the impending publication of six resource maps at a scale of 1:50,000 and drafting of a physical development strategy by the end of 1985 (an unsuccessful proposal was made to combine a land capability cadaster with the rural and property cadaster funded by AID);

- A resource management project is about to be launched in St. Vincent, to which Canadian CIDA may commit follow-up project funds; and
- A plurinational Economic Base Resource Management Project is being discussed for implementation beginning in 1986, to be channeled through the OECS, with West German government cooperation.

The importance of close coordination among donors, lenders, and technical assistance providers suggests itself even more strongly in the case of the Caribbean mini-states than in some other developing regions or countries. After all, the absorptive capacity of the Carribbean islands for external capital and advice is sharply limited by the tiny size of their economies and their bureaucracies. These institutions are easily supersaturated with programming, identification, appraisal, preparation, supervision, and evaluation missions and with expatriate technical assistance and project implementation personnel. Continuation or, worse, acceleration of the current trend is likely to lead to either passive dependency and cynicism, or to a reaction against all further external assistance.

The issue of road maintenance was discussed in Chapter Four. Future response to this issue will be the most important result of policy-level consideration of this evaluation. Reliance on covenants has been insufficient to guarantee appropriate maintenance of project and non-project roads, despite nominal, fiscal compliance. However, there is so little conceptual difference between road rehabilitation and road maintenance that the distinction between investment and recurrent expenditures becomes a fiscal absurdity.

The evaluation team strongly suggests that in future projects of this nature RDO/C ensure that road maintenance actually takes place and that local capability for -- and attitudes toward -- road maintenance are tangibly enhanced. To this end, the following steps are recommended:

- Funding of maintenance costs should be included in the project design and financial plan; however, to avoid creating a host government dependency on external funding of maintenance costs, AID should scale down its contributions annually over the life of the project.

- The project agreement should contain a provision making possible effective monitoring of actual performance of road maintenance in both engineering and financial terms.

- Project funding should include procurement of basic road maintenance equipment, such as graders and bitumen spreaders, the use of which should be reserved exclusively to the subdivision dealing with maintenance; indeed, where such a subdivision does not exist, it may make institutional sense to create one.

- Cost-effective maintenance systems involving the participation of rural beneficiary population should be developed for those aspects of maintenance that require only hand labor with simple tools; some suggestions in this respect are made in the Chapter Eight.

- Once all of the above preconditions are ensured, an appropriate level of technical assistance in maintenance planning and execution should be provided by the project; monitoring of road maintenance performance will be facilitated if this technical assistance is provided on a long-term, continuous basis.

RDO/C may wish to acquaint itself with the proposed joint initiative of CDB, EDF, and BDD to install a permanent maintenace capability in Dominica, including the use of external grants to support budget expenditures, perhaps with an eye to joining the effort, but at least to study it.

A benefit-cost analysis model with alternative maintenance scenarios for the use of RDO/C and host government agencies is presented Chapter Eight, followed by suggestions for innovative, cost-effective approaches to road maintenance involving labor-intensive local participation.

One general technical point, designed to enhance the benefit/cost ratio of feeder road rehabilitation and construction technique, is important: serious consideration should given to the use of crushed stone or gravel in some cases instead of hard surfacing on true feeder roads, with a bitumous treatment on the steeper grades. Reluctance to construct all-weather crushed stone or gravel roads often stems from fear of breaking a local tradition of asphalting all roads as a status symbol. All-weather unpaved, low traffic volume feeder roads have been successfully used in many parts of the world, including the United States. With proper and timely maintenance, this method could be employed in selected areas of St. Vincent and St. Lucia. Maintenance of these surfaces is labor intensive; a light grader is its principal mechanical equipment requirement, whereas asphalt-surfaced roads require the transport of relatively specialized equipment and skilled crews.

EVALUATIONS

In the process of undertaking this evaluation, lessons were learned that could be useful to both AID and future evaluation teams.

Lessons for AID

First, there should be a clear concept of the nature and scope of the evaluation: whether it is to be interim or final, operationally or impact oriented, superficial or in depth, project specific or generalizable.

Second, preparation and financial resource allocation should then be commensurate with the evaluation's nature, purpose, and scope. As regards funding, a realistic evaluation budget should be established in the project, commensurate with the type and depth of evaluation that the project designers consider appropriate (or vice-versa); this should be explicitly and clearly stated in the PP.

Third, evaluations will be more cost-effective if they are prepared meticulously in advance. These preparations would include:

- Allowing the team to brief itself on key facts and parameters prior to arrival at post;
- Assembling all additional pertinent documentation (internal as well as external) prior to the team's arrival, including a sufficient number of copies of key documents and maps;
- Having such key data as are known to be required by the team prepared in advance by the project manager and host country institutions; and
- In the case of complex in-depth evaluations, particularly where no base-line data are available, allowing the team leader up to a week of preliminary on-site investigation, designed, among other purposes, to establish relations with the host country institutions involved and request collection and appropriate processing of such data as the team leader may feel are required, as well as to discuss the situation and problems with the team, all prior to their definitive arrival.

Fourth, in-depth evaluations should not be expected in the absence of meaningful and reliable base-line data.

Fifth, AID should early on ensure the full cooperation in the evaluation of the host country institutions concerned. In view of the scarcity of human and financial resources in the

Caribbean islands, a portion of the funds earmarked for evaluation in the project should be set aside for compensating host country institutions and individual specialists for their collaboration. This is not only an operational necessity; it is important if AID wishes the evaluation results to be appropriately considered and utilized by the host country government and institutions.[2]

Lessons for the Evaluators

On the assumption that another evaluation team finds itself confronted by the constraints to which the above suggestions are addressed, team members should spend only a minimum amount of initial time at RDO/C reading documentation and having discussions (perhaps no more than two or three days) and plunge without delay into the site realities. An evaluation method cannot usefully be designed until the physical, human, and data realities have been tested first hand. A good deal of reading of perhaps interesting but, in retrospect, comparatively irrelevant documentation can be avoided through initial contact with the site realities.

On site, as little time as possible should be spent in general interviews and discussions; instead, specific questions should be prepared by each team member for the specialists with whom he or she will deal (on the advice of the project manager, it is hoped). The team should distribute itself as much as possible, in a human and institutional sense as well as geographically, to the extent that transport availibility allows. Daily discussions should be scheduled for that phase to compare notes and identify information gaps early.

As soon as the team feels it has developed a sufficient understanding of the issues involved in the evaluation, it should investigate the existence of data files that can be tapped on

short notice, acquaint itself with the nature of the data, and commission the required compilations.

Unless base-line data are available, and a great deal of time, surveys that would result in statistically non-representative data should not be attempted. Rather, the time would be better spent in case-study type field interviews with the assistance of host country specialists who know both the people and the subject matter.

An obvious lesson was that an early attempt might have been made to repeat the economic analysis of those road segments that have been appraised for the PP (although in the case of St. Lucia did not include analyses of true feeder roads, which were deemed to be the key to ex-post appraisal). This lesson could probably be generalized for other types of projects as well, where economic analysis of components or segments were made for the PP, rather than for -- or in addition to -- the project as a whole.

NOTES

1 The team understands that a watershed protection component is part of a new AID-funded hydroelectric project for St. Vincent. However, the small size of the islands calls for a comprehensive study and plan, rather than local, ad hoc ones.

2 As with maintenance, this is another case to which covenants were not adhered. In fact, covenants requiring the respective governments to provide plans for the interim project evaluation incorporating "identification of necessary base-line data and other information. . ." were incorporated only in project Amendment No. 1 (pp. 37-38), that is, nearly one and one-half years after original project approval. Although project funds could have been used in principle by the government to undertake the necessary (although belated) surveys and data compilations, funds were not specifically earmarked for this purpose and the government obviously had other priorities.

