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## LABOR-INTENSIVE RURAL ROADS IN KENYA, TANZANIA, AND BOTSWANA: SOME EVIDENCE ON DESIGN AND PRACTICE

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*Abstract:* The labor-intensive road programs in Kenya, Tanzania, and Botswana share a great deal of common features. The programs are by and large experimental and donor supported. They are small in terms of their share in total road networks and employment. They promote the twin goals of improving access roads and generating employment. Employment is open to all working adults. Wages are time rated, administratively determined, and uniform. But real wages vary across time and space, and, consequently, labor supply responses vary accordingly. Implementation of road works rests largely on public institutions, but with minimum community involvement (except for provision of local labor).

The evolution of the programs in the 1970s and 1980s shows a pattern of convergence among the three programs in design and implementation practices. The road programs are shifting towards road maintenance, where unit cost of output is lower and share of labor cost is higher as compared to road construction and improvement. Such a shift promises a greater and more stable employment, and an increase in share of labor income. Tanzania and Botswana are approaching Kenya in their evolution towards a consolidation of their road programs into a national planning framework, and setting standard guidelines and procedures in identification, implementation, and monitoring of road works. Kenya's current experiment on alternative low-cost technologies for road works (Project 2000) marks an important advance that will soon have an impact on these other countries.

The sustenance of these programs depends on how much they progress towards self-sustenance and cost-efficiency. And, as the evidence from Kenya shows, such progression needs to take into account the potential for these programs to contribute to short-term poverty reduction through asset creation with a minimum adverse effect on long-term growth. Policy makers have an important role in translating these insights and knowledge into improved policy design. Since government has an important role in such an experimental and translation process, it is crucial that it overcomes its current ambivalence towards labor-intensive public works schemes.

### I. INTRODUCTION

The application of the concept of labor-intensive public works programs has expanded in Sub-Saharan Africa since the 1980s [5]. These programs have been applied to a wide variety of projects, but most fall into a few categories, such as rural road projects, irrigation, and resource conservation and afforestation. With some exceptions, these projects are rural-based. This paper focuses on a brief review of the evolution, design, and growth of rural road projects in Kenya, Tanzania, and Botswana. Since the road works constitute the major component of public works programs, they provide a reasonable approximation to the

understanding of the characteristics of labor-intensive public works in these three eastern and southern African countries.

The paper begins with a brief clarification of the concept of labor-intensive public works. It then traces and compares the evolution, design, and outcome of the programs across the three countries. The final section highlights the main features of the programs, indicates the direction to which the programs are evolving, and draws some policy recommendations.

## II. CONCEPT AND ISSUES

Labor-intensive public works programs (LIPWP) produce public goods such as roads, irrigation schemes, and afforestation through a choice of production processes that have a large proportion of unskilled labor. By definition, the set of choices of the production process in terms of factor-factor space is limited to the area where the proportion of labor to capital is more than unity.

Typically, these programs have dual objectives: asset creation and employment generation. And these twin objectives have important welfare functions at household or individual level. First, access to public works (in form of employment in short run or benefits associated with created assets in the long term, including the labor market effect) contributes to improvement in the level of income and consumption. Second, access to public works contributes to a stabilization of income and consumption, particularly in an environment where there are fluctuations in employment and income. This consumption smoothing function becomes critical in countries that are prone to natural disasters like drought, floods, and large population movements due to war. And when the stabilization function is guaranteed (or available on demand), public works schemes add an important feature of risk insurance [14]. Access to guaranteed employment protects the poor from engaging in undesirable survival strategies, which involve liquidation of productive assets, distress migration, indebtedness, and reduction of food consumption (see, for example, [20]). The weights attached to these multiple functions in a particular country context depend on an initial set of conditions that prompt their initiation.

When such programs are targeted to the poor through provision of employment or distribution of income associated with created assets, the programs contribute to a reduction of poverty. When such a reduction in poverty translates into improved consumption, especially food consumption, the programs then address the problem of food security. How much such programs contribute to food security of the poor then depends on (1) the extent to which the poor are involved in the programs (that is, degree of participation); (2) a net increase in employment, allowing for substitution of labor times; (3) the extent of net income transfer

(allowing for cost of participation); and (4) the share of additional income that is allocated to food consumption.

The key factor that determines the extent of employment creation and labor income is the factor proportion (labor to capital ratio) that is embodied in LIPW programs. Where factor markets are functioning, such factor proportion is market determined by relative factor prices. The growing use of labor-intensive production techniques in Africa, for example, is partly in response to changing factor market prices [5].

However, public policy can modify such market-determined factor proportion to alter the relative weights attached to asset creation, employment generation, and income transfer functions. Typically, factor proportions are set high to ensure such programs promote employment creation and income transfer, or wage rates are set below market wages to promote high intensity of labor. A key design attribute of public works is, in fact, the use of wages to self-select the poor. Here, wages are set below reservation wage of the non poor so that only the poor are willing to self-select into the programs.

But such emphasis on income transfer may involve economic inefficiency, which may be decomposed to technical inefficiency (for example, the same output may be produced with less labor) or allocative inefficiency. The latter may assume importance if the goal of income transfer entails a substantial trade-off between current income transfer goals and future income. How much such trade-off occurs depends on the marginal rate of substitution between current income maximization and future income foregone. The policy challenge for poor countries that face resource constraints is how to lower such trade-offs to ensure that short-term poverty reduction is achievable at a minimum cost of future income generation.

### III. EXPERIENCE WITH LABOR-INTENSIVE ROAD WORKS

The demand for public works has its origin in the growing demand for investment in productive infrastructure, and changing labor market environment and incidence of poverty. The three case countries below demonstrate how these sources of demand for public works prompted the evolution of labor-intensive road programs in three case countries. The brief review of these programs that follows is intended to enhance the understanding of their design and implementation features and their contribution to asset creation, employment generation, and poverty alleviation.

