

## New trends in rural feeder roads planning

by

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### A. THE NEW TRENDS

International lending agencies are rapidly moving, as a matter of policy, towards focusing their road infrastructure investments on rural feeder roads.

For AID this is in response to a "Congressional Mandate" that infrastructure projects should directly benefit the small farmer. Therefore the distribution of benefits is at least as important as the total value of the producer surplus created or the balance of payments effect, and the measurement of benefits involves social welfare as well as incremental income valuation. Consequently, priority is given to farm to market roads as compared to feeder roads which provide point to point links with marketing centers. The former are not viewed as forming part of the future national road network.

IBRD's approach is in the same direction but less single-minded. It will continue to finance a broad spectrum of road works but is trying to correct past neglect of farm access and secondary roads. This implies an acceptance of lower engineering standards, a departure from economic justifications based on vehicle operating savings alone, and a commitment to more local cost financing. Moreover, IBRD is sponsoring a substantial amount of research to improve the economic and engineering techniques for design, justification and evaluation of rural road projects.

This attention to rural roads is part of the growing emphasis that international financing agencies are placing on the rural sector, especially on efforts to raise productivity and income levels of the rural poor through generally a multi-disciplinary approach involving in a number of cases integrated rural development projects. It reflects a recognition that subsistence sector cannot be modernized simply by migration of labor out of agriculture into the modern sector. Employment opportunities in the non-rural sector cannot be generated sufficiently fast to absorb the under-employment or low productivity of labor in the rural areas, as well as relatively rapid natural growth in population characteristic of most of the less developed subsistence economies.

There is little agreement on how high a priority should be placed on roads relative to other resource inputs in integrated rural developing planning. Access to marketing and service centers are generally agreed to be an essential component of any rural development planning. There are numerous examples which demonstrate that investment in rural roads alone does not necessarily yield a greater producer surplus or improvement in rural standards of living. The particular national, regional, local environment within which rural development is planned conditions to a large extent the success of investments. An important characteristic of the environment is the density of the existing rural road system as related to population density and the extent to which this system permits all-weather access. However, much of the effort

in rural development projects is directed towards increasing outputs and incomes of low-income producers by the introduction and expansion of technological change at the farm level.

*"The assumption underlying this effort is that three basic conditions must be met if changes are to be brought about: producers must know how to increase their output; they must have access to the means of increasing their output; and they must have incentive to make the effort and accept the risks associated with increasing their output. Agriculture is atomistic in the sense that there are many producers each with little influence over the prices he receives (though improved marketing techniques can often raise prices at the farm gate). Consequently, most projects tend to be focused on cost effective ways and means of delivering to farmers the goods and services that they need. These include all inputs and those that investment and infrastructure, such as irrigation and transport, will provide."*[1]

The principal attempt of this paper is to draw the reader's attention to the fact that the planning and evaluation of rural feeder roads is a much more complicated, interdisciplinary and uncertain task, than the traditional engineering and cost/benefit analysis used for developing justification for and the implementation planning of capital investment in transport. Roads are the mode of attention since they represent the most flexible and least cost means of providing transportation services to rural populations, with the exception of a few areas where rivers may provide an alternative. Although the per-capita investment may be relatively small, the absolute needs on a regional or nationwide basis are often very large and consequently require very substantial investments. They are spatially widely dispersed, and involve the development of new implementing organizations, training, and management skills. Furthermore, the risks or uncertainties of success, i.e. of accomplishing project objectives no matter how defined or quantified, are often substantially greater than for traditional investment projects. Moreover, relatively little careful research has been devoted to determining what makes for a successful project and whether the successful components can be replicated from one area to another within a single country and still more conjecturally whether the experience in one country can provide good guidelines for planning in others.

### B. DEFINITION OF RURAL FEEDER ROADS

There is still some fuzziness in defining the term rural feeder road. For the purposes of this paper the following characteristics are implied, which are broad enough to encompass both the AID and IBRD views.

1. The purpose of the road is primarily to provide improved farmer access to producer markets and to markets supplying goods and services to farmers.

2. The road will generally be intra-provincial, either linking farms to a small marketing center, or these centers to the provincial centers.

3. The investment cost per kilometer will not exceed \$30,000, except in difficult terrain.

4. The roads may be either dry-weather or all-weather but will not have asphalt or concrete paving or a formation greater than 6 meters.

