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Rural Roads in Sub-Saharan Africa

Lessons from World Bank Experience

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ABSTRACT

The gravity of rural transport bottlenecks across Sub-Saharan Africa has been underscored by the Bank's Long Term Perspectives Study (LTPS). Recent experience indicates that the potential benefits of structural adjustment operations are reduced because of inadequate rural transport capacity. The effectiveness and sustainability of past programs for rural roads have been hampered by the lack of a coherent policy framework and institutional focus for planning, funding and maintenance.

The report, prepared under the Rural Travel and Transport Project of the Sub-Saharan Africa Transport Program (SSATP), presents findings from a review of 127 projects with rural road components in SSA. The review highlights key policy changes discussed under the main headings of planning, design and technology, resource mobilization, and sectoral organization and institutional performance.

The report stressed the urgent necessity to develop a coherent Rural Road strategy and support for institutional capabilities in each country. Planning is seen as a process involving key constituencies at various levels rather than a methodology. Prevailing financial constraints and low traffic volumes suggest that the majority of SSA rural roads should be designed to provide essential access, emphasizing spot surface improvements better drainage.

Labor-based methods should be systematically promoted for construction, rehabilitation and maintenance of rural roads where conditions are appropriate. Close cooperation with ILO, and transfer of technology among SSA countries will be increasingly needed for further actions. The Bank should prepare clear guidelines to assess labor-based operations paying particular attention to maximizing employment of women on such operations.

Providing financial and institutional capabilities for long term rural road maintenance had proven difficult. The report stresses the need to eventually involve local funding administered by local organizations, with technical advice from central authority. However, competition for resources is fierce at the local level, and investigation is necessary to evolve suitable methods for rural road maintenance, funded and administered by local organizations.

Finally, institutional problems were found to predominate in rural road projects, but improvement has been slow. Although setups should accommodate local conditions, the moist effective institutional arrangement is likely to be through a small-centralized agency which can act as a focus for policies, planning and funding for rural roads. Operations should then be undertaken through local organizations responsible for maintenance.

ACKNOWLEDGMENTS

This paper has been prepared as part of the Rural Travel and Transport Project of the Sub-Saharan Africa Transport Program (SSATP). It combines the results of a separate review of individual Bank projects, and results of the joint SSATP and MADIA studies of rural roads and agricultural performance in Cameroon, Kenya, Malawi, Nigeria, Senegal, and Tanzania. Financial support was provided by the Swiss Development Corporation (SDC), NORAD, Swedish International Development Agency (SIDA), and the World Bank. The report was prepared by John Riverson (Task Manager), Juan Gaviria, and Sydney Thriscutt, consultant, under the direction of Jean Doyen, Chief, Infrastructure Division of the Africa Technical Department (AFTIN). The authors analyzed information from World Bank appraisal and other reports, and information and comments obtained during discussions and meetings with many World Bank staff and members of the International Coordinating Committee (ICC). Special mention is made of Messrs. Paul Peter of SDC, Tore Gjos of NORAD, Per Persson of SIDA, G. Metschies of GTZ, Geoff Edmonds and Sven Hertel of ILO, M. Marumo of ADB, and M. E. Dhliwayo of ECA, members of the ICC who discussed the final results and policy recommendations. The paper also benefited from detailed internal review and comments by B. Chatelin, P. Morris, A. Faiz, S. Carapetis, A. Nickesen, U. Lele, T. Pankaj, B. Mitchell, and H. Walters. S. Halgrimsson and P. Gyamfi provided information on the Abidjan Feeder Roads Unit. Written or verbal comments were received from C. Cook, A. Galenson, H. Beenhakker, J. Peberdy, A. Pellegrini, J. Brown, and R. Burns, Prof. A. Mabogunje of DFRRI, Nigeria, Dr. K. C. Kaira, University of Dar-es-Salaam, Tanzania, J. Karuiru, Roads Department, Ministry of Public Works, and G. Taylor, SDC, Nairobi, Kenya. The authors benefited from final comments made during a seminar attended by managers of Infrastructure and Agriculture divisions chaired by F.S. O'Brien, Chief Economist of the Bank's Africa Region. V. Herron, K. Waters-Reed and M. Verbeeck assisted in final word processing for publication.

FOREWORD

The importance of rural roads and transport in agricultural development has been recognized in the past, and has also been recently underscored by the Bank's Long Term Perspectives Study of Sub-Saharan Africa. Despite Bank's long experience in financing rural road projects, the effectiveness and sustainability of past programs for rural roads have been hampered by the lack of a coherent framework and institutional focus for planning, funding and maintenance. Research and policy analysis are needed to understand the transport needs of rural households and to devise effective ways to develop and promote rural transport services in rural areas.

One of the objectives of the Rural Travel and Transport Project of the Sub-Saharan Africa Transport Program (SSATP) is to develop and disseminate improved policies to plan, finance, build and maintain rural roads. A review conducted under this project has refocused attention on relevant policy issues analyzed from 127 Bank rural road projects in Africa over the past 25 years. The findings of this review were discussed at a Bank's Africa Regional Management Seminar in April 1990.

The findings of the work to date shows that African governments must develop rural roads strategy which are closely tied to other highway, rural and agricultural development strategies. The Bank is assisting some governments in this regard through operational projects in Ghana, Madagascar, Nigeria, Uganda, and Ethiopia. The strategies require on the part of governments, the Bank, and other bilateral donors, long-term commitment, as well as continuity for developing the policy framework and institutional capabilities for rural roads planning, improvement and maintenance. With the prevailing financial constraints, spot surface improvements and improved drainage must be emphasized rather than increased road widths. It is also essential to systematically promote the development of capacity for labor-based methods in each country. This could be done through pilot programs in close cooperation with ILO, making use of horizontal transfer of know-how, with cross-fertilization among SSA countries. Lastly, policy development for rural roads will only be complete after policy actions needed to improve rural transport services are also more clearly defined as part of the ongoing program of studies.

This document is the first of a series by the Infrastructure Division of Africa Technical Department and the SSATP addressing policy issues related to the management, rehabilitation and maintenance of rural road infrastructure in Sub-Saharan Africa. The present findings should provide the basis for follow up work to develop rural road strategies to support the needs of agriculture and other sectors in each country.

Ismael Serageldin
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ABBREVIATIONS

ADP	Agricultural Development Project
ADT	Average Daily Traffic
AGR	Refers to rural road projects appraised by agricultural divisions
CMB	Ghana Cocoa Marketing Board
COMWORKS	Ministry of Communications and Works in Tanzania
DDC	District Development Committee in Kenya
DFR	Department of Feeder Roads in Ghana
DFRRI	Federal Directorate of Food, Roads and Rural Infrastructure in Nigeria
DH	Directorate of Highways (e.g. Cameroon)
DNGR	Direction Générale du Génie Rural
DRIMP	District Road Improvement Program in Malawi
EPD	Economic Planning Department in Malawi
ESAMI	Eastern and Southern African Management Institute
ETCA	Ethiopian Transport Construction Authority
FACU	Federal Agricultural Coordinating Unit
FCFA	Franc CFA
FNCV	Fondo Nacional de Caminos Vecinales in Colombia
GHA	Ghana Highway Authority
HDM	Highway Design Model
ILO	International Labour Office
IMT	Intermediate Means of Transport
IRR	Internal Rate of Return
km2	Square kilometer
LGA	Local government authority in Nigeria
LTPS	Long Term Perspective Study
MADIA	Managing Agricultural Development in Africa - Bank research project
MINPAT	Ministry of Planning and Territory in Cameroon
MLG	Ministry of Local Government in Malawi
MOTC	Ministry of Transport and Communications in Kenya
MRP	Minor Roads Program in Kenya
MSADPs	Multistate ADPs in Nigeria
MWS	Ministry of Works and Supplies in Malawi
ONCPB	Office National Céréalière et des Produits de Base in Cameroon
PCR	Project Completion Report
Period I	1964-1979
Period II	1980-1989
PPAR	Project Performance Audit Report
RARP	Rural Access Road Program in Kenya
RMI	Road Maintenance Initiative of SSATP
RRO	Rural Roads Organization in Ethiopia
RTTP	Rural Travel and Transport Project
SAR	Staff Appraisal Report
SNPR	Togo's National Feeder Roads Service (Service National des Pistes Rurales)
SODECAO	Société de Développement du Cacao
SODECOTON	Société de Developpement du Coton
SODEFITEX	Société pour le Développement des Fibres Textiles
SOTOCO	Société Togolaise du Coton (Cotton Development Agency)
SRDR	Benin Service des Routes de Desserte Rurale
SSA	Sub-Saharan Africa
SSATP	Sub-Saharan Africa Transport Program
TPU	Transport Planning Unit of MWS in Malawi
TRP	Transportation appraised rural road projects
UNDP	United Nations Development Program
Veh-Km	Vehicle-Kilometer
VOC	Vehicle Operating Costs
vpd	Traffic in vehicles per day

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EXECUTIVE SUMMARY

1. The gravity of rural transport bottlenecks across Sub-Saharan Africa has been underscored by the Bank's Long Term Perspective Study (LTPS) which states that "improving rural infrastructure is an essential requirement for the modernization and growth of agriculture. Better market incentives to farmers will be blunted if the physical barriers and economic costs of transporting goods to and from local markets are too high". Recent experience indicates that supply response of structural adjustment operations has been stifled by rural transport deficiencies. The effectiveness and sustainability of past programs for rural roads have been hampered by the lack of a coherent policy framework and institutional focus for planning, funding and maintenance.

2. Sub-Saharan Africa has approximately 700,000 kilometers of rural roads, with half of them in poor condition. Road densities per km^2 are generally much lower than those of Asia or Latin America. Low population densities, low levels of income and weak road planning and maintenance capabilities combine to make Sub-Saharan Africa altogether under-equipped and overburdened in terms of rural road infrastructure. Total needs for rehabilitation of existing roads and for expansion of rural road networks are enormous and have generally not been recognized by planners and policy-makers.

3. During the past 25 years, the Bank has provided about US$ 1.7 billion (in constant US$ of 1988) in loans and credits for 127 projects to construct, rehabilitate or maintain over 160,000 km of rural roads in SSA. The review of these projects as well as the analysis of the experience of the six MADIA countries provides an adequate basis to recommend several new directions for improved policies and operational strategies. These analyses also point out critical areas where further research and policy analysis will be needed; in particular, maintenance, local resource mobilization and rural transport services. The outcome of the study is discussed under the main headings of: planning, design and technology, resource mobilization, and sectoral organization and institutional performance.

Planning

4. The importance of rural roads extends to all aspects of economic and social development of rural communities. As a result, planning for rural roads has been driven by a multiplicity of objectives and institutions with lack of continuity and lack of attention to sustainability, and generally poor use of resources. The first and foremost conclusion regarding planning is the necessity in each country to formulate a coherent Rural Road Strategy including measures to strengthen related capabilities at all levels i.e., national/central, regions, districts and local communities. Country strategies should recognize the need for close coordination with programs and policies concerning main roads, as well as agricultural development.

5. Typical approaches used for planning and evaluation of rural road programs have shown systemic shortcomings. They have not paid sufficient attention to maintenance and have not fostered community involvement. The scarcity and poor quality of data on production and traffic have limited the validity of economic return computations based on savings in vehicle operating costs and producer surplus. Moreover, such approaches have tended to neglect increases in personal travel which have characteristically been one of the most striking impacts of rural road improvements.

6. The experience from several successful rural road programs point out the need to think of rural road planning in terms of a system comprising not only methodology and criteria, but also the process and the procedures through which key constituencies are involved at various levels. This points towards multi-tiered planning and programming systems based on locally acceptable criteria allowing participation of local communities. The method used to assess relative priorities should reflect the determinants of community demand for rural roads; these would normally include: population, area, production, and social, economic and cultural services. It should also include technical information on: terrain, materials, hydrology, etc. Further research is needed to guide the design of planning systems for rural roads.

7. The poor record of SSA countries in rural road maintenance points out the need to establish a consolidated framework for network-based programming and budgeting so that requirements for maintenance and rehabilitation are considered along with construction and improvements. Such fungibility may be politically difficult to accept but it is essential if one considers that earth road improvements have a life span of three to five years. A consolidated framework is further justified by the fact that the tasks and skills involved in maintenance of earth roads are basically the same as those needed for construction.

Design and Technology

8. The scarcity of resources, the low traffic flows and the fact that all-year vehicular access is not always essential, all indicate that conventionally engineered rural roads are in many instances neither necessary nor possible. This points out the need to design and maintain rural roads in relation to specific levels of serviceability defined in terms of access by specific types of vehicles during various seasons. The prime considerations in defining rural road improvements should be reliability and durability rather than width and speed. This would lead to concentrating expenditure on essential access, spot surface improvements in critical sections (poor subsoil, gradients), on surface drainage and essential structures, rather than on geometric characteristics determined by design speeds.

9. Considering the lack of income opportunities in many rural areas and the intractable problems inherent in the deployment and operation of mechanical equipment for small-scattered works, labor-based methods should be considered as the normal choice for rural road works. Conditions inappropriate for labor-based methods may be found in very sparsely populated areas, and also for specific tasks, e.g., long distance earth movements.

10. The development of labor-based capability for road works is a long-term undertaking requiring considerable up-front inputs in technical assistance and training. Successful efforts supported by the ILO have typically been sustained over a period of ten years starting with pilot projects and leading to the development of countrywide programs relying on a critical mass of trained engineers, field supervisors, etc. The future development of labor-based capability would benefit greatly from transfer of expertise between SSA countries. It would be useful in this respect to support the preparation by African experts of guidelines concerning the range of application of labor-based methods and the employment of women in such operations.

11. Problems of supervision, the poor motivation of workers and the inherent lack of flexibility of public sector operations, have proven very difficult to overcome in force account work. Contract operation, although not without problems, is generally a preferred alternative. The weakness of domestic contracting capability is a major obstacle. A long-term rural road program would provide the opportunity to build up the capability of the domestic construction industry. A policy decision to favor the use of

contractors is necessary. Specific measures to facilitate their development and to improve their operation should be part of rural road projects. The experience gained under ongoing rural road projects in Ghana which include training of domestic contractors in the use of labor-based methods should be useful in designing similar programs.

Resource Mobilization

12. Given the severe lack of resources at the local level, rural road development will continue to require central funding, a large portion of which will be provided from external sources. It is clear, however, that the stepped-up mobilization of local resources is an essential element of improved rural road policies. It is the only way to address the problem of maintenance. Review of Bank experience offers no ready-made solution. Approaches in which local constituencies have been involved in all stages of rural road programs have been more successful in mobilizing local resources. In many instances it will be necessary to undertake measures to build up basic organizational and technical capabilities at the local level. Bank experience in Latin American Countries suggests that once basic institutional capabilities have been established at the center and at the local level, matching fund schemes can be effective in encouraging local resource mobilization, and ensuring the implementation of country-wide policies. Further field investigations and policy analysis will be necessary to evolve suitable approaches to mobilize local resources for rural road maintenance.

13. The deployment of technical assistance in support of rural road programs has been a source of difficulties. The low unit cost per km and the scattered nature of the work have contributed to high overheads and lack of effectiveness. Except in the case of ILO-sponsored labor-based programs, training has suffered from the lack of continuity and lack of institutional anchor. The aims, objectives and target outputs for technical assistance need to be clearly specified and agreed. Training should be undertaken in the perspective of capacity building efforts sustained over sufficient length of time varying from eight to ten years. Results of technical assistance and training need to be routinely monitored. Reliance on local engineers and planners should be encouraged.

Sectoral Organization and Institutional Performance

14. Institutional problems are endemic to rural road projects. Improvements have been slow. However, a number of principles have emerged from the projects which have been considered successful:

i) rural road units or departments set up in a main roads agency, with an adequate degree of autonomy and separate funding have proven to be effective in launching and implementing rural road programs of national scope;

ii) participation of agricultural officers and local communities at the planning stage has lead to better sub-project selection and has facilitated subsequent maintenance;

iii) steady commitments and simple and well established planning procedures have encouraged participation and resource mobilization at the local level.

Overall, the most effective institutional arrangement is likely to involve a small centralized agency acting as a focal point for policies, overall planning and funding and overseeing regional community organizations responsible for local planning and operations. The latter should be able to raise their own funds, but would receive technical advice and matching funds from the central agency.

Transport Services

15. Improvements in transport infrastructure serving rural areas have not necessarily been followed by increased availability and efficiency of transport services for goods, as well as people. Chronic shortages of fuel resulting from inadequate pricing and marketing policies have affected rural areas most severely. Deficiencies in transport services are often the outcome of inadequate policies concerning pricing and marketing of fuel, tariffs regulation, and parastatal control. More attention should be given to policies affecting the availability and cost of transport services at the local level. These should also deal with intermediate means of transport (i.e., intermediate between headloading and motorized transport) which are generally underdeveloped.

16. Programs to improve the productivity of farmers in SSA have, by and large, not focused on transport activities which account for a sizeable part of the work involved in agricultural production and household upkeep. The introduction of productivity improvements related to on-farm transport and movements could be considered under Benor-type T&V extension programs. Such improvements would rely primarily on the initiative of the farmers either individually or organized in groups; however, they would have to be spurred by advice, demonstration, technical assistance and possibly credit. Improvements would have to be sought through changes in transport technology, especially alternatives to headloading (wheelbarrow, bicycle, animal draft, power tillers, etc), improvement in off-road infrastructure and changes in post-harvest practices (processing and storage).

Country Level Action Plans

17. In most countries, an action plan will be needed to introduce the policies outlined above; the key elements of such plans would include:

- preparation of country strategies for rural roads closely coordinated with main road policies and programs, and with agricultural development strategies;
- development of labor-based contracting capabilities; and
- review of policies affecting motorized transport services in rural areas and promotion of intermediate means of transport.