### 3.1 Origin and Goals

The Kenya labor-intensive road works program started in the 1960s [1]. It was reinitiated in 1974, following the recommendations of the 1972 International Labour Organization (ILO) strategy document on promoting productive employment in Kenya [9]. A special labor-intensive road program was instituted to construct rural access roads—the Rural Access Roads program. These roads were unclassified within the country's road network, but operated under the Ministry of Public Works. And since 1986, the program has expanded to minor roads, which includes both unclassified rural access roads and classified lower-traffic roads.

The labor-intensive rural road program in Botswana (officially designated as program LG 34) had its origin in the relief food-for-work program that operated in the 1960s. The relief program appeared as cash-for-work program during the 1978-79 drought. In the aftermath of the drought, the country introduced a regular road work program (LG 34) and experimented with it between 1980-82. The LG 34 expanded to all districts in 1986. It has since then operated independent of the relief works programs.

The road project in the United Republic of Tanzania (URT) started in 1978 as part of the multi-sectoral special public works program. The project focused on improvement of rural access roads in Rukwa and Ruvuma regions. The whole program phased out in these regions in 1992. However, there are still small-scale donor-supported labor-intensive road programs in the country (NORAD in Tanga and Mbeya regions, SDC in Morogoro region, and FINNIDA in Mtwara and Lindi regions).

All these road programs share a common set of goals: (1) road improvement and maintenance; (2) employment creation for unskilled rural labor; and (3) income generation for the participating rural population. Poverty reduction is more often an implicit, rather than explicit, objective in all three countries. However, there are some variations in weights attached to these goals in practice.

### 3.2 Cost Structure

The work schemes in Botswana and Tanzania follow administratively set guidelines on setting the factor proportion between labor and capital. Typically, 60 to 70 percent of the project costs are allocated to a wage bill to cover payments for unskilled labor. The Kenya program is an exception. Here the Minor Roads program has a latitude to vary the proportions of labor to capital, depending on the type of road work (that is, road improvement that includes graveling and maintenance), and technical conditions (for example, soil, topography, skill intensity of work).

In practice, there are some notable deviations from the prescribed factor shares. The actual shares of labor cost are in general lower than what are often stated in project design. For example, the shares of unskilled labor averaged 65 percent of the operating costs in Botswana during 1986/87 and 1990/91 [20]. In Tanzania, the road works in Ruvuma averaged 60 percent of the operating cost in the first phase of the program --1980-86 [23].

These shares are much lower when the costs of technical assistance and project overheads are factored into the total costs. These two cost components account for nearly 30 percent of the total project costs in Botswana. The percentage is even higher in Tanzania. The combined cost of technical assistance and overheads accounts for about one-half of total funds. When the cost share of unskilled labor is seen in context of the entire cost of the projects, it is too low in some of these schemes, so that they hardly qualify as labor-intensive [12], [25]. This also applies to the road improvement and graveling work in Kenya, where the share of labor accounts, on average, for 36 percent of the total project cost [15].

### 3.3 Source of Financing

The programs in all the three countries are largely donor supported. The Minor Roads program in Kenya is funded by a group of bilateral donors. As of 1993, the government of the Republic of Kenya (ROK) gets financial and technical support from the governments of Canada, Switzerland, Sweden, Denmark, and the Netherlands [15]. In 1992-93 fiscal year, for example, these donors accounted for 90 percent of the total financial contributions [15]. The capital share of the government was only 7 percent. But the government covers the expenses for local staff and administrative overheads.

The capital component of the road work in Botswana (LG 34) is fully funded by the government of Norway. The government of Botswana, which was able to spend as much as 13 percent of its capital budget to finance the 1982-87 drought relief program, has not yet committed itself to provide capital funding to the regular labor-intensive road program (LG 34). It has only committed to finance the maintenance of the improved roads.

The program in Tanzania is jointly supported by the United Nations Development Programme (UNDP), and the International Labour Office (ILO) with financial contributions from the Netherlands, Germany, Denmark, and the European Community (EC). The contribution of the government of Tanzania was about 11 percent of the total capital fund.

The financial arrangements in all the three countries exhibit similar features. First, the capital budgets of the road programs are largely donor funded. The contribution of national governments to capital funding is marginal. Second, the provisions of these capital budgets are often tied with technical assistance. Third, the national governments bear the costs for local staff and administrative overheads. Fourth, the responsibility for financing maintenance work is largely assumed by national governments.

### 3.4 Organization and Management

The implementation of the minor roads program in Kenya rests with the Ministry of Public Works. At the district level, the implementation of the program is placed with District Maintenance and Improvement Engineers (DMIEs), inspectors, and overseers. The overseers are directly responsible for supervision of the works at road sites.

In Botswana, the road program (LG 34) is located in the Ministry of Local Government and Lands. It is linked to the Ministry of Public Works, which coordinates classified road networks in the country, at the district level through the District Council Road Units. These units are responsible for implementation of all district roads. They are staffed by trained technical officers and are responsible for supervision of all road works, including the labor-intensive road works.

In the case of Tanzania, the special public works program is coordinated within a special unit of the Prime Minister's office. At the national level, there is little linkage between the special unit and the Ministry of Public Works. The national coordinating committee that is supposed to oversee the works of the special unit has not been effective in practice. At the regional level, implementation of the program is coordinated through regional development committees. But the labor-intensive road projects are not integrated within regional and local development plans and hence government ministries had no jurisdiction on implementation and supervision of the special program.

Different types of labor arrangements are practiced at work sites. The dominant mode, which is particularly applied to road construction and improvement, is the technician-foreman-gang mode. The modality changes for routine maintenance. Here, work allocation follows the length-man approach, where a headman or team leader is assigned to a group of workers to supervise a given length of road. Each contractor (length-man) is typically assigned between 1.5 to 2.0 kilometers of road work.

The three country cases represent different degrees of progression towards integration of labor-intensive road works into the national planning and administrative framework. All road works in Kenya are coordinated and executed within the Ministry of Public Works. Selection, construction, and maintenance of these roads are subjected to standard guidelines and procedures. The Ministry ensures that the different categories of roads fit into the national road networks. The labor-intensive road work in Botswana is integrated within the district plans. But, integration and coordination of labor-intensive work at national level is weak. The problem of lack of integration and coordination is much accentuated in the case of Tanzania. The projects under the special public works program operated in the 1980s as independent units, with little effective coordination at national, regional, and district levels.

