



13th WEDC Conference

*Rural development in Africa
Malawi: 1987*

Economics and rural infrastructure provision

Richard Franceys and Peter Barker

Rural Infrastructure

An integrated development programme aiming to improve the quality of life in the rural areas requires a level of physical infrastructure to support and complement the other development activities. For example, feeder roads, improved water supplies, sanitation systems, community buildings (medical and educational), grain storage, flood relief or land drainage schemes, soil erosion prevention and power supply are all normally required in varying degrees.

Economic analysis can be used to indicate the scale of provision of these goods, the standard of provision, the price which will be socially optimal and the resulting financial consequences. In examining these issues it is useful to distinguish between private goods, public goods and merit goods.

The allocation of private goods

Most economic goods and services are allocated to consumers by the rationing device of price. In free enterprise economies these prices are determined by the forces of supply and demand. When the demand can be met profitably suppliers will endeavour to meet it. Thus prices both ration what is available between buyers and signal what is required to sellers.

Given that individuals have different incomes, tastes and preferences they will consume specific goods in quite different amounts. When such different consumption levels are possible markets can operate to allocate goods between consumers. Such goods are called private goods and they have two characteristics. Firstly it is possible to exclude non-payers from their consumption. Secondly one person's consumption reduces the total amount available to others. The fish I consume is not available for other consumers. Private goods are therefore characterised by excludability and are 'rival' in consumption.

Public or collective goods and development

In contrast to private goods there exists a class of goods and services which are both non-rival in consumption and non-excludable. The former characteristic means that one person's consumption does not subtract from that available to others and the latter means that for economic, technical or institutional reasons the good is available to all once it is provided for any one person.

Many of these goods and services such as feeder roads or flood protection occupy an important place in rural development and are termed public or collective goods.

Merit goods

A third class of goods are merit goods. These are goods or services which could in principle be left to the market to supply and which could be sold at market prices. They are, thus, excludable and rival as previously defined. Water provision, inoculations and education are examples. However, free market provision of these goods would result in less than the socially optimal amount being produced and consumed. Whether provided at the central, regional, or village level, provision of these goods shows the 'paternalistic role' of government. In effect the government is saying it knows better than individuals how much of these goods and services should be provided and consumed.

This paternalism may be justified on the basis of superior knowledge of government or recognition that individuals may fail to see the benefits of higher consumption. Thus government may identify the community health benefits of higher water consumption or more hygiene education. To the economist these considerations are called externalities which in these cases are estimated to be significant.

There may also be a reduced demand for merit goods below the socially optimal level because of low incomes and therefore low affordability. Even though the people may recognise some of the benefits to be gained by a particular development they require some form of support to enable them to overcome their shortage of income.

Public goods and free-riders

An important finding of public goods analysis is that even if it is recognised that a public good is socially beneficial independent voluntary action may well not result in its supply. Consider investment in a public good, say a flood relief scheme which will confer benefits on two landowners, A and B.

Cost of scheme=1000, benefits to A=600, benefits to B=700

If individual A pays all the costs, net benefit to A=600-1000=-400, net benefit to B=700-0=700

If individual B pays all the costs, net benefit to A=600-0=600, net benefit to B=700-1000=-300

If the costs are shared equally between A & B, net benefit to A=600-500=100 and to B=700-500=200

These results may be transferred to a pay-off matrix:

		Individual B	
		Pays	Does not pay
Individual A	BENEFITS	A B	A B
	Pays	(100, 200)	(-400, 700)
	Does not pay	(600, -300)	(0, 0)

General conclusions may be drawn from this simple example:

i) Neither individual is likely to independently and voluntarily assume the costs of implementing the project. This is despite each individual recognising the project is socially beneficial

ii) Whenever one individual pays, the other individual finds it beneficial not to pay i.e. the temptation to free-ride and hope that somebody else will pick up the bill is strong.

iii) A better outcome for both would be for each to pay. But for independent and voluntary contributions this would require a degree of trust in each other.

iv) If the example was enlarged to include other individuals it would be seen that when the number of potential beneficiaries is increased the individual may well feel that his own decision not to contribute will go unnoticed. Free-rider behaviour may be a function of numbers.

The socially efficient output and price of a good A major branch of theoretical welfare economics is concerned with the determination of rules which if implemented would result in an efficient allocation of resources and goods. The chief finding of welfare theory is that the socially optimal level of provision of a good is where the price is equal to the marginal social cost of provision.