CHAPTER EIGHT

SPECIAL COMMENTS: ROAD MAINTENANCE AND COASTAL TRANSPORT

The importance of ensuring adequate maintenance of the islands' road networks has been stressed. In this chapter, the team offers an analytic model for estimating the relative benefit-cost ratios of two maintenance scenarios: low and full. This model, it is hoped, will serve AID and other donor and lenders, as well as host country decision makers, to allocate resources more rationally, so long as the public bookkeeping continues to make the fictional distinction between investment and recurrent expenditures regarding public roads. The analysis will show that all road expenditures, except new road building, are in fact recurrent; the only difference lies in the frequency of their recurrence. This analysis is followed by a brief outline of alternative models of cost-effective, labor-intensive maintenance that involves the participation of local populations.[1]

The chapter concludes with some thoughts about the appropriateness of studying the restoration of regular coastal and inter-island water transport.

ANALYTIC MODEL

Tables VIII-1 to VIII-4 show that full maintenance over 20 years is not only financially wise in that it lowers public expenditures, but also economically justified in that it yields substantially greater rates of return. This holds for both major roads, as in St. Vincent, and feeder roads, as in St. Lucia.

Tables VIII-1 and VIII-3 are generated using two scenarios: a full maintenance scenario that assumes that the MCW keeps the roads in good condition (4,000 mm per km of roughness) for the

Table VIII-1: St Vincent -- Vigie Highway Economic Analysis of Maintenance Scenarios

Calendar Year		Average Daily Traffic	SCENARIO 1: FULL MAINTENANCE Projected Costs	VOC Savings	Net Benefits	SCENARIO 2: LOW MAINTENANCE Maintenance Costs (expected)	VOC Savings	Net Benefits	DIFFERENTIAL FLOWS Scenario 1 - Scenario 2 Costs	Net Benefits
			US$							
1983	0	1,476	379,613	0	-379613	379,613	0	-379613	0	0
1984	1	1,619	409,613	141,781	-267832	379,613	141,781	-237832	30,000	-30000
1985	2	1,761	30,000	308,527	278527	12,000	308,527	296527	18,000	-18000
1986	3	1,849	60,000	323,954	263954	12,000	323,954	311954	48,000	-48000
1987	4	1,942	60,000	340,151	280151	24,000	272,121	248121	36,000	32030
1988	5	2,039	60,000	357,159	297159	24,000	214,295	190295	36,000	106864
1989	6	2,141	60,000	375,017	315017	24,000	150,007	126007	36,000	189010
1990	7	2,248	60,000	393,768	333768	24,000	78,754	54754	36,000	279014
1991	8	2,360	300,000	413,456	113456	379,613	0	-379613	(79,613)	493068
1992	9	2,478	30,000	434,129	404129	379,613	434,129	54516	(349,613)	349613
1993	10	2,602	30,000	455,835	425835	12,000	455,835	443835	18,000	-18000
1994	11	2,732	60,000	478,627	418627	12,000	478,627	466627	48,000	-48000
1995	12	2,868	60,000	502,558	442558	24,000	402,047	378047	36,000	64512
1996	13	3,012	60,000	527,686	467686	24,000	316,612	292612	36,000	175074
1997	14	3,163	60,000	554,071	494071	24,000	221,628	197628	36,000	296442
1998	15	3,321	300,000	581,774	281774	24,000	116,355	92355	276,000	189419
1,999	16	3,487	30,000	610,863	580863	379,613	0	-379613	(349,613)	960475
2,000	17	3,661	30,000	641,406	611406	379,613	641,406	261793	(349,613)	349613
2,001	18	3,844	60,000	673,476	613476	12,000	673,476	661476	48,000	-48000
2,002	19	4,036	60,000	707,150	647150	12,000	707,150	695150	48,000	-48000
2,003	20		Salvage Value:	78,923	78923		78,923	78923		

Economic rate of return - 37 percent 29 percent

Rate of return on marginal maintenance expenditures - 73 percent

[Computed as the IRR for the difference between the net benefit flows of Scenarios 1 and 2]

Table VIII-2: St Vincent -- Vigie Highway FINANCIAL ANALYSIS OF MAINTENANCE

Calendar Year	Project Year	Scenario 1: Full Maintenance Cost/Mile		Scenario 2: Low Maintenance Cost/mile		Discounted Cash Flows * Scen 1	Scen 2
		US$		US$			
1983	0	350,000	rehab	350,000	1st rehab	350,000	350,000
1984	1	13,500	A	0		12,054	0
1985	2	13,500	A	0	effective	10,762	0
1986	3	27,000	B	14,000	mainten-	19,218	9,965
1987	4	27,000	B	14,000	ance	17,159	8,897
1988	5	27,000	B	14,000		15,321	7,944
1989	6	27,000	B	14,000		13,679	7,093
1990	7	135,000	C	350,000	2nd	61,067	158,322
1991	8	13,500	A	0	rehab	5,452	0
1992	9	13,500	A	0		4,868	0
1993	10	27,000	B	14,000	effective	8,693	4,508
1994	11	27,000	B	14,000	mainten-	7,762	4,025
1995	12	27,000	B	14,000	ance	6,930	3,593
1996	13	27,000	B	14,000		6,188	3,208
1997	14	135,000	C	14,000		27,624	2,865
1998	15	13,500	A	350,000	3rd	2,466	63,944
1999	16	13,500	A	0	rehab	2,202	0
2000	17	27,000	B	0		3,932	0
2001	18	27,000	B	14,000	effective	3,511	1,821
2002	19	27,000	B	14,000	mainten-	3,135	1,625
2003	20	27,000	B	14,000	ance	2,799	1,451
Total		1,025,000		1,218,000		584,823	629,261

* -- interest rate of 12 percent assumed

Maintenance Codes
A -- cutting grass, clearing ditches and drains
B -- A plus potholing
C -- new surface dressing with 30% rehabilitation of base

Table VIII-3: St Lucia -- Morne Panache Feeder Road
Economic Analysis of Maintenance Scenarios

Calendar Year		Average Daily Traffic	Construction Costs (actual*)	SCENARIO 1: FULL MAINTENANCE				SCENARIO 2: LOW MAINTENANCE				DIFFERENTIAL FLOWS (Scenario 1 - Scenario 2)	
					Economic Benefits				Economic Benefits				
				Maintenance (projected)	VOC Savings	New Production	Net Benefit	Maintenance (expected)	VOC Savings	New Production	Net Benefits	Costs	Net Benefits
			US$										
1983	0	96	163,770	4,000	0		-167770	0	0		-163770	4,000	-4000
1984	1	101		4,000	5,887	16,973	18860	0	5,887	16,973	22860	4,000	-4000
1985	2	106		6,400	6,181	28,723	28504	1,600	6,181	28,723	33304	4,800	-4800
1986	3	111		6,400	6,490	32,640	32730	1,600	6,490	32,640	37530	4,800	-4800
1987	4	117		6,400	6,815	32,640	33055	4,400	6,815	32,640	35055	2,000	-2000
1988	5	123		6,400	7,155	32,640	33395	4,400	7,155	32,640	35395	2,000	-2000
1989	6	129		50,000	7,513	32,640	-9847	0	0	0	0	50,000	-9847
1990	7	135		4,000	7,889	32,640	36529	0	0	0	0	4,000	36529
1991	8	142		4,000	8,283	32,640	36923	0	0	0	0	4,000	36923
1992	9	149		6,400	8,697	32,640	34937	0	0	0	0	6,400	34937
1993	10	156		6,400	9,132	32,640	35372	0	0	0	0	6,400	35372
1994	11	164		6,400	9,589	32,640	35829	0	0	0	0	6,400	35829
1995	12	172		6,400	10,068	32,640	36308	0	0	0	0	6,400	36308
1996	13	181		50,000	10,572	32,640	-6788	0	0	0	0	50,000	-6788
1997	14	190		4,000	11,100	32,640	39740	0	0	0	0	4,000	39740
1998	15	200		4,000	11,655	32,640	56672	0	0	0	0	4,000	56672
Salvage Value					16,377								
Economic rate of return:				14 percent				0 percent					

Rate of return on marginal maintenance expenditures = 37 percent

[Computed as the IRR for the difference between the net benefit flows of Scenarios 1 and 2]

* Adjusted for shadow value of labor:
economic cost is 79.5% of actual (not FAR) cost