### 3.5 Selection of Roads

Choice of roads follows prescribed guidelines in Kenya. District-level development committees draw up list of roads. The roads are then subjected to a series of standard screening process, which involves testing if the roads (1) pass through high and medium potential agricultural areas with a minimum defined population density; (2) meet the minimum traffic volume of 70 vehicles per day, and (3) link up to the network of roads. Roads that meet these qualifications are further subjected to technical and financial feasibility analyses. Then, these roads are prioritized. The number of roads selected in a particular year depends on the level of committed capital funds. These roads are then integrated into the national roads program.

The process is less rigorous in Botswana. Road sites are identified in consultation with local communities. The district technical staff undertake feasibility assessment and prioritize the roads. The ranked road links are then passed to District Development Committees for further evaluation. The final decision rests with district councils, whose members are elected representatives of the district population. Roads that are selected are eventually incorporated into the district development plans. But, unlike the procedures in Kenya, there are no standard procedures and guidelines on the choice of roads [8]. No comprehensive network plan exists for district roads [8]. Thus, the process varies across districts.

The process is even less standardized in the case of Tanzania. A special unit in the Prime Minister office identifies roads in consultation with rural communities. The special unit is supported by ILO technical assistance and UN volunteers for identification, implementation, and monitoring of road works. Similar to Botswana, there are no standard selection guidelines. And the roads in the special public works program are not integrated within both national and regional road plans.

### 3.6 Physical Output and Growth

As of 1991, Kenya had nearly 62,000 kilometers of classified roads [16]. This was 41.3 percent of the total length of road network in the country. The balance was unimproved earth roads. By the end of 1992-93 fiscal year, the minor roads program improved a total of 3,238 kilometers of earth roads. As compared to the total classified roads, this accounted for a mere 5.2 percent. And compared to the unimproved earth roads, this covered 3.3 percent.

The recent records on annual output of improved roads show a declining trend (Figure 1a). For example, yearly output of improved roads (earth construction and graveling) dropped from 1,381 kilometers in 1989-90 to 473 kilometers in 1992-93. Thus, as the figure shows, the cumulative growth curve is increasing, but at decreasing rate.

Such a decline is, in part, due to a public policy shift towards strengthening existing improved roads in two ways. First, there is an increasing emphasis on graveling existing earth

roads. Between 1988-89 and 1992-93, for example, the share of graveling in total improved roads increased from 49 percent to 60 percent. Second, there is a shift towards maintenance of improved roads (Figure 2a). For example, annual average road maintenance increased from 8,600 kilometers in 1988-90 to 9,600 kilometers in 1991-93 periods. The 1991 strategy proposal goes further to extend labor-intensive road maintenance to all classified roads with low traffic volume [16].

As of 1990-91, the labor-intensive road work program in Botswana produced a total of 1,054.6 kilometers of earth roads. This accounted for 5.8 percent of the total road network in the country [4]. As compared to total earth and sand roads alone, its share was close to 10 percent.

The mean level of yearly output has increased over the years, but with sizable variations around the mean, as shown in Figure 3a. For example, yearly output increased at an average rate of 6.1 percent between 1986/87 and 1992/93. But the trend in annual growth rates shows a wide range between minus 9.1 percent and plus 25 percent over these years. Such annual variations are often linked to irregularity in flow of capital funds and problem of labor shortage in some parts of the country, especially districts close to major towns, such as the southeast district near Gaborone, or thinly populated, such as the western districts in the Kalahari Desert.

The Tanzanian experience is quite different. Being a project targeted to be phased out at the end of 1991, the road works came to an end in 1990. But there is little information on length of road rehabilitated under the project. A recent project document on Rukwa road work indicates that actual output was only 29 percent of the planned level [10].

The growth of these roads has been largely linked to the availability of funds, especially to donors' support for capital budget. National governments have shown a great deal of ambivalence towards the application of labor-intensiveness to roads works. Even Kenya, which has shown a great deal of conviction to the labor-intensive method, still calls on donors to provide 70 percent of the required capital budget for funding its planned expansion of maintenance work [16]. Although Botswana has placed a central role on public works as an income transfer instrument in time of drought, it has not yet committed to expand the small Norwegian-funded road project (LG 34) in its non-drought period. The Norwegian support, which appears to operate under a fixed budget to hire as many as 3,000 unskilled laborers, is intended to be demonstrative and hence may not be committed further to expand the project. On the other hand, a major effort is underway in Tanzania through donors' support to consolidate and coordinate a nationwide program to rehabilitate and maintain priority rural roads [24],[26].

### 3.7 Employment Design and Practice

The minor roads works in Kenya show a declining trend in level of unskilled labor employment. Over the last five fiscal years, the road works absorbed, on average, 16,700 casual workers per year (less than 1 percent of the 1988 estimated 6.1 million smallholder work force). The peak occurred in 1989-90 fiscal year, when it reached 20,300 workers. Since 1989-90, the level of yearly employment has been declining. It reached its lowest level of employment ever in 1992-93. Such a decline in employment is directly related to the contraction of road improvement work and the lower labor intensity of maintenance work. The rate of growth of maintenance works has not been sufficient to compensate the loss in employment in road improvement.<sup>1</sup> Without rapid expansion of the maintenance program, it is unlikely to reverse the current trend in employment contraction.

As of 1992/93, the road work program in Botswana has created temporary employment for about 3,700 casual workers in construction and maintenance works (nearly 2 percent of the agricultural labor force). The trend over the years shows an increasing cumulative growth. This is attributed to expansion of both construction and maintenance of earth roads. The minor roads program in Kenya, where maintenance employment is increasing at the expense of falling road improvement work, Botswana has managed to promote the growth of the two road works.