Operational Approach for the World Bank

18. The Bank support for rural roads will continue to be channeled through transport projects as well as agricultural projects. A major objective should be to foster the development of an agreed policy framework and associated institutional capability for rural road planning, construction and maintenance. It is proposed that one infrastructure operation in each country (either a rural road or rural infrastructure project or a broader highway or transport project), be designated as the vehicle to support the development of rural road policy and institutional capabilities with the objective of providing a coordinated framework for rural road components undertaken under other agricultural projects.

19. A second objective would be to promote the development of capability for labor-based methods, in close cooperation with ILO and interested donors, recognizing the value of horizontal transfer of know-how among SSA countries.

20. The Bank should also seek to support pilot programs to test the application of the T&V approach to the introduction of intermediate means of transport for on-farm transport with particular attention to the needs of women.

21. The development of country level rural road strategies is a resource intensive undertaking and will require direct involvement of Bank staff and frequent interaction at the country level. The good experience of the West Africa Feeder Roads Unit in Abidjan suggests that it would be useful for the Bank to review the possibility of supporting the development of country level rural road strategies and programs through the field deployment of staff, either in specific countries or in regional units covering groups of countries.

Further Studies, Research and Dissemination

22. The Rural Travel and Transport Component of SSATP provides a framework to pursue further study and research. The following is planned over the next eighteen months:

- operational analysis and case studies to provide guidance concerning (i) planning systems for rural roads; and (ii) policies and institutional approaches concerning community participation, labor-based capability, and maintenance funding systems;

- field research and comparative analysis concerning the transport requirements of farming households and lessons from experience concerning the adoption of technological innovations for on-farm transport.

23. The present study and the outcome of the research outlined above will be used in the preparation of strategy statements for the Second Transport Decade (UNTACDA II). A series of policy seminars in collaboration with EDI and ESAMI are planned during the first and second halves of 1992 to review and disseminate the outcome of the SSATP work concerning rural roads and transport services.

INTRODUCTION

1.01 At a time when the Bank's own focus in the agricultural sector stresses agricultural policies and adjustment, the gravity of rural transport bottlenecks across Sub-Saharan Africa (SSA) has been underscored by the recently published Long Term Perspective Study (LTPS). 2/ Reflecting on Bank experience, the report states that "improving rural infrastructure is an essential requirement for the modernization and growth of agriculture. Better market incentives to farmers will be blunted if the physical barriers and economic costs of transporting goods to and from local markets are too high". Deficient rural transport capacity has stifled the strong initial supply response elicited from farmers by adjustment programs. For example, it is reported that half the cotton harvest in three regions of Tanzania, and 80 percent of the rice paddy in another region, were lost in 1988 due to inadequate rural transport. In the same year, over half of all seeds, fertilizer and herbicides were lost in another region for the same reason. 3/

1.02 The importance of rural roads 4/ extends to all aspects of development of rural communities including demand for and access to health, education, information, etc. Recent comparisons concerning the six countries of the MADIA study suggests that SSA is grossly under-equipped compared with other developing regions. In a study of MADIA countries, Mellor suggested that the present rural road network of SSA needs to be increased up to tenfold if the full agricultural potential of the region is to be realized. Low population densities and low income per capita, however, put Sub-Saharan Africa at a natural disadvantage where investment in road infrastructure is concerned. Financial constraints and limited capacity for planning and maintenance suggest that in most countries what could be realistically envisaged in the medium-term is a program of rehabilitation and maintenance, with gradual expansion of road density where required. It is estimated that a total of US$5.2 billion will be required overall to restore and maintain the rural road network over the next ten years. Albeit modest compared to needs, such a level of expenditure would represent a six fold increase vis-a-vis current level of rural road expenditures. Total SSA road needs are enormous and will have to be addressed with limited resources calling for better policies.

1.03 Despite the long standing involvement of the World Bank in rural roads in SSA, no clear policy framework for rural roads has emerged as a consistent guide to governments, Bank staff and other donors. Sustainability problems related to planning, funding and most importantly maintenance still remain to be addressed. Significant work was done by the World Bank in the rural transport field described in a series of Staff Working Papers by Beenhakker, Carapetis, Carnemark, Cook and others. 5/

2/ The World Bank, 1989, "Sub-Saharan Africa, From Crisis to Sustainable Growth".

3/ See Gaviria, J., 1990, "A Regional Analysis of Institutional and Financial Constraints to Rural Transport: The Case of Tanzania", SSATP/MADIA Discussion Paper.

4 Rural roads in this paper are public roads functionally classified below Primary, Trunk or Secondary roads in most countries. They include roads often described as rural access, feeder, agricultural, irrigation forestry or unclassified roads. They may include Tertiary roads if these are functionally grouped as Rural Roads as here defined.

5/ C. Carnemark, J. Biderman, D. Bovet, 1976, "The Economic Analysis of Rural Road Projects." World Bank Staff Working Paper No. 241.

In addition, the International Labor Organization (ILO) has produced a series of reports on rural road operations, mainly concerned with labor intensive work. Finally, "Rural Transport Services" by Beenhakker, Carapetis, Crowther and Hertel (I.T. Publications, 1987) provides a complete and practical guide to planning and implementation. All the above work provide good basis for supporting rural road and transport policies. However, in an effort to foster a common policy, the present review has been carried out to assess experience in rural road lending, and to identify the lessons and policy implications for SSA governments, the Bank and other donors. It is based on: (i) an assessment of the Bank experience in rural road lending in SSA with a view to draw lessons concerning policies; and (ii) reviews of rural roads and transport and their linkages with agriculture in six MADIA countries (Cameroon, Kenya, Malawi, Nigeria, Senegal and Tanzania). The intention is to identify key issues, suggest rural transport policy changes, and to establish the need for research or specific case studies.

1.04 Improvement of infrastructure has not necessarily lead to improvements in cost, availability and quality of transport services. This is evident along roads in many SSA countries, where most rural traffic consists of pedestrians or head loaders. The conditions for the provision of transport services and related policies have not been systematically reviewed although some of the earlier Bank works have discussed the topic. It is clear that the reliance on parastatal truck fleets for crop transport has stifled the development of private transporters. This and other restrictive government policies have exacerbated the situation, because of a combination of scarce foreign exchange, lack of spare parts, and low vehicle importation, all of which affect transport capacity. Likewise, in many countries, inadequate policies concerning pricing and marketing of fuel contributes to chronic shortages which have drastically curtailed the availability of motorized transport services in rural areas. In general, the condition for the development of transport services would have to receive more attention. This would include, in particular, intermediate means of transport (IMT), i.e., intermediate between walking/headloading and cars, pick-ups and trucks. In this regard, Bank projects in Malawi, Guinea-Bissau, Cameroon and Ethiopia either will study, or introduce pilot components for, rural transport and mobility needs. In northern Ghana, prototype designs for bicycle trailers and handcarts were developed and have now been taken up for manufacture, sale and further development by a local factory.

1.05 Another question which is starting to receive attention relates to the need to provide improvements to off-road transport (rural infrastructure and IMT) which are equally essential for improving the accessibility and personal mobility of rural people. A recent review of the role of off-road transport carried under SSATP 6/ has lead to the following specific hypotheses, that:

- lack of off-road transport seriously reduces the timeliness and amount of agricultural goods delivered to motor roads, and constrains rural economic growth and social development; thus,

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Washington, D.C.: World Bank.

H.L. Beenhakker and A.M. Lago, 1983, "Economic Appraisal of Rural Roads: Simplified Operational Procedures for Screening and Appraisal." World Bank Staff Working Paper No 610. Washington, D.C. World Bank.

S. Carapetis, H.L. Beenhakker, J.D.F. Howe, 1984, "The Supply and Quality of Rural Transport Services in Developing Countries." World Bank Staff Working Paper No 654. Washington, D.C.: World Bank.

C. Cook, H.L. Beenhakker, R. Hartwig, 1985, "Institutional Considerations in Rural Road Projects." World Bank Staff Working Paper No 748. Washington, D.C.: World Bank.

6/ Riverson, J. and S. Carapetis, 1990, "Potential Role of Intermediate Means of Transport in Rural Travel and Transport in Sub-Saharan Africa", AFTIN Working Paper, World Bank, Washington, D.C.

raising the capability of off-road transport could result in much higher returns to rural roads investments;

- significant productivity gains can be achieved through very low cost investments in improving off-road transport (i.e., rural infrastructure and IMT) which are likely to impact the lives of rural women;

- role of the government in these transport improvements through introduction of IMTs would be largely facilitative and promotional.

Such promotional activities could effectively apply the Training and Visit approach used in agricultural extension. The above reviews have pointed out the need for a better understanding of the nature of rural travel and transport and its impact on rural development which is being addressed under SSATP. The rest of the review presented in this paper, however, focuses on the experiences with rural road projects in SSA.

1.06 After a description of the rural road network in SSA and an outline of the results of the project review, this paper points out experience and the lessons to be learned from Bank experience under the main headings of planning, design and technology, resource mobilization and institutions. Given the short life span of rural roads, the lack of maintenance is the central problem affecting the sustainability of past investments and the pace of future development. Earth roads only last a few years. Except for structures, the activities and skills involved in maintenance of earth road is the same as those involved in improvement and rehabilitation. The position taken in the present paper is that maintenance of rural road in SSA has to be integrated at all stages of planning, resource mobilization, and selection of technology. Therefore, maintenance is not treated separately but rather as an integral part of every issue analyzed. The paper outlines the emerging policy options for governments and reviews the implications for the Bank operational approach. Finally it suggests areas for further research and study.

II. RURAL ROADS IN SUB-SAHARAN AFRICA

2.01 There are approximately 700,000 kilometers of rural roads out of a total of over 1.02 million kilometers of road in SSA (Table 2.1), with concentrations in a few countries. Three countries (Nigeria, Cameroon and Côte d'Ivoire) have more than half the rural roads in West Africa, while Zaire, Zimbabwe, Madagascar and Tanzania account for more than two thirds of East African rural roads. The density of rural roads is low compared with other parts of the world. Nigeria has about 90 meters of rural road per square kilometer, but an acceptable 'target' density, based on Indian experience in areas with similar population densities to those in Nigeria, would be about 730 meters. Density also varies widely within countries. In Kenya, highly populated provinces with abundant natural resources have 400 to 500 meters per square kilometer, falling to less than 30 meters in non productive areas. Sparse populations and low agricultural productivity mean that the burden of providing and maintaining an adequate rural road network falls more heavily on SSA populations than it does, for example, on the heavily populated and productive countries of Southeast Asia. Whereas road lengths per head of population are high, they are still low per unit of area.

Table 2.1. Kilometers of Roads by Type and Region

Region	**All Roads**	**Rural Roads**	**Density** (m/km2)
Western Africa	430,937	286,425	32
Eastern and Southern Africa	589,943	398,972	36
Total	1,020,880	685,397	34

Source: Various Bank Appraisal Reports and Country Data

2.02 The funding needs to rehabilitate rural roads in SSA are enormous, and a range of estimates has been made. The highest estimate (see paragraph 1.02) calls for US$2.5 billion per year for a ten-fold increase in the rural road network. On the other hand, a 1988 Bank study 7/ estimated that US$350 million per year are required considering that half of the rural road network in SSA (350,000 km) requires substantial rehabilitation. 8/ In addition to the latter, annual outlays of US$400 million for maintenance and US$20 million for institutional building would be needed to keep up the present

7/ Harral, C., 1988, "Road Deterioration in Developing Countries" World Bank Policy Study, Washington, D.C..

8/ Completed Bank projects have so far constructed or rehabilitated some 89,000 km and enhanced maintenance over a further 75,000 km of the network (Table 3.1).

network. The total annual requirements of US$770 million would amount to about 0.5 per cent of the region's GNP. 9/ For agricultural production to rise, the rural road network would need to be extended commensurate at least with the expected rate of growth of marketed agriculture and use of modern inputs. 10/ The need for network expansion can therefore be estimated on an average annual growth of 3 percent, for a total annual outlay of about US$920 million a year or 0.6 percent of regional GNP.

2.03 The need for a better rural transport infrastructure in SSA is pressing and obvious. The structural transformation from subsistence to market economy is dependent on transport. The potential gains in agricultural outputs and incomes, which is unlikely to occur without improved roads, would be sufficient to make the economic case for the level of expenditure mentioned above. In practically all countries, a rapid expansion of rural road networks would not be feasible unless adequate financial and institutional arrangements for planning construction and maintenance can be put in place.

2.04 The sparse densities and the low level of income in rural areas imply a heavier burden per capita. The all around weakness of rural infrastructure management capabilities severely constrains resource mobilization and maintenance. Hence, while Africa is underequipped in relation to its potential it is overburdened by the little infrastructure that it possesses.

9/ This amounts to one-fifth of the 2.5 percent of GNP reported to be required by the overall road sector ("Road Deterioration in SSA", paper presented at SSATP Road Maintenance Policy Seminars, 1989). The region's GNP is reported as US$149 billion in 1987 (World Bank, 1989, "World Development Report").

10/ Further expansion of the network will be justified given the need to increase the marketed surplus as a share of the total agricultural growth, to support fast growing urban populations.

III. REVIEW OF BANK EXPERIENCE

3.01 The present review has taken into consideration 127 rural road projects carried out since 1964 (Annex 1). 11/ Summaries of each project were made from SARs, PCRs, PPARs and supervision reports. These summaries include basic project information, data on road selection methodology, responsibility for road design, supervision, construction and maintenance, whether labor or equipment based methods were used, and a subjective rating on how adequately technical assistance, maintenance funding and maintenance institutions were handled in the project. 12/

3.02 For comparison, projects were divided between two periods:

Period I : 1964 through 1979 (79 projects)
Period II: 1980 through 1989 (43 projects)

Table 3.1. Rural Road Project Targets and Costs in Sub-Saharan Africa

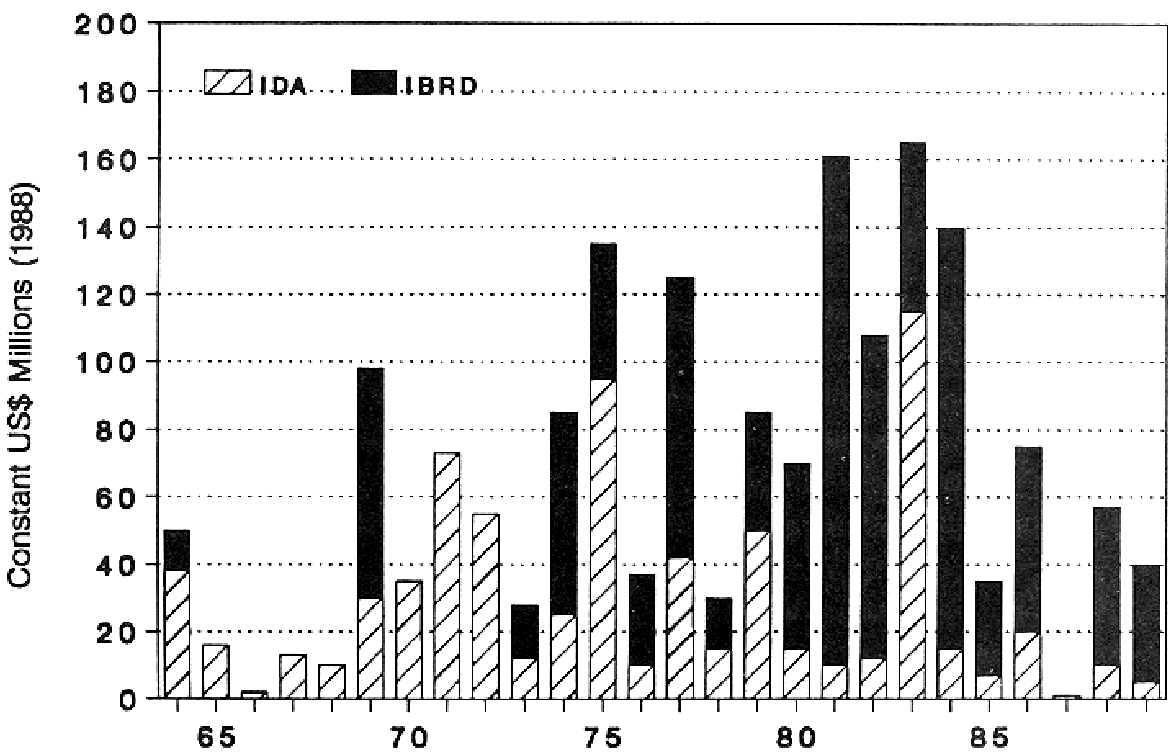
(Actual)	No. of Projects	Ln/Cr. Amount	Project Cost	Rural Road Component	Constructed or Rehabilitate Targets (Actual)	Maintained Targets
		(million of dollars in 1988 prices)			(Kilometers of Roads)	
Period I (1964-79)						
Transportation Divisions	40	1,558.4	3,942.7	611.3	30,115 (73.4%)	27,319 (41.7%)
Other	39	1,301.7	2,124.8	276.0	19,884 (92.5%)	1,659 (46.3%)
Period II (1979-89)						
Transportation Divisions	15	703.2	1,715.4	247.5	15,057 (88.6%)	15,983 (53.1%)
Other	28	1,704.6	4,097.0	615.8	24,055 (62.0%)	30,210 (n.a.)
Both Periods						
Transport. Divisions	55	2,261.6	5,658.1	858.8	45,172 (77.0%)	43,302 (42.6%)
Other	67	3,006.3	6,221.8	891.8	49,939 (81.6%)	31,689 (46.3%)
TOTAL	122	5,267.9	11,879.9	1,750.6	89,111 (79.2%)	75,171 (42.7%)

Note: Achievements include completed projects only

The division corresponds approximately to the time when an emphasis on structural adjustment was introduced. A summary of projects reviewed is shown in Table 3.1, with details in Annex 2. Five projects which had not been approved by the Bank at the time of the review are not included in these tables, but their features are reviewed since they represent emerging trends in the Bank's approach. Costs were taken from PCRs or PPARs where possible, but otherwise, SAR estimates were used. Road lengths achievement in Table 3.1 were calculated with data from the 66 completed projects reported in the PCRs and PPARs (Annex 1).