5. Existing traffic will not exceed 100 VPD, most frequently will be less than 50 VPD, and therefore road user savings are not a reliable or sufficient measure of benefits.

### C. MAJOR ISSUES

The planning and justification of such roads raises the following major issues:

1. How rapidly can a country embark on a rural roads program given the constraints of budget, managerial and technical skills, and availability of workforce?

2. What are the appropriate criteria for determining priorities? Among the broad alternatives are:

a. Highest priority to areas of highest population density and development potential. This implies a high value assigned to economic efficiency.

b. Highest priority to areas whose development has been neglected relative to other parts of the country. This alternative implies a social equity criteria, i.e., the use of roads program to narrow income or social welfare disparities between regions.

c. Highest priority to roads which compliment or are a part of comprehensive regional development schemes. This implies that a specific set of complimentary inputs are necessary for the roads to generate a significant economic response.

3. Closely associated with the issue of appropriate criteria is the question of who should set the criteria. Some would argue that for a nationwide program, utilizing in part or in total national funds, this can only be determined at the highest political level and be translated into operating guidelines by technicians of a ministry planning bureau. Others contend that rural road programs will never succeed unless priorities are determined at the local level by the people who are to directly benefit from the investment and who may be asked to contribute some money or labor to the project.

4. How is one to forecast economic activity and associated transport demand, particularly where roads are not a part of an integrated rural development package? How much time and expense are warranted in making such forecasts? Are the tools for evaluation which may be developed and the interrelationships they may postulate applicable, beyond the spatial confines of the area studied, either to other regions within a country or to other countries?

5. What design standards and construction techniques are appropriate? What are the trade-offs between construction and maintenance costs and labor and capital intensive techniques? Is cost efficiency to be the primary guide for evaluating these choices? What impact should the policies of aid donors have on these choices?

6. How should a rural roads program be organized and financed? If one believes that he who holds the purse strings also determines the way the program will be designed and executed, the organization and its financing are closely related. Among the possible alternatives are:

a. The provincial and local authorities are primarily responsible and are provided with the financial capacity to undertake the program. They may contract for services and equipment not locally available.

b. An entirely new works organization may be established.

c. Rural roads programs may be organized and undertaken by public agencies responsible for agriculture, livestock, community development and the like, as an additional but complimentary activity to those for which the agency is already responsible.

d. Private commercial enterprises, with a special interest in road access and conditions in a particular area, (cooperatives, agro-industries, mining or forestry enterprises) may take upon themselves road building and maintenance, with or without some financial or technical assistance from public authorities.

7. *Trained Manpower* Since it is the intent to build rural roads to minimum standards and costs consistent with the traffic to be served, it is unlikely that one can afford detailed engineering proceeding construction. Therefore the critical individual, both for detailed planning and works execution, will be the on-site construction supervisor. These minor road works are likely to be unattractive to large private contractors and also difficult to execute by contract without detailed specifications. Therefore construction will be done by public works agencies (force account) or by small private contractors who have relatively unsophisticated management skills or financial resources. Therefore the responsible public agency will have to greatly increase its pool of works supervisors. Can this be accomplished rapidly and what types of skills and training are appropriate?

The supervisor will have to have some engineering planning, and administrative skills. He will have to be innovative and self-reliant to a much greater extent than if he were working on a larger job, to detailed plans, under close supervision by an engineer. If works are to be accomplished largely by labor intensive techniques, will he know how to obtain the best productivity under these conditions? Will he have the personality required to effectively manage a large labor force or to negotiate for labor with the leaders of local communities? Must one train manual labor in the use of tools and other small implements?

8. *Maintenance*. The issues here are who will have maintenance responsibility for the roads once built, what level of maintenance is necessary, does it require seasonal peak efforts and if so how can the effort be assured at times and places required, who will finance it, and should it be a labor or capital intensive activity or some mix of both?

Economics dictate that one can only afford to spend a few hundred dollars a year on routine maintenance of rural feeder roads. This eliminates machine intensive maintenance as an alternative except in areas of very sparse population. The best alternative appears to be to use persons living in proximity to the roads to perform routine maintenance, with each person or gang responsible for a specific road section that is within walking distance of their homes. This solution has many advantages:

a. Maintenance labor can be held specifically responsible for physical sections of road both by local communities (their peers) and by the agency supervising their work.

b. The laborers are always on-site to identify road deterioration and make necessary repairs.

c. The cost of labor is relatively low as compared to laborers permanently employed by a works agency whose cost, when minimum wages, fringe benefits, works camp expenses, and transport are incurred, may be four times higher.

