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Report No. 7739

PROJECT COMPLETION REPORT

NIGER

FEEDER ROADS PROJECT (CREDIT 886-NIR)

APRIL 28, 1989

**Africa Region
Infrastructure Division V**

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Office of Directors-General
Operations Evaluation

April 28, 1989

MEMORANDUM TO THE EXECUTIVE DIRECTORS AND THE PRESIDENT

SUBJECT: Project Completion Report on Niger Feeder Roads Project
(Credit 886-NIR)

Attached, for information, is a copy of a report entitled "Project Completion Report on Niger Feeder Roads Project (Credit 886-NIR)" prepared by the Africa Regional Office. Under the modified system for project performance auditing, further evaluation of this project by the Operations Evaluation Department has not been made.

Attachment

A handwritten signature in black ink, appearing to be 'P. May', is written over the word 'Attachment'.

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IBRD 19198	

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FEEDER ROADS PROJECT (CREDIT 886-NIR)

PROJECT COMPLETION REPORT

PREFACE

This is a Project Completion Report (PCR) of the Niger Feeder Roads Project, for which Credit 886-NIR, in the amount of US\$10.0 million, was approved on March 20, 1979. The credit was closed on June 30, 1987, three years later than estimated at appraisal. US\$9.97 million of the credit were disbursed, and US\$0.03 million were cancelled.

The PCR was produced by staff of the Africa Region on the basis of a draft report prepared by the Borrower, which was discussed with a project completion mission in June 1987. The PCR took account of the project's Staff Appraisal Report (SAR), the President's Report, the Credit Agreement and internal Bank memoranda and reports on project implementation and issues contained in relevant files.

This PCR was read by the Operations Evaluation Department (OED). The draft PCR was sent to the Borrower on February 28, 1989, for comments by April 16, 1989, but none were received.

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FEEDER ROADS PROJECT (CREDIT 886-NIR)

PROJECT COMPLETION REPORT

BASIC DATA SHEET

KEY PROJECT DATA

<u>Item</u>	<u>Appraisal Expectation</u>	<u>Actual or Current Estimate</u>
Total project cost (US\$M)	13.0	14.5
Underrun or Overrun (%)	-	12%
Loan/Credit Amount (US\$M)	10.0	
Disbursed		9.97
Cancelled 12/31/86		0.03
Date Physical Components Completed	12/31/83	12/31/86
Proportion Completed by Above Date	69%	100%
Time Overrun or Underrun	-	50%
Economic Rate of Return	21%	24%

OTHER PROJECT DATA

<u>Item</u>	<u>Original Plan</u>	<u>Actual or Est. Actual</u>
First Mention in Files		11/10/75
Government Application		12/10/76
Negotiations		1/9-12/79
Board Approval		3/20/79
Credit Agreement Date		4/27/79
Effectiveness Date		12/10/79
Closing Date	6/30/84	6/30/87
Borrower	Government of Niger	
Executing Agency	Ministry of Public Works and Housing	
Fiscal Year of Borrower	October 1 to September 30	
Follow-on Project	Transport Sector Credit	
Credit Agreement	CR 1706-NIR/SF A.18-NIR	
Amount (SDRs)	13.0/13.0 million	
Date	6/30/86	

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FEEDER ROADS PROJECT (CREDIT 888-NIR)

PROJECT COMPLETION REPORT

STAFF INPUTS

(Staff Weeks)

	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>Total</u>
Preappraisal	5.2	9.0	11.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.6
Appraisal	0.0	0.1	9.8	23.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.2
Negotiation	0.0	0.0	0.0	14.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.3
Supervision	0.0	0.0	0.0	3.8	7.0	8.0	5.7	1.8	4.0	8.7	5.9	9.2	0.8	54.3
Other	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8
Total	5.2	9.1	21.2	42.0	7.0	8.0	5.7	1.8	4.0	8.7	5.9	9.2	0.8	128.2

Cumulative Disbursements
(US\$ million)

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Appraisal Estimate	4.6	6.5	8.0	9.2	10.0	10.0	10.0
Actual	2.7	4.7	6.2	7.2	7.9	8.9	10.0
Actual as % of Appraisal	58	72	77	78	79	89	100
Date of latest Disbursement:	January 8, 1987						

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PROJECT COMPLETION REPORT

MISSION DATA

<u>Purpose</u>	<u>Date</u>	<u>Weeks</u>	<u>Persons</u>	<u>Staff Weeks</u>	<u>Report Date</u>
Identification	11/75	1	2	2	12/05/75
Identification	5/76	1	2	2	6/14/76
Identification	7/76	1	1	1	10/06/76
Preparation	1/77	1	1	1	
Preparation	2/77	1	2	2	3/25/77
Preparation	9/77	1	1	1	
Preappraisal	1/78	2	3	6	2/02/78
Appraisal	4/78	2	3	6	
Postappraisal	7/78	1	2	2	
Postappraisal	12/78	1	2	2	12/21/78
Supervision	3/79	1	1	1	4/09/79
Supervision	5/79	1	2	2	6/22/79
Supervision	8/79	1	1	1	
Supervision	2/80	2	2	4	2/26/80
Supervision	6/80	1	1	1	7/10/80
Supervision	12/80	1	1	1	1/12/81
Supervision	5/81	1	1	1	7/13/81
Supervision	11/81	1	1	1	12/08/81
Supervision	4/82	2	1	2	
Supervision	2/83	2	2	4	3/30/83
Supervision	10/83	2	2	4	1/31/84
Supervision	1/84	1	1	1	
Supervision	4/84	1	1	1	4/11/84
Supervision	10/84	1	4	4	11/20/84
Supervision	3/85	2	2	4	
Supervision	5/85	3	3	9	6/28/85
Supervision	10/85	2	2	4	11/07/85
Supervision	2/86	3	3	9	3/24/86
Supervision	11/86	2	4	8	2/11/87
Completion	7/87	1	2	2	
Total		<u>43</u>		<u>89</u>	

COUNTRY EXCHANGE RATES

<u>Name of Currency</u>	<u>CFA Francs</u>
Appraisal Year Average	US\$1 = CFAF 230
Intervening Year Average	US\$1 = CFAF 343
Completion Year Average	US\$1 = CFAF 345

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FEEDER ROADS PROJECT (CREDIT 886-NIR)

PROJECT COMPLETION REPORT

Evaluation Summary

Introduction and Objectives

i. About 1,000 km of feeder roads and tracks were to be improved and then maintained in areas where agricultural development was either planned or at implementation stage. Additional revenues would thus accrue to farmers and transporters of farm input and output in those areas. The project included provision of equipment, materials, and technical assistance needed by the Feeder Roads Technical Section it established to carry out the four-year program.

Implementation Experience

ii. The force account works started in October 1980 instead of January as planned. Cumbersome procurement and strikes account for the delay (para. 3.02). The three brigades, two heavy and one light, were unable to reach the productivity targets owing to adverse terrain conditions and the poor performance of equipment and of the equipment maintenance team (paras. 3.04 & 3.05). The closing date was extended twice and the construction program revised to a lower target of 800 km. At project completion in June 1986, some 650 km of feeder roads and 150 km of connecting side roads had been completed (para. 3.13). The construction costs overran the appraisal estimates by about 50% , partly because the roads standards had been upgraded to ensure all-weather access (para. 3.06).