However, the recent trend shows that the share of maintenance labor in total employment is rapidly growing-- an indication that the program is facing a problem of accelerated growth in construction of new roads. The share of maintenance labor increased from 15.2 percent in 1986/87 to 37 percent in 1992/93. And with the increasing emphasis of the government on maintenance of existing earth roads, such share is likely to grow. Such a shift to maintenance work has been accompanied with an increasing share of female labor. During the same period, the share of female labor in total unskilled labor force increased from 22 percent to 48 percent, respectively.

The road work projects in Tanzania (the Ruvuma project, in particular), by far, dominated the scale of employment that was generated through the special public works program in 1980s [23]. In the period between 1980-86 (the first phase of the program), the road projects hired 46 percent of the total employment (124,000 workdays per year). Ruvuma road work alone accounted for 39 percent of the total employment. The Rukwa project largely failed, as the government that was responsible for financing the wage bill resorted to a "self help" mode of labor mobilization [11]. The contribution of the two road projects declined to 32 percent (53,100 workdays) in the second phase of the program (1987-1990).

Employment in all these road programs have some common features. First, employment is open to all who are able to work. Second, initial selection is typically done through some administrative screening. When there is excess supply of labor to available positions, different methods of quantitative rationing are applied (random selection through lottery technique, quota

setting by sex, limit on number of participants per household). Recruitment and selection continue at the road sites, where workers are often employed on demand because of high labor turnovers.

Third, the average length of employment per worker is short for non-maintenance workers. The explanations lie mainly in the nature of the road work, labor laws and regulations, and labor supply characteristics of the workers themselves. First, the length of employment is directly linked to the duration of road work in a specific area. Often the work force is changed when the road work shifts its location of operation. Second, in areas where there is an excess labor supply, the practice of job rotation to reach all job seekers translates into low days per capita. Third, projects that operate in a legal environment where casual workers have to change into permanent status after a defined period of time (for example, three months in Kenya and Tanzania) prefer to rotate labor for circumventing the legal requirement and avoid the additional labor cost. Fourth, some workers enter into road work as stopgap measure (for example, school leavers) and choose to quit working as they find better and stable employment opportunity. Also, given the inflexibility of wages to accommodate spatial variations in transport and other commuting costs, workers have little incentive to supply their labor in distant project areas. This is particularly problematic in areas where local labor supply is insufficient to meet labor demand.

Fourth, the road works tend to stabilize intra-year employment fluctuations, but not on a sufficient scale, because of the failure to synchronize with seasonality of agricultural work. A study in Tanzania finds a weak correlation between labor days in agriculture and labor days in project work, which suggests that more could have been made of labor during the slack season [12]. Some degree of counter-seasonality is evident in Kenya, but largely by default than by design (Figure 4a). The flow of funds to road works tapers off towards the end of the fiscal year (April-June), which coincides (by default) with peak farm activities [23]. Similarly, there is some counter-seasonal pattern in Botswana by default. The months when the projects are closed for holidays (part of December and January) coincide with the seasonal peak in demand for farm work (Figure 4b).

There may be an exception in the case of poor households (or poor areas or poor agricultural season) that have limited choices during the peak farm season. For example, a study in Kenya shows that the poor (the near landless and landless) tend to stay on the road works (rather than look for spot casual employment), but this involves a change in labor supply strategy for own-farm work (work longer duration, pool family labor into farm work, including the young and old, and exchange of labor). The road projects thus intensify the work burden on these often labor-short households.

The shift towards road maintenance in Kenya and Botswana has some implications on the type of emerging employment pattern. First, the length-man approach becomes the dominant mode of employment as opposed to revolving gang approach. Second, workers on

routine maintenance assume a long-term employment contract. Hence, maintenance work offers a more stable and permanent employment to road workers. Third, access to employment will concentrate on those who reside close to road sites, since the prerequisite to qualify for such employment is a close proximity to work site. Workers have to attend the maintenance work on a regular basis. Finally, the Botswana case suggests that such type of work favors female workers. But this cannot be generalized without understanding the local labor supply conditions, as the evidence from Kenya shows.

### 3.8 Wage and Labor Supply

Wages are fixed by the government in all the three countries. Wages are often linked to minimum wage policies to ensure some subsistence level. In Tanzania, the minimum wage is applied as a ceiling wage in rural areas [7]. In all the programs, wages are set uniformly regardless of type of work, location of work site, and interpersonal variations of workers (age, sex, education, experience, and so forth). Wages are set on a daily basis. And workers are paid cash wages once in a month.

The project wages are at variance with comparable unskilled wages in rural areas. In Kenya, the road wage in 1993 was equivalent, on average, to 71 percent of daily farm wages [22]. But it varied between 60 percent in high-wage districts and 125 percent in low-wage districts. In Tanzania, road wages are closely at par with wages of farm workers on maize and paddy fields, but less than the wages paid for coffee workers [23]. In Botswana, wages in road works are higher than comparable unskilled wages (herding, domestic work, and sorghum stamping) in small villages, but much lower in areas close to big villages and towns, where the road work often faces a tight labor supply, particularly male labor.

In real terms, these pan-territorial wages vary across space because of variations in regional costs of living indices. For example, the mean provincial prices of maize in Kenya, the dominant food crop, varied by a ratio of 1:1.41 between the lowest and highest provincial level prices. These differences are bound to be large where there are large variations in food prices due to poor market integration.

Trends in real wages across time shows an irregular lag response to inflation. That is, wages are often increased in step wise progression but lack a built-in mechanism to respond to changing inflation rates. For example, real wages paid for workers in minor roads program in Kenya increased 4.9 percent between 1988-89 and then averaged negative growth between 1989-91 (negative 5.0 percent between 1989-90 and 25.0 percent between 1990-91). The wage rate was increased 56 percent in 1992-93, but was offset by an equal growth in the inflation rate [22]. The trend in real wages in Botswana shows a positive but uneven growth. They barely kept growth rates above the rates of inflation in the 1980s (for example, it grew, on average, 1.9 percent per year between 1986/87 and 1988/89). However, there is an apparent

higher growth in the early 1990s—the annual growth rate averaged 2.3 between 1989/90 and 1991/92.