3.03 The 127 projects reviewed comprised at appraisal 164,000 km of rural road to be constructed, rehabilitated or maintained. The total rural road components amounted to US$1,750 million (1988 costs), 13/ US$990 million in IBRD loans and US$760 million in IDA credits. Peak lending occurred in the early 1980's, largely as a result of Nigeria's agricultural development projects (Figure 3.1). Projects took place in 28 countries, with two thirds in Western Africa, and four countries (Nigeria, Ethiopia, Kenya and Côte d'Ivoire) accounted for 64% of the total cost, Nigeria taking 35%. 24 countries shared the remainder. Cumulative total for each country are in Annex 3.

Figure 3.1: World Bank Rural Roads Lending in SSA
IBRD and IDA



13/ The 1988 costs were determined using the GNP deflator from UNDP/World Bank, "African Economic and Financial Data", Washington, D.C.: 1989.

3.04 Achievement, measured as actual over target road lengths, was greater for construction and rehabilitation (79 per cent) than for road maintenance (43 per cent). Despite the emphasis on maintenance in on-going projects, recent supervision reports indicate that maintenance targets are often still substantially below expectations (Annex 4).

3.05 The review identified major problems in four main areas as follows:

1. Poor planning at appraisal or during execution;
2. Inappropriate design standards or technology;
3. Difficulties with mobilization of financial and other resources; and
4. Deficient institutional and managerial arrangements.

Details of the frequency of these problems are shown in Table 3.2. Some projects suffered significantly from more than one type of problem. Overall, the incidence of major problems in projects was lower after 1980, which indicates that later projects benefited from the experience gained. There are also cases where similar problems show up in a series of projects in one country or region, indicating either insufficient consideration of past experience in planning new projects or intractable problems requiring a radical reappraisal of project suitability.

Table 3.2. Identification of Major Implementation Problems

Percentage of Projects Affected Significantly

	1964-1979		**1980-1989**		**1964-1989**		
Type of Problem	**(i)**	**(ii)**	**(i)**	**(ii)**	**(i)**	**(ii)**	**Total**
Inadequate Planning	26	27	0	7	15	22	26
Resource Constraints	50	24	11	7	33	20	27
Institutional	47	34	36	20	42	30	37
Technical	26	10	7	0	18	7	13
Other Minor	8	15	36	33	20	20	20
None Identified	3	5	18	13	9	7	8
No. of Projects	39	40	28	15	67	55	122

(i) Rural road components of Agricultural and Rural Development Projects
(ii) Rural road components of Road/Transportation Projects

Note: Some projects were significantly affected by more than one type of problem.

Source: Various Bank Appraisal Reports and Country Data

3.06 Institutional problems were by far the most common, affecting 35 per cent of projects. Only one third were rated in the review as having an acceptable level of institutional preparation and performance. Poor planning and resource constraints each affected about a quarter of projects, while technical problems occurred in about one project in eight. Bank work in rural roads has lacked a firm policy foundation and a long-term institutional perspective. Most projects have been done as add-on to highway projects or integrated agricultural operations except for the series of self-standing projects prepared by the feeder roads unit established within the Resident Mission in West Africa in Abidjan over the period of 1978-82. Trend of recent projects is to recognize the importance of the policy framework and institutional issues. In most countries, however, the policy framework and institutional arrangements needed to support expanded efforts to build and maintain rural roads has yet to be developed. The emerging lessons of positive experience in selected countries, Kenya, Malawi, Côte d'Ivoire, Ghana will be helpful in this task.

IV. PLANNING

4.01 With few exceptions, planning in rural road projects has been confined largely to the process of evaluating costs and benefits of individual routes or groups of routes as a means of putting together a program of work. Few countries have recognized that rural road planning needs to establish a coordinated approach for rational resource allocations at the national, sectoral and regional levels. Rural road investment have generally not received the correct emphasis in overall planning efforts.

4.02 Allocation of resources to rural roads has usually been subject to ad hoc decisions with lack of continuity and fragmentation through separate projects. At the national level, decisions are - and are likely to remain -governed by political and macro-economic considerations. At the sectoral level, there is at present no simple analytical means to decide what proportion of roads expenditure should go to rural roads. This proportion has generally been low in the past, between seven and 31 per cent in a sample of six MADIA countries (Table 4.1). Depending on the policy framework and institutional capacity in place, overall funding for rural road from various sources should reach 20 to 30 percent of total road expenditures.

Table 4.1 Rural Road Characteristics in MADIA Countries

	Lengths % of Total	Veh-Kms % of Total	Expenditures as percent of total for roads		Expenditures as percent of total national budget	
			Main	Rural	Main	Rural
Malawi	53	NA	85	15	5.0	1.0
Kenya	52	13	69	31	3.4	2.4
Tanzania	32	NA	88	12	5.0	1.0
Nigeria	58	12	78	22	3.2	1.0
Cameroon	35	10	90	10	8.7	0.9
Senegal	39	10	93	7	2.9	0.4

Source: Gaviria, J., 1990, "Linkages Between Agricultural Performance and Rural Transport in Africa", World Bank.

4.03 There are no firm guidelines presently available for splitting expenditures between new construction, rehabilitation and maintenance for rural roads cannot, as yet, be analyzed as it can for main roads. A recent review of main roads in SSA, 14/ concluded that in a stable main road network, 65 per cent of expenditure should be for maintenance, 15 per cent for rehabilitation, and no more than 20 per

14/ "Road Deterioration in Sub-Saharan Africa": Paper presented at World Bank Road Maintenance Policy Seminars in Africa, 1989.

cent for new construction and improvement. Planning and funding for maintenance has generally been neglected or handled separately from construction. A consolidated planning and budgeting framework is called for, given the short life span of rural roads (i.e., 3 to 5 years) and the fact that tasks and skills involved in maintenance of earth roads are basically the same as those needed for their construction and rehabilitation.

4.04 Most projects reviewed specify a means of route evaluation and selection, using either vehicle operating cost savings, producer surplus or both (Table 4.2). However, a high of 40 per cent did not specify any particular method. It must be said that in practice, the validity of rural route selection using economic parameters is open to question. Using vehicle operating costs where the majority of traffic is non-motorized and where low-volume traffic estimates are inaccurate is obviously problematic. Similarly, producer surplus methods relying on the same supply response coefficients for different regions, and on spotty production data, will give uncertain results. In addition, prospects for rural road maintenance have not been correctly assessed, so that assumptions on useful road life have been too optimistic, and the full benefit stream has not developed as predicted.

Table 4.2 Road Selection and Evaluation Criteria

	Pre-1980		**1980-1989**		**TOTAL**	
	AGR	**TRP**	**AGR**	**TRP**	**AGR**	**TRP**
Producer Surplus (PS)	9	6	8	2	17	8
VOC Savings	1	10	1	6(1)	2	16
VOC + PS	5	2(1)	3	2	8	
Other Criteria	11	4	3	1	14	5
Not Specified	18	15	14	4	32	19

(1) represent projects not yet approved by the Board (as of 11/15/89)

Note: Combinations of the above criteria were applied in some projects.

Source: Various Bank Appraisal Reports and Country Data

4.05 Planning has focused on route selection and subsequent determination of appropriate level of improvement largely based on geometric design standards, rather than optimization of given resources over the network. This has fostered in overdesign and undue emphasis on investment. Concentration on the derivation of economic rates of return has centralized the planning process, thus limiting the participation of local interests in project design. Economic returns should be used principally to validate results based on multiple criteria (economic, social, etc.) with local community involvement. The process should ensure a balance between major improvement, rehabilitation and maintenance.

4.06 The exceptions noted in the paragraph 4.01 refer to cases where planning has been more than a simple route selection exercise, and include some of the most successful rural road projects. For example, the Malawi District Road Improvement and Maintenance Program (DRIMP), had clear priorities and allocation formulae developed for the whole roads sub-sector, including rural roads. Work programs for trunk roads were prepared using an HDM-type model based on road deterioration and vehicle operating costs. For rural roads, priorities were assessed using economic criteria plus social factors and engineering judgement. Although not rigorous, the system does produce a practical means of planning within the roads sub-sector. It would be desirable to develop similar methods elsewhere in SSA as an aid to sectoral planning.

4.07 The planning processes introduced in Kenya RARP (Box 4.1) and Malawi DRIMP used a combination of economic and social criteria. They succeeded because they were clearly defined and understood at project preparation stage, they were broadly accepted by the Government, and they used existing District level planning capacity, working in Kenya through District Development Committees. The Bank's involvement in the early stages of RARP and now in DRIMP has indicated that the development of local planning capacity takes place over a succession of projects, and not within the three to five years period of a single project.

Trends and Lessons to be Learned in Planning

4.08 Sectoral and regional planning is bound to be very much influenced by national planning, and hence will be at least partly political. Planners at all levels need to have firm policy guidelines within which to work, and to get these, an agreed rural road strategy is required in each country. The involvement of donors in this development will vary according to in-country abilities. The most successful operations have been where there exists a competent central authority to act as a focus, coupled with maximum local participation from the outset (Kenya RARP, Malawi DRIMP, Colombia, Thailand and some Indian States). Developing logical rural road strategies to guide sectoral and regional planning should be a principal aim of donor operations in rural roads in SSA.

4.09 To help in arriving at suitable rural road planning systems, there are merits in a simple, but formal, methodology to assess priorities between regions and within the sector. Inputs are likely to include a range of agricultural, engineering, demographic, educational and social parameters. The main problems are to operate within the limitations of easily available and reliable data, and to assign weights to the different parameters. Two recent projects (Nigeria and Cameroon) propose using road densities and population densities as means to evolve rural road planning systems, but the process is still in its early stages. Methodologies used in Bank projects for route selection could be substantially improved by: (i) including population densities in the process; (ii) introducing target road densities as additional criterion; and (iii) improving traffic demand assessment under low flow conditions. These possibilities are discussed in detail in Annex 5.

4.10 Current projects emphasize maintenance through the adoption of consolidated processes for planning and programming of maintenance, as well as improvement and rehabilitation. The more advanced road authorities use intervention criteria based on road condition, maintenance costs, traffic data and budget levels to set maintenance programs. Few SSA countries now have an adequate institutional arrangement to facilitate the collection, analysis and subsequent use of such data for maintenance planning of their rural roads. Some countries (e.g., Senegal) collect simple and reliable data, such as per kilometer costs and maintenance periodicity under prevailing conditions, to assist rural road maintenance planning.

4.11 The review of experience shows the advantages of a well-established country strategy for rural roads. In most countries, the development of such a strategy is a high priority, and would lead to consistent sectoral and regional rural road planning. Methods of route evaluation and selection need to be discussed and agreed at all levels so as to assess availability and reliability of data. Under current conditions, it is very likely that procedures will consist of a mix of economic, technical and social factors, and more information is needed to assess which factors to include and the weight to be given to each. While the methodology should be well established, it is more important to put in place the procedures and processes for rural road planning, following agreed policies.

4.12 The Bank's present portfolio includes the development of rural road planning strategies in two countries. First, Nigeria's overall roads strategy considers some of the institutional aspects related to rural road planning. Second, Ghana is preparing with Bank assistance, a rural road strategy as part of the proposed National Feeder Roads Program. It includes a district priority system to guide future road planning in coordination with recently developed agricultural strategies, and road selection will be done by local representatives. The experience with the development of sectoral and regional planning in the Rural Access Road Program in Kenya (RARP,) in DRIMP, and elsewhere in Colombia and Thailand's ARD program, have been positive in guiding investments and securing the prospects for sustainability of rural road programs. Without a clear strategy feeder road programs may lead to higher investments in areas of relatively low agricultural potential or low population densities. 15/

15/ Nigeria's ADPs concentrated investment in the Northern States, which are not those with the highest potential. In Cameroon, most investment has been in areas of high value crops, where government has been most active and parastatals are strong. In Senegal, major investment took place in cash crop areas which government saw as high priority.

Box 4.1. Planning for the RARP in Kenya

The relatively successful planning of Kenya's Rural Access Road Program offers important lessons. The road selection process before 1980 was started by each District Development Committee (DDC) which selected between 150 and 200 kilometers of roads for improvement, following a set of criteria set by the Rural Roads Branch of the Ministry. The preliminary selection was given to the Ministry of Transport and Communications (MOTC) in Nairobi where an internal rate of return (IRR) was calculated for the road package submitted by each district. If approved, the package and plans were then submitted to the funding agencies and the construction units. Three main problems affected the outcome of the selection process: (1) lack of reliable agricultural production data which led to fabrication of data and consequently to overestimation of supply response, (2) livestock production changes were unaccounted for, and (3) IRR analysis in Nairobi was made for each group of roads as a whole and included roads which otherwise would not have been justified in economic and rural access terms (note that this type of analysis with groups of roads is different from the regional prioritization advocated at the regional planning level). However, the inclusion of the DDC as a planning body has had an important spin-off creating planning capacity at the district level. After 1980 the RARP in Kenya reformulated the road selection process based on an analysis of the evaluation data which suggested that the main determinants of feasibility were the size of the impact area and the population served. The selection process was to be performed by a district field engineer from MOTC, with help from the District Development and Agricultural Officers. In this way it was guaranteed that the selection process would include adequate knowledge of local conditions. The changes introduced demonstrated that flexibility in the program added to its strength.

The criteria used for the successful Rural Access Road program in Kenya included: road length (e.g. 5-10 kilometers), present state (e.g. non-motorable), type and state of connecting roads, degree of connection to markets and social services, density of population and small farmer holdings, degree to which cultivated area could be expanded in road impact area, number of related development programs in the impact area, availability of appropriately priced labor for road construction, degree to which development constraints would hinder road impacts, cost of road and technical feasibility The revised road selection process de-emphasized the production oriented approach and expanded the criteria to include social and political variables. Such changes were not widely supported, even though the "Government, with the tacit support from some of the donors, successfully resisted pressures from the Bank and some other donors to conduct a (purely) economic evaluation of each road". (PCR)

V. DESIGN AND TECHNOLOGY

5.01 The review shows that about one project in eight was affected by technical problems (Table 5.1), with transportation appraised projects very significantly less affected than others. Although technical problems have reduced over time, several aspects of this type of problem are still very relevant.

Geometric Standards

5.02 Design standards have varied widely between projects (Annex 6). In general, design has been via set geometric standards based on design speed and safety considerations rather than in relation to specific serviceability requirements defined in terms of access by types of vehicle and seasons. Roads have been planned with a seven meter wide carriageway plus shoulders, for traffic of 20 to 30 vpd. 16/ Unnecessarily high standards affect both cost and program output over time. The Feeder Road and Highway Maintenance project in Côte d'Ivoire, for example, constructed roads well above appraisal recommendations, with the result that the length of road constructed fell far short of plans. When projects are defined as a list of specific road sections there is the tendency for both geometric and wearing course standards to creep upward (Box 5.1).

Box 5.1. Change of Road Standards during Project Life in Nigeria

The early enclave ADP projects in Nigeria proposed uniform minimum construction standards whereby the roads would be unsurfaced, and provide a right of way of 12 meters, and a carriageway of 5 meters. However, the PPAR states that only surfaced roads (with 100 to 150 mm of laterite) were built eventually with the argument that "the roads will generate much traffic and the vehicles using them were heavier that expected." The other specifications adopted followed closely the SAR.

The carriageway of some of the roads constructed in the MSADP varied between 7 and 10 meters against a suggested width of 4.5 meters. This difference lead to a substantial increase in rehabilitation and maintenance costs.

5.03 In the case of the Kenya RARP, the problem was that although the standard for rural roads was not unduly high, the quality was higher than that of the rural and secondary classified system. With deterioration of the classified system, a standards gap appeared between the main road system and the rural access roads, resulting in a change of emphasis away from rural access roads and towards the classified minor road network.

5.04 Recent projects have adopted standards related to specific serviceability requirements and more importantly have supported time slice of programs defined through agreed planning and programming

16/ See PPAR on the World Bank's Cameroon Feeder Road Project, 1989, para 3.12.

procedures. In Malawi's DRIMP program, there has been more concentration on culverts and better drainage, which reduces later road maintenance problems. 17/ Recent projects in Botswana, Zaire, Kenya and Ghana have set lower and more realistic standards.

5.05 Proposal to lower standards is likely to meet stiff opposition from SSA road authorities. The objective is to optimize resource allocation over a given network instead of providing set width and speed for a few selected roads. Most of the benefits of improved rural mobility can accrue without year-round vehicular access, so long as services can be ensured during critical periods. The optimum solution will in many instances involve spot improvements to existing tracks, designed to drain waterlogged areas and provide a more durable running surface over poor soils and on steep gradients. Such an approach calls for more on-site design and supervision than does construction to engineered standards. 18/ In conclusion, design methodologies need a fresh look to ensure that the emphasis is placed on access and durability rather than on geometry and speed.