Results

iii. Agricultural production in the influence area of the roads did not increase as expected. This is traced to drought but also to the failure of the rural development projects, as most farmers failed to adopt the new methods (para. 4.05 c). The sharp decline in the production of cash crops found some compensation however in the unexpected and remarkable progress of off-season crops, very much dependant on reliable road transport (para. 4.07). Traffic on the improved roads grew 30% faster than expected at appraisal, but remained low (paras. 4.03 & 4.12). Long distance migration were unaffected, whereas concentration of population in the villages and areas close to the roads was noticeable (para. 4.05 b). The transport supply remained generally constrained throughout the project area and surveys revealed a substitution of private cars, vans and light trucks for the four-wheel drive vehicles previously utilized (para. 4.05 e).

Sustainability

iv. A feeder road unit was developed within the Directorate of Public Works for planning and execution of construction works. At project completion date, the unit still showed definite weaknesses, both in management and maintenance areas. Training by consultants largely failed, for lack of suitable counterparts and consultant's neglect (para. 3.28). The three brigades suffered from local cumbersome procurement causing late availability of equipment, which in addition performed poorly (para. 3.15). The force account works however proved satisfactory quality wise (para. 6.01). Local funding remained insufficient for maintenance of rural roads, making it dependant on foreign financing (para. 5.04).

Findings and Lessons

The project was successful. Its economic rate of return was recalculated as 24% , compared to the appraisal estimate of 21% (para. 11). The principal lessons learned are:

- (a) the project showed unexpected links between access improvement and improved welfare for rural people (para. 5.05), which should be taken into account by follow-up operations.
- (b) equipment should be carefully selected, with due consideration to local conditions and maintenance capabilities.
- (c) the swift response of transport supply to improved road conditions, truckers included, calls for designing feeder roads at standards ensuring investment sustainability (para. 5.03)
- (d) the opening of a revolving fund in 1985 helped reducing payment delays, to the benefit of small contractors and of wage earners participating in the project (para. 3.25).

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FEEDER ROADS PROJECT (CREDIT 886-NIR)

PROJECT COMPLETION REPORT

I. INTRODUCTION

1.01. The Republic of Niger is a landlocked country of about 1.27 million km², located between coastal West Africa and the Maghrebian Sahara. Agriculture, which accounts for more than 80% of total employment, is limited to about 150,000 km² or about 12% of the total land area along the southern border. The population of approximately 6 million had a per capita income of US\$325 equivalent in 1986, making Niger one of the poorest countries in the world. Since independence, Niger has given high priority to the construction and maintenance of a road network serving all parts of the country. In 1978 the improved road network covered approximately 5,000 km.

1.02. The Feeder Roads Project (Cr. 886-NIR) was the fifth IDA-financed road project in Niger. The First Highway Project (Cr. 55-NIR, US\$1.5 million, 1964) consisted of engineering and construction of about 60 km of roads mainly serving groundnut producing regions. The Highway Maintenance Project (Cr. 128-NIR, US\$6.47 million, 1968) addressed Niger's highway maintenance needs and also included pre-investment studies which led to the Second Highway Project. The Second Highway Project (Cr. 231-NIR, US\$6.55 million, 1971) provided for the construction of about 140 km of roads and detailed design for another 170 km. The Third Highway Project (Cr. 612-NIR, US\$15.6 million, 1976) covered a four-year highway maintenance program (including equipment purchase and training), and construction of 49 km of roads from Maradi and Zinder to the Nigerian border, as well as a survey of Niger's road construction industry. This project was cofinanced by BADEA and the African Development Fund. IDA also assisted in financing the Niamey International Airport (Cr. 473-NIR, US\$5.0 million, 1976) and small feeder road components in the Drought Relief Project (Cr. 441-NIR, US\$2.0 million, date) and the Maradi Integrated Rural Development Project (Cr. 608-NIR, US\$10.7 million, 1976). In general, these projects were well executed using mainly foreign consultants and contractors.

1.03. Niger's internal transport system consists essentially of road transport. External transport requirements are largely met by road or road/rail routes between Niger and the ports of Cotonou (Benin), Lome (Togo), Abidjan (Ivory Coast), and Lagos (Nigeria). In 1978, the road network consisted of about 18,000 kms, of which about 11,000 kms were unclassified rural roads and tracks and 6,923 kms were classified roads, of which 1,761 kms were paved. From 1970 to 1977, CFAF 35.5 billion (US\$154 million) was invested in road construction and improvement, of which external financing accounted for about 85%. Road maintenance was financed from Government sources (National Budget and National Investment Fund).

1.04. The Government's initial efforts focused on the main road network, designed to facilitate external communications and to provide links between the major urban centers. The drought of the early seventies first drew the Government's attention to the problem of rural access. The low density of secondary and rural roads prevented a significant part of the population from

gaining access to food aid provided by the international community. In addition, lack of access was perceived as a major constraint on rural development initiatives.

1.05. At appraisal in 1978, Bank Group lending for Niger was increasingly focused on efforts to ensure food self-sufficiency and to improve the income and standards of living of the rural population; to upgrade physical infrastructure and improve its maintenance; to develop alternative approaches to training and educational reform; and to diversify the economic structure and expand modern sector employment. In the transport sector, it was anticipated that future emphasis would be placed on assistance for the construction of secondary and access roads to support the Government's agricultural program, while continuing support for maintenance of the existing infrastructure. The Feeder Roads Project was expected to be the first step towards this objective by providing for feeder road needs and by integrating their planning, construction, improvement and maintenance into the overall transport sector strategy. Also, it provided an institutional structure to improve coordination in feeder road planning and execution between the Ministries of Plan, Rural Development, Interior, and Public Works, Transport and Urban Development, by establishing an Interministerial Feeder Roads Committee.

1.06. Overall responsibility for project implementation was assigned to the Ministry of Plan. Planning and execution of the project was to be carried out by the newly created Feeder Road Technical Section in the Department of Public Works. Because of their important role in project implementation, establishment of the Interministerial Committee and of the Feeder Road Technical Section were made conditions of project effectiveness.

1.07. The project was highly successful. Construction targets were substantially achieved in terms of construction quantities, although the introduction of higher standards required a reduction from the original length of road to be constructed (para. 3.06). Institutional objectives were fully attained in that counterpart staff carried out their responsibilities in a very able manner long after the technical assistance staff left the country. The Interministerial Committee continues to play an important role in coordinating investment planning between the agriculture and transport sectors.

1.08. This report is based on documents available in the West Africa Information Center files and on a draft report prepared by the Borrower, which was discussed with a project completion mission in June 1987.

II. PROJECT IDENTIFICATION, PREPARATION AND APPRAISAL

Identification

2.01. Prior to the project, feeder roads and tracks in Niger were generally in poor condition and in need of improvement. In the period from 1969 to 1975, the Government concentrated on improving its primary and secondary road

network, and relatively little effort was put into feeder roads. Feeder roads, nearly all unclassified, were the responsibility of local authorities, who did not have adequate financial or physical resources for maintenance and improvement. The Nigerien Government expressed a need for improvements to the feeder road system, and a reconnaissance mission in November 1975 identified the need for a separate feeder roads improvement and maintenance program. The project was identified in May 1976.

Preparation and Appraisal

2.02. The Government had undertaken a Transport Plan Study in 1976, which was expected to take two years to complete. Although it incorporated some information on rural roads, it was not adequate to prepare a project. Consequently, in November 1976 the Government requested and IDA approved US\$200,000 from its Project Preparation Facility to carry out a Feeder Road Study. The study was completed by consultants BCEOM in mid-1978. During project preparation, particular emphasis was placed on the importance of examining the developmental impact of rural road improvements, and on the use of appropriate construction and maintenance technologies.

2.03. Appraisal was carried out in April 1978. Given the relatively low volumes of expected traffic and the high anticipated construction costs, the appraisal mission recommended lowering the improvement standards proposed by the Government and the consultants. Post-appraisal missions were carried out in July and December 1978 to resolve issues with the Government on technical and organizational matters raised during the appraisal mission.