On the other hand, a decomposition of the growth rate of the unit cost of labor per kilometer (which is a difference between growth rates of nominal wages and productivity of labor as measured by average labor per kilometer) shows a close association between growth in unit cost of labor and nominal wage rates. That is, growth in real wages responds relatively more to the trend in inflation rates than to the change in productivity growth. For example, annual growth rates for nominal wage and labor productivity in Botswana averaged 7.1 and 4.4 percent, respectively, in 1988/89 [20]. In 1990/91, the respective growth rates were 30.6 and 16 percent, respectively. The examples illustrate that the current design and practice of these programs appears to be lax on the central importance of enhancing productivity growth to support high wage rates. Improvement in productivity of labor is crucial to justify the basis for improvement in wage rate, unless these works are considered as a sole income transfer instrument.

The restrictive structure of pan-territorial wage rates limits the flexibility of the road programs to adjust wage rates in accordance with local labor supply conditions. The current wage structure implicitly assumes: (1) there is sufficient unutilized labor in rural areas that is readily available at some subsistence wage rate; (2) the subjective price of labor is the same for all rural households; and (3) augmentation of labor demand, and not labor supply, is instrumental to employment creation in rural Africa.

By and large, such type of unconstrained labor supply behavior has only been witnessed in some of the countries that experienced severe decline in farm employment due to droughts in the 1980s (for example, the 1982-87 drought years in Botswana). Because of an excess supply of labor, jobs had to be rotated in Botswana to ensure that jobs were equally shared among the rural population.

However, there is growing evidence to contradict some of these key design assumptions. First, rural labor markets in Africa, albeit small in size, are active. These markets are strongly linked to agricultural seasons. And wage rates vary across space and time, largely due to factors that affect labor supply to and demand factors for agriculture, and due to variations in food prices.

Second, because of the non-uniformity of real wages, the extent of labor supply varies across seasons and locations. Labor supply falls short of prescribed employment quotas when projects operate during peak farm seasons or where project wages are too low as compared to other competing wages in areas located close to major villages and towns or simply insufficient to cover transaction costs of labor mobility, due to the high cost of transportation, especially in low-population dense areas.

Some of the road projects practice different compensation schemes to bypass official wage rates and obviate the problem of attracting labor to road works. In most cases these are accomplished through manipulation of the productivity parameter (given the constancy of wages, this is the main parameter available to project managers). For example, task rates are adjusted such that workers obtain the same wage rate per day but for a shorter length of work. And all tasks are adjusted such that all the workers complete their piece rate at the same duration of work per day. This is achieved by adjusting the productivity norm downward. In some instances, cash wages are supplemented with food to boost real wages.

### 3.9 Reaching the Poor

The three reviewed programs have no explicit policy of targeting the poor. That is, the setting of the design (for example, location of projects, wage rates, and employment policy) is not explicitly intended to screen the poor into the road works. But, in practice, it is plausible that the poor are participating in the programs. Although what is important is to assess the proportion of the poor in the road programs relative to the rural population, the existing evidence falls short of establishing such incidence of poverty targeting. But the cases below indicate that the poor are drawn into the programs.

Findings from surveys of female participants in Tanzania [19] show that female participation is high in areas with a higher concentration of landless or small farmers with no access to alternative wage employment. These areas also witness a high male out-migration in search of employment. Where there are few employment options, more older women participate in rural works schemes. Women with children have a greater propensity to participate in poor areas. In areas where women have alternative employment with better returns, young females with no children tend to participate in rural works schemes [17].

The results of the 1991/92 International Food Policy Research Institute (IFPRI) sample survey of project villages in Botswana also indicate some degree of poverty targeting [21]. First, the road work project tends to have a large proportion of low asset-holding households with working adults, especially female adults. Female households with adult working males have higher representation in areas closer to towns and large villages. Better-off households (those with many livestock and land, their own business, and salaried income) are less likely to participate in the road work. Second, these low asset-holding participating households allocate a large share of their economic time to project work. Participating households in remote villages, in particular, allocate a greater share of their economic time to project work.

The results from a recent rapid survey of project villages in three districts of Kenya (Kirinyaga, Kitui, and Laikipia) also indicate a large representation of poor families in road employment [22]. The poor in Kenya, according to the perception of villagers in the project areas, are typically families who are (1) young with large dependents; (2) landless and near-

landless; (3) engaged mainly in casual wage employment for livelihood; and (4) at risk of chronic food insecurity. The small but randomly selected sample in these project villages found a high representation of these families in the road work sites. The self-reported reservation wages of these families indicate that they are willing to take lower wages than what the road project offers as a premium for regularity and security of road work compared to the alternative sporadic casual rural wage employment. The premium they are willing to offer is even higher for off-farm season when alternative off-farm wage employment is thin in rural areas.

### 3.10 Sustenance of Benefits

The short-term benefits of the road programs accrue to those who engaged in construction work [21]. The recent IFPRI study in Botswana shows that road projects have unambiguously increased the income of participating households through a combination of a net addition in time allocated to work and a shift from activities with lower returns. The project has also improved the relative income position of the participants, at least in moving them towards the middle-income group. Participation in the project has also contributed to an added advantage of improved access to the rural credit market. That is, access to cash employment substitutes for collateral in rural areas to establish a credit line.

A recent IFPRI village-level survey in Tanzania shows that income from rural works projects reach at least 64 percent of the survey villages in project areas [23]. Employment in the projects ranks at least as the third major source of income in these villages. Moreover, access to wage employment through the projects (64 percent of the villages) exceeds the access through other non project wage employment. However, the direct link between employment and income flow is delinked where rural households contribute unpaid labor (self-help scheme). This concept was tried in the Rukwa road project but failed, partly, since such a type of public asset cannot ensure the full accrual of benefits in accordance to labor input.