Design and Construction of Drainage Structures

5.06 One of the key elements of rural gravel and earth road construction and maintenance is the provision of sufficient drainage -- surface and side drainage (by camber or cross-slopes, and side ditches), and stream and river crossings (i.e., culverts, causeways or also known as drifts or fords, and bridges). Many rural roads and tracks whose surfaces consist of local materials, either naturally occurring on the road or imported from nearby sources, are quite adequate structurally when traffic is light weight and low volume, and the wearing course surface is well drained and has sun exposure. However, poor drainage is responsible for most of the structural deficiencies of these roads because the wearing courses become waterlogged and soften, or because unrestrained or uncontrolled water flows cause erosion or scouring.

5.07 Unpaved road surfaces must be sloped (with camber of up to 5%) to remove standing water and to prevent softening and surface slipperiness after rains. Unfortunately this is often compromised with during construction, or neglected in maintenance. Side drains over 2-3% gradient usually need frequent scour checks and turn outs (miter drains), and must sometimes be provided with cross-drainage pipes to ensure good lateral drainage. Both machine and hand labor methods have been successfully used to construct good drains for rural roads. Their continued good performance depends on the consistency in maintaining the original camber specifications, and to keep the drains clear of debris. Drainage structures have usually been an integral part of rural roads design and construction, and much has already been written on this topic. 19/ Therefore, detailed design and construction aspects are not covered in the present paper. Given the importance of good drainage for adequate performance of rural gravel and earth roads it is essential that drainage specifications are clearly defined and disseminated.

17/ Relf, C., 1987, "Malawi's District Road Improvement and Maintenance Program", ILO Report CTP 74, Geneva, paras 3.41 through 3.44.

18/ The PCR for the Upper Volta Rural Roads Projects comments "The main reason for continuous graveling was to avoid the need for scarce and costly managerial inputs that adequate supervision of appropriate use of variable standards ... would have required".

19/ Drainage considerations for rural roads design, construction and maintenance have been adequately described in Transportation Research Board, 1978, "Transportation Technology Support for Developing Countries" Compendiums Nos. 1,2,3,4, 5, National Academy of Sciences, Washington, D.C.; and H. L. Beenhakker, S. Carapetis, L. Crowther and S. Hertel, 1987, "Rural Transport Services", Intermediate Technology Publications, U.K.

5.08 Concrete and corrugated metal pipes are most commonly used for cross-drainage structures in many countries. Pre-cast concrete pipes are usually made locally, but supply of cement sometimes poses problems; corrugated metal pipes require foreign exchange. The extensive needs and cost become a major constraint in many countries resulting in a continued search for low-cost solutions. Drifts are the simplest cross-drainage often used providing inexpensive protection for the pavement, while allowing water in normally dry stream crossings to flow over the road surface during heavy rains. In addition, low-cost stream crossings have been provided by constructing timber logs, with or without wooden decks, to bridge streams and provide basic access. Simple bridge designs use masonry abutments with wooden decks as in the case of DRIMP in Malawi. It is reported that experiments with wooden bridge designs are ongoing in Nigeria by DFRRI and in Ghana by the Building and Road Research Institute.

5.09 Under resource constraints, as well as to secure essential access in many areas, some projects have assisted local communities by constructing simple bridges and culverts. The communities then provide labor for the construction or rehabilitation of the access road to the bridges. A good example of this is the Village Access Roads and Bridge Improvement Assistance Unit (VARBAU) in Malawi which provided assistance for the improvement of access roads to villages otherwise not covered under DRIMP. To effectively provide improved rural road access, each country needs to prepare and implement specifications for low-cost river crossings and drainage structures. Necessary engineering expertise and technical supervision as well as funding will in many instances have to be provided centrally.

Environmental Considerations in Rural Road Design

5.10 Environmental impact was not a special consideration in the Bank rural roads projects reviewed, hence these issues are only briefly discussed in this paper. However, environmental assessment has recently been made a requirement for Bank project appraisal. 20/ The Bank's Infrastructure and Urban Department has already initiated some studies on environmental aspects of land transport. 21/ The environmental concerns cover the natural and social conditions surrounding all organisms. Transport projects are therefore to be examined in terms of their: (i) direct physical impacts on the environment (e.g., effects on noise levels, air and water quality, soil erosion, and flora and fauna); and (ii) indirect impacts which are often socio-economic and/or cultural in nature (e.g., effects on settlement patterns, tribal organizations, and commercial output). 22/

5.11 The greatest direct environmental impact associated with rural roads is erosion and flooding of farmlands and road surfaces. These adverse environmental impacts can usually be reduced through proper design, construction and maintenance of drainage and river crossings (see paragraphs 5.06 to 5.09). Special drainage requirements through small town and settlements should also be incorporated in rural road designs. In this regard, the experience emerging from environmental assessments of new rural road projects (e.g., Ghana, Nigeria, and Cameroon) should be useful in evolving practical guidelines on the subjects. Other direct environmental impacts relate to the improper location and lack of restoration of

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20/ Operational Directive Number 4.00 of October 31, 1989 provides guidelines for Environmental assessment in Bank projects.

21/ Sinha, K., Varma, A., Walsh, M.P., and Faiz, A., 1990, "Environmental and Ecological Considerations in Land Transport: A Resource Guide," Infrastructure and Urban Development Department, Report No. INU 41, World Bank, Washington, D.C., and Sinha, K., Varma, A., and Walsh, M.P., 1990, "Land Transport and Air Pollution in Developing Countries," by , Infrastructure and Urban Development Department, Report No. INU 60, World Bank, Washington, D.C..

22/ See Heggie, I., 1990, "Designing Environmentally Sound Transport Projects", Infrastructure Note, Transportation No. ENV-1, Infrastructure and Urban Development Department, World Bank, Washington, D.C.

gravel borrow pits after use. The borrow pit restoration aspect, in particular, must be clearly specified and enforced in engineering contracts. By ensuring proper drainage and location of borrow pits, much of the adverse environmental impact from rural roads projects can be avoided.

5.12 The indirect impact includes changes in land use patterns, and access to markets likely to occur when new rural roads are constructed. Although some of these may result in positive economic impact, some adverse ecological impact (e.g., increased accessibility to forests with increased depletion of trees for farming and charcoal production, and using primary hard wood species for drainage structures) are likely. Although these aspects may be addressed through other complementary interventions (e.g., replanting trees, etc.), the environmental impact of road access and settlements should be included in comprehensive land use plans.

Choice of Work Methods for Construction and Maintenance

5.13 The review shows that equipment based methods have normally been used for rural road construction and rehabilitation, and sometimes also for maintenance. Labor based methods were used or specified in only 14 road construction projects (16%) and in 19 road maintenance projects (20%). Labor based technology was specified more often in transport appraised than in agriculture appraised projects. Use of labor based methods for rural road maintenance has increased since 1980 (Table 5.1).

Table 5.1. Choice of Construction and Maintenance Technology

	Pre-1980		1980-89		TOTAL	
	AGR.	TRP	AGR.	TRP	AGR.	TRP
Construction Technology						
Labor Based (LB)	1	3	1	2	2	5
Equipment	10	3	7	3	17	6
LB and Equip.	0	4	0(1)	3(1)	0	7
Not Specified	28	30	20	7(1)	48	37
Maintenance Technology						
Labor Based (LB)	1	4	4(1)	6(1)	5	10
Equipment	2	1	4	1	6	2
LB and Equipment	0	3	0	1(1)	0	4
Not Specified	36	32	20	7	56	39

(1) represent projects not yet approved by the Board (as of 11/15/89)

Source: Various Bank Appraisal Reports and Country Data

5.14 The review shows that there have been difficulties in achieving efficient use of equipment (para 5.13), and labor based methods of road construction seemed to have been a viable alternative in Lesotho, Botswana, Madagascar, Kenya, Malawi and Ghana (Box 5.2), as well as in Benin. 23/ Under suitable conditions, labor based rehabilitation of rural roads has been reported to be 15 percent cheaper than using equipment, with a 40 percent saving in foreign exchange. In Kenya, the Bank and ILO found that labor based force account construction was 40 to 50 per cent cheaper than equipment based methods, and 50 to 60 percent less in economic terms. On the other hand, experiences with a German funded pilot labor based construction in Niger, where costs were very high, persuaded the Bank not to advocate its use in their projects there. Table 5.1 indicates that, unlike maintenance, there has been no significant increase in the use of labor based methods for rural road construction in later projects compared to earlier, although pilot schemes are proposed in some recently approved projects.

Box 5.2. Successful Implementation of Labor Based Methods

The success of the RARP in Kenya has paved the way for other countries and the ongoing Minor Roads Program (MRP) in Kenya to implement rural road programs with labor based methods. At appraisal of the RARP the Government wanted to set up 74 construction units in 26 districts, 8 of which were to be financed by the Bank. Each unit was expected to undertake labor-based road construction with equipment provided for the hauling of gravel. Each unit was headed by an inspector and employed 250 casual laborers, divided among seven sub-units (one administrative, two earthwork, two drainage, one graveling and one quarry). A senior inspector was to be in charge of four units, and to report to the Rural Access Roads Engineer in Headquarters. Forty-five units were established (only 8 financed by the Bank) by the end of the RARP in 1984. The organization proved effective and cost efficient. Road maintenance is the responsibility of the District Engineer, who is assisted by 1 or 2 inspectors and by 1 to 4 overseers depending on the length of roads in the district. Routine maintenance is executed using the lengthman system with local people acting as contractors and taking care of 1.0 to 2.0 kilometers of road. Each contractor is paid the equivalent of 3 days a week of casual labor with the consent of the overseer who ensures that all maintenance work needed has been performed. In order to avoid discrepancies, the Ministry has started to develop productivity standards for the contractors.

Another successful implementation of labor based methods has been the DRIMP in Malawi. Even though maintenance has been attempted using the lengthman system, its implementation has had some flaws. In theory, under this scheme, the maintenance of a section of road (1-3 kilometers) is the responsibility of one person. Tools and training are provided. The lengthman receives payments upon approval of each section's maintenance standard. In order to avoid fraud, the supervision is usually assigned to a different person than the one paying salaries. The time requirements imposed by road maintenance activities are such that they can be accommodated with time requirements of agricultural activities. In practice, the system described above has not been implemented. (DRIMP, Phase VI, Final Report). The work has been carried out by groups of 5 to 6 laborers directed by a capitao (gang leader). Both routine and periodic maintenance activities are carried out in this way. The size of the groups varies during the year, but reaches a peak in the wet season. In this way, there is no accountability by individuals, and this has led to poor maintenance practices in many districts. The report for DRIMP Phase IV, recommended that the capitao should only be employed when larger gangs are required, such as for periodic maintenance. Routine maintenance could be efficiently carried out with the lengthman system and with foremen in charge of a group of lengthmen (10 lengthmen to a foreman).

5.15 Labor based road maintenance is generally accepted as the method of choice for roads carrying low traffic volumes and for routine maintenance tasks on paved roads. It operates either through 'lengthmen', each responsible for two or three kilometers of road, or via mobile gangs working over longer lengths. Problems have arisen from poor motivation and supervision rather than from the work methods themselves. The need to provide specific training to supervisors and engineers in labor-based technologies and related management procedures is now better recognized.

5.16 The country reviews and the convincing outcomes of longstanding ILO labor-based programs support the case for extending the range of application of labor-based methods. While it cannot be argued that labor based methods are appropriate under all circumstances, they should be the first choice where it is reasonably certain that (i) the finished product will be technically satisfactory (albeit with revised specifications), and (ii) results will be cost effective when compared with equipment-based work. Some operations, such as longitudinal earth haulage, large-scale compaction and some bituminous surfacing, are inherently unsuitable for labor based methods to routine maintenance. Low population densities may limit the range of application of labor-based methods. For the majority of SSA rural road construction and maintenance operations, however, maximum use of labor is likely to give comparable results to, and be cheaper than equipment-based methods.

5.17 Widespread unemployment and lack of alternative income opportunities in rural areas, especially among the unskilled, strengthen the case for labor-based methods. Additional incomes boost local markets and small manufacturing industries. Workers also acquire construction skills that lead to an increase in the availability of small contractors for maintenance activities.

5.18 Even though labor-based methods have proven economically and technically viable, they have not yet been widely adopted. The reasons include constraints linked with external financing (e.g., tied aid, lack of financing for local costs) and procurement procedures that favor equipment-based methods. A joint effort is in line to remove obstacles to the use of labor-based methods involving external development agencies and governments.

Use of Mechanical Equipment

5.19 Chronic foreign exchange shortages in SSA are, prima facie, a good reason to reduce equipment use wherever possible. This argument is strengthened by the endemic problems relating to equipment use revealed by the project review. Fuel shortages, delays in procurement for both equipment and spares, unbalanced and heterogeneous fleet, inappropriate types of equipment, poor work planning, lack of understanding of equipment use and poorly trained and motivated operators, have all been reported. 24/ These add up to a situation where the true cost of earthmoving, for example, may be ten times the estimate, the balance being concealed in expenditures apparently unrelated to the works, and in the fact that planned work programs are not completed, although funds may be spent. 25/

24/ The PCR for the Cameroon Feeder Road Project reported 18 months delay in delivery (para 3.02), and for Upper Volta Rural Road Project, two years to procure spares (para 3.02); Benin First and Second Feeder Road Project PCR reported late delivery and poor performance of equipment (para 3.06), while procurement problems were a factor in the Gambia Highway Maintenance Project. The Ethiopia First Sector Credit suffered from fuel and spares shortages, as well as delays in equipment procurement. The timing of work in the Zaire Fourth Highway Project and in the Liberia Feeder Road Project was upset for the same reasons. In Niger's First Feeder Roads Project, equipment costs increased 90 percent due to changes in standards and poorly maintained equipment, while the cost of fuel, lubricants and spares were double the estimates.

25/ Project costs increase rapidly due to poor equipment operation. In the Mali Third Highway Project, only 856 km of the proposed 1200 km

5.20 Although conditions in SSA and the weight of project evidence favors labor based work for rural roads, making the change from equipment-based methods is neither quick nor simple. Equipment will always be required for some operations, and some types of intermediate technology equipment now available is likely to be successful on small scale and scattered rural road works. 26/

Force Account and Contract Operations

5.21 Construction and rehabilitation of rural roads by contract was advocated in about 27 percent of transportation projects, but in only 4 percent of others (Table 5.2). Contractors undertook road maintenance in less than 5 percent of the projects reviewed.

Table 5.2. Management Responsibility and Implementation of Projects

	Pre-1980		1980-89		TOTAL	
	AGR.	**TRP**	**AGR.**	**TRP**	**AGR.**	**TRP**
Management Responsibility						
Central Government	37	33	18(1)	10	55	43
Local or State Govt.	1	1	8	1	9	2
Local Community	0	0	0	0	0	0
Not Applicable	1	6	2	4	3	10
Implementation						
Force Account by:						
Central Government	9	16	5	9	14	25
Local or State Govt.	1	1	1	1	2	2
Special Project Unit	23	1	12	0	35	1
Contractor:	3	11	5(1)	0	8	11
Mixed Contractor and Force Account:	2	5	3	1	5	6
Not Specified/ Applicable:	1	6	2	4	3	10
All Projects	39	40	28(1)	15	67	55

(1) represent projects not yet approved by the Board (as of 11/15/89)
Source: Various Bank Appraisal Reports and Country Data

of road were completed, due to equipment, spares and fuel problems.

26/ Towed graders, now manufactured in SSA, are a lower cost and suitable alternative to heavy imported power graders. Locally made bottom dump trailers towed by agricultural type tractors are suitable to transport materials over short hauls. The Technology Unit in Kenya's Ministry of Public Works has reported on performance of locally produced tools and equipment.

5.22 Despite general support for greater use of contractors, competent domestic contractors are only to be found in a few SSA countries, and they are mostly interested in construction, rehabilitation and the types of maintenance that require mechanical equipment. A notable case is the recent development of private contractor capacity for labor-based work in Ghana, which has been supported by the Bank, ILO and bilateral donors (Box 5.3). There are important regional differences in the availability of contractors which need to be investigated during project preparation, as has been done for the multi-state Agricultural Development Projects (MSADPs) in Nigeria and for the proposed Rural Infrastructure Project in Cameroon. 27/ Little is reported or known about the capacity of petty contractors in SSA for routine manual maintenance of rural roads. Manual routine maintenance using the lengthman system has been considered in a few projects, 28/ but there seems to have been little attention given to development of the necessary supervisory capacity for their work.

Box 5.3. Contractors for Labor-Based Road Rehabilitation in Ghana

Ghana presents an example in SSA where labor-based rehabilitation has been carried out by contractors. In 1985, with the assistance of an IDA credit and UNDP/ILO technical assistance, the young Department of Feeder Roads (DFR) started implementing a unique project using local labor-based contractors. A pilot project in the Western Region (cocoa areas) was first established in 1986. This program included a 23 week course for contractors, supervisors, and DFR staff, all of whom were being exposed to this technology for the first time. During the training, the participants completed the rehabilitation of a 10 kilometer road at a training model site, using labor from local villages. At the end of the training the contractors were provided with 4-year loans to buy their own set of tools and light equipment to carry out labor-based contracts. The equipment comprised a tipper truck, tractors and trailers, pedestrian vibratory roller, water tank, water pump, and a complete set of hand tools. Following the training stage each of the contractors was awarded a 5 kilometer **trial** contract to allow DFR to assess their performance. Technical advice and close supervision are still provided by ILO and DFR engineers. The contractors performed well during the trial contract (2 km per month) and received a **standard** contract for 25 kilometers (one year). After three courses, 21 contractors have been trained with a potential output of approximately 500 kilometers per year.

Source: UNDP/ILO, 1990, "Feeder Roads Improvement in Ghana".