Negotiations and Board Approval

2.04. Project negotiations were held from January 9 to 12, 1979. During negotiations, it was agreed that equipment financed by the project could also be used to maintain 500 km of improved rural roads not constructed under the project. The Association also agreed to the Niger delegation's request to delete the condition requiring an independent audit of project accounts, since these would be part of the accounts of the Ministry of Public Works which are audited by the State Inspector. Also, at their request, IDA agreed to change the establishment of the Interministerial Committee from a condition of Board presentation to a condition of effectiveness. Lastly, IDA agreed to finance construction of offices for the Feeder Roads Technical Section and the purchase of training materials by reducing a corresponding amount from local labor costs for civil works.

2.05. The Board approved the credit on March 20, 1979. The Credit Agreements were signed on April 22, 1979. The Inter-ministerial Committee was officially created in September 1979, and the project became effective on December 10, 1979. Effectiveness took place approximately six months later than expected due to lengthy administrative procedures in Niger.

Project Objectives and Description

2.06. The main objective of the project was construction, improvement, and subsequent maintenance of about 1,000 km of feeder roads serving agricultural development areas. The Government decided to execute this program through force account in order to create the necessary institutional structure for development and execution of comprehensive feeder road programs. Consequently, considerable emphasis was placed on training local staff. Works were to be executed by three brigades using varying degrees of labor and equipment, in order to test the feasibility of alternative technologies in the Niger setting. The main components of the project were:

- (a) Purchase of equipment, spare parts, and workshop tools and equipment;
- (b) Provision of materials and supplies;
- (c) Construction and repairs of small structures by local contractors;
- (d) Construction of offices for the Feeder Roads Technical Section;
- (e) 210 man-months of technical assistance, including:
 - (1) about 150 man-months of engineering assistance to establish the feeder roads division within the Public Works Department;
 - (2) 40 man-months for training specialists in civil and mechanical engineering; and
 - (3) 20 man-months for an economist/cost accounting specialist to set up a cost accounting system, to monitor and analyze project results, to prepare annual work programs and proposals for a longer-term feeder road strategy, and to develop a follow-up program; and
- (f) Purchase of training materials.

III. PROJECT IMPLEMENTATION

3.01. The project started promptly after the credit became effective. The Interministerial Feeder Road Committee was created in September 1979. The head of the consultant team arrived in February 1980, and key engineering staff of the Feeder Road Division were selected in the same month. However, the nomination of a counterpart accountant was considerably delayed, and a counterpart economist was not identified until after the departure of the technical assistance team. The first group of equipment operators and mechanics was recruited and trained starting in April 1980. The training program was prepared and implemented by the consultants under the ongoing Third Highway Project.

3.02. Project start-up was slowed mainly by delays in the procurement and delivery of equipment. Consequently, road construction did not begin until October 1980. A call for bids on equipment had been issued in June 1979, but due to cumbersome administrative procedures, the contract was not approved until February 1980. Delivery was further delayed by three months over the contractual period. Thus, the equipment which had been expected to arrive in January 1980 was not actually received until July 1980. Project start-up was also delayed by sporadic strikes among the work force resulting from undue delays in the payment of wages to temporary workers.

3.03. The project continued to experience delays during implementation, due to low output during the initial training period, lack of flexibility in the equipment fleet, and frequent breakdowns of equipment. The project was originally expected to close on June 30, 1984, but the closing date was extended twice and the project actually closed on June 30, 1986. The Credit was fully disbursed on December 31, 1986.

3.04. The Interministerial Committee met in June 1980 to select the roads for the first year program. The following roads were selected:

Say-Kobadie (60 kms)	Brigade 1 ("Heavy")
Margou-Koygolo (58 kms)	Brigade 2 ("Heavy")
Mirriah-Dogo (30 kms)	Brigade 3 ("Light")
Korgom-Matameye (28 kms)	Brigade 3 ("Light")

3.05. Based on the expected output of 6.87 km/month for the heavy brigades and 6.6 km/month for the light brigade, it was expected that this program would be completed by the end of 1981. However, by that date actual output was only 115 km or about 65% of the target. In addition to the causes of delay noted above (poor equipment performance and occasional strikes by workers), this delay was due to unexpectedly long material transport distances, the construction of a 17 km extension of one road which was not in the original program, and to changes in the agreed design standards for some roads.

3.06. Roads with relatively low traffic were intended to be built with little or no embankment, in accordance with construction techniques practiced under similar climatic, topographical and soil conditions. However, in May 1981, following construction of the first such roads, the Government requested IDA to approve construction of higher standard roads in low lying areas in order to ensure all-weather access and to reduce future maintenance costs. The adoption of higher standards would imply higher unit costs as well as a greater use of equipment. After carefully studying these implications, the Government proposed and IDA approved a revised program with the construction target reduced from 1000 km to 800 km.

3.07. The second phase of the program was approved by the Interministerial Committee in December 1981. It included the following roads:

Kollo-Koure-Dantiandou (91 kms)	Brigade 1
Kcygolo-Yeda-Baleyara (41 kms)	Brigade 2
Bonkoukou-Chical (35 kms)	Brigade 2
Banda-Wacha-Gouchi (84 kms)	Brigade 3

Normally, this program should have been completed in about a year. However, due to the delays experienced in completing the first phase program, the second phase did not get started until the second quarter of 1983. A year later, none of the brigades had completed its part of the second phase program.

3.08. Program output was estimated at appraisal to average 240 km per year. In October 1983, a supervision mission reported completion of about 376 km, well below appraisal forecasts. On December 31, 1983, when the project was expected to be completed, cumulative progress was as follows:

Brigade 1:	287 kms (80% of target)
Brigade 2:	232 kms (66% of target)
Brigade 3:	114 kms (56% of target)

The relatively better performance of Brigade 1 is related to terrain conditions in the region where it was working; a lateritic plateau requiring little in the way of earthworks and materials transport. Poor cohesion of the natural soils combined with long transport distances explain the relatively poorer performance of Brigades 2 and 3. All of the brigades suffered from poor performance of equipment and of the equipment maintenance team. In fact, the "light" brigade equipped with SM8 trucks lost half of its transport capacity. The Volvo loaders recorded an average of 182 days out of service during 1983. Equipment problems became such a serious constraint that the head of the technical assistance team, a road engineer, had to be replaced by a mechanical engineer. Problems due to delays in wage payments were resolved with the creation of a project account in May 1981.

3.09. The supervision mission of October/November 1983 concluded that the remaining available funds would be sufficient to complete between 650 and 750 kms. of roads. In other respects, the project was viewed as successful due to excellent collaboration between the consultants, their counterparts, and the Government. A cost accounting system had been developed and applied, and control had been good throughout in terms of both resource management and engineering practice. The mission also concluded that the costs of the lower standard roads were no less than those of the higher standard, because although lower quantities were involved, the lower capacity equipment of the light brigades resulted in higher unit costs.

3.10. A third phase program was agreed by the Interministerial Committee in May 1983. It included the following roads:

Badeguichiri-Laba (84 kms)
Gabi-Maraka (21 km)
Baga-Tamaske (45 km)
Tchadaoua-Gazaoua (72 km)

This phase, which was completed in December 1986, was entirely executed by Nigerien staff. The consultant team left in April 1984 and from then on supervision was provided by the national staff. The light brigade was gradually converted to the same characteristics as the heavy brigades. Productivity levels were maintained but not improved, mainly due to continuing difficulties with the equipment. These problems worsened as the equipment became older and when, after 1985, restrictions were placed on equipment maintenance expenditures preventing to use private services.

