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RURAL ROADS AND POVERTY
REDUCTION IN BARINGO DISTRICT

By

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By

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ABSTRACT

Before independence Baringo was a closed district with lagging development. During the 1980s, the pace of development increased tremendously due, perhaps, to the ^{why is the 80s?} opening-up of the district by way of investments in road.

Road projects are an integral part of Kenya's regional development policy. Investment in roads is considered to have potential and desirable impact on standards of living. However, any type of infrastructure investment invariably results in social, economic, political and environmental changes that were initially neither expected nor desired.

The proposed study is an attempt to assess the social and economic impacts of rural roads on different households in the district. The analysis will focus on the processes of social and economic changes which have accompanied or resulted from investments on road networks in Baringo District over the last ten years.

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Introduction

This is a research proposal for an ex-post study of the impacts of rural road on poverty in Baringo district. The perception of the benefit and beneficiaries of road investment has changed fairly dramatically in the last two to three decades, with poverty reduction being a relatively recent concern. An understanding of the reasons for this change is as important as the changes themselves.

In the 1950s and 1960s, roads were seen as essential for economic development. The rationale for investments in road projects was to stimulate growth in productive activities such as in industry and agriculture. In the 1970s and 1980s there has been a shift from that perspective towards a greater concern with questions of income distribution and access to services. The tendency has been to move away from generalisations about the contribution of roads in rural development to considerations of local circumstances influencing change, and from a purely economic analysis towards a broader view incorporating social dimensions of development as well.

During the course of these shifts certain gaps have appeared in the theory and policy of rural roads and rural development. One, there has been a dearth of empirical work done on the differential impact of rural road projects on the livelihoods of children, women, men, resource poor and rich farmers. This lack of research has contributed to the slow theoretical development of how transport in general and roads in particular influence social-economic development. In terms of policy, the focus has been to expand or improve road networks without giving due consideration to local level transport needs.

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These changes in perspective including the theoretical and policy gaps noted have relevance to Kenya whose economy is predominantly agrarian with more than 70% of her population living in the rural areas. Kenya's broad policy objectives in rural development are: to increase food production, improve living conditions and generate rural employment. Under these considerations, the transport system in general and roads in particular are considered as being critical to the achievement of national development targets because, "without such a system, development of markets for goods and services will not be fully realised and national social and economic integration will be seriously hampered."

The extent to which investments in roads contribute to rural development is perhaps dependent upon the capacity of the local and regional economy to respond and particularly to reallocate resources. This study will research the relationship between rural road improvements and socio-economic change in Baringo district.

PROBLEM STATEMENT.

The wider objective of Kenya's regional development policies is to promote rural development. More than 70% of Kenya's total population live in rural settlements and about the same proportion of her total labour force is directly or indirectly employed in the agricultural sector. The population factor coupled with the fact that agriculture is the dominant sector in generating economic growth have been instrumental in shaping government policies that give priority to promoting rural development.

Investment in road improvements has in the past been used as a strategy

for promoting rural development. Transportation in general and roads in particular are usually seen as directly related to growth of productive activities, a condition perceived to be necessary for development to occur. It has been argued, either rightly or wrongly, that road construction and/or improvement has potential and desirable impact on investment decisions, distribution of income and the quality of life. Such arguments seem to be built on the modernisation theories of the 1950s and 1960s which have seriously been questioned throughout the 1970s on empirical grounds since, in many cases, they have led to the mushrooming of large-scale infrastructure projects which have had negative or unintended impact. Theoretically as well, modernisation has been criticised for paying too much attention at the aggregate level of the economy without giving due consideration to the micro-level aspects.

It is suggested that rural development policies fail to recognise or deliberately ignore the probability that some, if not all, road improvements result in some form of social, economic, political and environmental changes that were initially neither expected nor desired. There is evidence in the literature that clearly shows that investments in roads can contribute to widening inequalities in income, land ownership, and generally worse poverty conditions. We would like to go one step further and suggest that where disparities in income, employment and productivity levels already exist and/or increasing, the negative impacts of investments in roads would worsen proportionately.

Presently, there is a dearth of research on the negative and often unintended impact of road improvements in Kenya. The study proposed in this

paper is likely to generate data that would then lead into policy dialogue between researchers and planners on questions of the validity of some of the assumptions underlying investments in rural projects particularly now that the country is undergoing political and economic reforms that have major implication for investment options.

Study Area

Baringo district is located in the Rift Valley Province of Kenya. The district covers an area of approximately 10,949 sq. km and lies between longitude 35° 30' and 36° 30' east and latitude 0° 35' north. Its altitude varies from 3,000 to 1,000 metres above sea level. Baringo is bordered by eight districts: to the north are Turkana and West Pokot Districts, in the west is Elgeyo-Marakwet District, on the eastern side are Samburu and Laikipia Districts, in the south is Nakuru District and in the south-west are Uasin Gishu and Kericho Districts.