Figure 1 below shows the marginal social cost to society which results from the production of good X and is a composite of marginal financial cost and marginal external cost (for example pollution) imposed on society. The market demand curve shows how much society would pay for each extra unit of consumption. The term marginal refers to the extra cost resulting from each extra unit of production. The negative slope indicates that society would be willing to pay more for the initial units of consumption. Satisfaction declines as consumption increases.

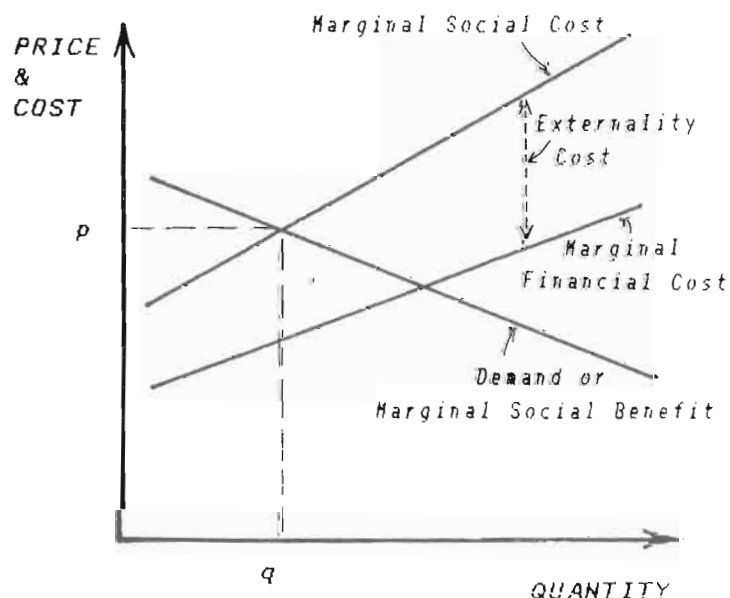


FIGURE 1

The socially optimal output is 'q' which can be sold at 'p' given the demand conditions ie. where price equals marginal social cost. The logic holds irrespective of whether the good is a private, public or merit good.

Problems of scale, consumption and subsidy

The discussion of public and merit goods suggests that market forces will either not provide or at best will provide sub-optimal amounts of important items of rural development. Collective action will thus be required. At a practical level the following issues need to be determined:

- a) the socially optimal level of service standards
- b) the level of provision, that is the standard or quality of service of the infrastructure in the absence of support or subsidy for the investment
- c) the subsidy required to achieve optimal consumption or standards
- d) a mechanism to discourage free-riding whilst enabling communities to make best use of a subsidy

To take an example, the people may decide individually or collectively that a closer, safer and more reliable water supply would make for a better life. Better because the resource cost, that is the operating cost and opportunity costs such as time spent in collection, inconvenience, lost

output and illness costs would be reduced. The demand curve (marginal social benefit) in figure 2 represents the social benefits derived from extra consumption. It includes not only the perceived benefits to individuals but also the benefits of which individuals may be ignorant.

Normally a marginal cost and benefit curve shows increasing production and consumption of extra items of the good in question. When related to rural development, increasing demand has to be seen in terms of increasing quality of, for example, drinking water at a closer proximity to the home in addition to increasing quantity. Similarly for a feeder road, increasing standards of running surface and extra width have to be considered rather than increasing numbers of roads.

Considering the question of optimal levels, provision should be expanded as long as the demand (benefit) is greater than the cost. As described above the socially optimal level of service is where demand equals supply. In practice this is achieved by cost benefit analysis.

However lower per capita incomes will constrain demand below the ideal demand, marginal social benefit, level. Considering a 'marginal affordability curve' as illustrated, without assistance the community level of consumption would be below the level to which the community aspire, as well as being below the social optimum.