3.11. A supervision mission in October 1984 concluded that the pace of production could be significantly increased if the equipment fleet were more efficient and flexible. The mission recommended that the Credit be restructured under the Special Action Program, to reduce the Nigerien contribution from 23% to 5% of costs net of taxes, to enable procurement of the needed equipment within the approved 1984-85 budget. The mission also recommended establishing a revolving fund to facilitate IDA contributions to the costs of spare parts and local labor.

3.12. In December 1984 the Special Action Program for Niger was approved. IDA's share of project financing was increased from 77% to 95%, including an increase from 25% to 95% in IDA's share of local labor costs. This change reduced the Government's contribution to the project as a whole from 21% to 18% of costs net of taxes. The Special Action Program also included establishment of a Special Account (revolving fund) for the project. The Credit Agreement was amended accordingly on January 18, 1985.

3.13. Project implementation improved from January 1985 as a result of these measures. However, a significant increase in productivity could only be achieved when additional and replacement equipment, procured under the project but not delivered until the end of 1986, became operational. At project completion in June 1986, some 650 km of feeder roads and about 150 km of connecting side roads had been completed.

Equipment Performance

3.14. Equipment performance was far from satisfactory. Over the course of the project, 1,237 working days were lost due to equipment breakdowns. This does not include time lost due to shorter interruptions in service or to breakdowns among the transport vehicles. Three types of equipment are worth more particular mention:

- (a) The Volvo loaders which alone were responsible for the loss of 234 working days. These were scrapped in 1983 after only three years of service.
- (b) The eight Land Rovers had an average lifetime of less than two years.
- (c) The SM8 trucks were proven too light and performed poorly.

3.15. The primary cause of this situation was a poor initial choice of equipment. However, equipment performance is also linked to the quality of

maintenance. Improvement in the equipment maintenance system continues to be one of the main concerns of project staff.

Project Costs

3.16. Table 1 shows costs foreseen at appraisal and actual costs. The total cost (evaluated in local currency) was about 52% higher than appraisal forecasts. The local contribution was 73% higher than expected, including financing of 40% of the cost overrun. The remainder was covered by the increase in the dollar exchange rate over the project period.

3.17. Equipment expenditures were 90% higher than forecast. Both the raising of design standards and the weaknesses found in certain categories of equipment (para. 3.15) made it necessary to acquire additional equipment. In addition, two contracts for a total of 409 million FCFA were awarded in 1985 for the purchase of new equipment, to be used for the second rural roads program; 50% of this amount was charged to the first project. Finally, 85% of the equipment purchase contracts included taxes, while at appraisal it was expected that these purchases would be exempted from tax.

3.18. Consumption of fuel, lubricants and spare parts cost more than twice as much as predicted. The indirect taxes included in the price of these goods and the declining purchasing power of the CFA franc partially account for this increase.

3.19. Personnel costs exceeded the forecasts by 60%. This is mainly due to the extended life of the project (seven years instead of four). An estimate based on data from the last four years of the project indicates that overhead costs (salaries of headquarters staff) represent 11% of the total.

3.20. The cost of technical assistance was more than twice what had been expected. The initial contract amount, which was already 40% higher than foreseen at appraisal, was increased three times to take into account 80 man-months of additional assistance and to include price adjustments. Technical assistance costs represented 23% of project costs.

Unit Construction Costs

3.21. Table 2 indicates the estimated unit construction costs and the actual costs for each road. Actual costs have been adjusted to 1978 prices assuming an average annual inflation rate of 8% over the project period. Estimated costs have been adjusted to take account of taxes, which are assumed to represent 30% of the with-tax cost. Four roads show important variations between estimated and actual costs: Mirriah-Dogo and Korgom-Matameye, which had actual costs significantly higher than the forecasts, and Badeguichiri-Laba and Gabi-Maraka, whose costs were less than forecast.

3.22. For Mirriah-Dogo, the initial design called for a gravel thickness of 14 cm, while the work accomplished had a thickness of 23 cm. In addition, work was frequently held up due to equipment breakdowns. Consequently, completion of this road took 11 months instead of the 3 months originally planned.

3.23. The cost savings achieved on Badeguichiri-Laba are partly due to the nature of the terrain. Almost all of this road lies on a lateritic plateau where earthworks are almost unnecessary and transport distances are rarely more than 1 km. On Gabi-Maraka, it was possible to rehabilitate a 9 km existing track, thus achieving substantial savings on brush clearing and earthworks.

Disbursement of Credit 886-NIR

3.24. Table 3 shows projected and actual disbursements over the project period. In the first year, disbursements were only half of projections due to the start-up delays. In the following two years, disbursements were approximately the same as projections (107% in 1981 and 100% in 1982). During 1983 and 1984, however, disbursements were approximately 15% less than projected, principally due to the rapid increase in dollar exchange rates. Thus, in December 1984, 20% of the credit remained undisbursed. The credit was fully disbursed at the end of December 1986.

3.25. Lengthy disbursement procedures initially posed a cash flow problem for the government and consequently for the small contractors and wage earners participating in the project. The opening of a special account in 1985 to serve as a revolving fund greatly eased this situation. This innovation made it possible for the government to reduce payment delays by 45 days.

Disbursement of Local Funds

3.26. The project accounts for counterpart funds from the national budget, the National Investment Fund, and the later Investment Budget, were regularly replenished by government. However, during the first two project years, only a small part of the amount allocated by government was effectively utilized (2% in 1980 and 13.5% in 1981). Performance improved considerably in the next year, when 70% of the available funds were used. From 1983 on, local funds made available for the project were fully utilized.

3.27. Disbursement procedures for local funds were very cumbersome. Some modifications were introduced over the life of the project to try to speed up disbursements. For example, after 1980 wage payments to brigade workers did not have to be approved by the departmental prefect. The main innovation was the opening in May 1981 of a special account into which IDA disbursements were directly deposited. Payments could be made from this account within two weeks, whereas following the normal procedures, payments could take from one to three months. However, this arrangement has not entirely solved all problems relating to the disbursement of local funds, since use of the deposit account does not fully substitute for local procedures.

Consultant Performance

3.28. The consultant team was present for a total of 51 calendar months, from February 1980 to April 1984. A total of 270 man-months of technical assistance was provided. The objectives of these services were as follows:

- to establish a feeder roads service within DTP;
- to procure the equipment and supplies needed for the project;
- to prepare bid documents for works to be executed by contractors;
- to carry out a four-year program of feeder road construction covering approximately 1000 km;
- to conduct a staff training program;
- to assist DTP in preparing and justifying each annual work program;
- to assist DTP in monitoring and evaluating project results; and
- to prepare a long-term strategy for feeder road improvement and maintenance.

With respect to the organization, execution, and reporting of the project, the consultants performed very well. However, their performance in the area of training was not satisfactory. For example, of 23 months spent in Niger by the training expert in mechanics, only 3 months were spent actually training counterpart staff. Training was also inhibited by the government's difficulties in finding suitable counterpart staff. However, the main reason for poor performance was the consultant's neglect of training in favor of project execution. This may be partly explained by pressure from the administration to see concrete results. Training was so poor that after the consultant left some services became inactive, no longer maintaining their records or preparing regular reports.

Supplier Performance

3.29. Supplier performance was generally satisfactory, with respect both to the quality of service and delivery times. However, two suppliers went bankrupt and were unable to honor their contracts. One of these was a small contractor selected to construct minor works on the Say-Kobadie road, and the other was a firm specializing in the supply of spare parts and vehicles. The corresponding contracts were cancelled with amounts totalling 11,863,800 CFA francs outstanding.