The topography in Baringo District is made up of four major features; the Tugen Hills, river valleys and plains, the Rift Valley floor and the northern plateau. Out of these, the Tugen Hills is perhaps the most conspicuous. The rugged hills have steep slopes with deep incised valleys which create conditions necessary for land slides and mass-movement of soils to occur. This can potentially be an impediment to transportation.

Drainage is another important factor influencing roads development in Baringo District. The major rivers in the district are the Kerio, Pekenra and Moio. The Kerio river meanders over a fairly flat plain - the Kerio Valley. Along much of its length it has cut deep steep gorges, an example of which can be

seen at Chebloch Bridge on the Kabarnet-Tambach road. Pekerra, another major river in the district, is formed by the union of several radial streams with heads in the Lembus forest. It flows in deep steep gorges cut into volcanic tuffs. The other river, Molo, drains the Mau Hills catchment. Apart from the above three, most other rivers in the district are seasonal. They gush down the slopes only during the wet season. Though short-lived, they are devastating to roads and bridges.⁵

During the colonial period Baringo was a closed district. Migration into-and-out of the district was strictly controlled by the colonial authorities. The only non-indigenous people of Baringo who were allowed to enter the district did so on the clear understanding that they were going there to work as labourers on European large-scale farms and in forest reserves.⁶ Throughout the colonial era, the southern part of Baringo was alienated for European settlement. Consequently, investments in roads and other infrastructure were made possible. The rest of the district, especially the Tugen Hills, remained untouched by development, partly because of the surface configuration and inaccessibility. The rugged terrain and impassable roads isolated the rich highlands from their southern neighbour and the rest of the country.

Whereas development activities were initiated since the time of independence in 1963, it is in the 1980s that the pace of development has increased tremendously due perhaps to the "opening up" of the district by way of investments in road projects. By 1989, Baringo district had a total of 1,586.1 km of classified road network of which only 95.9 km were rural access roads (Table 1), arguably the most appropriate level to serve rural households

for most of whom short distance trips within and around the village make up routine transport demand.

In terms of agriculture, Baringo District is disadvantaged by the fact that 45% of its land is either too steep or too dry for arable farming. Apart from the south-west corner of the Tugen Hills, the rest of the district is arid or semi-arid rangeland. The district is divided into four agro-ecological zones; Upper Highland, Lower Highland, Upper Midland and Lower Midland Zones. The main crops of the district are finger-millet, maize, beans, wheat, cotton, coffee and pyrethrum. Sorghum, cassava, bananas, potatoes, groundnuts, vegetables and fruits are also grown. Livestock is also a very important sub-sector of the rural economy in Baringo District. Table 2 shows the numbers and value of livestock as of 1981/82.

In terms of demography, Baringo District had 200,702 people in 1979 - 102,186 females and 101,606 males. During the 1989/93 plan period, the population of Baringo is expected to grow at an approximate rate of 3.1% to reach 355,674 people in 1995. Much of Baringo is sparsely populated. The average density as of the 1979 population census was 19 people per sq. km. The most densely populated areas are the high and medium potential zones of Kabarnet, Kabartonjo, Eldama Ravine and Tenges divisions. It is here that 61% of the district's total population is found. The low and marginal areas of Marigat, Mogotio and Uginyang divisions are sparsely populated and accommodate about 40% of the population with some areas having a density as low as 2 persons per sq. km.

Despite the apparently low densities, landlessness is a problem in Baringo District. 19.5% of rural households in the district do not own land

(Table 3). While these families are fairly evenly distributed among the household composition categories, they tend to belong to the lower end of income earnings groups. In terms of land size holdings, the mean is 6.6 acres per household, although out of this only an average of 2.6 acres (or 39%) is under crop.

In terms of employment and other sources of income, about 36% of the employed population is in general labour. Agriculture and forestry account for about 21% of persons in wage employment (Table 4). There is apparently very little enthusiasm shown towards employment in the transport sector. Perhaps this has something to do with the past underdevelopment of the transport sector.

The picture is somewhat different with respect to self-employment. Production and manufacturing lead with about 41% participating in this category. This is followed by sales which takes a share of about 23%. Again, transport seems to have been largely ignored by the self-employed (Table 5).⁶ The employment scenario in the transport sector portrayed in the above tables, however, may have been modified quite significantly following the substantial investments made in construction and improvement of roads in the district during the 1980s.

While it is at present not possible to give a figure to show the magnitude of those investments, it is assumed that they have had major impacts on social and economic development of Baringo District. Moreover, the physical constraints of a harsh terrain, and the way this has blended with climatic conditions to produce a specific human settlement pattern provides a rich ground in which to conduct a study on roads. The colonial and post-colonial

background of the district is an interesting dimension to this study. What must not be forgotten, however, is the fact that the proposed research is on the impact of rural roads on living standards of rural households and, therefore, the conditions of rural poverty in the district will be a prime consideration of the study.