The long-term effects of these road works depend on income generated directly from the created assets and labor market effects. Evidence is, in general, thin on such long-term effects. But there are a few cases where second-round income effects (income from created assets or labor market effects) are sizable. For example, four impact studies in Kenya, which were based on comparison of control and road project areas in central (Kirinyaga and Nyeri Districts) and Nyanza (Kisumu and South Nyanza Districts) provinces in the late 1980s, highlight some of the long-term effects. First, improvement of rural roads contributed to an increase in road accessibility, a greater density of traffic, and a shift to motorized traffic. The extent to which these changes accrued varied across areas, depending on the initial level of economic activity. Second, improvement in roads was associated with an increase in density of social infrastructure and service centers. Third, in some areas, there was a marked increase in volume of marketing due to an increase in marketable surplus and entry of new products.

Fourth, the presence of roads contributed to an increase in farm income through increased intensification of inputs and extension contacts, increased yields and output, and a shift in crop composition to high valued crops. Fifth, these roads also contributed to an expansion of the income base of the rural population through increased diversification of income sources. Sixth, the rural population in the road areas shifted their expenditure patterns, especially towards increasing shares of nonfood consumption expenditures and investment in household and farm activities.

The sustenance of these benefits depends on maintenance of created assets. The current emphasis on maintenance of roads in Botswana and Kenya confirms the realization of the need to generate these gains on a continuous basis. But such long-term effects are much diminished in the case of Tanzania, due to poor maintenance of assets. For example, a recent project document acknowledges that 2,903 kilometers of the 3,700 kilometers of roads in Ruvuma are in need of rehabilitation because of extensive deterioration [13]. Fragmentary records invariably ascribe the sources of such rapid loss of assets in Tanzania to failure to integrate the program into the national planning framework; lack of public commitment to fund maintenance work; undervaluation of nonlabor inputs; failure to involve community participation in identification and confirmation of demand for such assets; and lack of a remunerative policy for maintenance of community-owned assets like village access roads.

#### IV. CONCLUSION AND POLICY RECOMMENDATIONS

The road programs in the three countries examined share comparable length of experience in labor-intensive public works. These programs expanded particularly in the 1980s in response to declining employment and deepening poverty, which were heightened during the prolonged drought years, declining real wages relative to cost of capital, and increasing donors' support in experimenting with labor-intensive works schemes.

In many respects, the road programs in the three sample countries are similar. They share common goals of improving access roads, and generating employment and income to the rural population. Employment in road works is open to all working adults, but priority is often given to villagers who are close to road sites. Factor shares between labor and capital are administratively determined. And wages are also administratively set, uniform, and often linked to minimum wage policies to ensure some subsistence level. Implementation rests largely on public institutions with minimum community involvement (except for provision of local labor).

However, there are some differences in design and performance parameters. For example, the institutions responsible for road works vary across the three countries. All road

works in Kenya are coordinated and executed within the Ministry of Public Works. On the other hand, the road projects under the special public works program in Tanzania operated as independent units outside the national planning framework. Second, Kenya follows national standard guidelines and procedures in selection of roads. Botswana follows a somewhat similar guideline at the district level, but there is no evidence of application of such guidelines in selection of roads in the case of the special public works program in Tanzania. Third, all classified roads, including minor roads in Kenya are linked to the national road network. This concept was not widely shared in the other two countries. On the other hand, Botswana has adopted the concept of labor-intensive public works as a drought-relief intervention and has integrated it into its national development framework. The other two countries, especially Kenya, have not yet incorporated it into its drought relief program.

Nevertheless, these programs are now evolving towards some convergence in at least four important directions: (i) integration of road works within centralized ministries, especially the Ministries of Public Works in Kenya and Tanzania; (ii) application of the concept of linking specific road projects within the national road network (for example, the current road policy in Tanzania adapts the Kenya's model of establishing a network of priority roads); experimenting with program design (the Project 2000 in Kenya) and implementation parameters (for example, the use of private contractors in labor-based maintenance works in Tanzania); and placing greater emphasis on maintenance of road works through the labor-intensive method. The current initiative in Tanzania comes a long way in moving the country (at least in design) at par with the progress that has been achieved in Kenya in the 1970s and 1980s.

But, there are still important issues that deserve policy resolutions. First, there is a need to take a fresh look at the concept and goals of these programs. Current thinking appears to be driven from a conceptual framework, where, given that wages and factor shares are fixed, employment growth is set as a simple function of a financial resource available to cover the wage bill. But such a concept conflicts with the goal of low-cost asset creation, which assumes flexible factor prices and a factor proportion that corresponds with technical and economic efficiency. The path of employment maximization will not necessarily coincide with an efficient cost path of production.

Second, it is crucial that the issue of what these works programs stand for clearly defined (create roads to enhance future income and consumption level or transfer income to the poor to deal with transitory poverty). If these two objectives should be integrated, then it is necessary to define the necessary conditions and design features. Employment creation needs to be viewed only as an intermediary goal derived largely from these two primary objectives, but not as an end in itself.

While the emphasis on labor intensity is justifiable under current trends in factor prices, there is no empirical basis to set uniform factor intensity regardless of project type (factor intensity of road work should not be necessarily the same as irrigation work), purpose (projects

designed for income transfer may allow a greater margin of labor share than what is technically defensible), and factor prices (factor prices, particularly labor, may vary across time and space and, therefore, factor ratios). The current effort to identify appropriate technology for road maintenance work in Kenya (Project 2000) is an important example for other countries to consider.

The concept of experimenting needs to be expanded, but it is crucial that an effective monitoring and evaluation component be built in early on to internalize the learning process. For example, there are little success lessons that Tanzania has learned today from its fragmentary labor-intensive works programs of the 1980s. The lessons from the current experiment in the choice of technology (Project 2000) and institutional innovation (the prime contractor approach in Tanzania) are important examples that these countries should document and share with others.

These experiments are likely to contribute to cost efficiency in the operation of these programs (for example, the search for appropriate technology is likely to move the program to a low-cost production path or the private contractor approach may allow a moving of the current wage setting process to a market-based mode, which is flexible to respond to changing factor endowments). In addition, there are measures that need to be instituted to cut current non operational costs, especially administrative overhead and technical assistance. Investment in training of nationals is essential to create an "in-house" ability to ensure the programs are sustainable with little technical support.