5.23 The case for greater use of contractors in road maintenance is well argued in the World Bank's 1981 publication 'The Road Maintenance Problem and International Assistance', but the change over from Force Account operations takes time and careful preparation to assess strengths and weaknesses of the local industry. 29/ Local construction firms in SSA usually lack the experience needed to manage unit price contracts obtained through competitive bidding. They have difficulties in satisfying all the terms

27/ The SAR for the first Multi-State Agricultural Development Project (MSADP) reports that 'a study was completed in Anambra State to establish the availability of contractors.... and similar studies have been launched in other states'. SARs for the recent second and third MSADPs report that 'there are adequate interested contractors', indicating that similar investigations were carried out.

28/ Spot Improvement and Maintenance Units in Ghana (SIAM), Kenya RARP, and proposed in the Third MSADP, Nigeria, the National Infrastructure Project in Guinea, and the Infrastructure Rehabilitation Project in Guinea-Bissau.

29/ See supervision report of February 1989, Nigeria ADP project: Memo from L.Campbell to A. Seth on 'Thematic Supervision: Feeder Roads and Water Supply Components of ADPs'.

and conditions of bidding, the general conditions of contract and the specifications. They frequently assume that they can bid low prices with the expectation of being able to raise them during implementation. Special measures are needed to facilitate the development of domestic firms; experience with past efforts points out the importance of policy and regulation concerning public procurement.

5.24 The small scale and scattered locations of rural road work raises serious problems of management and supervision for Force Account work. Contract work can ease but not eliminate these problems, since the contractor is less constrained and better motivated since payments, hence expenditure, are linked with outputs. However, the supervision of scattered contractors raises special problems of control, deployment and training, which have generally not yet been fully recognized. Provided proper attention is paid to the build-up of capabilities for supervision and administration of contracts, and a system is found to make timely and reliable payments, rural roads programs can be suitable means by which to develop the local construction industry.

The Role of Women and Labor-Based Methods

5.25 The opportunity offered by labor-based rural road works for increased off-farm income for women has received considerable attention. The evaluation of projects funded by NORAD in Kenya and Tanzania, and DANIDA and ILO in Tanzania indicate that road works can become an important targeted income generator, especially for women who were not able to harvest enough food (e.g., more than half of the women interviewed in a road project in Tanga cultivated less than one hectare).

5.26 The percentage of female road workers is generally a fraction of that of males. An evaluation of a NORAD funded project in Mbeya and Tanga regions in Tanzania shows that women's participation reached 20 and 10 percent of the labor force, respectively. Low women's participation is explained by the following factors:

- priority given to the demands of domestic activities such as milling maize, fetching water, collection of wood, cooking, etc. Most of the participants tend to be young women;
- lack of information related to women's eligibility for employment;
- scarcity of forewomen;
- lack of transport to the work sites combined with already mentioned time constraints;
- lack of pilot projects using labor-based methods with special emphasis on women's participation.

The NORAD project has recommended measures to alleviate the constraints and set targets of 30 to 50 percent female participation.

5.27 Participation of women has the potential to: (1) increase women's off-farm incomes, (2) strengthen technical and leadership skills, (3) disseminate labor-saving equipment (including IMT), and (4) support women enterprise development (e.g., contractor training). Rural road programs should consider measures to facilitate the participation of women at all levels including supervisors and contractors. These measures may include provision of childcare services, and flexible hours. 30/

30/ See Kudat, A., undated, " Participation of Women in Rural Road Maintenance in Sub-Saharan Africa", World Bank, Washington, D.C., which suggests practical means to increase the role of women in rural roads and transport.

Trends and Lessons to be Learned in Design and Technology

5.28 Rural road design standards, which have tended to be too high, are now being adjusted. If resources are to equate the need for rural roads in SSA, the process must go further; with most programs geared essentially to selective improvements concentrating on drainage and graveling. Often, the choice will not be between First Class or Third Class rural roads, but between essential access and no access at all over wide areas.

5.29 More than a decade of experience, principally under the aegis of ILO, has demonstrated that under suitable conditions, labor based road construction and maintenance has financial and economic advantages and need not have technical disadvantages. Where labor based operations are indicated, as they are in many SSA countries, governments need to make a clear policy commitment for change. The introduction of labor based work calls for revisions in design, specifications, work methods, project administration and supervision. The development of country capability for labor based rural road construction and maintenance is a long-term, say 10 years, endeavor; requiring a lasting commitment. It relies on large up-front investments in T.A. and training to develop managerial as well as technical skills. ILO has played a leading role in fostering labor-based methods and is in a position to facilitate cross-fertilization among SSA countries.

5.30 Although the Bank has had a policy of reliance on contractors since 1981, implementation has been difficult, and the majority of projects still rely upon Force Account. The drive to move away from Force Account should be intensified, although a pragmatic view needs to be taken where it has worked reasonably well (e.g., Benin). The assessment of contracting capacity and the policy and institutional measures necessary to foster the development of domestic contractors should be studied and pursued.

VI. RESOURCE MOBILIZATION

6.01 Problems associated with resource mobilization were the second most common among the projects reviewed. They were less common during period II (1980-89), affecting 10 percent of projects compared with 37 percent earlier. Incidence of these problems in transportation and other projects showed no significant difference. Resource mobilization problems are considered under the two main headings of financial and human resources.

Financial Resource Mobilization

6.02 Most projects have been funded by: (i) multilateral and bilateral donors; (ii) central government; (iii) regional government (Tanzania); (iv) special accounts, such as oil revenues in Nigeria, Gabon and Cameroon; (v) vertically integrated parastatals such as SODECOTON in Cameroon, COTONCHAD in Chad, SODEFITEX in Senegal, SOTOCO in Togo, CMB in Ghana, and timber companies in several SSA countries; (vi) cooperative societies; and (vii) local government councils.

6.03 External financing has typically accounted for a large portion of funding for rehabilitation of rural roads (e.g. between 60 and 90 percent in most MADIA countries). At times, this has carried the risk of overloading fragile local managerial capacity, as occurred in Kenya's RARP, where the rapid construction program eventually outgrew the maintenance capabilities of the Ministry, itself one of the better organized in SSA. Also in RARP, the large influx of donor aid for rural roads had the effect of creating resentment in other parts of the Ministry, which at the time were short of funds for urgent graveling and culvert construction programs. A successful aspect of the RARP projects was the coordination achieved between the many donors involved. This only occurred after careful preparatory discussions.

6.04 The review shows lack of, or delayed, counterpart funding as a major cause of late completion or non-completion of projects with attendant immobilization and wastage; this was a significant factor in rural road projects in Togo, Ghana, Niger and Mali. The situation calls for realism at the time of preparation in assessing local funding capabilities and ensuring that the pace of the project is kept in line accordingly. Annual reviews of aggregate requirements should be recommended systematically to avoid overwhelming the government's ability to provide funds on time.

6.05 Experience with resource mobilization through parastatals and agricultural agencies has been variable. Some development companies, or parastatals, have obtained external credits and mobilized own funds from crop commercialization with the objective of rehabilitating roads (e.g., SODECAO and SODECOTON in Cameroon). Nevertheless, these have not shown the same ability to fund and carry out maintenance.

6.06 Locally mobilized resources account generally for a small fraction of rural road financing. The low levels of income and the weakness of local governments are major constraints. There have been interesting exceptions where substantial resources have been mobilized, e.g., Cameroon's rural communities, rural roads in the Mbeya and Tanga regions of Tanzania, and emergency and bridge repairs in the Shaba region of Zaire. 31/ Further investigations of positive responses could be useful to provide guidance on these crucial aspects.

6.07 The delegation of maintenance (i.e., funding and operations) to local authorities has generally not provided a satisfactory solution. In Nigeria and Tanzania, where they have this responsibility, there have been serious funding problems. In Malawi, the DRIMP program made significant improvements in the network, but local authorities were quite unable to handle the resulting large increase in maintenance requirements. Recent projects have tried to include local authorities in the planning and route selection process from the start, so that they shall come to understand and accept the benefits of maintaining the roads.

6.08 Voluntary labor has been used as a means to reduce the local funding requirement, and has sometimes worked well on construction, but is unlikely to be applicable to maintenance. The experience with mobilization of local labor on a voluntary basis is on the whole negative with the possible exception of Rwanda where the Umuganda system (each adult to devote one day per week to work organized by the 'secteur' i.e., lowest echelon of administrative and political organizations about 100 households) relies on relatively well structured local authorities with strong political legitimacy. The high population densities and hence short distances between the work site and home is also a positive factor. As a rule it seems that application of field voluntary labor may be limited to emergency work and to work in the immediate vicinity of the communities involved, in particular off-road paths and tracks.

31/ See Siegel, L., et al., 1989,"Decentralized Finance and Management of Road Maintenance in Zaire", Associates for Rural Development Inc. for USAID, and Groupe Huit-Brees, 1989, "Finances Communales et Perspective de Développement Municipal au Cameroun" Department of Local Councils, Cameroun.

6.09 An alternative way to reduce the need for local funds has been food aid, which has played a large part in rural road programs in India, but not so much in SSA countries. 32/ As pointed out by Mellor in the study of food aid in MADIA countries, food aid is supported by different constituencies in donor countries, and may therefore be more stable and have a character of additionality vis-a-vis financial aid. Mellor found also that the impact of food aid on agricultural prices is relatively limited. Infrastructure improvements through project food aid is the most direct way to link food aid with a stimulus to agricultural production. Project food aid requires the build up of reliable delivery mechanisms, which once established, work best within a long-term programming framework and suffer from on/off support.

6.10 Resource mobilization is most crucial for maintenance to ensure project sustainability, during project preparation the resources needed for maintenance should be clearly identified, and here the Bank's record could be better. In 51 percent of rural road projects reviewed, sources for maintenance funding after construction were left unspecified at appraisal (Table 6.1), and this proportion rose from 42 percent in Period I to 67 per cent in Period II. Only 26 percent overall could be regarded as having maintenance funding well planned, 16 per cent in agricultural appraised projects and 38 percent in transportation appraised. The record for maintenance institutions (Table 6.2) is similar.

Table 6.1. Maintenance Funding

	Pre-1980		**1980-89**		**TOTAL**	
	AGR	**TRP**	**AGR**	**TRP**	**AGR**	**TRP**
Well Planned	7	16	4	5	11	21
Incompletely Planned	15	8	4(1)	1	19	9
Not Specified	17	16	20	9(1)	37	25

(1) represent projects not yet approved by the Board (as of 11/15/89)

Source: Various Bank Appraisal Reports and Country Data

32/ See manuscript "Food Aid and Development in MADIA Countries", paper by Mellor and Pandya-Lorch (International Food Policy Research Institute, Washington D.C.) 1990.

Table 6.2. Maintenance Institutions

	Pre-1980		1980-89		TOTAL	
	AGR.	TRP	AGR.	TRP	AGR.	TRP
Existing	6	5	1(1)	4	7	9
Well Planned	5	17	6	8	11	25
Incompletely Planned	12	4	18	3(1)	30	7
Not Specified	16	14	3	0(1)	19	14

(1) represent projects not yet approved by the Board (as of 11/15/89)

Source: Various Bank Appraisal Reports and Country Data

Human Resource Mobilization

6.11 PCRs refer frequently to the lack of trained personnel to fill key posts during the project and after the withdrawal of technical assistance, to continual staff moves and departures, and to the attraction of other sources of employment. In spite of this, detailed review of human resource needs and development is still not routine during project preparation. Appraisal of the Senegal First Feeder Road Project, for example, did not address the question of qualified staff, which became a major constraint. In Niger's First Feeder Road Project, the counterpart economist was not identified until after the technical assistance team had left. Similar problems have plagued the ongoing first multi-state ADP in Nigeria, where there have been long delays in hiring road engineers. 33/ Ineffectiveness has often gone hand in hand with high relative costs.

6.12 The deployment of technical assistance in support of rural road programs has been a source of difficulties. The low unit cost per km and the scattered nature of the work have contributed to high overheads and lack of effectiveness. Except in the case of ILO-sponsored labor-based programs, training has suffered from the lack of continuity and lack of institutional anchor. The aims, objectives and target outputs for technical assistance need to be clearly specified and agreed. Training should be undertaken in the perspective of capacity building efforts sustained over sufficient length of time varying from eight to ten years. Results of technical assistance and training need to be routinely monitored. Reliance on local engineers and planners should be encouraged.

Trends and Lessons to be Learned in Resource Mobilization

6.13 Bank experience offers no ready-made solution to the central problem of mobilization of local resources for maintenance of rural roads. Early involvement of local government in planning seems to be beneficial in building up awareness, but in the long term they must have some reliable means to raise funds themselves. The Bank's Colombia Rural Roads Projects offers an interesting experience; a fairly competent centralized agency built up over time a number of regional authorities, who are able to raise funds through

33/ This has been only part of the problem. Lack of equipment and spares for Force Account work, and procedural complications for contracts, have caused delays. During 1987-8, only one state (Cross River) was up to schedule. Other progress has ranged from disastrous (Benue) up to satisfactory.

local taxes (Box 6.1). The FNCV (Fondo Nacional de Caminos Vecinales) and its local authorities (Juntas de Caminos) have established their credibility and competence and have been able to mobilize matching funds to complement central allocations. Their example underlines the need for a specific funding line for rural roads.

Box 6.1. Colombia's National Rural Road Fund

A good example of how responsibility for rural roads can devolve from central authority was in Colombia, where the World Bank has been concerned with road transport since 1950, but in rural roads only since 1980. A 1989 evaluation of the rural road project comments that "prospects for project sustainability are good." A rural road authority (Fondo Nacional de Caminos Vecinales - FNCV) was set up in the 1960's initially under central government, but has operated since 1972 as an autonomous rural roads agency. Over the years, FNCV has moved away from central into local government, where about 90 per cent of FNCV staff now operates, leaving only a policy and overall planning function in central government. In addition, to qualities listed above that contributed to successful rural roads development in Colombia, FNCV has had some earmarked revenues from a share in taxes and duties, which was matched by funds mobilized locally. The funds, have, however, been insufficient for maintenance and as part of a proposed follow-on project, assistance is planned to ensure funding for rural road maintenance.

6.14 Where there are no suitable local authorities, parastatals and NGOs may be willing to undertake maintenance of rural roads when they have a direct interest in the matter, and are entitled to mobilize resources for the purpose through their operations.

6.15 Future project appraisal needs to outline clearly the permanent financial arrangements proposed for maintenance. It is preferable to consider all rural road expenditure separately under a consolidated framework providing for maintenance along with improvement and rehabilitation. The matching funds approach adopted in Colombia is an interesting model. It implies capable monitoring, a fair degree of institutional cohesion achieved through a separate light organizational structure fully devoted to rural roads and benefiting from adequate political support.

6.16 Technical assistance will continue to be needed; requirements should be reviewed initially and the condition for effective management should be carefully discussed and agreed. The definition of the objectives of TA programs and the expected outcome need more upfront attention. TA teams should be deployed gradually, and in step with project progress.

6.17 Similarly, training should be need-specific and designed to provide numbers and skills that are most required. This implies agreement between governments and donors on sector-wide training strategies. Training needs should be designed in a long-term perspective based on a steady government commitment. This is of particular importance in building up labor-based capabilities and developing domestic contractors.

VII. SECTORAL ORGANIZATION AND INSTITUTIONAL PERFORMANCE

7.01 In many countries the development of rural roads has been hampered by the lack of proper institutional arrangements. While central road agencies have usually played a key role in rural road management, other departments have frequently been involved in specific aspects of planning and funding, via a special project unit or in an ad-hoc basis. Institutional performance is considered here under the main headings of: (i) rural road units within central road authorities; (ii) special project units and agricultural parastatals; and (iii) local institutions and communities.

Rural Road Units within Central Roads Authorities

7.02 The institutional problems that beset central roads authorities have been adequately described in a number of reports and papers, 34/ and they apply equally to rural road units. Where special rural road units or departments have been set up, although they may have experienced the same institutional problems as their parent Ministry, they have nevertheless been able to serve as a central focal point for policy and planning for rural roads, and as a channel for earmarked funds. Successful examples of this are to be found in Benin’s Service des Routes de Desserte Rurale (SRDR), Togo's Service National des Pistes Rurales (SNPR) and Ghana's Department of Feeder Roads (DFR).

7.03 Kenya's RARP, set up within the Special Programs Branch of the Roads Department, quickly attracted donor support, plus technical help from ILO. It succeeded because it was placed within a ministerial structure that already had a well-established record for administration of roads. The same can be said of DFR in Ghana. On the other hand, where the institutional abilities of the parent ministry have not been well assessed, high expectations have not been fulfilled. In Cameroon's First Feeder Road Project, for example, objectives were not met because the Feeder Road Unit set up within the Department of Highways was not managed properly. Procurement contracts were not awarded until after bid expiry, withdrawal applications were late, a construction contract was awarded against Bank guidelines, and slow payments to suppliers caused spares and fuel shortages, although funds were available. All of these are clear indications of poor institutional performance.

7.04 A characteristic of the more successful operations is that they were self sufficient and able to operate with reasonable autonomy. During the First Feeder Road Project in Senegal, there was a very real improvement after the unit became autonomous. 35/ Two ingredients were identified as instrumental in the transformation: (i) direct control by the unit over small, but important, expenditures; and (ii) a technically and administratively experienced local management which set production goals, clearly communicated them to staff, followed up on performance and did not hesitate to remove poor performers. The unit thus came to operate more like a contractor, but orientated to achieving maximum production with given funds rather than to making a profit.