The rest of this proposal deals with the research questions that arise from the general debate on roads as well as the hypotheses formulated to be tested in the field. The last part of the proposal looks at what will constitute evidence, data and methods to be used in the study.

Literature Review

Roads and Rural Development.

Transportation is an important factor influencing the pattern of social and economic activities in an area. Governments in Africa have invested in roads in the faith that this would spur economic growth. In some cases the impact of roads has been beneficial to the economy while in other instances, investment portfolios have neither been justified in cost-benefit terms nor in terms of improved living conditions of the rural people. Whatever the impact, investment in roads is still regarded as indispensable to economic development. How was this assumption arrived at and is it valid?

Modernisation Paradigm.

During the last four decades, rural development has been identified variously with economic growth, modernisation, increased agricultural production, socialist forms of organisation, and with services for basic needs

such as health, education, transport, and water supply.¹⁰ In the 1950s, and to some extent the 1960s, rural development was thought of in terms of planned change by exogenous public organisations, i.e. as entailing a set of interventions directed by non-rural change agents. Diffusion models were advanced to explain the likely impact of direct transfer of agricultural technology from the North to the South. The diffusion model of agricultural development assumed that farmers in developing countries could substantially increase their agricultural productivity by allocating existing resources more efficiently and by adopting agricultural practices and technologies from the industrialised countries. Rural peasants were perceived as bound by traditional beliefs which limited their responsiveness to economic incentives. Similar world views about rural life were shared by proponents of the community approach to rural development who assumed that villagers, meeting with community development specialists, would express their felt needs and unite to design and implement self-help programmes aimed at promoting rural development.¹¹ In this context, investment in road networks was seen as a principal strategy by which rural development objectives could be attained.

Studies in developing countries have shown that many of the assumptions previously held about rural life and rural institutions were erroneous.¹² The assumption, that direct transfer of technology from the North to the South would improve agricultural conditions in the latter were not always tenable. Capital intensive inputs that do not reflect local factor endowment have compounded rural unemployment and emigration to the urban centres at rates that are unsustainable. In choosing technology, therefore, local resource capacity is perhaps the single most important consideration. Recent trends in

road construction indicate that more attention is being given to the flexibility of reducing use of equipment with a view of making more effective use of labour.¹³

Increasing agricultural production in the developing countries through international transfer of technological knowledge *per se* will not suffice. This was thought to be possible by the diffusion of green revolution technologies.¹⁴ While there is evidence that the diffusion of high yielding varieties of wheat and maize transformed agricultural productivity in India and Philippines, the balance of forces that emerged during growth did not help to strengthen the impoverished rural labourers and farmers.¹⁵ Moreover, the assumption that increased production would automatically translate into increased benefits for people was at best, ill founded.¹⁶

Dependency Paradigm.

By the mid-1960s, lack of progress towards modernisation in the developing countries gave impetus to an alternative paradigm which was a complete reversal of the logic of modernisation. Serious questions were raised about the modernisation thesis particularly its preposition that North-South contact offered promise for development of the periphery. From a radical political economy and dependency perspective such contact was viewed as a recipe for continued impoverishment. The argument was that underdevelopment in the South was not simply a stage of development as in the linear growth models of modernisation, but the result of the expansion of the world capitalist system. The continued integration of the South into the world capitalist system entailed unequal exchanges between the metropolis and peripheries which

in turn caused conditional dependency of the former to the latter. These arguments partly explain the shift in development thinking away from a concern with the rate of aggregate economic growth *per se* towards a greater concern with the social dimensions of development.

In an attempt to reduce their dependency on the advanced countries, developing countries chose what seemed to be an easy way to industrialise. They adopted Import Substitution Industrialisation (ISI) strategies where several industries were set up locally to produce consumer goods that were hitherto imported. Protective barriers were created to protect such infant industries from foreign competition, and multinational companies were invited to open production lines in these countries at unrealistically high concessionary terms which tended to favour industry at the expense of agriculture. In an effort to build an industrial base, agriculture became the main source of investment capital for urban infrastructure projects necessary to attract industry. The "urban bias" thesis argues that resources from the rural economy are expropriated and invested in non-profit making urban ventures thus generating the downward spiral of the rural economy that has characterised many developing countries in the last 30 years.¹³

Basic Needs Paradigm.

The focus on ISI vis a vis technology transfer, monopoly power and capital repatriation, gave rise to the infant industry debate of the early 1970s. As a result, new and more complex strategies emerged to reduce the dependence of poor countries on the industrialised economies, spread the benefit of development to lagging regions within developing countries and

increase the productivity and incomes of the poorest groups.¹⁷ To address the question of equitable growth, a series of programs were proposed: employment creation; redistribution with growth; basic needs; and a new international economic order. Central to rural development was the emphasis out on an integrated approach to rural development which was partly in response to the observed bias towards the urban industrial sector during the 1960s development decade as well as the need to foment development of the rural sector.