Government has an important role in such an experimental and transition process. It has to overcome its current ambivalence, which manifests itself in a low level of commitment in provision of capital funding, inadequate institutional arrangement to integrate labor-intensive road works in a national planning framework (Kenya is the exception), and insufficient willingness to experiment and adjust policies accordingly. It is crucial that the sources of such ambivalence be identified and rectified, especially problems related to attitude towards a labor-intensive concept and resource constraints (both finance and skilled manpower). If public resources should be committed, it should be in context of a sound macroeconomic framework, transparent and flexible management arrangement, and an accountable financial structure.

The Kenya and Botswana experiences also have a far-reaching implication to design of such programs for poverty reduction. As the recent study in Kenya shows, the labor-intensive road work approach promises to integrate short-term poverty reduction through asset creation with a minimum adverse effect on long-term growth and poverty reduction. The key policy design lies in finding the right incentive for the poor to participate in the program with low foregone employment and income opportunity. Moving the projects to the place where the poor are concentrated, which, in Kenya, is also the locus of growth potential, and making it available when competition with other productive employment is low are likely to improve the

participation of the poor. The current shift towards labor-intensive maintenance work promises a high rate of employment creation, and asset sustenance to perpetuate long-term benefits.

#### NOTE

Given the differences in levels of labor intensity between road improvement (which averages 2,881 labor-days per kilometer), the latter has to increase nearly twenty-nine fold for every kilometer of road improvement to maintain the same level of employment. It is not clear why such expansion has not been possible given that the unit cost saving from improved road work (which averages KSh 440,000 per kilometer in 1992-93 prices) could finance 72.1 kilometers of road maintenance work (at present average real unit cost of KSh 6,100 per kilometer in 1992-93 prices). That is, the cost saved from road improvement can create 7,200 labor-days in routine maintenance (2.5 times more than what it could create in road improvement). The switch to routine maintenance, in fact, promises a much larger employment creation effect.