34/ See World Bank, 1981, "Road Maintenance Problems and International Assistance" World Bank, Washington, D.C., and World Bank, 1989, "Road Deterioration in Developing Countries" World Bank Policy Paper, World Bank, 1989, "Road Deterioration in Sub-Saharan Africa" and supporting RMI papers (SSATP).

35/ The Bank had threatened to stop the project in 1979, which caused a change in policy. It is reported that the change 'caused resentment' within the Ministry, and the arrangement could only be kept in place because it was financed by foreign funding.

7.05 Experience in Ethiopia's Road Sector Project was different, and less encouraging. The Transport Construction Authority (ETCA) was unenthusiastic about the creation of what it saw as a competing road building bureaucracy in the form of a semi-autonomous Rural Roads Organization (RRO). The project had planned for a total of 14 mechanical workshops to service the needs of rural roads equipment under RRO. Opposition to the changes prevailed and, eventually with Bank consent, RRO became simply another department of ETCA.

Special Project Units and Parastatals

7.06 Project units set up in Ministries of Agriculture, or within parastatals (development companies or 'filière'), have generally lead to high construction costs driven by fixed equipment expenditures and high overheads. Another problem has arisen upon completion when project units have often been disbanded or have gone to other work leaving no institutional arrangements for maintenance. Finally coordination with institutions outside the projects has generally been lacking. In the earlier projects, special units usually carried out construction by Force Account. As these units would typically disappear at the end of the project, little long term institutional benefit resulted, either from the formation of effective government organizations, or from building up local contractor capacity.

7.07 Where units are part of an agricultural parastatal, their responsibilities may overlap with those of other government agencies for funding and constructing rural roads. In Cameroon, for example, present investment in rural roads is mostly via agricultural parastatals, and some of these maintain roads which are also in the Roads Ministry budget. It is important that responsibility for the administration of rural roads is made very clear, which implies that the coordination necessary between units and other authorities must be well defined during project preparation.

7.08 The issue of classification and management of feeder roads after project completion has to be clarified during project preparation, as it will affect future maintenance prospects. In Mali, feeder roads built as part of the first highway projects were not maintained because they had not been officially classified as part of the road network. Similarly, the Ministry of Public Works refused to classify, and thereby adopt for maintenance, roads built by SODECOTON in Cameroon's Northern Province Rural Development project, with the result that maintenance was not done.

Local Institutions and Communities

7.09 Local institutions and communities (which include local government below state level), have usually been involved in rural road projects at the planning stage and in maintenance. So far as maintenance is concerned, results have been disappointing. Lack of financial resources and trained personnel are obvious reasons, but insufficient consideration at appraisal and during project implementation of ways to include local interests has been a factor.

7.10 Malawi's DRIMP program illustrates the difficulties of transferring responsibility for rural road maintenance to local organizations. Although the program has been implemented in 21 out of 24 districts, responsibility for maintenance has been transferred in only one (Kasungu) where a pilot program is in place. Major contributions have been made to institutional development both at district and central level in respect of road maintenance, according to the first stage PPAR, but in spite of this, the inability to hand over maintenance to districts has been due to their lack of organizational, technical and managerial resources. 36/

36/ Relf, C., "The District Road Improvement and Maintenance Program, an Evaluative Study" ILO, Geneva, 1986.

Trends and Lessons to be Learned in Institutional Performance

7.11 Institutional arrangement for rural roads have had mixed, and in some cases, very disappointing results. The more encouraging results gained in some projects (Ghana, Senegal, Kenya, Malawi in SSA) seem to be associated with:

(i) having a single focal point with primary responsibility for rural roads policy and funding;

(ii) separate organizations with specific responsibilities for rural roads, with a sufficient degree of autonomy to conduct planning in cooperation with local communities;

(iii) program based approach not affected by the off-and-on cycle of approval of external funding;

(iv) maximum participation of agricultural officers and local communities at route selection stage; and

(v) long-term arrangements for maintenance laid out in advance, through established local institutions who may match funds to cover improvements, rehabilitation and maintenance.

7.12 Experience in other parts of the world (Colombia, Thailand) supports these guidelines. An important aspect appears to be that a rural roads unit has sufficient autonomy in its operations that it can act as a central focus for policies, planning and funding of rural roads in accordance with an agreed government strategy. Tendencies to set up rural road programs under a variety of ministries and authorities should be resisted, as it would lead to fragmentation of policies and probably favors short-term politically motivated objectives.

7.13 Once a central rural road policy unit has been set up, governments must still ensure that other procedures and regulations (such as labor employment conditions, contract awards, procurement of equipment and supplies, and payments to suppliers) do not lead to poor institutional performance of the unit. So far as maintenance is concerned, prospects appear to be improved where local interests are responsible with their own independent sources of funds, but having technical and policy matters dealt with by a central authority.

7.14 A review of institutional aspects of recent projects, including those not yet approved, shows a broader concern for institutional aspects. In general, however, the planning and management of institutional aspects still lags behind improvements in other aspects of rural road projects. 37/ In the third MSADP project in Nigeria, novel institutional proposals include specific agreements with local government authorities, expected to encourage road maintenance by local organizations.

37/ Rural roads are not alone in this respect. See OED report no. 5085 "Institutional Development in Africa: A Review of World Bank Project Experience" May 1984, Summary Findings, p. iv, para 5.

VIII. BANK PROJECT MANAGEMENT

8.01 Rural road operations have been handled for the most part as free-standing projects of transport divisions, or as part of rural development projects carried out by agricultural divisions. Of the 127 projects reviewed, 59 (including four awaiting approval) were free standing rural road projects or components of highway and transport projects appraised by transportation divisions. Sixty-eight others (one awaiting approval) were agricultural or rural development projects appraised mainly by agricultural divisions. There was a large increase in the Bank's agricultural projects with rural road components during Period II (1980-89) compared with transportation projects (Table 3.1), due to the overall growth of the Bank's agricultural portfolio, and to increased attention in the transport sector to major highways, a situation which is now changing.

8.02 The coordination between agricultural and transport operations has generally been insufficient. Rural road components of agricultural projects have typically been handled through consultants with limited involvement of the highway engineers responsible for the transportation sector. Similarly in assessing the Bank's presence in the transport sector, highway engineers and transport economists have not systematically covered the Bank involvement in feeder roads in SSA has by and large suffered from lack of continuity and insufficient attention to the policy framework and to long-term institutional requirements. The experience of the Abidjan Feeder Road Unit is of particular interest as it showed the benefit of a well-focused approach.

The Regional Feeder Roads Unit in Abidjan

8.03 Between 1975 and 1982, identification, preparation, appraisal and supervision of feeder road projects and components in West Africa (except Nigeria) were done by a Feeder Roads Unit located at the Bank's resident mission in Abidjan. The Unit's mandate was to assist in the preparation and supervision of feeder road components of agricultural projects, and to launch feeder road projects in selected countries. The Unit provided a special focus on feeder roads and was soon able to step up Bank involvement in rural roads in the sub-region. At one time, the Unit had a portfolio valued at US$250 million, excluding road components of agricultural projects. During its existence, the Unit successfully handled a growing number of projects in Senegal, Liberia, Burkina Faso, Côte d'Ivoire, Togo, Benin, Cameroon, and planned one in Chad which did not proceed. The Unit was engaged in successful operations in Togo, Benin and Côte d'Ivoire where the elements of a rural road policy and related institutional arrangements were put in place.

8.04 On the positive side, the Unit's location meant that there could be better support to project management with frequent supervision at low cost. On the negative side, there was a lack of close rapport with Bank headquarters. Board presentation usually involved Unit staff coming to Washington, because headquarters staff was not fully conversant with projects. Although its effectiveness was recognized, the Unit was discontinued for lack of institutional support at Headquarters when the Divisions handling transportation were reorganized. The experience of the Abidjan Feeder Road Unit has confirmed the effectiveness of an approach involving dedicated staff posted in the field. The problems encountered by the Unit would now be very much reduced by the Bank's more decentralized organization and much denser field presence through Resident Missions in SSA. In addition, substantial improvements in communications technology over the past decade would greatly ease previous communication problems 38/

38/ Road components of irrigation and agricultural projects in India have been handled for some years -apparently successfully - by special staff, including a highway engineer, attached to the Resident Mission, New Delhi.

Lessons to be Learned from Bank Project Management

8.05 The Bank will continue to support rural roads through a number of channels, and a major objective should be to foster development of an agreed policy framework and associated institutional capacity for rural road construction, improvement and maintenance. One project in each country – either a rural road or rural infrastructure project, or broader highway or transportation project – should be designated as the vehicle to introduce and support the development of rural road policy and institutional capabilities, so as to ensure a coherent framework for rural roads components of operations carried out in other sectors, in particular, agriculture. The long-term nature of policy and institutional objectives must be recognized. Thus, such institutional development and capacity building can be achieved only after a series of operations.

8.06 The positive experience of the Regional Feeder Roads Unit in Abidjan in focussing attention on the problems of the sub-sector suggest the possible use of regional centers to increase the Bank's project preparation and supervision capacity for rural roads projects in the region. Better coordination between donors over rural road policies, and greater interchange of expertise and experience, particularly with ILO, will help to raise the success rate of rural road projects.

IX. POLICY RECOMMENDATIONS

9.01 The policy recommendations that emerge from this review relate to specific country policy actions, Bank project operations, and studies, research, and dissemination.

Recommendations for Country Policies

9.02 The following recommendations comprise the elements of coherent country level rural road policy:

- establish a central focal point for:
  - rural roads policy formulation and review,
  - overall planning and funding,
  - coordination with ministries of agriculture, local government and public works, and
  - coordination with donors;
- provide separate funding for rural roads, with local resource mobilization on a matching fund basis;
- adopt a multi-tiered planning and programming system allowing the participation of local communities (i.e., national, sectoral, regional, local levels and route evaluation and selection based on approaches that consider multiple criteria);
- establish a consolidated framework for network-based programming and budgeting considering improvements and rehabilitation, together with maintenance;
- adopt design standards that emphasize drainage and spot surface graveling, rather than geometric improvements for width and speed;
- ensure adequate maintenance of drainage in order to minimize adverse environmental impact of rural roads;
- build up capacity for labor-based construction and maintenance, where appropriate, for rural roads programs with an up-front emphasis on training;
- adopt a policy for reliance on domestic contractors taking steps to build up its capacity through managerial and technical training;
- investigate options for promotion of intermediate means of transport and improvements in off-farm transport using Training and Visit approaches.

Country Level Action Plans

9.03 In most countries, an action plan will be needed to introduce the policies outlined above; the key elements of such plans would include:

- preparation of country strategies for rural roads closely coordinated with main road policies and programs, and with agricultural development strategies;

- development of labor-based contracting capabilities; and

- review of policies affecting motorized transport services in rural areas and promotion of intermediate means of transport.

Recommendations for Bank Operations

9.04 The Bank support for rural roads will continue to be channeled through transport projects as well as agricultural projects. The following policy actions are recommended:

- systematically support the development of the policy framework and institutional capabilities for rural roads planning, improvement and maintenance, recognizing the long-term nature of institutional and policy objectives; and provide a coordinated framework for rural road components of agricultural operations;

- designate one infrastructure operation in each country (either a rural road or rural infrastructure project or broader highway or transport project), as a vehicle to support the development of rural road policy and institutional capabilities, providing a coordinated framework for rural road components of agricultural operations;

- systematically promote the development of capacity for labor-based methods, in close cooperation with ILO recognizing the value of horizontal transfer of know-how, cross-fertilization among SSA countries;

- support the review of current policies that affect the provision of transport services (e.g., fuel pricing, tariffs, taxation);

- support the development and dissemination of intermediate means of transport, with particular attention to the needs of women;

- undertake a pilot program to test and perfect T&V-type approaches to the supervision of labor-based maintenance works, as well as to the introduction of IMT, and at the community level.

- in coordination with other donors in the framework of SSATP, undertake to disseminate the emerging elements of the rural roads policy outlined in this paper;

9.05 The development of country level rural road strategies is a resource intensive undertaking that will require direct involvement of Bank staff and frequent interaction at the country level. The positive experience of the West Africa Feeder Roads Unit in Abidjan suggests that it would be useful for the Bank to review the possibility of supporting the development of country level rural road strategies and programs similar ones already started in Ghana, Madagascar and Uganda.

Further Studies, Research and Dissemination.

9.06 The Rural Travel and Transport Component of SSATP provides a framework to pursue further study of the outstanding issues of rural road and transport policy. The following is planned over the next eighteen months:

- further analytical and conceptual work to assess overall requirements and capabilities and to propose better approaches to planning,
- case studies to document proposed policy responses and institutional approaches concerning community participation, labor-based capability, maintenance funding systems and organization,
- analysis of rural transport and travel patterns by gender in a variety of agricultural and transport environments over a given time frame,
- assessment of past experiences in and prospects and means of introducing and developing IMT including a determination of institutional requirements and functions and the external constraints to IMT use,
- assessment of the impact on the role of women in improving accessibility by introducing IMT.

9.07 An important element will be to review the present state of IMT in the region and to address the following hypotheses:

- lack of off-road transport seriously reduces the timeliness and amount of agricultural goods delivered to motor roads, and constrains rural economic growth and social development; thus, raising the capability of off-road transport could result in much higher returns to rural roads investments;
- significant productivity gains can be achieved through very low cost investments in improving off-road transport (i.e., rural infrastructure and IMT) which are likely to impact the lives of rural women;
- government's role in these transport improvements through introduction of IMTs would be largely facilitative and promotional.

These promotional activities could effectively apply the Training and Visit approach used in agricultural extension.

9.08 The present study and the outcome of the research outlined above will be used in the preparation of strategy statements for the Second Transport Decade (UNTACDA II). A series of policy seminars in collaboration with EDI and ESAMI are planned during the second half of 1991 to review and disseminate the outcome of the SSATP work concerning rural roads and transport services. The intended audience will comprise:

- country officials (e.g., senior country policy makers, local authority officials, and operational managers responsible for rural roads and agricultural development planning);
- Bank and other lending agencies and bilateral donors; and
- NGOs.

The objective would be for each participating country to develop plans as part of its rural road and transport strategy to initiate required policy changes in their own country.

ANNEX 1

IBRD/IDA Projects with Rural Road Component: in SSA (1964-1989)

Country	Division	Project	Credit Loan	Appr. Year	Total Amount	Original Principal	Amount for Rural Roads	Appraisal Road Kms			Actual Road Kms		
						(US$ million)		Const	Rehab	Maint	Const	Rehab	Maint
Benin	AG	Zou-Borgou Cotton	C-307	72	12.7	6.1	0.7		610			490	
Benin	TR	Feeder Roads	C-717	77	6.1	5.5	5.5		845	425		344	0
Benin	TR	2nd Feeder Roads	C-1090	80	8.7	7.0	7.0		700	800		690	425
Benin	TR	3rd Feeder Roads	C-1485/F-023	84	13.2	12.0	12.0	840		2000	720		
Benin	AG	2nd Borgou R.D	C-1877	88	67.3	21.0	4.9		300	300			
Burkina	AG	Drought Relief Fund	C-442	73	14.0	2.0	?		800			366	
Burkina	TR	Rural Roads	C.579	75	8.5	7.5	7.5		1200	3300			
Cameroon	TR	2nd Highway	L-935/C-429	73	71.0	48.0	1.1						
Cameroon	AG	Cocoa Project	L-1039	74	23.8	6.5	2.1		906			606	
Cameroon	TR	Feeder Roads	C-749	77	21.1	6.5	6.5	2200			800		
Cameroon	AG	2nd SEMRY Rice	C-763	78	55.5	29.0	0.7	50					
Cameroon	AG	Northern Province	L-1919/C-1075	80	74.7	37.5	10.0		800 B			600	
Cameroon	AG	2nd Western Province	L-2406	84	55.7	21.5	4.5		500 B				
Cameroon	AG	2nd FSAR (R.D)	L-2567	85	56.6	25.5	4.0	350		350			
Cameroon	AG	Cocoa Rehabilitation	L-2912	88	285.4	103.0	19.6	1350	2400 A	3000 A			
Chad	AG	Sategui-Deressia Irri.	C-489	74	12.0	7.5	1.4	102					
Chad	TR	2nd Highway	C-490	74	3.5	3.5	1.3		800	800			
Chad	TR	Rural Projects Fund	C-664	76	13.4	12.0	1.2			2300 R			
Cote d'Ivoire	AG	2nd Cocoa	L-1069	74	34.7	20.0	2.8	270	40				
Cote d'Ivoire	AG	Cotton Area R.D	L-1077	75	52.5	31.0	6.5		920				
Cote d'Ivoire	AG	4th Palm Oil & Coconut	L-1382	77	40.6	20.0	14.9				1059		
Cote d'Ivoire	TR	Feeder Road & Hwy Main	L-1501	77	63.2	29.0	12.4		3600	5000	1300		
Cote d'Ivoire	AG	2nd Grand-Bereby Rubber	L-1575	78	60.4	20.0	0.7				910		
Cote d'Ivoire	TR	2nd Hwy Sector Loan	L-2581/B-0131	85	230.7	118.0	16.9	197. G	186				
Country	Division	Project	Credit Loan	Appr. Year	Total Amount	Original Principal	Amount for Rural Roads	Appraisal Road Kms			Actual Road Kms		