Instead of simply recommending agricultural growth via support prices, improved infrastructure, technological innovations and extension programmes, it was observed that technical change had to be specifically oriented towards small holders.²⁰ Typically, the integrated development approach constituted a package programme involving the cooperation of all government planning and implementing units built on the "top-down" model which tended to emphasise sectoral integration as an end in itself.²¹ It has been argued, perhaps correctly so, that the people-centred perspective that was developed around the growth with equity and basic needs strategies did not offer more than a partial alternative to the production-centred development paradigm of the 1950s and 1960s.²² Critics of the neoclassical school point to the fact that only a massive, wide-ranging, balanced, and continued attack on poverty and maldistribution of income has much chance of succeeding. Hence, the need for fundamental changes in social structure and institutions.²³

The Sustainability Debate

A great deal of anxiety has been generated in the recent past as scholars, policy makers and members of the public become increasingly aware of

man-environment processes such as pollution, deforestation, global warming, ozone depletion, loss of biodiversity, and other problems associated with economic growth and development. The effect has been a rethinking of the main development paradigms prompting the current debate on whether development can actually be sustained.

The current debate on sustainable development has historical precedents. The notion of sustainability has been appreciated for some time in diverse academic fields but it is only in the past two decades or so that the idea has become more widely acknowledged now that a number of subsidiary ecological situations have reached critical stages.¹⁴

Thomas Malthus (1884??), for example, thought that population would increase at a geometric progression and would consequently outstrip food production which he speculated would grow arithmetically. Due to this discrepancy, humanity was doomed to a deteriorating material existence. Although the Malthusian doom model has been criticised for failing to take into account important technical and social changes which might mitigate his predictions, the basic structure of the model continues to be used even today although the focus of concern seems to have shifted from the means of subsistence *per se* to the ecosystem defined in its widest possible sense. Presently, the global ecosystem is being adversely affected by the pace and pattern of growth which are exerting extreme pressure on the absorptive capacity of the major elements - land, water and air - thereby causing them to strain upto and possibly beyond their threshold level.¹⁵

Despite such an ominous state of affairs, it is believed that the "Malthusian trap" can be escaped by using resources in a sustainable manner -

"by depleting resource stocks only when the contribution those resources make to current income, including capital formation, is greater than the opportunity cost in terms of future benefits foregone...The appropriate depletion path for biological resources such as forests and fisheries is to gradually decrease resource stocks, thereby increasing the growth rate until the resource stock reaches its economically optimal size...(which) may be approximated using the biologist's notion of maximum sustainable yield."²⁶ Although Maximum Sustainable Yield (MSY) has been used extensively especially in the fishing industry, an error in the calculation of MSY could cause the resource to collapse.²⁷ Such an occurrence would spell doom to large populations of fishermen and their families as well as the local and national economies, particularly those whose fisheries sector forms a major component of their Gross National Income. The euphoria that followed the oil shocks of the 1970s; and the oil glut of the 1980s have been cited as examples of the fallacy of the Malthusian based "limits to growth" thesis which identified resource depletion as a key factor.²⁸ But, it has also been noted that growth, at least as it is currently conceptualised, is incompatible with sustainability.²⁹ These divergent views on sustainable development can, at their best, end in a cul de sac. Crucial to the debate on sustainable development, however, is some ingenuity that will get us out of this impasse not only conceptually, but also politically. Without prospect for growth, the development coalition would need to face the uncomfortable prospect of recutting the pie rather than making it bigger.

The idea of growth as the central focus of development is part of the Washington consensus. The World Development Report (1992)³⁰ is emphatic that

growth and sustainability are somehow compatible. Although this study will focus on the impact of rural roads on agricultural production, the implications for different household structures is by no means less important.

Neo-Liberal paradigm.

The oil shocks of 1973/74 and the world recession beginning in the mid-1970s forced attention back to the purely economic concerns. This led to a renewed emphasis on market based liberalisation policies such as removal of tariff barriers and other restrictions on free trade, strategic devaluation of national currencies, and tight government control on monetary policy. These structural adjustment policies (SAPs), are crucial to any discussion on rural roads and rural development because, "their unintended but real impact is a diminished budgetary allocation to projects and programs which involve budgetary outlays."³¹ Investment in roads are bound to suffer the consequences of a reduction in public expenditure.

The SAPs also tend to impose unbearable burden on the vulnerable members of society - children, women, pastoralists, small farmers, the rural landless, and the urban poor.³² Due to these considerations, rural development focus is currently geared towards the reduction of poverty and increasing entitlements of the rural poor to secure means of livelihood. The new poverty agenda emphasises livelihoods and employment, social security and safety nets, and the key role of the state.³³

Evidence from other studies.