IV. ECONOMIC REEVALUATION

4.01. A study of the short-term socio-economic impact of the five roads completed by 1983 was carried out in 1984 by the consultants as part of their final report. The study used actual construction costs and maintenance costs estimated on the basis of the cost accounting data collected during project implementation. Expected benefits were calculated according to the consultant's original project evaluation methodology and included both vehicle user cost savings and value added in agricultural production.

4.02. Construction costs ranged from US\$10,100 to US\$14,150 per kilometer net of taxes. The variation in costs was due to variations in terrain and in site organization rather than to the use of different design standards.

Following the appraisal methodology, the consultants excluded one-third of the project technical assistance costs from the economic evaluation of the completed roads.

4.03. Traffic on the improved roads, as measured by actual traffic counts, exceeded the volumes predicted in the pre-project study but remained at relatively low levels (less than 10 vehicles per day in most cases). Since there were no pre-project traffic data, it was not possible to determine whether the expected shifts in vehicle types had taken place. Using the appraisal estimates of pre-project traffic, and assuming that the shift did take place, the consultants concluded that traffic had grown by about 20% per year on the newly opened roads and that user cost savings accounted for more than half the benefits on all but one road. Traffic consisted mainly of public passenger vehicles, commercial and administrative vehicles, and trucks carrying firewood.

4.04. The calculation of benefits due to increase in net agricultural value added was questionable because of the poor quality of available agricultural data. The consultants forecast a linear growth of production in line with trends during the late seventies, which would generate an increasing marketable surplus in the project areas. However, in most cases the anticipated increase in net value added proved relatively unimportant in the calculation of rates of return. The consultants calculated rates of return ranging from 7% to 35%, assuming a future traffic growth rate of 5% per year.

4.05. Near the end of the project, in 1987, staff of the Feeder Roads Division, with short-term support from the consultants, conducted traffic counts and field studies in the area of influence of the 11 project roads, including two which were still under construction. They reached the following conclusions:

- (a) The influence area of the roads, originally assumed to extend for 5 kms to each side, was actually much larger. In fact, the roads provided improved access to several communities not actually located on the roads, but linked to them by unimproved tracks. It appeared that the road improvements provided sufficient incentive for transporters to use these tracks and that villagers were prepared to travel up to 15 kms. on foot or by animal transport in order to reach the improved roads.
- (b) Improved roads did not appear to induce significant long-distance migration. However, the population in the districts served by the roads tended to become more concentrated in the villages and the area close to the roads.
- (c) Agricultural production in the influence area of the roads did not increase as expected. This was attributed to the failure of the rural development projects, which were supposed to have significantly increased yields through the application of improved technology (use of fertilizer) and the use of new plant varieties. Most farmers failed to adopt the new methods, and consequently agricultural production in the impact zones barely kept pace with

population increase. Drought was also seen as a contributing factor to poor agricultural performance.

- (d) Lack of pre-project data made it impossible to assess possible changes in patterns of service utilization. However, the improved roads served over fifty local markets with an estimated total volume of sales representing about FCFA 70 million in tax revenues. About 20 health centers and more than 50 schools were located in the project influence areas. Services and supplies furnished to these facilities accounted for a significant share of traffic on the roads.
- (e) To complement the traffic counts regularly carried out by the Road Management Bureau (BGR) on the improved roads, Feeder Road Division staff conducted an origin-destination survey of traffic on five roads (Say-Kobadie, Gazaoua-Tchadaoua, Margou-Baleyara, Mirriah-Dogo, and Bande-Wacha-Gouchi). According to the 1986 BGR counts, traffic averaged 22 vehicles per day on the rural roads, 30% more than the appraisal forecasts. Heavy truck traffic was more than three times higher than predicted. The most frequently found vehicle types were light trucks and vans, representing two-thirds of total traffic. These vehicles were mainly dedicated to passenger transport with small amounts of accompanied baggage. Passenger load factors were generally in excess of the authorized capacity.
- (f) Private cars represented 18% of total traffic. Such traffic was generally linked to development project activities and social services. Heavy trucks accounted for 16% of traffic and generally transported foodgrains (millet, sorghum, and cowpeas). However, in the more wooded regions (Say-Kobadie, Kollo-Koure), truck transport of firewood was even more important than food. More than 60% of the trucks counted on Say-Kobadie were transporting firewood. Average truck load factors were close to 90%.
- (g) Throughout the project area, transport demand continues to exceed supply. Animal-drawn carts represent an important share of road traffic (up to 50% on some roads) to which no benefits are attributed in the economic analysis. The very high load factors and the margins which transporters can charge over their actual costs indicate that supply is still constrained, mainly by the difficulty of purchasing new vehicles and securing spare parts.
- (h) The post-project evaluation revealed that the improved roads, which originally served the function of rural feeder roads, have become significant links in the regional and even the national road network. For example, the rural road from Gabi to Maraka, an extension of RN 18, offers the local population a direct link to Nigeria. Similarly, the road from Margou to Baleyara provides the eastern part of Niamey Department with direct access to the Benin frontier.

4.06. The economic evaluation methodology adopted by the consultants who prepared the project relied heavily on benefits to be derived from increased agricultural production as a result of the rural development projects planned for the road impact zones. Agricultural value added was expected to account for 85% of the benefits. Passenger traffic was forecast, based on a gravity model, to grow at about 6.5% per year. The projection of user cost savings for freight traffic was also derived from the expected increase in agricultural production. This conceptual error (double counting of benefits) caused Bank staff to discard the consultant's methodology at appraisal, relying instead on benefits derived from user cost savings on non-agricultural traffic and from agricultural losses avoided. However, staff of the Feeder Roads Division were not informed of this change, and they continued to apply the consultant's methodology for rural road evaluation.

4.07. Ten years later, however, it became apparent that these assumptions were no longer valid. With few exceptions, the rural development projects did not achieve their objectives. The production of cash crops (groundnuts, cotton) has declined considerably. In contrast, some activities which were not even considered ten years ago have shown remarkable progress, particularly the cultivation of off-season crops (cultures de contre-saison). Production of such crops, which are perishable and consequently transport-sensitive, is probably closely related to reliable road transport.

4.08. The economic re-evaluation is based on the same costs and benefits used at appraisal, with one exception. The appraisal assumed that the roads (to be constructed to a light design standard) would have no residual value after ten years. The re-evaluation considers that, due to the implementation of higher design standards, the roads will have a residual value amounting to 30% of construction costs at the end of the evaluation period. The calculation of benefits due to transport of agricultural freight is based on the same crops (foodgrains) considered in the appraisal, without regard to additional benefits that may have been generated by growth in production of off-season crops or by harvesting of firewood. These benefits are included in the growth of non-agricultural traffic.

4.09. Traffic data used in the economic re-evaluation were furnished by BGR for all but two roads (Gazaoua-Tchadaoua and Gabi-Maraka). On these roads, the Feeder Roads Division organized 3-day counts with support from BGR and the local road maintenance services. Future non-agricultural traffic growth is forecast at 7% per year, corresponding to historical growth in the vehicle fleet. This assumption is believed to be fairly conservative, since a comparison of 1986 data on the rural roads for which traffic was counted in 1983 indicates an average annual growth rate of more than 20% in the years immediately following the opening of the roads. Agricultural traffic is assumed not to grow in the future.

4.10. Vehicle user costs were taken from the interim report of the ongoing National Transport Plan Study. Since this study did not provide unit costs for 4-wheel drive vehicles, the most common vehicle type on rural roads, these costs were estimated by applying corrective factors to the components of unit costs for ordinary light trucks. Costs and benefits are given in constant 1986 dollars using an 8% inflation rate.