Table VIII-4: St Lucia -- Morne Panache FINANCIAL ANALYSIS OF MAINTENANCE

Calendar Year	Project Year	Scenario 1: Full Maintenance Cost/Mile		Scenario 2: Low Maintenance Cost/mile		Discounted Cash Flows * Scen 1	Scen 2
		US$		US$			
1983	0	278,000	rehab	278,000	1st rehab	278,000	278,000
1984	1	5,400	A	0		4,821	0
1985	2	5,400	A	0	effective	4,305	0
1986	3	8,600	B	3,000	mainten-	6,121	2,135
1987	4	8,600	B	3,000	ance	5,465	1,907
1988	5	8,600	B	3,000		4,880	1,702
1989	6	8,600	B	3,000		4,357	1,520
1990	7	67,500	C	278,000	2nd	30,534	125,753
1991	8	5,400	A	0	rehab	2,181	0
1992	9	5,400	A	0		1,947	0
1993	10	8,600	B	3,000	effective	2,769	966
1994	11	8,600	B	3,000	mainten-	2,472	862
1995	12	8,600	B	3,000	ance	2,207	770
1996	13	8,600	B	3,000		1,971	688
1997	14	67,500	C	3,000		13,812	614
1998	15	5,400	A	278,000	3rd	987	50,790
1999	16	5,400	A	0	rehab	881	0
2000	17	8,600	B	0		1,253	0
2001	18	8,600	B	3,000	effective	1,118	390
2002	19	8,600	B	3,000	mainten-	999	348
2003	20	8,600	B	3,000	ance	892	311
Total		548,600		870,000		371,972	466,756

* -- interest rate of 12 percent assumed

Maintenance Codes
A -- cutting grass, clearing ditches and drains
B -- A plus potholing
C -- new surface dressing with 30% rehabilitation of base

economic life of the road; and a low maintenance scenario in which maintenance expenditures (and performance) allow the road to deteriorate to its original condition (assumed to be 7,000 mm per km of roughness).

This deterioration process is modeled, in Scenario 2, by projecting that VOC savings decline linearly over the five years, from 1987 to 1991, at which time the road returns to its pre-project condition. The deterioration of the road is expected to generate a response from the government only when the road is in obvious need of major repairs, and the cycle of costly rehabilitation followed by low maintenance starts again.

The economic return on the project is affected by the level of maintenance: Scenario 1 for the Vigie Highway has an internal rate of return of 38 percent; the rate of return falls to 29 percent in Scenario 2. The fact that the internal rate of return falls only nine points obscures the high rate of return on proper maintenance work, which can be demonstrated by examining the net return on marginal maintenance expenditures.

The column of Table VIII-1 marked "Differential Costs" shows how much more money must be spent on maintenance when it is performed adequately. The column marked "Differential Benefits" represents the net benefits under Scenario 1 minus net benefit under Scenario 2. The first four years of negative net benefits represent the additional investment in maintenance and the following years show the benefits. The internal rate of return for this flow of differential benfits is 75 percent. This figure would seem absurdly high for many applications, but it is within the range reported by the World Bank in a review of 21 highway loans and credits:[2]

> An economic rate of return was calculated for twelve of the maintenance components and for all new construction components. The rate of return for the maintenance components was estimated to be more than 100 percent in four cases and averages more than 40 percent in their other cases, while the estimated rate of return for new construction averaged 24 percent, within a range between 11 pecent and 56 percent.

Tables VIII-2 and VIII-4 are included to aid in comparison of the purely fiscal features of the costs of various maintenance programs. Both discounted and undiscounted cash flows are included, and even if one ignores the loss in benefits that result from inadequate maintenance expenditures, the long-term cash expenditures on most roads will be higher.

MAINTENANCE MODEL

Road maintenance is conventionally done by crews employed permanently or intermittently by the agency responsible public roads. Occasionally, maintenance may be carried out by commercial contractors. In at least one country (Italy), basic road maintenance has been traditionally the responsibility of "cantonieri," permanent employees of the autonomous public roads agency (ANAS) who live in houses built for them by ANAS on the right-of-way at regular intervals.

In contrast, a number of developing countries (including Mexico, Dominican Republic, Panama, and Kenya) have had experiences with highly cost-effective labor-intensive systems of construction and maintenance that involve the people living or farming in the area of influence of the roads. The aim of this section is to outline two alternative general models -- for basic, routine maintenance only -- that could well be applied on a pilot basis and in the mix that is deemed appropriate in one or more of the Caribbean islands.

Model A contemplates having the maintenance performed by families living near a given road. Immediately after the road is rehabilitated, reconstructed, or newly constructed, it is divided into sections of approximately 1 mile in length. A head of family living within the area of the road is selected from among the applicants and is contracted to maintain that section of road. He and his family receive the necessary tools and some quick training on what is expected and how to do it; they are paid a monthly fee to maintain that road section at an acceptable level of service. Their tasks include keeping the ditches cleaned, removing small slides, filling potholes, and replacing some surface material. Annually, prior to the rainy season, the MCW would take care of those maintenance operations that require light equipment, generally to reshape the road and replace lost material.

Model T attempts to mobilize evident or latent local traditions for voluntary community improvement. Where these traditions are strong, and where an organizational structure exists that gives some ensurance of efficient management, the government agency can contribute tools and materials against the formal undertaking of the community organization to do routine maintenance on a specified section of road to the point where the next community -- or the public agency -- takes over. Although this is doubtless the least expensive maintenance method in terms of recurrent money outlay, it may well require more initial effort in terms of promotion than the paid family-type system suggested as Model A; however, the promotion aspects (as distinct from technical training) can often be taken on by private voluntary organizations, which tend to be more aware of local volunteer initiatives and traditions than the government agencies.

In any event, both models require periodic inspections by road agency technical personnel to ensure that the obligations are being complied with. Payments under Model A, and supply of materials under Model T, as well as continuance of the arrangement under either system, should be subject to satisfactory performance.

RDO/C expressed a great deal of interest in these models, in large measure because they coincided with its ideas for designing two new projects, one in connection with the Basic Human Needs Program funded through the CDB, and the other in relation to a proposed FY 1986 project entitled Infrastructure Expansion and Maintenance Systems Development. The evaluation team reiterates what was said in Chapter Seven, namely, the importance of close coordination and, if possible, cooperation with other donor projects.

COASTAL TRANSPORT

The possibility suggests itself that the ready availability of passenger and goods transport vehicles at world prices, and with liberal bank credit, has prevented both political decision makers and private entrepreneurs from examining the traditional alternative of coastal transport. The small size and broken topography of both islands make road building, maintenance, and use relatively expensive. They also make road transport (assuming good road conditions) only fractionally faster than water transport in relative terms, whereas the absolute differences would often be a question of minutes rather than of hours. Merchandise might be transported more cheaply by coastal craft, and delicate merchandise such as bananas and other fruit and vegetables would not be at the mercy of road conditions.

Tourists often prefer this mode of transport for sightseeing. Finally, most of the islands' population lives on or near the coast and most economic activity takes place there.

Safe, reliable, and accessible coastal transport, of course, requires infrastructure of its own, largely in terms of wharves and jetties. However, these are in general one-time investments that, if they are well constructed, require less maintenance than roads.

The evaluation team possesses no special knowledge of the technology and economics of water transport. However, discussions indicate some interest in an expert study in St. Vincent (where it is believed coastal transport is more practical for the leeward than for the windward coast because the waters are calmer). Reaction in St. Lucia was less positive. It appears that no recent study of the potential for water transport exists for these islands. Hence, it is suggested that AID, perhaps in concert with other donors, sponsor initially a pre-feasibility study by a competent institution or firm, to be followed by feasibility studies of such aspects as the first study indicates may be worth following up. The study might profitably include the possibilities of combining coastal traffic with the re-establishment of regular inter-island water transport to provide cheaper alternative transport for passengers, make possible more interchange of goods among the islands at more internationally competitive costs, and facilitate the pooling of goods for export.

NOTES

1 Reference is suggested to Chapter Nine of World Bank (1981), which addresses both the local participation issue in rural roads maintenance and the appropriateness of external financial assistance.