The changes in the theoretical perception of rural development have

parallels in empirical studies carried out in different parts of the developing world. Early research on rural roads attempted to evaluate the economic impact of such investments. Following the modernisation tradition, it was assumed that transport cost savings due to a road project would fully be passed on to the producer in the form of a higher ex-farm price. In an ex post evaluation of the economic effects of feeder road construction in Uganda (1948-56),³⁸ for example, investigations were confined to measuring the rise in volume and value of cotton production without attempting to determine the effects on distribution of incomes.³⁹ Most of the studies^{40,41,42} carried out in the 1960s concentrated on production as the main economic benefit to road improvements with increased agricultural and forest production and increased business activity seen as the only impact of road investments.

Despite their narrow focus, such studies made many interesting observations about the conditions that either favoured or discouraged road induced growth. Prior dynamism together with some reasonably good economic potential⁴³ were thought to be preconditions for a successful transport investment. Conversely, depressed regions were thought to have little of the unexploited natural resources or the economic dynamism necessary for successful transportation investment.⁴⁴

Other studies, however, tended to be more focused looking at the outcome of road investment in detail. One such study noted that the mechanism that served to stimulate additional output, cultivation of new lands and more passenger travel was a sharp decrease in freight and passenger charges and improved service.⁴⁵ The trickling down of the benefits accruing from road investments has by no means been certain, while studying highway improvements

and agricultural production in Argentina, for example, Miller (1968) found that a large fall in transport costs may have minor effects in producers' incentives and when savings accrue to trucking enterprises, there is no guarantee that they will be passed on to either producers or intermediaries, or alternatively that the intermediaries will pass on benefits to the farmer.

Empirical evidence from various studies conducted in different parts of the world seems to suggest that local conditions are important considerations in determining the impact of roads on local communities. The construction of a road in one region of Papua New Guinea stimulated village gardening; new estate production of rubber, copra, cattle and timber milling; teak production; large-scale poultry farming and the growing of European vegetables.⁴² Yet, in another region, an ex post study of the impact of roads found little evidence of much change having occurred in the marketable agricultural production.⁴³ It would appear, therefore, that broad generalisations of various "impacts" of roads is not possible.

Where conditions are favourable, it can be expected that investment in roads will have a greater impact than would otherwise be the case. The substantial agricultural benefits to the local inhabitants of Bundali mountains in the form of increased coffee production and sales following the construction of a 40 km long feeder road was mainly due to: (1) the road was built by manual labour; (2) the inhabitants were familiar with the advantages of a money economy as they had seen developments in the neighbouring coffee areas; and (3) the availability of expert advice through the agricultural extension service and the presence of a co-operative marketing organisation.⁴⁴

In some cases lack of complementary government action may result in dismal impact of roads on regional development.¹⁰

The importance of complementary programmes cannot be overstated. The opportunities that roads bring to the agricultural sector can be largely missed unless official action can intervene to stimulate interest and confidence in real prospect, in anticipation of, and simultaneous with, the development of roads.¹¹ Studies done in Honduras suggest that co-ordination of public policies and programmes is necessary for small farmers to participate in growth. Only when government provides access to information, inputs, credit and technical assistance, and only when profitable markets exist, can benefits reach the poor.¹²

The political economy of an area served by a new and/or improved road is an important determinant of the latter's contribution towards social and economic development. Studies done by the United States Agency for International Development (USAID) in North-East Africa, South-East Asia, Central Africa and Europe point to the fact that the indigenous production structure was a major obstacle to development, and roads *per se*, had little effect in changing this structure or introducing new crops.¹³ A study of the effects of road construction in Nepal found that new business opportunities created were taken up predominantly by already advantaged, particularly those successful in business and with capital to invest.¹⁴ Similar results were obtained in a study on the impact of transport investment on the distribution of income in Thailand. In relation to cash crop production, it was observed that conversion to cash crops tend to increase the inequalities of income distribution as generally only those with large capital available to start

with would reap the benefits from new or expanded cash crops.⁵⁰

A number of studies in West Africa, South-East Asia and Central America show that those better able to take advantage of road improvements (landowners near the road, middle-men, retailers, truckers, urban dwellers, upper- and middle-income levels) will profit more if no specific countervailing programmes are present.

Towards a Theoretical Framework

This study will be done within the framework of entrepreneur response to external change which is based on two assumptions: 1) that appropriate incentives for individual entrepreneurs are required to induce change upon rural production functions. The effectiveness of road projects with regard to generating increased output depends upon how rural entrepreneurs perceive those changes. They will be viewing such changes through the lenses of the political system, the value system, and the institutional system that define their environment; and 2) rural road investments are ultimately transformed into gains in social welfare primarily via increases in rural output. Higher output generally means higher income and improvements in various components of welfare. More direct influence are also possible, such as improved health through provision of piped water and non-work related passenger traffic when roads are improved.