4.11. Table 4 shows the internal rate of return calculated for each road. Only two roads have rates of return of less than 10%, both in Tahoua Department. In most cases the rates of return are higher than the appraisal estimate. Two roads, Margou-Baleyara and Mirriah-Dogo have rates of return of over 30%, considerably higher than expected. The rate of return for the total program is re-evaluated at 24%, compared to 21% anticipated at appraisal.

4.12. The structure of benefits is also significantly different from that expected during project preparation. Agricultural traffic, which was expected to account for well over half of the benefits, is estimated to account for only about 10% of the actual benefits. In contrast, user cost savings for non-agricultural traffic, which were not expected to be significant, actually represent almost all of the benefits. The increase in user cost savings is due both to the higher than expected increase in traffic (30% more than forecast) and to a major increase in unit vehicle operating costs over the project period (up to double the 1978 value in real terms). Part of the increase in user cost savings is due to an unanticipated shift in vehicle types used for passenger transport; on improved roads, private cars, vans and light trucks now substitute for the four-wheel drive vehicles previously used for passenger transport.

4.13. It may be noted that the most expensive rural roads are not necessarily the least economic. The roads with the highest rates of return are those located in areas of high population density. Finally, the economic viability of the northern roads, Badeguicheri-Laba and Bagga-Tamaske, may have been underestimated in this analysis. Traffic on these roads, at the time of the survey, was restricted by government controls on passenger transport and by the poor condition of some sections where structures (to be executed by local contractors) were not yet completed. Consequently, some of the potential traffic may have been diverted to other roads.

V. BANK PERFORMANCE

5.01. The project responded well to felt needs on the part of the Government of Niger and the people of the project areas. It was executed with reasonable dispatch by the implementing agency, while delays in project execution were mainly due to central government actions beyond the agency's control (delays in credit effectiveness, cumbersome procurement procedures, and delays in making local funds available for wage payments). With two main exceptions, the Government complied with the agreements made at negotiations. The exceptions were (1) the strengthening of road design standards relative to those agreed at appraisal, and (2) the funding of rural road maintenance from the project budget. In both cases, the Bank agreed after discussions with the Government to accept the Government's proposals. The Borrower has no comment on Bank performance.

5.02. The project was adequately supervised, with an average of two Bank missions per year over the project period. Supervision missions averaged two staff members and included engineers, economists, financial analysts,

sociologists, and equipment experts. Although there was considerable turnover in supervisory staff over the project period, continuity was good and this did not present a problem for project implementation. Lessons drawn from the successful establishment of a feeder roads division, the implementation and use of a cost accounting system, the comparison of construction methods involving varying degrees of labor and equipment, and the socio-economic impact study, have since been reflected in the design of other Bank-financed feeder road projects.

5.03. The Bank failed to anticipate the rapid growth of traffic and its changing composition on improved roads, particularly the increase in heavy trucks. Consequently, the design standards agreed at appraisal were actually too light. The Government recognized this problem and the Bank responded in a positive way during project implementation. As a result, the feeder road program was completed to standards capable of supporting current traffic levels and the roads now represent a sustainable investment. One consequence of this change was a shift in emphasis from labor-based methods suitable for light construction to greater use of heavy equipment, increasing costs and construction time, but also increasing the viability of the project.

5.04. Government failure to comply with its agreements regarding the separate funding of rural road maintenance was noted in supervision reports and brought to the attention of Government authorities. However, given the severe revenue constraints being experienced by the Government at the time, Bank staff accepted Government proposals that, for a few years, the improved roads should be maintained by the feeder road brigades using project funds. The issue of adequate road maintenance funding arose at the same time in connection with the Fourth Highway Project and was fully addressed under the follow-on Transport Sector Credit, which includes a second rural roads program.

5.05. If Bank staff had accurately predicted the failure of rural development programs in Niger, it is probable that this profitable investment would never have been undertaken. The evidence of this project shows that the relationship between access improvement and improved welfare for rural people is more complex than has hitherto been assumed. Despite the projects' failure to attain their agricultural objectives, there is a large and apparently still unsatisfied demand for transport in densely populated rural areas. This means either that people are producing and selling products other than those on which the rural development programs have been based (off-season crops, firewood, fish and dairy products), or else that they are finding wage employment or other sources of nonfarm income (e.g. smuggling). Regardless of the nature of income-generating activities, road access removes a critical constraint on the mobility of labor and capital and the functioning of rural markets.

5.06. An issue that has only recently come to the attention of Bank staff is the likely sustainability of development initiatives in fragile ecological settings. As a Sahelian country, Niger is vulnerable to drought and desertification following upon excessive concentrations of population. To the extent that rural roads may accelerate the process of deforestation and encourage increased exploitation of the land, they may have a negative

environmental impact in the long run. On the other hand, by promoting a transition to nonfarm employment and by providing access to health, education, and extension services, rural roads may actually facilitate the development of a more sustainable lifestyle for rural people in the long run. Specific attention should be paid to this issue in the socio-economic impact research to be carried out by the Feeder Road Division under the Transport Sector Credit.

VI. CONCLUSIONS

6.01. The immediate objectives of the project (execution of the road program and institutional strengthening) have been achieved. However, due to the agreed changes in design standards, the total length completed was only 70% of the original target. Furthermore, brigade output never reached the rates foreseen in the appraisal report. Construction by force account proved satisfactory with marginal costs less than those of construction by contract. In many regions it can be seen that project roads do not deteriorate as fast as those executed by contractors. Finally, this procedure was based on the local recruitment of unskilled labor, allowing the beneficiaries of the project to participate in project execution.

6.02. The available evidence seems to indicate that the project has made an important contribution to the process of rural development in Niger, even though this came about in ways that were not anticipated at the beginning of the project. The sustainability of this contribution critically depends upon the continuing commitment of the Government to provide regular routine maintenance and to ensure that periodic maintenance takes place as needed. The system of road management installed under the Fourth Highway Project and supported under the Transport Sector Credit makes it seem likely that this objective can be achieved, unless limited by a lack of funds in the future.

6.03. In a broader sense, the sustainability of this development intervention depends on achieving and maintaining a balance between the needs of the ever-increasing project area population and the productive capacity of the physical environment. This implies the development of a more complex economy in rural areas, based on more specialized production activities and on increasing interdependence and exchange. It requires the dissemination of knowledge and communication of concerns among rural residents, the development of more complex forms of social organization, and the establishment of greater ties between urban and rural areas. Transport will continue to play a critical part in this process of rural development, and investments to reduce the costs of transport must be an essential part of any strategy to improve the standard of living for Niger's rural poor.