2 World Bank, 1981, p. 22.

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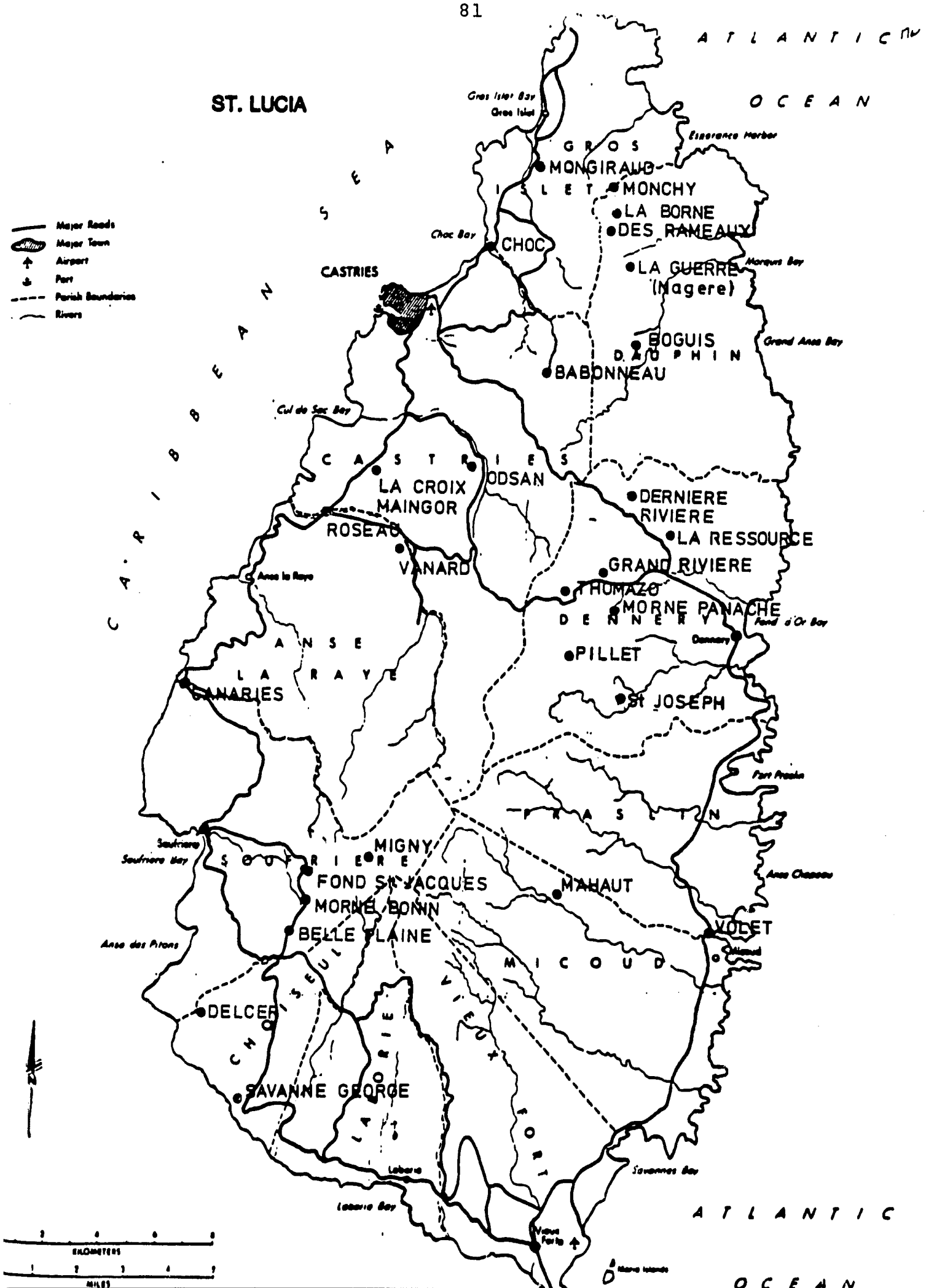
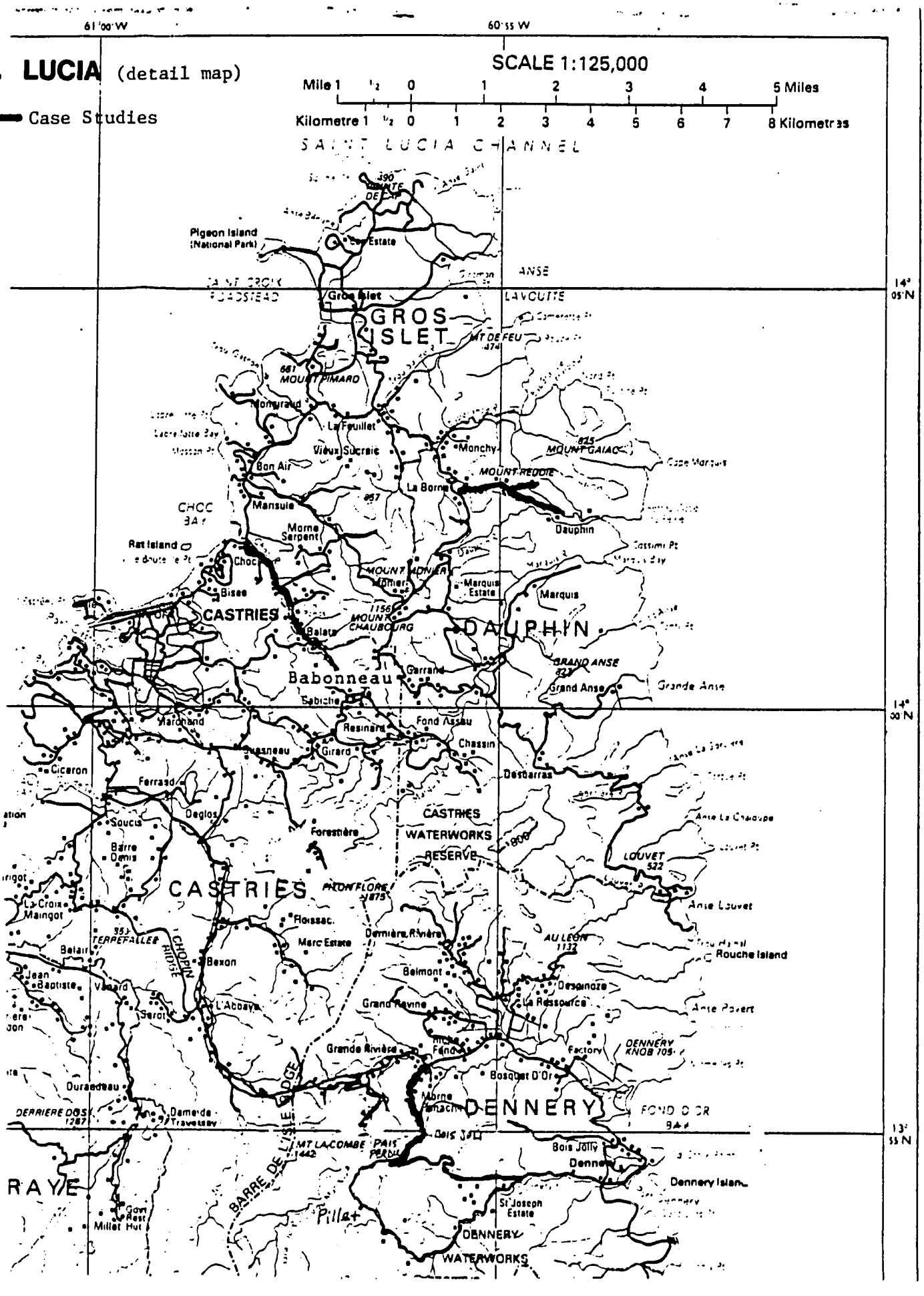
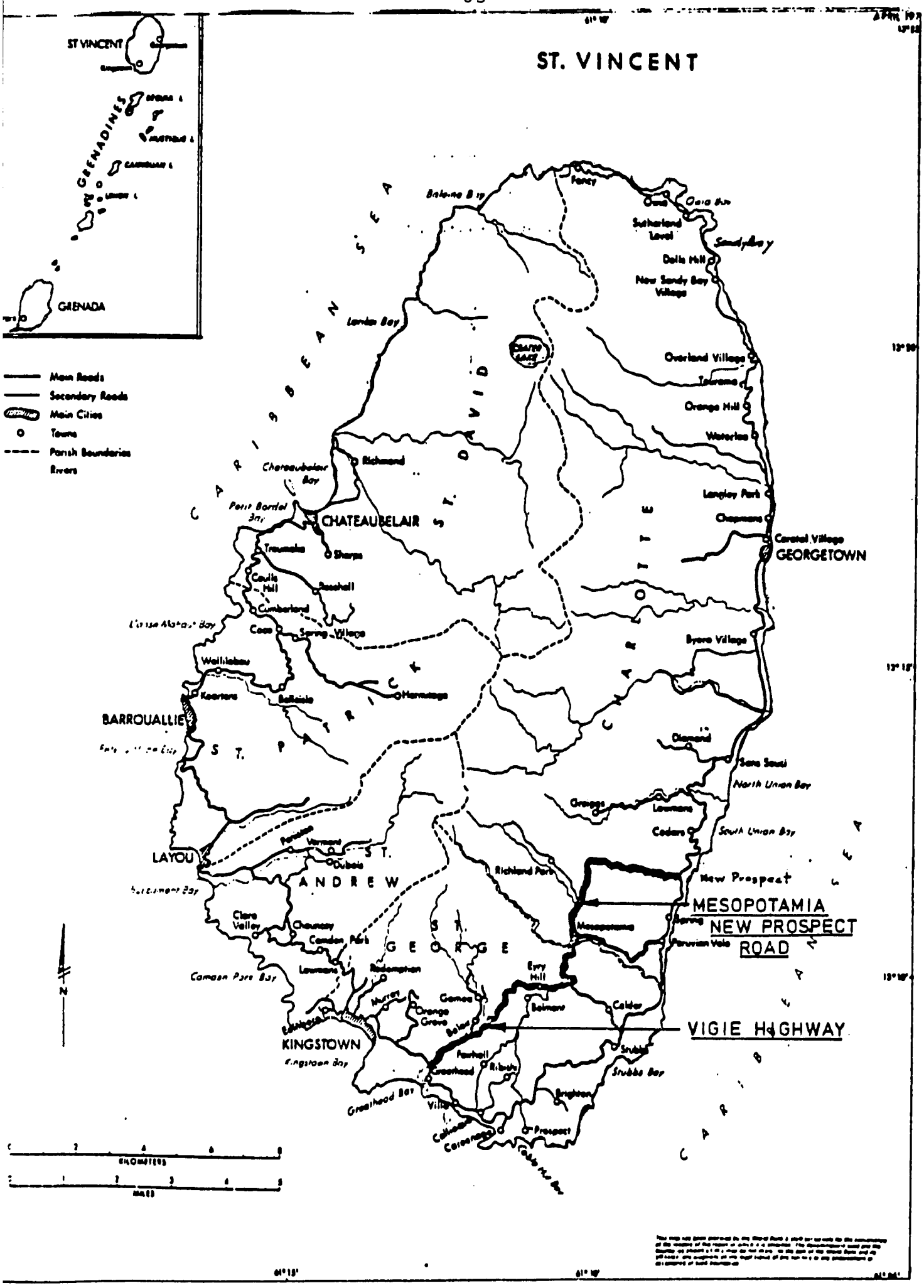