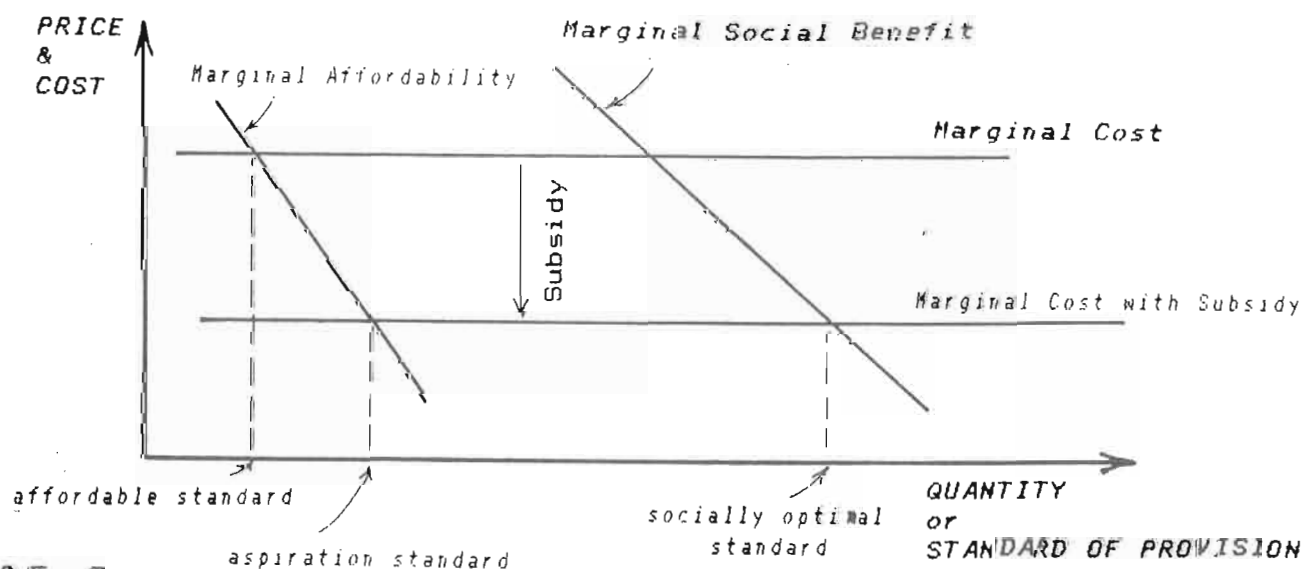


FIGURE 2

Demand is constrained by two factors:

i) low per capita incomes ii) ignorance of the social benefits of higher consumption.

To tackle i) a subsidy to production is required which is sufficient to reduce the cost to consumers. Through the involvement of the people a level of consumption aspired to by the community may be determined. This is a level of service at which the people understand the implications and required social changes and are therefore likely to realise the expected benefits. Figure 1 shows this aspiration level in relation to the actual demand or marginal affordability curve.

Without any subsidy, at the marginal cost shown, if consumers are charged a price reflecting cost the resultant low standard is all they are able to afford. Thus the level of subsidy must be sufficient to lower the marginal cost line to the subsidised level which by reducing cost allows the aspired level of consumption to be reached.

The second constraint (ii) may not necessarily be removed by subsidy. Where health or other education has not been effective and people are not aware of the benefits to be gained by an improved standard of service, even where that service is provided it will not be used effectively in a way that brings the desired health improvement. For example, the demand for clean water by any community is normally specified in terms of quantity and proximity rather than quality. However, much of the resource cost can be justified in terms of improved health.

To that extent it is possible to consider a 'perceived' social benefits curve representing what the people would like to do if they could afford it, to the level where they know they will be receiving benefits.

The initial level of subsidy will then be the difference between the marginal affordability curve and the perceived social benefit curve. This would be less than the socially optimal level but would represent the limit of present community understanding. To go beyond this level immediately would not realise greater benefits and

therefore would be a wasted investment. Any development scheme should thus be designed to allow communities to upgrade their levels of service as their understanding improves upto a maximum where the marginal social benefit curve crosses the marginal cost curve.

The problem of free-riders demands some form of community participation which encourages maximum cooperation and involvement of all levels of the community. If a government agency were simply to provide the facility without any user participation there would be no difficulty. However the vital benefits of involving people at all levels of infrastructure provision can be summarised as:

i) the significantly improved use of the facility and therefore enhanced benefits when people have been fully involved in all aspects of the planning and construction, ii) more effective operation and maintenance of the completed facility which may not depend upon outside assistance iii) reduced overall project costs and iv) an enhanced ability to undertake further community development work without external assistance.

Using the techniques of economic analysis outlined above it is possible to determine the socially optimal standard of service to aim at, the minimum level of subsidy required to begin the development process and the maximum efficient extent of the subsidy in order to facilitate a programme of infrastructure development through community participation.

A simple organisational mechanism is then required to deliver the subsidy in a flexible manner which discourages free-riders. One approach to consider is the use of performance related disbursements. The community is given total control of the project within the bounds of appropriate technical feasibility and an agreed level of subsidy is paid on completion of measurable sections of the project, with only specialised tools or materials given in advance. If a representative development committee of the community is used as the channel for assistance then the community is free to develop its own methods of control according to its own traditions.