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## APPENDIX

Figure 1a—Road improvement in Kenya,  
1988-1993

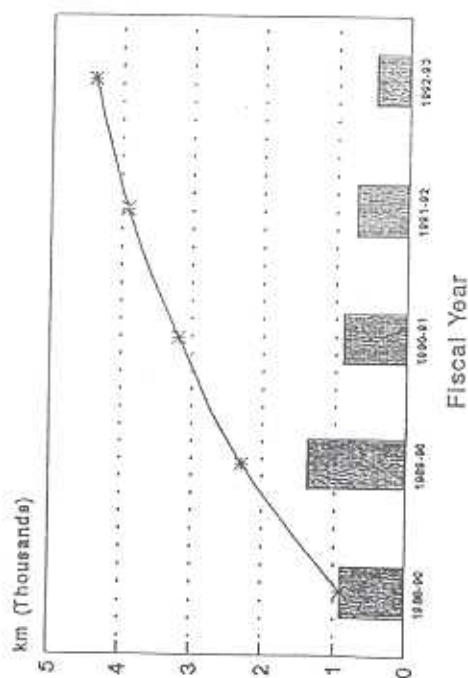


Figure 1b—L.  
K<sub>t</sub> for road improvement in  
Kenya, 1988-1993

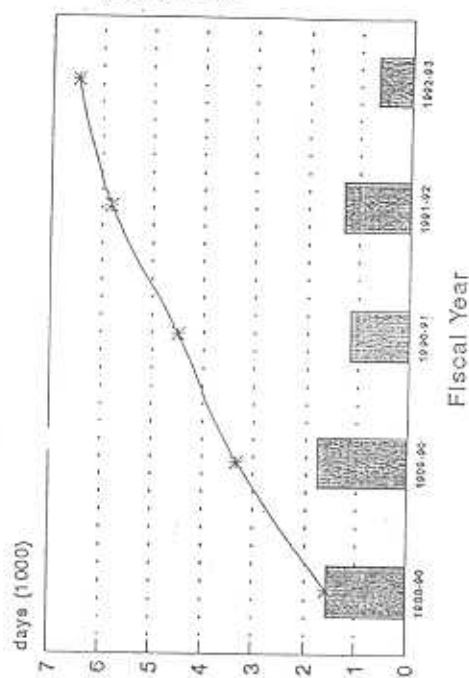


Figure 2a—Road maintenance in Kenya, 1988-1993

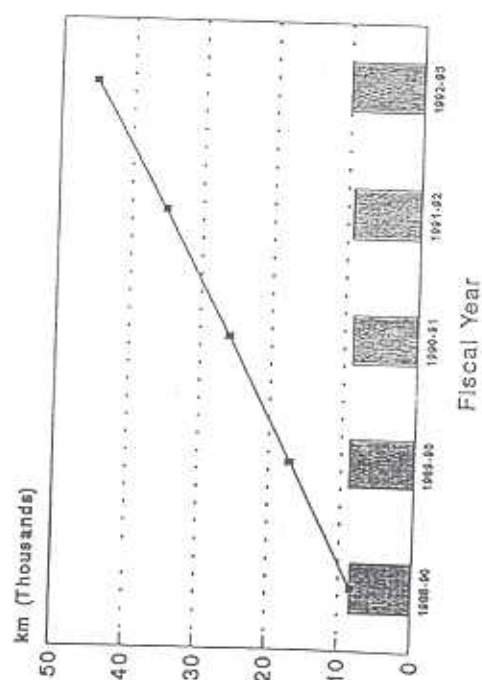


Figure 2b—Labor days for road maintenance in Kenya, 1988-1993

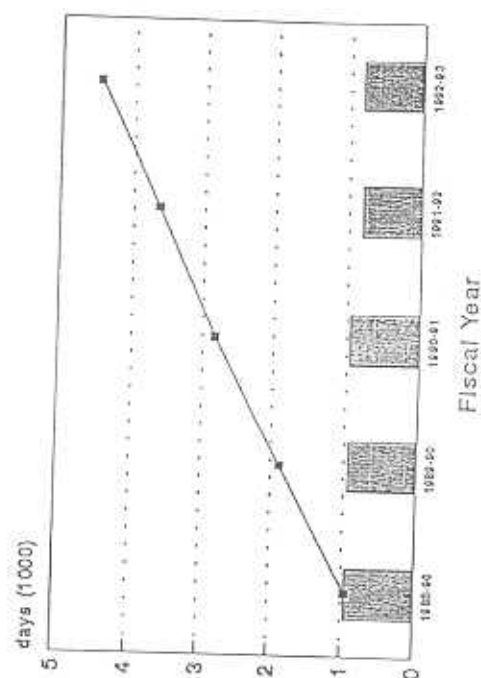


Figure 3a—Construction of earth roads, Botswana, 1986-1993

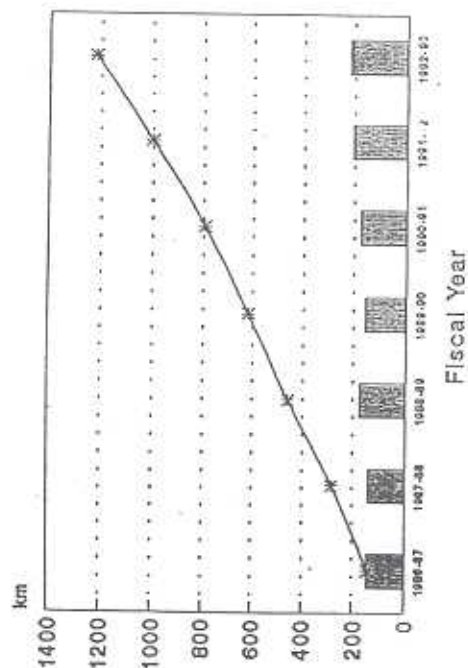


Figure 3b—Total labor used in road construction, Botswana, 1986-1993

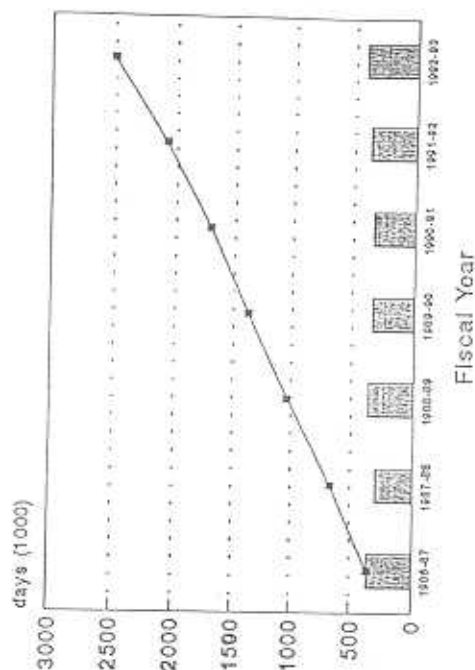
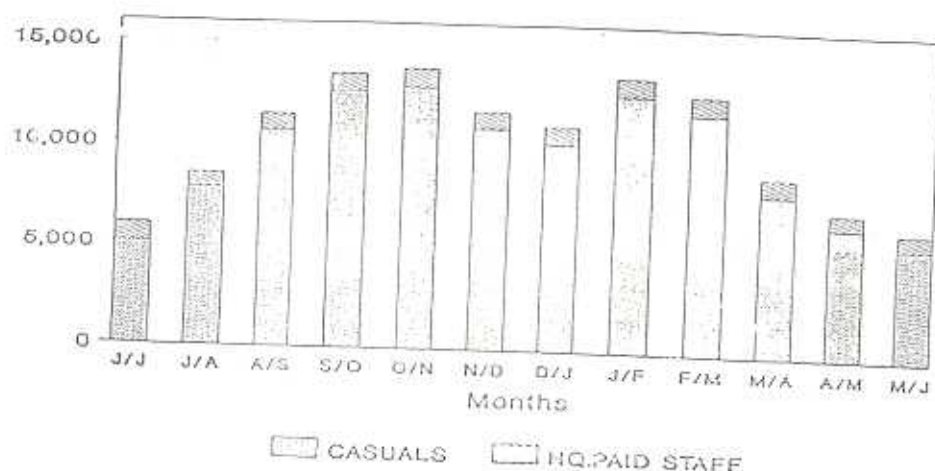
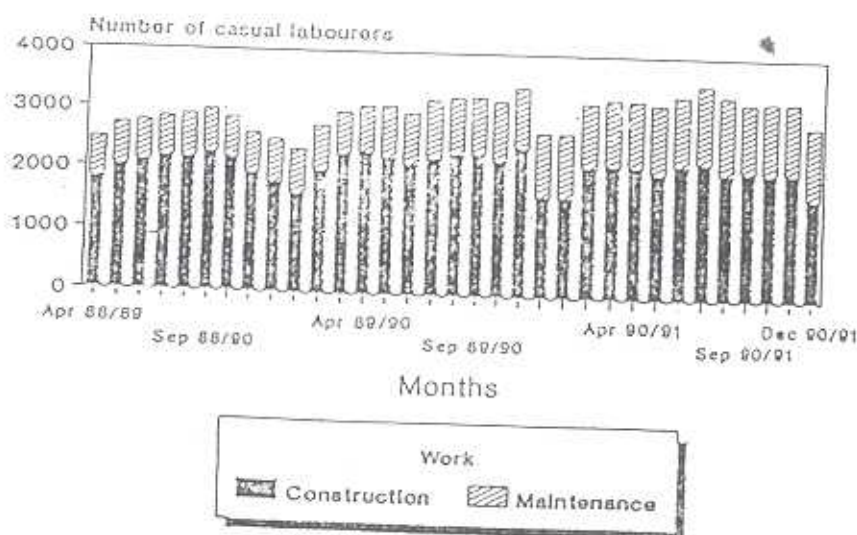


Figure 4a—Monthly average labor force for the financial year 1992-93



Source: ZIF

Figure 4b—Casual labor force, Botswana



Source: Bruderfors (1991).