ST. LUCIA
ATLANTIC OCEAN
CARIBBEAN SEA
Major Roads
Major Town
Airport
Port
Parish Boundaries
Rivers
Gros Islet Bay
Gros Islet
Esperance Harbor
GROS ISLET
MONGIRAUD
MONCHY
LA BORNE
DES RAMEAUX
Choc Bay
CHOC
CASTRIES
LA GUERRE (Nagere)
Moreau Bay
BOGUIS
DAUPHIN
Grand Anse Bay
BABONNEAU
Cul de Sac Bay
CASTRIES
LA CROIX MAINGOR
ODSAN
DERNIERE RIVIERE
ROSEAU
LA RESSOURCE
VANARD
GRAND RIVIERE
Anse la Raye
THUMAZO
MORNE PANACHE
DENNERY
Fond d'Or Bay
Dennery
ANSE LA RAYE
PILLET
CANARIES
ST JOSEPH
Port Praslin
PRASLIN
Soufriere
Soufriere Bay
MIGNY
SOUFRIERE
FOND ST JACQUES
MAHAUT
Anse Chastanet
MORNE BONN
VOLET
BELLE PLAINE
Anse des Pitons
MICOUD
CHOISEUL
DELCER
VIEUX FORT
LAURIER
SAVANNE GEORGE
Laborie
Savannes Bay
Laborie Bay
Vieux Fort
Maria Islands
KILOMETERS
MILES


ST. LUCIA (detail map)
Case Studies
SCALE 1:125,000
Mile 1 ½ 0 1 2 3 4 5 Miles
Kilometre 1 ½ 0 1 2 3 4 5 6 7 8 Kilometres
SAINT LUCIA CHANNEL
61°00'W
60°55'W
14° 05'N
14° 00'N
13° 55'N
Pigeon Island (National Park)
SAINT CROIX ROADSTEAD
Gros Islet
GROS ISLET
LAVOUTE
ANSE
MT DE FEU
MOUNT PIMARD
Monchy
MOUNT GAIAC
MOUNT REDDIE
La Borne
Dauphin
Mansuie
Morne Serpent
Rat Island
Choc
Bisee
CASTRIES
MOUNT MONIER
Marquis Estate
Marquis
MOUNT CHAUBOURG
DAUPHIN
Balata
Babonneau
Garrand
BRAND ANSE
Grand Anse
Grande Anse
Babiche
Marchand
Resinard
Fond Assau
Chassin
Girard
Desbarras
Cicaron
Ferrand
Deglos
Soucis
Barre Denis
Forestière
CASTRIES WATERWORKS RESERVE
LOUVET 522
Anse Louvet
CASTRIES
PITON FLORE 875
La Croix Maingot
Floissac
Marc Estate
Dernière Rivière
AU LEON 1132
Rouche Island
TERREFALLER
CHOPIN HOUSE
Belair
Bexon
Belmont
Desoinoze
Jean Baptiste
Vieuxfond
Serot
L'Abbaye
Grand Ravine
La Ressource
Anse Pavert
Grande Rivière
Factory
DENNERY KNOB 705
Bosquet D'Or
Duraedeau
Morne Fanaché
DENNERY
FOND D'OR BAY
DERRIERE DOS 1287
Damede Travessay
Bois Jolly
MT LACOMBE 1442
PAIS PERDU
Bois Jolly
Dennery
Dennery Island
BARRE DE L'ESCARGE
RAYE
Gov't Rest
Millet Hut
Pillar
St Joseph Estate
DENNERY WATERWORKS


ST. VINCENT
ST VINCENT
GRENADINES
GRENADA
Main Roads
Secondary Roads
Main Cities
Towns
Parish Boundaries
Rivers
CARIBBEAN SEA
Balcome Bay
London Bay
Sutherland Level
Sandy Bay
Dalts Hill
New Sandy Bay Village
Overland Village
Orange Hill
Waterloo
Langley Park
Chapmans
Coastal Village
GEORGETOWN
Richmond
Chateaubelair Bay
Petit Bordel Bay
CHATEAUBELAIR
Sharpe
Cumberland
Spring Village
Byera Village
Wallilabou
Kingstown
Belleisle
Hermitage
BARROUALLIE
ST. PATRICK
Diamond
Sans Souci
North Union Bay
Grenges
Lowmans
Cedars
South Union Bay
LAYOU
Dubois
ST. ANDREW
Richland Park
New Prospect
MESOPOTAMIA
NEW PROSPECT ROAD
Clare Valley
Chauncey
Camden Park
ST. GEORGE
Lowmans
Redemption
Camden Park Bay
Murray
Orange Grove
Calder
VIGIE HIGHWAY
KINGSTOWN
Kingstown Bay
Greathead
Ribisi
Villa
Brighton
Prospect
Stubbs Bay
Greathead Bay
KILOMETERS
MILES

ANNEX A

CASE STUDIES

ANNEX A

CASE STUDIES

Perhaps the most significant case studies in the Monchy area (BGA District 5) were two small growers on the Laborne-Dauphin feeder road, completed in March 1983.[1] Vincent started growing bananas here in 1976, seven years before part of the rocky trail was improved and before the beginning of field packing (which he started in August 1983). The team spoke to his wife who was busy with field work. Their home and another banana patch are on the Monchy-Desrameaux road (which was constructed under the CDB project in 1981), about 1 mile on foot cross-country, 2 miles on the road. Transport damage before the road improvement was estimated at about 5 percent, in contract to none now (note the road was completed six months before field packing began). Fertilizer was carried to the banana patch on their heads. Vincent's banana deliveries increased one-third from 1982 to 1983 and another 25 percent in 1984, when he shipped a total of 68,000 lbs (including output from his other banana patch near his house), worth more than EC$11,500 at the farm gate without bonuses and more than EC$15,600 with bonuses typical of the area (but before deductions for inputs supplied). No additional land is available to them off this road, but they are replanting a patch nearer to their home.