Supervision of maintenance requires more planning and perhaps staff but this cost can be minimized by careful organization. One can have the lowest level supervisor using a bicycle, then his supervisor covering more area with a motorcycle, and finally a senior super-

visor in a motorized vehicle. Where hauling of materials is necessary, this can be scheduled as an intensive motorized task a few times a year with materials stockpiled at locations convenient for placement by hand labor.

Periodic maintenance, required at intervals of one to three years, may remain a more centralized responsibility undertaken with more mechanization.

#### D. PROJECT EVALUATION

Traditionally, the analysis of transportation investment projects has relied on the concept of economic efficiency (benefit/cost). In the traditional transportation benefit/cost analysis, it is assumed that the economy is in equilibrium and the constituency consists only of users of the transportation system. Under this assumption, economic benefits accruing to current and prospective users are evaluated against the economic costs of constructing and maintaining the facilities or equipment. While the impact on users is a vitally important component of a benefit/cost analysis, experience had demonstrated that transportation investments may have a far greater socio-economic impact upon the people who live near the facility and upon the communities and towns served by the facility.

While the transportation planner was, in one instance, faced with the requirements for highly sophisticated and advanced planning techniques, on the other hand, he was increasingly criticized for his failure to deal with social equity, income distribution, rural development, and in recent years environmental considerations. Transportation planning was faulted for evaluating project benefits in the form of savings or benefits which were received by the monetized or modern sectors of a developing economy. These recipients were the relatively prosperous urban and modern farming sectors.

In undertaking such rural road evaluation studies, the analyst must first ascertain the extent to which the present lack of adequate access has significantly distorted the development potential of a region. Then, the analyst must identify on a micro-level the present structural and socioeconomic characteristics of the economy of the area, including non-transport institutional constraints, the available human natural resources, the development potential, and the region's comparative economic advantage and income distribution to analyse why the region has trailed the national economy or other equally endowed regions in economic development. Such studies involve multidisciplinary analysis and raise significant problems of input compatibility (e.g. how does one compare agricultural production with improved health and welfare).

#### E. NEW TECHNOLOGY AND RESEARCH

These issues are very challenging. They call for new or adapted technology, engineering design, construction work methods, management, and finance. In this paper it is only possible to briefly summarize the steps that many organizations are taking to improve the state of the arts.

The IBRD, through its Transportation Research Department, is sponsoring substantial research. It is attempting to identify the developmental impact of rural roads, namely the classification, magnitude, and distribution of benefits and farmer response to perceived benefits. This is being accomplished through the following:

1. In-house position papers outlining the need and methods of a new analytical approach.
2. Operations research systems to support application of these methods.
3. Research programs in Brazil, Ethiopia, Malagasy, Yemen and probably Kenya to monitor the socioeconomic impact of new rural roads through long-term before

and after construction studies.

IBRD and ILO are also concentrating on studies of labor/equipment substitution in civil construction. IBRD has sponsored a series of technical memoranda based largely on field work in Northwest India and Indonesia undertaken by Scott Wilson Kirkpatrick in collaboration with government counterparts. ILO has sponsored several closely controlled pilot construction projects in various countries utilizing largely labor and special equipment adopted for use with draft animals.

The UK Transportation and Road Research Laboratory (TRRL) is undertaking research on the feasibility of using a variety of in-situ materials for gravel surfacing in E. Africa and is studying the effects of various methods and degrees of compaction in an attempt to lower rural road surfacing costs.

The TRRL and MIT have both developed new models for analyzing vehicle operating costs and road wear for gravel roads with traffic in the 100 VPD and higher range.

Our firm is also rapidly gaining experience in this field and is increasingly being called upon to take the lead in assisting to find answers to the critical issues. In the last twelve months we have completed work in Haiti, Tanzania, Kenya and Ethiopia which have had as a principal focus the planning of rural feeder roads.