C.A.R	AG	Cotton Area R.D	C-1376	83	51.2	10.4	4.4		950	2300			
C.A.R	AG	National Livestock	C-1681	86	37.3	11.9	1.5		600				
Ethiopia	AG	Wolamo Ag. Dev.	C-169	69	5.1	0.2	3.9	375			479		
Ethiopia	TR	5th Highway	C-332	72	22.0	17.014.4	430						
Ethiopia	AG	Coffee Processing	C-290	72	10.3	6.3	1.6	400			367		
Ethiopia	TR	6th highway	C-552	75	54.7	32.0	31.6	397 G					
Ethiopia	TR	Road Sector	C-708	77	368.0	32.0	6.3	26.43			2521		
Ethiopia	AG	2nd Coffee	C-1429	83	57.0	35.0	7.0	150	300			320 B	
Ethiopia	TR	Road Sector	C-1404	83	70.0	70.0	30.9	36.70					
Gabon	TR	Road Maintenance	L-3046	89	110.0	30.0	10.8			2800			
Ghana	TR	2nd Highway	L-1182	75	36.8	18.0	10.9		0	6000		436	2000
Ghana	AG	Volta Ag.Dev.	C-1009	80	49.8	29.5	2.7		648 B				
Ghana	TR	Road Rehab.	C-1601	85	108.0	40.0	2.5		200	2000			
Guinea	AG	Gueckedou Ag. Dev.	C-1635	85	25.2	6.6	2.6	240		500			
Kenya	TR	Tea Road Project	C-077	65	4.2	3.6	3.6		1300 B	1300			
Kenya	TR	Roads Project	C-104	67	7.8	6.4	2.7	224		200	269		240
Kenya	TR	2nd Highway	C-120	68	16.2	12.9	0.6						
Kenya	TR	3rd Highway	C-639	69	36.3	23.5	16.7		975 B			1450 B	
Kenya	TR	4th Highway	C-276	71	42.0	22.0	16.6		1582 B			1525 B	
Kenya	TR	5th Highway	L-932	73	239.7	29.0	2.7	240	148	240	148		
Kenya	TR	Rural Access Roads	L-1305/C-651	76	10.1	8.0	8.0	1000			1590		
Kenya	AG	Sugar Rehabilitation	L-1636	78	132.0	72.0	7.2	435	243		0	0	
Kenya	AG	Narok Ag.Dev.	C-858	78	18.9	13.0	1.3	115	98				
Kenya	TR	Highway Sector	L-1684	79	110.0	90.0	6.9		1475				
Lesotho	TR	Road	C-082	66	5.4	5.0	0.6		30				
Liberia	TR	Road Project	L-368	64	5.9	3.3	2.8		120 B			120 B	
Liberia	TR	2nd Highway	L-907	73	14.1	3.0	1.8						
Liberia	TR	3rd Highway	L-1156	75	46.7	27.5	1.8		150 B			130 B	
Liberia	TR	Feeder Roads	L-1664	79	18.8	10.7	10.7	1150		1500			
Liberia	AG	2nd Lofa Ag. Dev.	C-1242	82	28.0	15.5	2.2		234 B	600			
Country	Division	Project	Credit Loan	Appr. Year	Total Amount	Original Principal	Amount for Rural Roads	Appraisal Road Kms			Actual Road Kms		
Liberia	AG	2nd Bong Ag. Dev.	C-1447	84	22.9	6.7	3.6		160 b	440			
Madagascar	TR	6th Highway	C-1391/F004	83	111.0	45.0	30.1		900	2000			
Madagascar	AG	Cotton Dev.	C-1433	83	34.4	7.9	2.8		275				

Malawi	AG	Lilongwe ADP	C-113	68	7.2	7.2	0.6	269			1027	
Malawi	AG	Shire Valley Ag.Dev.	C-114	68	4.6	4.3	1.1	265	49		265	40
Malawi	AG	2nd Lilongwe ADP	C-244	71	8.6	7.4	1.7	860			960	
Malawi	AG	2nd Shire Valley	C-363	73	13.5	10.5	1.9	180			32.5	
Malawi	TR	2nd Highway	C-523	74	12.5	10.0	2.0		1400 B			1059 B
Malawi	AG	3rd Lilongwe ADP	C-550	75	12.0	8.5	1.7	424			600	
Malawi	AG	Shire Valley Ag. Cons.	C-823	78	12.6	10.7	1.0	139		339	111	
Malawi	TR	4th Highway	C-1099	81	42.2	33.0	7.0		2644 B			2776 B
Malawi	TR	5th Highway	L-2363/C-1423/SF6	83	84.0	44.9	10.9		1900 B			1199 B
Malawi	TR	Infrastructure		89	157.7	28.8	5.1	350	500			
Mali	TR	Highway Maintenance	C-197	70	9.3	8.9	1.2		1450			
Mali	TR	Highway	C-197	70	9.3	8.9	5.9	1450			470	
Mali	TR	3rd Highway	C-599	75	13.4	10.0	3.0		1200	944		856
Mali	TR	2nd Highway	C-383	75	20.5	9.5	0.9					
Mauritius	AG	Rural Development	C-419	73	11.0	4.0	2.1					
Niger	AG	Maradi R.D	C-608	75	11.9	10.7	0.8	80				
Niger	TR	Feeder Roads project	C-886	79	13.9	10.0	10.0		1000	1000		700
Niger	TR	Transport Sector	C-1706	86	212.9	15.0	11.9	883		1483		
Nigeria	TR	Northern Road	C-073	64	23.7	18.7	8.5		135		750	
Nigeria	AG	Gusau	L- 1099	74		19.0	3.6	750			750	
Nigeria	AG	Gombe	L- 1164	74		21.0	3.8	500			406	
Nigeria	AG	2nd Cocoa	L- 1045	74	40.0	20.0	4.9		1250 B			380 B
Nigeria	AG	Funtua	L- 1092	74		29.0	5.0	750			521	
Nigeria	AG	Rice	L- 1103	74	35.0	17.5	3.1	117	186			150 B
Nigeria	AG	Lafia Ag. Dev.	L- 1454	77	85.0	27.0	8.4		600			796 B
Nigeria	AG	Ayangba Ag. Dev.	L- 1455	77	85.0	35.0	8.6		1300 B			1667 B
Country	Division	Project	Credit Loan	Appr. Year	Total Amount	Original Principal	Amount for Rural Roads	Appraisal Road Kms			Actual Road Kms	
Nigeria	AG	Bida Ag. Dev.	L- 1667	79	41.8	23.0	2.5		620			429
Nigeria	AG	Ilorin Ag. Dev.	L- 1668	79	64.4	27.0	4.9		300 B			72 B
Nigeria	AG	Oyao North Ag. Dev.	L- 1838	80	69.4	28.0	12.0	550	250	800		362 B
Nigeria	AG	Ekiti-Akoko Ag. Dev.	L- 1854	80	80.5	32.5	18.4	250	250	500		257 B
Nigeria	AG	Kano Ag. Dev.	L- 1982	81	482.2	142.0	72.0	1440				940 B
Nigeria	AG	Bauch State Ag. Dev.	L- 1981	81	350.6	132.0	44.0	1200				1280 B

Nigeria	AG	Sokoto Ag. Dev.	L- 2185	82	498.7	147.0	70.4	1700				931 B	
Nigeria	AG	Kaduna State Ag. Dev.	L- 2436	84	193.7	122.0	73.9	1400			403	225	
Nigeria	AG	Multi-state Ag. Dev.	L- 2733	86	261.1	162.0	46.6		600	1000 T			
Nigeria	AG	2nd MSADP	L- 2988	88	125.0	85.2	15.3		1460 B	4330			
Nigeria	AG	3rd MSADP		89	159.4	100.9	27.8		1880	9990			
Rwanda	AG	Bugesara R.D	C-668	76	23.3	14.0	1.0		1350 B				
Senegal	TR	Highway Project	C-198	70	2.5	2.3	0.9	78			78		
Senegal	TR	Feeder Roads	L-1221	76	8.5	6.6	6.6						
Senegal	AG	Debi-Lampsar Irrig.	C-775	78	36.7	20.0	1.1	210					
Senegal	AG	Eastern Senegal R.D	C-1406	83	47.7	16.1	8.7	800					
Senegal	TR	5th Highway	C-1448/F015	84	49.9	21.5	6.3			4900			
Somalia	AG	Bay Region Ag. Dev.	C-972	79	45.0	12.0	9.2	210	600				
Tanzania	TR	Highway Supplement.	C-115	68	22.8	3.5	0.2						
Tanzania	AG	Flue-Cured Tobacco	C-217	70	14.7	9.1	1.4	1560		350	525		
Tanzania	TR	3rd Highway	C-265	71	9.5	6.5	2.2		475				
Tanzania	AG	Geita Cotton	C-454	74	23.8	17.5	4.9	500			500		
Tanzania	AG	Pyrethrum	C-1007	80	13.2	10.0	3.4		318			111	
Togo	AG	Cocoa/Coffee Dev.	C-503	74	10.0	6.0	1.5		160 B	160		196 B	
Togo	AG	Maritime Regional R.D	C-638	76	15.7	9.5	1.8		300 B			166 B	
Togo	AG	R.D in Cotton Area	C-741	77	26.0	14.0	4.3		700 B	700		500 B	
Togo	TR	Feeder Roads	C-810	78	9.1	5.8	5.8	1000		1000	595		
Togo	AG	2nd Coffee & Cocoa	C-945	79	25.8	14.0	5.4		300 B	460		300 B	
Togo	AG	2nd R.D	C-1302	82	46.4	23.5	7.0		450	2100			
Togo	AG	3rd Coffee & Cocoa	C-1745	86	33.2	17.9	5.8	250		1000	60		
Country	Division	Project	Credit Loan	Appr. Year	Total Amount	Original Principal	Amount for Rural Roads	Appraisal Road Kms			Actual Road Kms		
Togo	AG	Cotton Sector	C-1929	88	37.5	15.1	0.0			3000 A			
Uganda	TR	Highway Project	C-108	67	7.2	5.9	0.5	24	7	150	24	3	
Uganda	TR	2nd Highway	C-164	69	16.5	13.0	3.6		387 B				
Uganda	TR	3rd Highway	C-1803	87	21.8	18.0	0.8						
Uganda	AG	S.W. Reg.Ag. Rehab.	C-1869	88	27.4	10.0	7.8		2000				
Zaire	TR	4th Highway	C-916	79	231.3	26.0	10.0			1800			900
Zambia	TR	3rd Highway	L-1566/C-798	78	26.5	22.5	1.0						
Zimbabwe	TR	Highway Project	L-2282	83	70.6	26.4	26.4	315			285		

Zimbabwe	TR	2nd Highway	L-2939	88	86.4	32.7	10.9		1772				
Sub-Total					7436.0	3173.8	1038.9	35332	53779	75171	17938	23301	4538
APPRAISALS IN THE PIPELINE (January 1990)													
Cameroon	TR	Rural Infrastructure		89	178.0	70.0	70.0	500	3000	13400			
Congo	TR	Road Rehab. & Maint.		89	69.3	26.0	0.8						
Guinea	AG	National Rural Infras.		89	84.4	36.5	3.5		2425	2000			
Guinea Bissau	TR	Infrastructure Rehab.		89	43.3	23.6	1.6		170	144			
Tanzania	TR	Roads Sector Project		89	857.5	170.3	20.0						
Sub-Total					1232.5	326.4	95.9	500	5595	15544			
TOTAL					8668.5	3500.2	1134.9	35832	59374	90715	17937	23300	4538

AG - Agriculture
TR - Transportation
A – Annual Length
B – Constructed or Rehabilitated
G - Gravel
R - Regrading
T – Routine maintenance per year in each of the 7 states of the MSADP.

Annex 2 – Table 1

Rural Road Operations per Year by Transport and Agriculture

(Million of Current US$)

	Number of Projects			Total Project Amount (US$ million)			Original Principal ((US$ million)			Amount for Rural Roads			Appraisal Road Lenghths Const. + Rehab. (kilometers)			Maint.		
Apprais Year	Tot	Tr	Agri	Total	Tr.	Agri.	Total	Tr.	Agri	Total	Tr.	Agri.	Total	Tr.	Agri.	Total	Tr.	Agric.
64	2	2	0	131.4	131.4	0.0	97.4	97.4	0/0	50.2	50.2	0.0	255	255	0	0	0	0
65	1	1	0	18.6	18.6	0.0	16.0	16.0	0.0	16.0	16.0	0.0	1,300	1,300	0	1,300	1,300	0
66	1	1	10	23.0	23.0	0.0	21.1	21.1	0.0	2.4	2.4	0.0	30	30	0	0	0	0
67	2	2	0	63.2	63.2	0.0	51.9	51.9	0.0	13.5	13.5	0.0	255	255	0.	350	350	0
68	4	2	2	215.7	165.6	50.1	118.3	69.5	48.8	10.5	3.2	7.3	574	0	574	350	350	0
69	3	2	1	233.9	213.3	20.6	148.4	147.6	0.8	97.8	82.0	15.8	1,537	1,362	375	0	0	0
1960-69	13	10	3	685.7	615.0	70.7	453.1	403.5	49.6	190.4	167.4	23.0	4,151	3,202	949	2,000	2,000	0
70	4	3	1	136.3	80.3	56.0	110.9	76.4	34.5	35.8	30.4	5.3	4,538	2,978	1,560	0	0	0
71	3	2	1	216.9	216.9	0.0	129.6	102.9	26.7	74.0	67.9	6.1	2,917	2,057	860	0	0	0
72	3	1	2	149,1	149.1	0.0	97.4	56.3	41.1	55.3	47.7	7.6	1,440	430	1,010	0	0	0
73	6	3	3	1037.4	927.5	109.9	275.6	228.4	47.1	27.3	15.8	11.4	1,368	388	980	0	0	0
74	12	2	10	458.0	37.5	420.5	416.3	31.7	384.6	85.3	7.7	77.5	7,731	2,200	5,531	960	800	160
75	9	6	3	542.3	381.0	161.3	326.4	220.5	105.9	136.4	117.5	18.9	4,371	2,947	1,424	10,244	10,244	0
76	5	3	2	147.7	66.6	81.1	104.2	55.3	48.9	38.8	32.9	5.9	3,650	2,000	1,650	3,550	3,550	0
77	8	4	4	1315.5	867.7	447.8	319.9	138.2	181.7	126.6	58.1	68.5	11,888	9,288	2.600	6,125	5,425	700
78	8	3	5	579,2	58.9	520.3	317.7	46.6	271.1	30.9	11.2	19.8	2,290	1,000	1,290	1,339	1,000	339
79	8	4	4	799.2	542.1	257.2	309.0	198.6	110.4	86.6	54.6	31.9	5,655	3,625	2,030	4,760	4,300	460
1970-79	66	31	35	5381.7	3327.6	2054.1	2407.0	1154.9	1252.1	696.9	443.9	253.0	45,848	26,913	18,935	26,978	25,319	1,659
80	6	1	5	392.7	11.6	381.1	191.5	9.3	182.2	70.9	9.3	61.6	3,766	700	3,066	2,100	800	1,300
81	3	1	2	1154.8	55.7	1099.1	405.2	43.6	361.6	162.3	9.2	153.1	5,284	2,644	2,640	0	0	0
82	3	0	3	767.8	0.0	767.8	249.2	0.0	249.2	160.6	0.0	16.6	2,384	0	2384,0	2,700	0	2,700
83	8	4	4	720.6	459.9	260.8	350.4	255.3	95.1	166.1	134.7	31.4	9,260	6,785	2,475	4,300	2,000	2,300
84	5	2	3	469.8	88.4	381.4	257.3	46.9	210.4	140.5	25.6	114.9	2,900	840	2,060	7,340	6,900	440
85	4	2	2	584.0	470.4	113.6	264.0	219.4	44.6	36.1	26.9	9.2	1,173	583	590	2,850	2,000	850
86	4	1	3	641.3	250.7	390.6	243.6	17.7	225.9	77.5	14.0	63.5	2,3333	883	1,450	3,483	1,483	2,000
87	1	1	0	23.4	23.	0.0	19.3	19.3	0.0	0.9	0.9	0	0.	0	0	0	0	0
88	6	1	5	629.0	86.4	542.6	267.0	32.7	234.3	58.5	10.9	47.6	9,282	1,772	7,510	10,630	2,800	9,990
89	3	2	1	429.0	268.9	159.4	160.4	59.1	101.4	43.9	16.0	27.9	2,730	850	1,880	12,790	2,800	9,990
1980-89	43	15	28	5812.4	1715.4	4097.0	2407.8	703.2	1704.6	863.3	247.5	615.8	39,112	15,057	24,055	46,193	15,983	30,210
TOTAL	122	56	66	11879.8	5658.1	6221.8	5267.9	2261.6	3006.3	1750. 6	858.8	891.8	89.111	45,172	49,939	75,171	43,302	31,869

Annex 2 – Table 2

Rural Road Operations per Year by Transport and Agriculture
(Million of Current US$)