Table 1

NIGER

FEEDER ROADS PROJECT (CREDIT 886-NIR)

PROJECT COMPLETION REPORT

Project Costs

<u>Cost Category</u>	<u>(Million CFAF)</u>			<u>(Million US\$)</u>		
	<u>Expected Cost</u>	<u>Actual Cost</u>	<u>Ratio</u>	<u>Expected Cost</u>	<u>Actual Cost</u>	<u>Ratio</u>
	(1)	(2)	(2)/(1)	(3)	(4)	(4)
Equipment	802	1,310	1.63	3.49	4.30	1.23
Spare parts	389	602	1.70	1.69	2.10	1.24
Fuel and lubricants	391	863	2.21	1.70	2.90	1.71
Locally hired labor	526	595	1.13	2.28	1.60	0.70
Technical assistance	504	1,046	2.08	2.19	3.40	1.55
Other	<u>379</u>	<u>64</u>	<u>0.17</u>	<u>1.65</u>	<u>0.20</u>	<u>0.12</u>
Total	2991	4,540	1.52	13.00	14.5	1.12

Project Costs by Financing Source
(Millions CFAF)

IDA	3,069
Government	1,471
National Budget	862
National Investment Fund	609
Total	4,540

Table 2

NIGER
FEEDER ROADS PROJECT (CREDIT 886-NIR)
PROJECT COMPLETION REPORT

Unit Construction Costs by Road

(Thousands CFAF/Km)

<u>Road</u>	<u>Completion Date</u>	<u>Expected Cost(1)</u>	<u>Actual Cost(2)</u>	<u>Actual Cost(3)</u>
Say-Kobadie	12/81	3,797	4,533	3,598
Kollo-Hamdalaye	9/83	4,723	4,028	2,961
Margou-Baleyara	9/82	4,837	6,537	4,805
Mirriah-Dogo	9/81	2,739	6,066	4,815
Korgom-Matameye	5/82	2,823	5,342	3,926
Bonkougou-Chical	12/84	4,560	6,936	4,371
Bande-Wacha-Gouchi	3/85	3,543	6,013	4,082
Gazaoua-Tchadaoua	9/86	3,030	5,065	3,447
Badeguichiri-Laba	9/86	7,424	4,234	2,470
Bagga-Tamaske (4)	6/88	4,614	8,515	4,602
Gabi-Maraka (4)	6/88	7,086	5,425	2,796

- (1) 1978 estimated unit cost
(2) Actual unit cost at completion date
(3) In constant 1978 CFAF (assuming an average annual inflation rate of 8%)
(4) Road construction substantially completed by 6/86. Construction of bridges by local contractors delayed until 6/88.

Table 3

NIGER

FEEDER ROADS PROJECT (CREDIT 886-NIR)

PROJECT COMPLETION REPORT

Rates of Return on Completed Roads

<u>Road</u>	<u>Length</u> (kms)	<u>Cost</u> (M FCFA)	<u>Cost/km</u> (K FCFA)	<u>IRR</u>
Say-Kobadie	61.5	285.5	4,533	24.6%
Kollo-Hamdalaye	103	388.59	4,028	27.1%
Margou-Baleyara	110	634.34	6,537	36.6%
Mirriah-Dogo	30	187.18	6,066	31.1%
Korgom-Matameye	26	134.84	5,342	23.7%
Bonkoukou-Chical	46	260.50	6,936	21.7%
Bande-Wacha-Gouchi	89	404.33	6,013	24.0%
Gazaoua-Tchadaoua	70	245.46	5,065	18.3%
Badeguichiri-Laba	78	231.21	4,234	0.4%
Bagga-Tamaske	45	309.24	8,515	0.5%
Gabi-Maraka	30	155.74	5,425	21.4%
Rate of return on entire program				23.6%

NIGER

FEEDER ROADS PROJECT (CREDIT 886-NIR)

PROJECT COMPLETION REPORT

Economic Evaluation Methodology

Actual construction costs per kilometer, which include taxes, were multiplied by 0.7 to obtain economic costs. All costs were assumed to have been incurred in the year of completion and were adjusted to constant 1986 CFAF using an assumed annual inflation rate of 8%.

Maintenance costs per kilometer were based on cost accounting data from the first (1983-1985) maintenance program carried out on rural roads.

Salvage value was estimated to be 30% of economic construction costs.

User cost savings were calculated as follows:

Passenger transport. It is assumed that light vehicle (private car and van) traffic will grow at 7% per year from the levels measured in 1985-86.

To calculate the costs of passenger transport without the improved road, the number of passengers transported is calculated on the assumption that vans have an average capacity of 20 passengers and an average load factor of 80%, while private cars have an average capacity of 5 and an average load factor of 60%. Thus each van corresponds to 16 passengers and each car to 3 passengers. It is assumed that without the project, the same amount of passenger transport would have been provided by 4-wheel-drive vehicles with a capacity of 17 passengers and an average load factor of 60% or 10 passengers.

The 1986 unit vehicle operating cost for both cars and vans on improved rural roads is about 133 CFAF/vehicle-kilometer. The VOC for a 4-wheel-drive vehicle operated on an unimproved track is 370 CFAF/veh-km.

Freight transport. The number of trucks transporting foodgrains is calculated by subtracting an assumed amount of local consumption (220 kg/person of millet and sorghum and 24 kg/person of cowpeas) from estimated total production in the influence zone of each road. It is assumed that the remainder is transported on the road. Estimated production is based on data

ANNEX

Page 2 of 3

from the sample villages studied for this report, and represents an average of production over the last four years. It is assumed that this commercialized surplus will not change in the future (i.e., that production will grow just enough to meet increasing demand for local consumption).

Millet and sorghum are assumed to be transported by medium (12-ton) trucks with an 80% load factor following the project, while the same amount is assumed to be transported by light (3.5-4 ton) trucks with a 60% load factor in the without-project case. Cowpeas continue to be transported using light trucks, but the load factor is assumed to increase from 60% to 80%.

Actual traffic counts show a number of trucks on the road that substantially exceeds the number that would be needed to transport the assumed agricultural surplus. It is assumed that these trucks are transporting cash crops and consumer goods and that this traffic will grow at 7% per year. It is further assumed that 25% more such trucks would be needed to transport an equal volume of goods in the without-project case, due to lower load factors.

Freight vehicle operating costs are shown below for improved and unimproved rural roads (in CFAF/vehicle-km).

	<u>Improved Roads</u>	<u>Unimproved Roads</u>
Light trucks	263	370
Medium trucks	294	420
Heavy trucks	382	546

Measured 1985-86 traffic levels on the rural roads are shown in the following table.

Annual Average Daily Traffic (AADT)

<u>Road</u>	<u>Cars</u>	<u>Vans</u>	<u>Light Trucks</u>	<u>Medium Trucks</u>	<u>Heavy Trucks</u>	<u>Total</u>
Say-Kobadie	3	11	3	3	2	22
Kollo-Hamdalye	3	13	1	1	-	18
Margou-Baleyara	6	24	2	2	1	35
Mirriah-Dogo	2	22	1	1	-	26
Korgom-Matameye	1	15	1	-	-	17
Bande-Gouchi	2	15	1	-	-	18
Bonkougou-Chical	4	15	1	1	-	21
Gazaoua-Tchadaoua	3	10	2	2	1	18
Badeguichiri-Laba	2	4	1	1	-	8
Bagga-Tamaske	1	7	1	1	-	10
Gabi-Maraka	4	7	4	4	3	22