Research Hypotheses

Infrastructure in general, and roads in particular, are associated with various types of impacts: economic, social, man-built environmental, natural

environmental and political.¹ The construction of a new road can set off a complicated chain of events. It can, for example, influence the production behaviour of rural entrepreneurs through the adoption of new technologies, such as fertilisers and high yield varieties (HYVs). The following hypothesis is thus proposed:

The use of farm inputs has increased due to a drop in transportation costs.

Secondly, a road can affect people differently according to their income, age, sex, etc. It can contribute to an improved or worse pattern of income distribution. Consequently, the following hypothesis is suggested:

There is no change in the distribution of income among households due to road investments.

Thirdly, a road can contribute to a better or worse quality of rural life in terms of health, family planning and nutrition, education, community organisation, personal travel, environment, etc. The connection between these factors are extremely complex. External or affecting factors, such as the availability of medical personnel, influence the levels of different impacts, in conjunction with road investments. Therefore, it is proposed to look at a diverse set of factors that may act to influence the impact of roads in social and economic change. In order to do this we will seek to answer the following questions:

Have roads contributed to increased income in the area?

More specifically we shall seek to answer the following questions:

1) What is the magnitude of time and cost reduction in using road and road transport for marketing and for other (social and cultural) activities?

- 2) What is the proportion of transport cost in the final cost of a product?
- 3) In what ways do rural roads affect the demand for traditional forms of transport?
- 4) How is food storage organised? (on-farm or centralised?)
- 5) What is the total number of local residents employed in road maintenance?
- 6) What is the trend in the purchase of consumer goods?
- 7) Has the pattern with respect to the use of credit changed?
- 8) Have the Ministries of Agriculture and Livestock extension services expanded into areas served by new roads?
- 9) What kind of investments have people made since the new road was constructed?
- 10) Have wages increased? In which areas?
- 11) Is labour more or less expensive to obtain?

Are roads good for income distribution?

- 1) Is crop and livestock development controlled or market determined?
- 2) Do monopoly conditions prevail in the provision of transport services?
- 3) What is the rate of transfer of land ownership?
- 5) Changes in land values over the last 3-5 years?

Are roads good for welfare?

- 1) Has attendance to local clinics, health centres and district hospital significantly changed in the last 10 years?
- 2) Is it easier (in terms of time and comfort) to transport sick ones to health facilities?
- 3) Any marked improvement in diet?
- 4) Are the local stores better stocked with health foods (high-protein and

high-caloric value foods)?

5) Are farmers growing more food? Why? To meet caloric requirements of their families?

6) Has there been discernible effects on school attendance, inspection or on student/teacher ratio?

7) To what extent has investments in roads increased mobilisation of human resources?

8) What forms of social organisations or groups that emerged? Has the capacity of the community to deal with local needs been enhanced?

9) Has siltation and river pollution increased due to road construction/improvement? Effects on drinking and irrigation water?

Partly because of the high variation in the timing of impacts and partly because of lack of finance, there have been relatively few long-term before and after (much less control and non-control groups) studies of the impact of rural roads. At best it has been possible to gather a small amount of baseline data and then repeat the procedure again after the construction or improved maintenance has occurred. Moreover, the usual alternative has been to attribute all changes in the project area to the road. This is certainly not the case but, it is very difficult to separate out other influences.⁶³ The next section outlines how this study intends to deal with the various limitations.

Methodology

This is a study of the socio-economic impact(s) of road improvements on rural households in Earingo district. We approach this task by measuring

objectively verifiable indicators or independent variables that will be useful in testing our hypotheses on the relationship between rural roads and production systems. Since there are many ways to influence rural output, observed changes in total output over time will be the result of a potentially large number of factors. The separate effects of road investments will therefore have to be measured, considering that effectiveness of road investments with regard to generating increased output depends upon how rural entrepreneurs perceive those changes. It is important that we measure those characteristics of the environment which act to stimulate or to inhibit the acceptance of various types of incentives. Similarly, we must quantify the various components of social welfare gains, especially those not directly related to increased output.

The Central Bureau of Statistics (CBS), through its National Sample Survey Evaluation Program (NASSEP) has developed a basis for monitoring the impact of rural infrastructure investments. The NASSEP is a national sample frame statistically selected in each district to generate planning data over a phased period of time. The first two phases ran between 1979-84 and 1985-89 respectively. In each phase, various district based surveys of farm inputs, output, output disposal (own consumption, marketed surplus, inventories), stock of agricultural implements, land use, etc. are carried out. These surveys will be the main source of baseline data for our impact study.