	Number of Projects			Total Project Amount (US$ million)			Original Principal (US$ million)			Amount for Rural Roads			Appraisal Road Lenghths (kilometers) Const. + Rehab.			Maint.		
Apprais Year	Tot	Tr	Agri	Total	Tr.	Agri.	Total	Tr.	Agri	Total	Tr.	Agri.	Total	Tr.	Agri.	Total	Tr.	Agric.
64	2	2	0	29.6	29.6	0.0	21.9	21.9	0/0	11.3	11.3	0.0	255	255	0	0	0	0
65	1	1	0	4.2	4.2	0.0	3.6	3.8	0.0	3.6	3.6	0.0	1,300	1,300	0	1,300	1,300	0
66	1	1	10	5.4	5.4	0.0	5.0	5.0	0.0	0.6	0.6	0.0	30	30	0	0	0	0
67	2	2	0	15.0	15.0	0.0	12.3	12.3	0.0	3.2	3.2	0.0	255	255	0.	350	350	0
68	4	2	2	50.8	39.0	11.8	27.9	16.4	11.5	2.5	0.8	1.7	574	0	574	350	350	0
69	3	2	1	57.9	52.9	5.1	36.7	36.5	0.2	24.2	20.3	3.9	1,737	1,362	375	0	0	0
1960-69	13	10	3	162.8	145.9	16.9	107.4	95.7	11.7	45.4	39.7	5.6	4,151	3,202	949	2,000	2,000	0
70	4	3	1	35.8	21.1	14.7	29.1	20.1	9.1	9.4	8.0	1.4	4,538	2,978	1,560	0	0	0
71	3	2	1	60.1	60.1	0.0	35.9	28.5	7.4	20.5	18.8	1.7	2,917	2,057	860	0	0	0
72	3	1	2	45.0	45.0	0.0	29.4	17.0	12.4	16.7	14.4	2.3	1,440	430	1,010	0	0	0
73	6	3	3	363.3	324.8	38.5	96.5	80.0	16.5	9.6	5.6	4.0	1,368	388	980	0	0	0
74	12	2	10	195.3	16.0	179.3	177.5	13.5	164.0	36.4	3.3	33.1	7,731	2,200	5,531	960	800	160
75	9	6	3	257.0	180.6	76.4	154.7	104.5	50.2	64.7	55.7	9.0	4,371	2,947	1,424	10,244	10,244	0
76	5	3	2	71.0	32.0	39.0	50.1	26.6	23.5	18.6	15.8	2.8	3,650	2,000	1,650	3,550	3,550	0
77	8	4	4	695.0	458.4	236.6	169.0	73.0	96.0	66.9	30.7	36.2	11,888	9,288	2.600	6,125	5,425	700
78	8	3	5	351.9	35.8	316.1	193.0	28.3	164.7	18.8	6.8	12.0	2,290	1,000	1,290	1,339	1,000	339
79	8	4	4	550.1	373.1	177.0	212.7	136.7	76.0	59.6	37.6	22.0	5,655	3,625	2,030	4,760	4,300	460
1970-79	66	31	35	2624.5	1546.9	1077.6	1147.9	528.2	619.8	321.1	196.6	124.4	45,848	26,913	18,935	26,978	25,319	1,659
80	6	1	5	296.3	8.7	287.6	144.5	7.0	137.5	53.5	7.0	46.5	3,766	700	3,066	2,100	800	1,300
81	3	1	2	875.0	42.2	832.8	307.0	33.0	274.0	123.0	7.0	116.0	5,284	2,644	2,640	0	0	0
82	3	0	3	573.1	0.0	573.1	186.0	0.0	186.0	79.6	0.0	79.6	2,384	0	2384,0	2,700	0	2,700
83	8	4	4	525.9	335.6	190.3	255.7	186.3	69.4	212.2	98.3	22.9	9,260	6,785	2,475	4,300	2,000	2,300
84	5	2	3	335.4	63.1	272.3	183.7	33.5	150.2	100.3	18.3	82.0	2,900	840	2,060	7,340	6,900	440
85	4	2	2	420.5	338.7	81.8	190.1	158.0	32.1	26.0	19.4	6.6	1,173	583	590	2,850	2,000	850
86	4	1	3	544.5	212.9	331.6	206.8	15.0	191.8	65.8	11.9	53.9	2,3333	883	1,450	3,483	1,483	2,000
87	1	1	0	21.8	21.8	0.0	18.0	18.0	0.0	0.8	0.8	0	0.	0	0	0	0	0
88	6	1	5	629.0	86.4	542.6	267.0	32.7	234.3	58.5	10.9	47.6	9,282	1,772	7,510	10,630	2,800	9,990
89	3	2	1	427.1	267.7	159.4	159.7	58.8	100.9	43.7	15.9	27.8	2,730	850	1,880	12,790	2,800	9,990
1980-89	43	15	28	4648.7	1377.2	3271.5	1918.5	542.3	1376.2	672.4	189.5	482.9	39,112	15,057	24,055	46,193	15,983	30,210
TOTAL	**122**	**56**	**66**	**7436.0**	**3070.0**	**4366.0**	**3173.8**	**1166.2**	**2007.7**	**1038.8**	**425.9**	**613.0**	**89.111**	**45,172**	**49,939**	**75,171**	**43,302**	**31,869**

ANNEX 3 – Table 1

IBRD/IDA Projects with Rural Road Components by Country (1964-1989)
Constant Terms (1988m = 100)

Country	Total Amount	Original Principal Loan/Credit	Rural Roads Related	Appraisal Road Length Const	Rehab	Maint
Benin	151.0	77.7	43.7	840	2,455	3,525
Burkina Faso	57.9	21.5	15.8	0	2,000	3,300
Cameroon	728.1	293.5	63.1	3,950	4,606 A	3,350 A
Chad	64.2	50.8	8.8	102	800	3,100 R
Cote d'Ivoire	808.6	401.9	96.6	467 G	4,746	5,000
C.A.R	114.1	28.3	7.8	0	1,550	2,300
Ethiopia	1113.9	349.9	199.3	8,065	300	0
Gabon	110.6	30.2	10.9	0	0	2,800
Ghana	293.6	132.6	30.0	0	848	8,000
Guinea	35.0	9.2	3.6	240	0	500
Kenya	1532.2	642.0	205.4	2,014	5,821	1,500
Lesotho	23.0	21.1	2.4	0	30	0
Liberia	261.2	126.5	44.7	1,150	664 B	2,540
Madagascar	199.2	72.5	45.1	0	1,175	2,000
Malawi	524.5	298.6	58.1	2,487	6,484	339
Mali	142.2	108.5	35.1	1,450	2,650	944
Mauritius	31.4	11.4	6.0	0	0	0
Niger	294.8	54.8	30.2	963	1,000	2,483
Nigeria	3578.6	107.4	616.6	8,657	8,831	16,620
Rwanda	48.4	29.1	2.1	0	1,350 B	0
Senegal	222.8	107.7	39.8	1,088	1,000	6,150
Somalia	65.4	17.4	13.4	210	600	0
Tanzania	260.6	127.2	30.1	2,060	793	350
Togo	295.8	157.5	48.9	1,250	1,910	8,420 A
Uganda	147.7	106.9	25.3	24	2,394	150
Zaire	336.2	37.8	14.5	0	0	1,800
Zambia	43.9	37.0	1.6	0	0	0
Zimbabwe	183.1	68.9	47.1	315	1,772	0
Total	**11668.0**	**5127.7**	**1746.1**	**35,332**	**53,779**	**75,171**

Notes :

A – Annual Length
B – Constructed or Rehabilitated
G – Gravel
R – Regrading
T – Routine maintenance per year in each of 7 states of the MSADP

ANNEX 4. ROAD CONSTRUCTION AND MAINTENANCE 1987-88 ANNUAL TARGETS AND ACHIEVEMENTS FIRST MSADP

Agricultural Development Project	Rehabilitation			Recurrent			Routine		
	Target	Actual		Target	Actual		Target	Actual	
		1987	1988		1987	1988		1987	1988
Benue	150	-	-	300	-	-	1,200	150	37
Cross River	150	160	NA	400	176	NA	1,000	-	NA
Imo	179	82	187	450	303	300	1,300	287	230
Ogun	No road program								
Plateau State	350	57	129	840	96	1,025	180	-	-
Anambra	170	64	76	400	-	25	1,000	-	-
Bendel	150	32	NA	300	38	NA	1,000	-	NA

Source: Supervision reports

ANNEX 5

RECOMMANDATIONS FOR LOCAL PLANNING

1. The experience with local planning in Bank projects indicates that any road section methodology recommended for Bank projects in the future could be substantially improved by: (1) incorporating population densities into the road selection process, (2) introducing road density targets as additional criteria in area development plans, and (3) improving traffic assessment in order to consider low volume traffic characteristics.

a. Population densities

2. The influence of population densities in road selection appears evident. However, many road selection exercises reviewed did not include it at all or used average population densities borrowed from other regions. The advantage of introducing population density in the area of influence as a factor in road selection it that it gives an approximate idea of the impact of a road will have on the area. Considering only potential supply response tends to favor areas with the largest farms.

Good examples on how to incorporate population densities have been provided by the ranking methodology in various projects including the Kenya RARP, MalaWs DRIMP, and Nigeria's ADPs. One of the main problems is how to weigh this factor against others such as producer surplus for example. Experience with local participation of district engineers (eg. Kenya!s RARP) showed that no mathematical formulation completely satisfies local level planners. Therefore, an agreement on a simple system of weights to evaluate the benefits and factors of each road in a given area is the first step to involve the local community. The other problem is how to find adequate micro level population data. Possible methods vary between countries, but the problem can generally be solved by developing densities from agricultural data, or in some cases during the topographic survey of the road. In some projects in Nigeria the densities have been derived from informal population counts obtained along the road.

b. Road Target Densities

3. The use of road target densities has been advocated in many countries. The main problem is the tendency to set target densities across country borders without proper evaluation of local conditions. However, there is enough regional (below national) level data from some countries in SSA to develop interregional comparison densities which can be more useful than national level densities.

4. The use of road target densities was tried in an early enclave ADP project in Nigeria. Project experience showed that the very high target rural road densities set at appraisal (similar to those in India) were inappropriate for Northern Nigeria. This points to the fact that comparisons of average rural road densities between countries (and even between SSA countries only) can be very misleading given the limitations of available data and the wide variations within countries. [1]Applying interregional rather than intercountry data, comparisons can be made among regions with similar resource endowments.

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[1] The lack of accurate records on road lengths is not unique to SSA. In most countries the rapidly changing state if rural roads and the existence of substantial numbers of unclassified kilometers outside of the executing Ministry’s network limits the use of rural roads densities.

5. Using target road densities blindly can lead planners into building more roads and increase densities in kilometers per unit of area to levels which are unmaintainable and probably unjustifiable in economic terms. Therefore, institutional and financial limitations should be taken into account as well as

Box A 5.1 Deficiencies with Traffic Data Analysis

Data Collection for traffic has been very deficient. The SARs and PCRs for the ADPs in Nigeria show that traffic counts in the earlier projects were only done sporadically, and never in a way that allowed a systematic evaluation of changes in road use. For the more recent ADPs, the Federal Agricultural Coordinating Unit (FACU) has collected traffic data on some roads before and after improvements. However, comparisons of the same road have not been possible in most cases, because the surveys are conducted on roads which are later not included in the road programs, or have not been included in the road programs to date. For example, the road selection for Benue State (first MSADP) states that "traffic levels on roads rehabilitated are not known for most roads, despite the fact that a traffic count study was commissioned by FACU. However, the roads covered in the survey do not coincide with the areas of influence of the candidate roads in the first year plan in these states" (FACU, 1988)

Wide variations to traffic volumes often occurs among rural rods in one project and call for adoption of different road selection methods and design standards. For example, the roads included in the Niger State ADP (first MSADP), observed traffic which varied from 15 to 124 vehicles per day, which clearly denotes the need to estimate road user savings on the busier roads (e g above 50 vpd). A consultant report for the second MSADP, indicates even larger variations of traffic in the supposedly rural roads. In Niger state, five out of ten roads surveyed had daily traffic ranging from 174 to 658 vehicles per day, while in Kwara state two roads bad traffic of 350 and 970 vehicles per day. These large volumes of traffic are quite distinct from those expected in the PPAR for the first MSADP in which "site inquiries by the appraisal mission in agricultural areas generally indicated average daily traffic (ADT) of 30 to 35 vehicles on market days and normal of 15 to 20."

using densities to establish desired levels of service In addition, environmental problems (e.g. deforestation and erosion) are likely to arise from unreasonable extensions to the road networks and improper attention to landscape and drainage design.

c. Traffic

6 Finally traffic as a factor in planning needs much more attention during project formulation So far, traffic forecasting, composition and changes brought about by the projects have been considered very lightly (see Box A 5 1)

7 Rural roads account for a small portion of total vehicular traffic (i.e about 90 percent of vehicle traffic move on 15 percent of main roads) but they are used for essential movements of persons and goods in agricultural areas. Traffic volume on rural roads is low, amounting to less than 10 vpd on many roads. Such low levels complicate forecasting due to high statistical errors and poor date availability. Examples of poor traffic forecasting are abundant. With such low volumes, only roads of low construction cost are justified to provide a transport facility, rather than the more expensive roads of higher standard which are usually advocated.

8. Traffic considerations in all Bank rural road projects have emphasized only vehicular traffic. A large proportion of the traffic is made up by pedestrians and non-motorized transport. With the difficulties associated with estimating the value of time, few projects have included non-motorized and pedestrian traffic in the economic evaluation. Such issues are currently being addressed by the rural travel and transport component of SSATP.

9. The importance of accurate estimations of traffic composition is reinforced by the fact that it has changed in ways unforeseen at appraisal. In the RARP in Kenya, for example, motorized traffic increases in the impact area were not encouraging. The estimates of agricultural benefits expected grossly overestimated vehicle traffic on the road. Moreover, after the roads were improved, farmers still delivered their coffee, sisal, cotton, and tea to the markets by headloading. Milk however, was transported out of the study area by bicycle, while fuel was moved on donkey carts.

10. There is always a danger that without adequate emphasis on traffic, the projects might end up improving secondary roads which serve a different function. The definition of rural road is usually too broad, particularly if no traffic data is collected. Projects should define specifically the type of roads to be included, and apply planning methods according to the level of service desired (partly in terms of vehicular and other traffic). For example, for higher volume roads (50 vpd or above), evaluation of vehicle operating costs and producer surplus would apply if data is available and adapted forms of computer economic analysis models (e.g. HDM model) can be used. However, for lower volume roads of less than 50 vpd the producer surplus approach, combined with factors such as population density, would be more appropriate for assessing the potential regional impact of the roads project.

11. Forecasts of agriculturally related traffic should in some way account for limitations of traffic growth depending on restrictions to operations, limits to entry and the rate of growth of the fleet. Agricultural effects such as supply response may not materialize because of pan-territorial pricing of inputs and outputs. No project reviewed entered such factors into account in the traffic forecast.

ANNEX 6

RURAL ROAD STANDARDS

Country	Project or Agency	ADT	Speed (km/hr)	Right of Way (m)	Min. Formation Width (m)	Carriage-way Width (m)	Base Thickness (mm)	Camber (%)	Drainage Depth (m)	Drainage Width (m)	Min. Culvert Length (m)	Maximum Gradient by Type of Terrain: Ondulating	Maximum Gradient by Type of Terrain: Hilly	Maximum Gradient by Type of Terrain: Mountainous	Minimum Horizontal Radius by Type of Terrain: Ondulating	Minimum Horizontal Radius by Type of Terrain: Hilly	Minimum Horizontal Radius by Type of Terrain: Mountainous
Cameroon	Rural Infrastructure			12-16		5-6	80-120					12.0	12.0	12.0			
Ethiopia	Road Sector	< 50	< 40	20.0	10-15	6.0	150.0					14.0	14.0	14.0	10.0	10.0	10.0
Ethiopia	Road Sector	< 30	< 40	20.0	10-15	4.0	75.0					12.0	12.0	12.0	10.0	10.0	10.0
Ethiopia	Road Sector	< 10		20.0	10-15	4.0	75.0					12.0	12.0	12.0	10.0	10.0	10.0
Guinea	National Rural Infra.	Market-Trunk	< 40	9.5	6.5	4.5	100.0	4.0	0.5		7.0						
Guinea	National Rural Infra.	Village-Market			4.5	3.5		4.0			6.0						
Guinea	National Rural Infra.	Farm-Village			4.0	3.0		4.0									
Kenya	RARP (< 1980)	< 30	< 40	7.3	4.5	4.0	100.0	5.0	0.3		5.0	11.0	11.0	11.0	30.0	30.0	30.0
Kenya	RARP (> 1980)	> 30	< 60	8.8	6.0	5.5	100.0	5.0	0.3		5.0	11.0	11.0	11.0	15.0	15.0	15.0
Kenya	MRP (> 1986)	< 50	60	20.0	5.4	5.4	120-200	8.0	0.4	0.6		8-10	10-12	10-12	40-100	15-50	15-50
Malawi	DRIMP	< 20			5.5	5.5		7.0	0.3	0.5							
Mali	Third Highway			12-16	4.3	4.3	130.0										
Nigeria	DFRRI	Unspec.		10.0		6.0	150.0		Adequate		6.0						
Nigeria	ADP	50-100		13.0	9.5	6.0	150.0	4.0	0.4		8.0						
Nigeria	Multistate ADP (I)	< 50		10.0	8.0	6.0	150.0	4.0	0.4		8.0	6.0	8.0	10.0	75-110	35-75	30-35
Nigeria	SPWP	Unspec.		13.0	10.0	6.5	<300										
Tanzania	MCW	> 60	50-60	10.0	8.5	5.5	100-150	3.0				5.0	8.0	10.0	200.0	100.0	50.0
Tanzania	MCW	20-60	40-60	10.0	6.9	4.5	100-150	3.0				5.0	8.0	10.0	200.0	100.0	50.0
Tanzania	MCW	< 20	30-50	10.0	5.9	3.5	100-150	3.0				6.0	9.0	11.0	125.0	50.0	30.0
Tanzania	NORAD	< 10	< 40		4.0	3.5	120.0	6.0	0.3	0.5							
Tanzania	Swiss Develop. Corp.	< 35			6.5	4.5	150.0	4.0	0.4			8-12	8-12	8-12	20.0	20.0	20.0
Tanzania	Proposed Roads	< 20	30-60	10-15	5.9	4.5	100-200	6.0	0.4	0.5		8.0	10.0	10.0	50-100	30-50	15-30
Togo	First Feeder Roads	> 20		10-12	6.5	5.5	150.0										
Togo	First Feeder Roads	< 20		7-8	5.0	4.0	100.0										