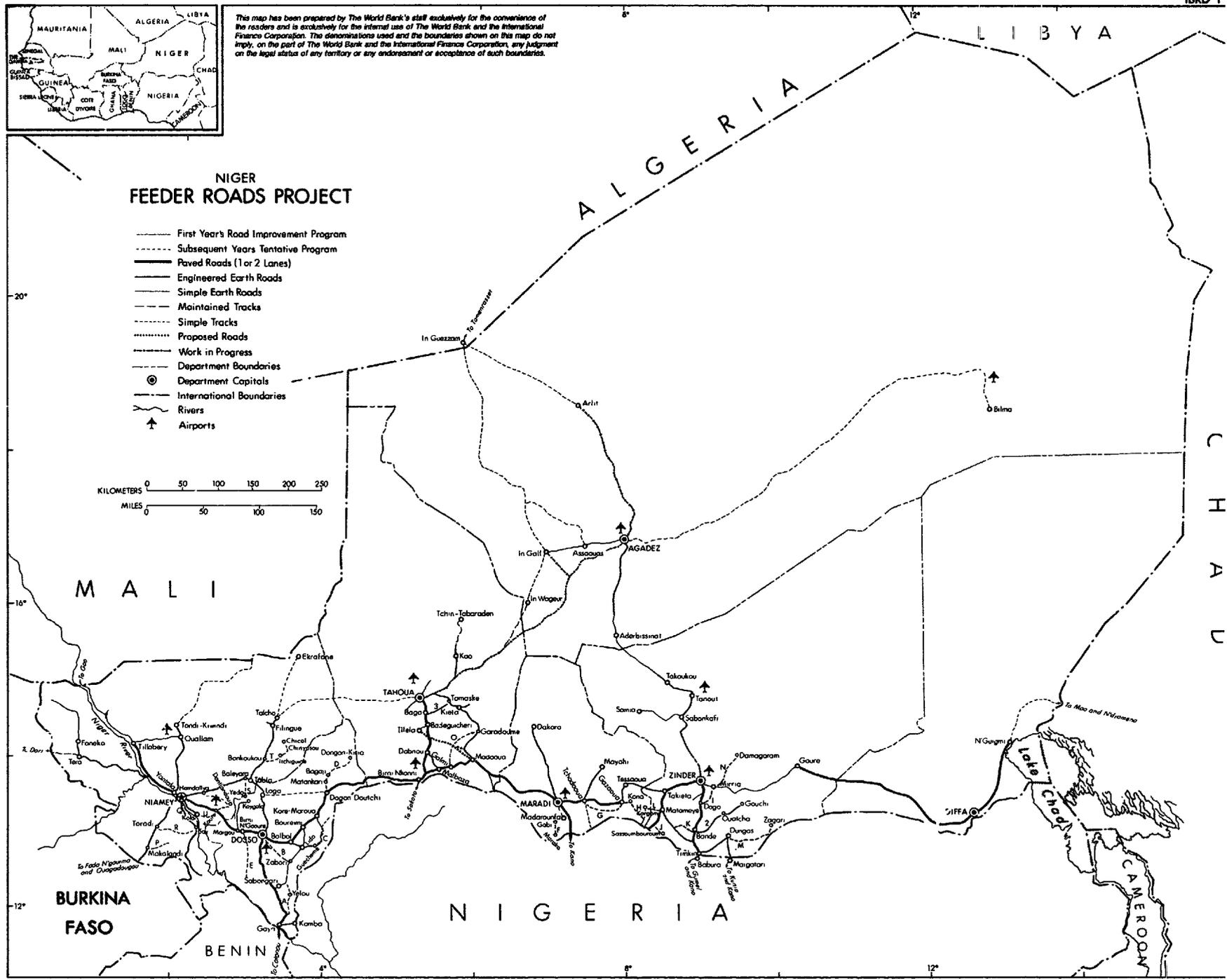
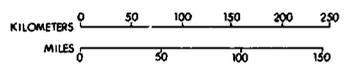
MAP SECTION



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NIGER FEEDER ROADS PROJECT

- First Year's Road Improvement Program
- - - Subsequent Years Tentative Program
- Paved Roads (1 or 2 Lanes)
- Engineered Earth Roads
- Simple Earth Roads
- Maintained Tracks
- Simple Tracks
- Proposed Roads
- Work in Progress
- - - Department Boundaries
- ⊙ Department Capitals
- International Boundaries
- Rivers
- ↑ Airports

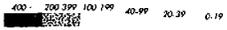


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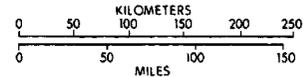
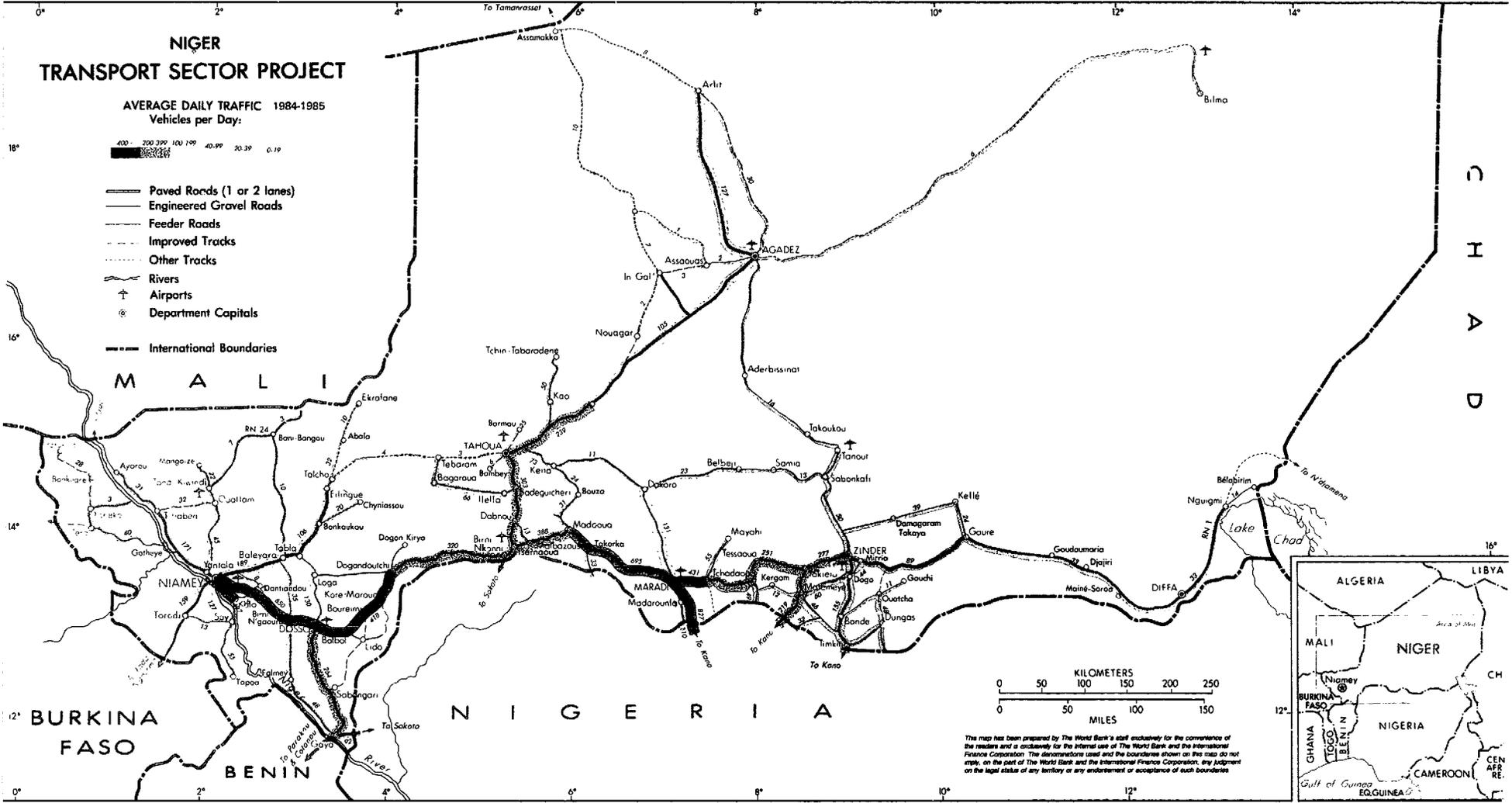
CAMEROON

NIGER TRANSPORT SECTOR PROJECT

AVERAGE DAILY TRAFFIC 1984-1985
Vehicles per Day:



- Paved Roads (1 or 2 lanes)
- Engineered Gravel Roads
- Feeder Roads
- - - Improved Tracks
- ⋯ Other Tracks
- ~ Rivers
- ↑ Airports
- ⊙ Department Capitals
- - - International Boundaries



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