United States Agency for International Development has prepared new guidelines for the planning (project design) of rural development projects. These guidelines are used by USAID missions around the world and by consultants that they may employ to prepare project justifications responsive to the "Congressional Mandate" mentioned earlier and require specific consideration of most of the points raised in this paper. Included in these guidelines is a complete new section requiring social soundness analysis in the planning of all new rural projects and specific consideration of simple technology, high-labor use techniques for project execution. Consultants who have better access to the multi-discipline expertise required for these types of analysis, are increasingly being called in by USAID to prepare these projects. Furthermore, the guidelines normally require that a specific evaluation program be planned for study of the project during its construction and for several years thereafter. This includes the establishment within the implementing host government agency of an evaluation function capability. This is a recognition of the fact that there may be important lessons to be learned from careful monitoring of the project implementation and ex post facto experience, in a field where careful empirical lessons are far and few between.

In Southeast Asia AID is assisting SEATAC in financing a research study specifically directed to evaluate the impact of transportation projects in four of its member countries. Namely, the Philippines, Malaysia, Thailand and Indonesia. Louis Berger International, Inc. has been employed as consultants to SEATAC for this study which will be launched in May. Each of these countries has organized a multi-disciplinary study team to evaluate projects in their own countries and consultants will help them develop methodology, provide training seminars and an operations manual for their guidance. The terms of reference of this study are appended to this paper.

In Upper Volta the IDA is financing a study for the purpose of evaluating the construction, maintenance and economic impact of the various road projects included in several agricultural projects financed by the IDA. In fact a great deal of the financing for rural road construction projects is subsumed under various agriculture or rural development projects. The study will serve to define the methodology to be utilized in future projects of rural road improvement in Upper Volta in order to permit an

analysis of the relative advantages of several possibilities and to choose the best method of obtaining these. The study will extend over a three year period. Traffic rarely exceeds 10-15 light vehicles per day. Most of the main secondary roads are unpaved and there is a vast kilometrage of non-classified roads or tracks. The study will begin with a critique of the economic analysis that was made in the original feasibility studies, such as cost of transport, projection of traffic, and distribution of benefits, comparing these with the ex post facto situation. It will consider the mechanism by which farmers received benefits, the estimated traffic induced by the road improvement and the mechanism by which this traffic was generated. It will also evaluate certain technical engineering aspects such as the geometric characteristics that were used and their rationale, and the methods of construction used, particularly labor intensive efforts. Finally, the study will produce an adapted methodology which can be used for analysis of projects in the future. The methodology will take account of all the quantifiable aspects as well as the social variables.

#### REFERENCE

[1] "Integrated Rural Development Projects: The Bank's Experience". Montague Yudelman, *Finance and Development*, March 1977.

#### ANNEX 1

##### Seatac study

##### Terms of Reference

I. The Louis Berger International, Inc. team in cooperation with SEATAC and the local study teams would undertake the intire scope of work presented in the Request for Proposal:

A. Collect copies of reports and documentation on the impact

of transport investment on socioeconomic development and take account of these reports in the selection of analytical methods relevant to the ex-post analysis or the types of projects included in the study.

B. Review the extent and specific contents of the data the local study teams have collected or are collecting and recommended changes, if any.

C. Upon receipt of data collected by the local study teams, to apply the appropriate method of analysis to each of four selected transport projects to determine the impact of each investment in relieving poverty, improvement of the life of the poor and improving the socioeconomic possibilities of the area. Variations of different analytical methods may be necessary to arrive at an optimum general methodology or methodologies for the different types of transport projects. This process of selecting methodologies and their utilization will be discussed with leaders of the local study teams as training to facilitate the application of the operations manual in the respective COORDCOM member countries.

D. Present appropriate methodologies and findings from the analysis of data as well as their implications at a workshop meeting among study participants including members of local study teams.

E. Prepare a report describing the major findings of the work undertaken during Phase I of this study and to provide specific guidelines for preparation of new projects during Phase II.

F. Draft an operations manual reflecting the findings and conclusions of Phase I of the study for the use of government and other agencies responsible for transport planning and social and economic development programs in remote areas. The manual will be primarily for project preparation and will include guidelines for calculating not only the direct economic benefits of projects but also, more importantly, the impact of the project investment in relieving poverty, enhancing the quality of life of the poor, and improving the economic possibilities of the area. (This manual, may be revised in accordance with the results obtained in Phase II).

II. The work would be completed within an eight month period, utilizing approximately 20 man-months of effort.