Barthelemy, in contrast, is a 22-year-old bachelor who started planting bananas along the short branch in 1983 after the road was completed. He now has 2,000 producing mats (probably equivalent to about 2.5 acres) from which he harvested and shipped 2,700 lbs between February and December 1984, and 4,100 lbs in the first six months of 1985, for an average of 680 lbs per month. He estimated that he earned about EC$300-400 from bananas last year, a figure that comes very close to his 1984 deliveries multiplied by the base price of EC$0.17 per lb. In addition, he earned EC$600 as a mason in two months this year.

He also built his home in 1983 at the side of the newly improved feeder road almost at the time he sold his first bananas.

Both Vincent and Barthelemy belong to the field packing group, where Barthelemy seems to be very active. According to the BGA agent, plantings of the entire group along the Laborne road doubled since the road was improved, to about 15,000 mats (15-20 acres). Annual yield in this low rainfall micro-area is estimated at about 1 long ton per 1,000 mats. Thus, incremental production of about 7 tons (15,400 lbs) is worth EC$2,600 at the base price and perhaps EC$3,500, including bonuses.

William lives a mile from the Mongiraud-Monchy road, up the La Riviere-Mitant feeder road, which is in very bad condition (this segment is scheduled for rehabilitation under phase III of the PIR project). This road was cut by hand in the 1950s. The government graded the road and put in a stone base in the 1960s, paid for by a collection. About one-half of the road was surfaced in 1982, but the surface has almost completely disappeared. Nevertheless, the originally improved part of the road is passable for small trucks going to the group packing shed throughout the year; only four-wheel drive vehicles can pass beyond that point. In the rainy season, 10 of the 32 members of the field packing group must carry their banana stems on their heads to the packing shed. There is better banana land beyond the end of the track, and someone hires a bulldozer almost every year to clear a little more, but the road condition is a damper on new plantings.

William started field packing in 1984 and is able to have bananas trucked to the wharf from the packing shed, which is close to his banana patches. Prior to field packing, he shipped

in field boxes to the IBD and had a bad experience with rejects from transport bruising. William estimates he nets EC$2,000-5,000 per year from his bananas.

An example of evident impact of secondary road rehabilitation was an egg producer who had established himself on the road after the construction. Previously, he had produced broilers on a nearby piece of land. He had also moved his house to the new location and was making substantial improvements. His wife asserted that they would not have dared to produce eggs at this location while the road was in its pre-project condition.

NOTE

1 This is one of the true feeder roads in the project, inasmuch as only one end connects with a secondary road; the other end consists of a double dead-end fork. The shorter branch of the fork is improved only halfway down to Dauphin and the sea, even though there is more produce being grown -- and goats raised -- all the way down the track; the longer leg goes along a ridge, also in the direction of the sea, and ends abruptly at a point where the group packing shed was established. Barthelemy farms alongside this leg; Vincent has some land along the common stem of the road. The entire rehabilitation measures 1.5 miles.

ANNEX B

METHODOLOGY OF BENEFIT/COST ANALYSIS

ANNEX B

METHODOLOGY OF BENEFIT/COST ANALYSIS

This annex provides a detailed description of the methodology followed in the benefit/cost analysis, along with the sources of the numbers used, and a sensitivity analysis. Several tables from the original PP are included to allow comparison with the analysis in this evaluation.

CONSTRUCTION COSTS

For each road segment analyzed, data on actual costs were available from the project office. It is more appropriate to use actual costs than FAR costs to calculate economic return, since the latter more closely parallel resources expended (any difference between the FAR and actual costs is considered a transfer).

For the Vigie Highway, for example, actual costs were US$889,000 for road rehabilitation, plus US$66,000 for bridges, bringing the total to US$955,000. Annex F of the PP, which contains the economic analysis, uses a projected economic cost of US$1,057,290.[1] This means that the projected financial cost was effectively US$1,281,564.[2] Using this figure as a point of reference, the actual costs were 25 percent lower than projected; this is the principal explanation for the high revised internal rate of return. Similarly, actual costs for the Choc-Babonneau Road were only 47 percent of the PP projection, because only 3.7 of the 7.5 miles were actually rehabilitated.

Labor cost in both islands was found to be 41 percent of total costs. Although direct hire of unskilled and semi-skilled workers accounted for 22 percent of costs in St. Lucia, other expenditure categories are estimated to contain significant labor components, as shown below:

	Cost (EC$)	Labor Share	Value of Labor
Direct Labor	751,925	100%	751,925
Equipment Hire	1,051,216	25%	262,804
Haulage	182,273	25%	45,500
Materials	455,034	20%	91,007
Subcontractors	157,781	95%	149,892
Surface Dressing	388,710	20%	77,700
Workshop	130,748	20%	26,150
Overhead	234,911	10%	23,491
Fuel	145,721	-	-
Total	3,498,320	41%	1,428,469

When converting from financial to economic cost, the share of labor is therefore revised upward, from 35 percent as estimated in the PP to 41 percent. The shadow wage for semiskilled and unskilled labor is maintained as half the wages paid, so economic cost is now defined as:

$$\text{Economic Cost} = \text{Financial Cost} \times (1 - [.41 \times .5])$$
$$= \text{Financial Cost} \times 0.795$$

MAINTENANCE COSTS

The MCWs on both islands are unable to provide a breakdown of maintenance expenditures on individual road segments. The team recommends that engineering estimates of the expenditures necessary to provide adequate estimates be used, and then the change in the economic return from worst-case maintenance scenarios be determined through sensitivity analysis. Although

these costs are very high by world standards (the World Bank, 1981, indicates a range from US$300 per mile to US$1,500 per mile as a network wide average), the estimates are based on current observed institutional capability; improvements in MCW operating procedures would result in lower dollar requirements to meet the same standard.

Maintenance expenditures are divided into three categories:

Code A: Routine maintenance on newly surfaced roads, including cutting grass, and clearing ditches and drains

Code B: Routine maintenance plus periodic filling of potholes

Code C: New surface dressing with 30 percent rehabilitation of base.

These expenditures vary according to the width of the road and the traffic on the road. The Morne Panache is a low traffic, narrow feeder road, and the Vigie Highway and Choc-Babonneau are high traffic connector roads; these extremes are assumed to represent the upper and lower bounds for most projects of this type.

The following figures are derived from planning materials obtained at the MCW in St. Lucia:

COST (US$/MILE)

Maintenance Type	Feeder Road	Connector Road
Code A	2,000	5,000
Code B	3,200	10,000
Code C	25,000	50,000

A sensitivity analysis shows that the actual level of maintenance expenditures has less impact on the internal rate of return than do the assumptions regarding the effectiveness of maintenance (that is, VOC savings). If maintenance expenditures for the Vigie Highway are overestimated, and true costs are one-third lower, the internal rate of return rises by 2.5 points. If the benefits of maintenance expenditures are overestimated, and the roughness of the road falls only from 7,000 mm per km to 5,000 mm per km, instead of falling to 4,000 mm per km as assumed (also a change of one-third), the internal rate of return falls by 24 points.

Thus, this quantitative analysis is extremely sensitive to assumptions about the efficacy of maintenance, and in-depth independent engineering assessments (perhaps including acquisition of a road bumpmeter) are recommended if greater precision is desired for evaluation purposes. An extension of this discussion, including analysis of two maintenance scenarios, is included in Chapter Eight.