The baseline data will be used to define (by use of statistically estimated production functions) the relationship between output and each type of input at the level of the individual farm. For the current (1991-94) NASSEP frame, a random sample of rural households (and the same number of farms) will

be drawn for analysis. Estimates of elasticities will be made for this cross-section of farms using the first phase data to approximate the long-run responsiveness of output to changes in specific inputs. It is assumed that the baseline established in the first frame represents a stable situation prior to road improvements.

The first frame will similarly provide the baseline for household expenditure, consumption and income. Data on access to services and amenities is also provided by KASSEP. These are the basic building blocks for estimating consumption functions which describe how household consumption behaves in response to changes in income, prices and socio-economic characteristics of households. As with the household elasticities, cross-section estimates of consumption elasticities of specific types of goods and services will be estimated for each phase. The first frame will provide the estimates of long-run price and income elasticities prior to a new investment in roads.

Data from subsequent phases will be used to measure changes in farm inputs, output and incomes, income distribution, and most of the components of consumption and welfare over time. These changes will be attributed to the total impact of investment in road improvements, other infrastructure projects, and all other influences on total output and consumption. The central problem, therefore, is how to determine the contribution of road improvements to the observed total impact.

To solve this problem will require that we partition the total change in output into: (a) that part due to changes in input if baseline elasticities remained constant, and (b) that part due to the changes in the elasticity over time if the baseline levels of the inputs remained the same, and (c) that part

due to other factors such as technological change. The partitioning of variables will be done using correlation, multiple regression and discriminant analysis to isolate the effects of change in accessibility on a range of socio-economic variables. A similar approach will be followed for changes in consumption over time.

For the proposed approach, it will be necessary to determine what part of the observed change in input should be attributed to investments in roads. This will be determined by obtaining more detail than is provided by NASSEP on the sources of inputs, baseline versus subsequently. Therefore, it will be necessary to determine the extent to which transport costs are represented in the total cost of each input.

Retrospective interviews with wholesalers and transporters will seek to determine the extent to which some part of benefits intended for rural residents are actually being captured by owners of these market intermediaries.

Participatory rural appraisal techniques i.e time line, local histories, seasonal diagramming, livelihood analysis, wellbeing ranking and participatory diagramming will be used to measure environmental variables that were not covered in the baseline survey. These are necessary for determining the probability of acceptance by entrepreneurs of different types of improved inputs. A number of variables will be used which describe the characteristics of farmer's environment, such as the resource base within which she is constrained to operate.

FOOTNOTES

1. Howe and Richards, 1984: p.43.
2. Barwell et al., 1985: pp.135-6.
3. Kenya, 1989: p.78.
4. Howe, 1984: p.30.
5. Kapule and Akong'a, 1986: pp.1-12.
6. Kinyanjui and Ng'ethe, 1976: p.13.
7. Ogutu, 1986: p. 36.
8. Barwell et al., 1985: p.135.
9. Odada and Otieno, 1990: pp. 99-111.
10. Chambers, 1983: p.146.
11. Staatz and Eicher, 1990.
12. Chambers, 1983.
13. Edmonds and Howe (eds)., 1980: p.4.
14. Rondinelli, 1983: p.5.
15. Lipton, 1988: p.44.
16. Korten and Klauss, 1984: p.1.
17. Rondinelli, 1983: p.7.
18. Lipton, 1988.
19. Rondinelli, 1983: pp.1-2.
20. de Janvry, 1981: p.286.
21. Mbithi and Barres, 1974: pp.6-7.
22. Korten and Klauss: 1984: pp.2-3.
23. de Janvry, 1981: p.259.
24. Dovers, 1989 and Miller, 1990.
25. Miller, 1990:28.
26. Roumasset, 1990:37.
27. Munn, 1989:72.
28. Miller, 1990:28.
29. Daly, 1990: 46).
30. World Bank, 1992.
31. Miller, 1990: p.23.
32. UNICEF, 1989.
33. World Bank, 1990.
34. Smith, 1959.
35. Howe and Richards, 1984: p.53.
36. Bonney, 1964.
37. Jones, 1964.
38. Jones and Orr, 1966.
39. Wilson, 1973.
40. Munro, 1966.
41. Wilson et al., 1965.
42. Ward, 1970.
43. Bouchard, 1972.
44. Lunning and Sterkenburg, 1973.

45. World Bank, 1974.
46. Blair, 1978.
47. Hamilton *et al.*, 1980.
48. World Bank, 1980.
49. Howe and Richards, 1984: p.61.
50. South-East Asian Agency for Regional transport and Communications Development, 1979.
51. Howe and Richards, 1984: p.72.
52. Dickey and Leon, 1984:7.
53. *ibid* p.131.