Benefits derived from time savings should ideally be included in this type of analysis; they are not trivial, and their omission means that these internal rates of return should be viewed as minimum economic return from the project.

These benefits fall into two categories: increased speed on PIR roads, and time savings from availability of shorter route to destination (a network effect). As mentioned in the analysis of Morne Panache, many farmers reduced their trip length to Castries by 8 miles with the road improvement. For the purposes of this study, the team felt that there were insufficient data on frequency of trips, and origin-destination patterns in general,

to make reasonable estimates of benefits. Quantification of this benefit will probably have to wait until a more comprehensive study of the transport sector is undertaken.

SAVINGS IN VEHICLE OPERATING COSTS

The benefits derived from VOC savings are inferred from changes in road roughness, which, in turn, are adopted from the TRRL studies. The team's estimates of VOC savings are accurate only to the degree that PIR roads have been smoothed by the same amount as TRRL roads. The consequences of imprecision in this regard are illustrated by the sensitivity analysis presented above.

Another method of estimating these benefits would be to conduct a study of transport operators, tracing their costs before and after the PIR project. This procedure is not recommended, as the data are extremely difficult to obtain, especially from farmer-truckers. In addition, the TRRL has already done the necessary field work. The formulas reported in their study remain the best way of estimating these benefits.

NEW BANANA PRODUCTION

Although reductions in damage to bananas must be attributed to the field-packing program, new production has been made possible through improved access to banana lands.

The most comprehensive method of analyzing the effect of improved access is to estimate the time savings for head-carrying agricultural inputs and outputs that resulted when roads close to the farm became passable. This method was deemed impossible as a result of the lack of base-line data at the micro level. This method would still be preferable over the approach taken here, as it does not rest so completely on ceteris paribus assumptions.

Nevertheless, in the absence of a full-scale agricultural study, an extension of the ceteris paribus method would be able to yield a substatial improvement over current knowledge. The basic impediment to a full-scale statistical analysis is the difficulty of matching individual farmers for whom banana output is available from BGA starting in 1982 with the that which have been improved. The BGA is technically capable of adding a code for individual road segments (the MCW has already coded the network) to the entry for each farmer in their data base; some incentive may be required to persuade them to implement the change. Once completed, however, there is nothing to prevent a comparison of output on all PIR roads with non-PIR roads.

Using the 100-percent sample obtainable at BGA would take most of the guesswork out of evaluating the impact of PIR on new banana production.

A sensitivity analysis of the internal rate of return for the Morne Panache Feeder Road shows that if new production is one-third lower than the 25 percent estimate, the internal rate of return falls from 14 percent to 7 percent; if new production is one-third higher, the internal rate of return rises to 21 percent.

NOTES ON METHOD AND DATA

a) It was not possible to determine to the team's satisfaction the degree to which production increases in recent years may be attributed to increased plantings; replantings; rehabilitation of temporarily abandoned land; and higher yields through improved

Sensitivity Analysis

Road	Variable	Range	IRR
Vigie Highway:			
	VOC Savings	US$ .053/mile	23 percent
		* US$ .08/mile	38 percent
		US$ .11/mile	51 percent
	Maintenance Projection	1/3 lower than projection	40 percent
		* As projected	37 percent
		1/3 greater than projection	35 percent
Morne Panache Road:			
	VOC Savings	US$ .053/mile	17 percent
		* US$ .08/mile	18 percent
		US$ .11/mile	20 percent
	New Production	17 percent	7 percent
		* 25 percent	14 percent
		33 percent	21 percent
	Average Daily Traffic	* 98 ADT	14 percent
		49 ADT	12 percent

* -- values used in tables V-1 and V-2

INTERPRETATION: On major connector roads such as Vigie Highway, the internal rate of return is much more sensitive to errors in projections of VOC savings than it is to errors in projections of required maintenance expenditures. On feeder roads, such as Morne Panache, a 33 percent error in projections of VOC savings leads to very small changes in the IRR -- here, the estimation of new production generated by the road is the critical variable.

cultural practices, including input use. One BGA extension agent, responsible for the Monchy area, guessed that the relative contributions have been, respectively, 20 percent, 10 percent, 30 percent, and 40 percent.

b) In St. Lucia, Amendment No. 1 announced that:

> base-line study of agricultural lands adjacent to the rehabilitated roads is scheduled to be undertaken by CARDI to ascertain how much cultivable lands remain idle or undercultivated as a result inaccessibility by road. This will provide a basis for determining the impact of road rehabilitation upon agricultural production (page 35).

Aside from the fact that the study was never undertaken, this, together with the statement (ibid.) that "at least 300 acres of previously inaccessible lands in St. Lucia will be brought under banana production alone due to the rehabilitation of the 16 feeder roads . . ." speaks for itself to show that additional banana plantings were expected as indicators of project impact, at least in 1983.

c) Quantitative estimates of banana growers' net earnings would be possible with the help of their passbooks and BGA files, given enough time. The passbooks show only quantities delivered, the value of inputs purchased, new debits, and the debit balance. Data on payments received from the BGA would have to be obtained from the association (although the data do not seem to be computerized) or roughly estimated from the quantities delivered by using the base price (the passbook also does not indicate quality bonuses or discounts).

The team urges the BGA to introduce into its computer data base a tag for each grower indicating the MCW-coded road segment of the farm; this would greatly facilitate spatial analysis of the banana industry. The BGA may also be amenable to including

earnings data in its file to facilitate analysis, as well as fertilizer and other input use by individual growers, and to disaggregate all these data by field-packing groups as well as by district. (Even the growers' passbooks do not indicate the types and quantities of inputs purchased.)

d) Estimation of VOC savings is hampered by the lack of records among small truckers (including trucker-farmers) and other vehicle operators. There are no large fleets of trucks or passenger transport vehicles on either island.

NOTES

1 It is not clear why such a high cost was used for the economic analysis; Annex H of the PP estimates total cost of the Vigie Highway, including bridges, at US$881,370.

2 Because only half of the payments to labor are counted as economic costs, and labor was estimated in the PP to be 35 percent of total costs, the economic cost is financial costs multiplied by 0.825.

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Morne Panache Banana Growers Survey

GROWER BGA ID#	GROWTH RATE IN PERCENT 82-84	82-83	83-84	BANANA OUTPUT (lbs/year) 1982	1983	1984
33M0012	62	-47	171	9737	5138	13938
33S0774	31	-29	90	20264	14426	27457
33M0195	49	44	54	7808	11257	17345
33H0057	38	71	6	18011	30861	32603
32D0103	16	27	6	17203	21809	23096
31V0162	133	100	-	583	0	1361
33H0294	0	-57	57	1830	793	1243
34W0081	34	50	18	15661	23436	27760
33E0242	76	87	66	6849	12784	21227
33M0209	-7	-9	-6	18966	17308	16265
33S0448	25	28	21	42352	54334	65826
33S0057	69	146	-7	37977	93342	87006
33M0217	30	18	41	8192	9679	13682
33S0030	-2	18	-22	20955	24740	19254
33J0208	9	52	-34	26315	40036	26315
31T0017	46	117	-24	16367	35499	26862
31J0517	-	-	-	0	0	26744
31A0085	64	99	29	41055	81684	105477
31A0190	24	-5	53	26118	24822	37915
33S0448	25	28	21	42352	54334	65826
31E0144	71	47	95	11110	16363	31912
31S0285	-7	5	-19	12492	13097	10652
33P0307	24	46	2	47429	69375	70820
31G0044	-10	-25	5	12868	9661	10129
32H0116	73	80	66	14603	26339	43751
31J0134	21	19	22	29489	35168	42835
34S0095	33	76	-9	31859	55959	51053
32H0116	73	80	66	14604	26339	43758
34B0077	49	74	25	23903	41665	51939
34M0271	461	-	461	0	4057	22775
SAMPLE TOTAL:	35	48	21	576952	854305	1036826
DISTRICT 31		73	6			
DISTRICT 32		49	15			
DISTRICT 33		34	9			
DISTRICT 34		42	2			
4-DISTRICT AVERAGE:		50	8			
ISLAND TOTAL:		27	19	98 mil	124 mil	147 mil

B. Road Segments

St. Lucia: Choc-Babonneau-Marquis Road

Costs

The construction costs for the Choc-Babonneau-Marquis Road include rehabilitation of the 3.8 mile section between Babonneau and Marquis while the 3.7 mile section between Babonneau and Choc will be resurfaced only. The total economic cost is estimated to be $393,496. Annual maintenance costs for drainage and patching are estimated to be $58,927. In addition to this work, every seven years the road will require a greater surface treatment input which would increase the total maintenance cost to $172,960 in that year.