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APPENDICES

Table 1. Road Length in kms. by Surface Type - Bungo District

Type of Road	Bitumen	Gravel	Earth	Total
International Trunk	0	0	0	0
National Trunk	92	0	88	180
Primary	53.2	64	64	181
Secondary	53	277.7	0	340.7
Minor	2	165.9	603.1	772
GOK Access	1.6	4	0.2	5.9
Rural Access	0	35.5	60.4	95.9
All Classes	223.2	547.1	215.8	1586.1

Source: Odada and Otieno (eds.): 1990) Socio-Economic Profiles, Table 5.2: p.101

Table 2: Inventory of Livestock by Type and grade owned and kept on shamba
Number ('value (KShs.))

Zebu Cows	52.8	1583.8
Zebu Heifers	88.5	3284.3
Zebu Calves	51.2	697.9
Crossbreed Cows	27.1	1271.4
Crossbreed Heif	9.4	233
Crossbreed Calv	11	120.1
Grade Cows	1.7	89.1
Grade Heifers		698
Grade Calves	3.3	41.6
Steers	9.6	458.1
Oxen	3.4	107.2
Breed Bulls	24.4	300.4
Sheep Rams	69.5	6903.2
Sheep Ewes	207.1	19502.3
Goats Male	171.6	18450
Goats Female	453	40091.9
Donkeys	14.5	4052
Poultry	299.6	3875.6
Bee Hives	155.5	7073.8
Others	2.4	757.8

Source: Odada and Otieno (eds.): (1990) Socio-Economic Table 5.14: p. Nairobi: Reata

Table 3: Holding Size by Gross Monthly household Earnings and Number of Persons in Household (in '000s of Households)
Monthly Household Incomes (KShs.) Household Sizes

Land Holding (acres)	Monthly Household Incomes (KShs.)					Household Sizes				
	Less than 300	300 to 599	600 to 899	900 to 1439	Above 1500	1	2 to 3	4 to 5	6 to 7	
No Holding	3.4	4.5	1.2	1.4	1.2	2.7	2.8	2.9	2	
From 0.1 to 0.9	2	0.3				0.9	0.3	0.6	0.6	
From 1.0 to 1.9	1.2	2.4	1.3	2.7	0.6	0.7	2.9	1.9	1.9	
From 2.0 to 2.9	1.5	2.2	1.5	2.7	2.1	1.8	1.8	2.8	1.8	
From 3.0 to 3.9	1.2	1.6	0.9	0.6		0.6	1.1	1.2	1.6	
From 4.0 to 4.9		0.9	0.8	1.4	0.3			0.3	3.1	
From 5.0 to 6.9	0.8	2	0.4	1.9	0.6	0.3	1.2	0.6	2	
From 7.0 to 9.9	0.3			0.6	0.3		0.6		0.3	
From 10.0 to 19.9	0.6	0.8	0.3	1.9	0.5			1.4	0.6	
Above 20.0	0.2	0.8		2	5.9	0.6	1.4	0.9	2.3	
Total	11.2	15.3	6.	15.	11.9	7.	12.1	12.4	16.	
Column %	18.7	25.7	10.	25.	19.7	12.7	20.2	20.8	26.	

Source: Odada and Otieno (eds.)(1990) Socio-Economic Profiles. TaNairobi: Reata.

Table 4: Persons ('000s) in Wage Employment by Activity

Type of Activity	Visit Number					Mean of All Visits
	1	2	3	4	5	
Professional/Technical	1.5	2.2	2.4	2.2	2.9	2.2
Administrative/Managerial	0.6	0.6	0.3	1.6		0.6
Sales				0.3		
Services	2.5	2.3	1.1	1.6	4.3	2.4
Agriculture/Forestry	2.5	10.7	1.1	1	5.2	4.2
Production/Manufacturing	2.2	1.5	1.5	2.3	3	1.8
Transport	0.3	0.3	0.4	0.6	0.3	0.3
General Labour	10.5	5.9	5.4	5.2	5.9	5.9
Not elsewhere classified	1.5	0.4	0.4	0.4	0.4	0.6
District Total	21.5	23.9	12.6	16.2	20.3	19.1
National Total	876.1	849.3	349.1	788.5	937	322.5

Source: Odada and Otieno (eds.)(1990) Socio-Economic Profiles. Table 5.17: p. 109. Nairobi: Reata.

Table 5: Persons ('000s) in Self-Employment

Type of Activity	Visit Number					Mean for All Visits
	1	2	3	4	5	
Professional/Technical		0.6	0.9		5	
Sales	2.5	3.3	2.8	1.9	2.6	0.4
Services	0.4			0.9		2.6
Agriculture/forestry	2.2	3.7	1.6	1.8	2.9	0.5
Production/Manufacturing	3.9	3.4	5.3	4.4	4.4	2.4
Transportation						4.3
General Labour	0.3	1.1				
Total	9.6	12	11.5	8.9	10.5	10.5

Source: Odada and Otieno (eds.)(1990) Socio-Economic Profiles. Table 5.18: p.110. Nairobi: Reata.