Benefits

The traffic counts taken on June 24 and 25--week days--reveal an average daily traffic of 560. This figure was adjusted downward to reflect lower weekend traffic. Effectively the ADT base after adjustment becomes 528. A simple linear traffic growth function is conservatively estimated at 5 percent per year over the period. The bulk of the traffic increase will occur as a result of regional growth. Generated and diverted traffic are assumed to be negligible. The traffic count indicates that approximately 40 percent of the vehicles are cars-pick-ups and 60 percent are trucks and buses.

A rate of return of 18 percent was calculated. While including a salvage value calculated at 10 percent of the economic construction costs, the rate excludes any production savings arising from the reduction of losses in banana and other agricultural production from the road rehabilitation.

ST. LUCIA

CHOC-BABONNEAU MARQUIS ROAD:
ECONOMIC DATA

Years	Average Daily Traffic	Economic Costs (US$) Construction	Economic Costs (US$) Maintenance	Economic Benefits (US$) User Cost Savings	Net Benefits
1983	528	196,748*	- -	- -	-196,748
1984	554	196,748*	- -	- -	-196,748
1985	582		58,927	127,409	+68,482
1986	611		58,927	133,779	+74,852
1987	642		58,927	140,468	+81,541
1988	674		58,927	147,492	+88,565
1989	708		58,927	154,866	+95,939
1990	743		58,927	162,610	+103,683
1991	780		172,960	170,740	-2,220
1992	819		58,927	179,277	+120,350
1993	860		58,927	188,241	+129,314
1994	903		58,927	197,653	+138,726
1995	948		58,927	207,536	+148,609
1996	996		58,927	217,912	+158,985
1997	1,045		58,927	228,808)	
Salvage Value				39,350)	+209,231

Economic rate of return: 18 percent

*Because of our treatment of labor, financial costs would be greater.

ST. VINCENT: VIGIE HIGHWAY AND MESOPOTAMIA ROAD

Costs

The economic construction costs of rehabilitating the Vigie Highway and Mesopotamia Road are estimated to be $1,057,290 and $562,247, respectively. Annual maintenance costs for the 18 foot Vigie Highway for drainage and patching are estimated to be $62,280; for the 12 foot Mesopotamia Road $27,680. Every seven years, in addition to these costs, the roads will require a surface treatment which would increase the total annual maintenance costs to $154,260 for the Vigie Highway and $68,560 for the Mesopotamia road.

Benefits

As in the case of St. Lucia, per mile reductions in motor vehicle operating costs arising from road rehabilitation were derived from the TRRL study. Based upon field observations, the Vigie Highway carries approximately 1,670 vehicle ADT load, while the figure for the Mesopotamia Road is 1,600. For each segment,traffic growth is conservatively estimated at 3 percent per year. Information on traffic composition is not available. Hence, it is assumed for both roads that 60 percent of the vehicles are trucks, buses, and mini-vans while 40 percent are cars and light pick-ups.

It also is expected that the road rehabilitation work would yield productions savings. Banana spoilage losses will be reduced and production stimulated. While estimates of banana spoilage losses range as high as 12 percent of overall banana production, it is expected that rehabiliation of the Vigie Highway and Mesopotamia Road to have only a modest impact. Most of the spoilage losses occur between the fields and boxing stations on feeder roads which are in serious disrepair.

Nonetheless, some losses do occur because of the current disrepair of the Vigie Highway and Mesopotamia Road. These losses are estimated at 1.5 percent of the bananas transported over the road segments. Roughly, 50 million pounds of bananas are transported yearly over the Vigie Highway; almost 22 million pounds on the Mesopotamia Road. Valuing the losses at the price to the grower-- 7 cents per pound, we obtain estimates of production savings of $ 55,800 per year for the Vigie Highway and $24,100 per year for the Mesopotamia Road. These estimates are conservative; they exclude the positive impact that the road rehabiliation work would have on production of bananas and other crops.

A rate of return of 28 percent was calculated for the Vigie Highway while a return of 33 percent was computed for the Mesopotamia Road.

ST. VINCENT

VIGIE HIGHWAY: ECONOMIC DATA

		Economic Costs (US$)		Economic Benefits (US$)		
Years	Average Daily Traffic	Construction	Maintenance	User Costs Savings	Production Savings	Net Benefits
1983	1,670	528,645*	-	-	-	-528,645
1984	1,720	528,645*	-	-	-	-528,645
1985	1,772		62,280	322,384	55,800	+315,904
1986	1,825		62,280	332,055	55,800	+325,575
1987	1,880		62,280	342,017	55,800	+335,537
1988	1,936		62,280	352,277	55,800	+345,797
1989	1,994		62,280	362,846	55,800	+356,366
1990	2,054		62,280	373,731	55,800	+367,251
1991	2,116		154,260	384,943	55,800	+286,483
1992	2,179		62,280	396,491	55,800	+390,011
1993	2,244		62,280	408,387	55,800	+401,907
1994	2,312		62,280	420,638	55,800	+414,158
1995	2,381		62,280	433,257	55.800	+426,777
1996	2,452		62,280	446,255	55,800	+439,775
1997	2,526		62,280	459,642	55,800	+453,162
1998	2,602		154,260	473,432	55,800	+374,972
1999	2,680		62,280	487,635	55,800	+481,155
2000	2,760		62,280	502,263	55,800	+495,783
2001	2,843		62,280	517,332	55,800	+510,852
2002	2,928		62,280	532,852	55,800	
Salvage Value					105,729	+632,101

*Economic rate of return 28 percent

*Because of our treatment of labor, financial cost would be greater.

ANNEX C

PERSONS INTERVIEWED
(except USAID)

ANNEX C

PERSONS INTERVIEWED
(except USAID)

BARBADOS:

BDD

H.B. Jackson, Engineering Adviser

A. Moon, Economic Adviser

CDB

Wendell Lawrence, Senior Manager (Infrastructure)

ST. VINCENT:

Ministry of Finance and Planning

Carl John, Chief Planner

Theophilus Shallow, Economist

Ministry of Communications & Works

Rudy Matthews, Chief Engineer, Roads Division

Bradley Francis, Field Engineer

Ministry of Agriculture

Kenneth Bonadie, Chief Extensionist

Hugh Phillips, Economist

Mr. Bullock, Extension Supervisor

Sylvia Boehm, UNTAD Associate Expert

Banana Growers Association

Vigert Williams, Asst. Operations Manager

C.B. Telemague, Manager, Agricultural Marketing Corporation

C.L. Keizer, Manager, Geest Industries

L.F. Hesser, Chief of Party, RONCO Consultants

Mr. Daniels, Manager, Agricultural Development Corporation

Jethro Greene, Chief Coordinator, Organisation for Rural Development

ST. LUCIA:

Ministry of Finance and Planning

O. d'Auvergne, Chief Planner

Roy Rodriquez, Senior Economist

Ministry of Agriculture

I. D'Auvergne, Minister

D. Demark, Chief Agricultural Officer

Gabriel Charles, Chief Forester

Andrew Desir, Head of Extension

Cosmos Richardson, Princ. Asst. Secretary

Ministry of Communications and Public Works

Peter Robinson, Senior Asst. Engineer, Roads

Banana Growers Association

Thomas St. Hill, Chief of Operations

Fremont Lawrence

Mr. Jean, Dementra Magloire, and Hillary St. Hillaire, BFA Officers

Mr. Nathaniel, Chief Accountant

C. Mathews, Managing Director, WIBAN

Leonard Augier, Crown Agent