2 Rural Transport in Sub-Saharan Africa

2.1 Transport Theories for Developing Countries

The high share of transport investments in the public expenditure of Sub-Saharan African Countries and in development aid from international donors gives rise to the question about the impacts of these expenditures for the regional development. Until today no general theory which assesses the economic and social impacts of transport investments, could be developed.

Since the beginning of economic theory, transport has been judged as a crucial element for the increase of welfare in society. Both Physiocrats and Mercantilists as well as classical and neo-classical economists demanded the dismantling of transport constraints. In 1837 Friedrich LIST described the impacts of steam trains as follows: "The more people are able to communicate and conduct actions complementing one another, the faster the progress of mankind accelerates" (§1). LIST forecasted that the introduction of steam trains would reduce transport costs and travel time, expand markets, increase production and consumption, enhance the division of labour and enlarge productivity.

These statements were verified one century later by empirical studies conducted by Walt ROSTOW (1960) and in Germany by Fritz VOIGT (1959). The latter explains the wealth of Industrialised Countries mainly by means of the autonomous development caused by shipping, railways and improved communication technologies. The author examines the impacts of the introduction of a modern transport system into a homogeneous pre-industrial region, in which, due to the isolated situation, no autonomous development takes place. A 'Big Push' caused by the introduction of an efficient modern transport system overcomes the stagnation by increasing the marginal productivity of capital in central locations, which gives incentives for new investments. These locations are the development poles which contribute to overcome subsistence economy. The following spillover effects have stronger impacts than the transport infrastructure itself: the attraction of purchasing power in the centres induces an expansion process with increasing demand, rising income, population growth and rural exodus. VOIGT judges the negative effects by the growing spatial disparities smaller than the benefits from this growth process. The following effects are generated by transport investments:

- Reduction of operating, maintenance, time and accident costs,
- increase of production due to reduction of transport costs,
- enhanced communication and diffusion of innovations and
- depletion of the peripheries.

VOIGT concludes that the transport system itself is able to create special impulses for an economic growth process (p. 306). Therefore transport invest-

ments in Developing Countries should be undertaken even if they are not economically viable (p. 312).

The optimism of the modernisation theories culminated in the statement of CHRISHOLM (1962): "...if you drive a road or railway through a cultivable area, you automatically stimulate economic development."

HIRSCHMAN (1958) could not share this optimistic view. He classifies investments into directly productive activities (DPA) and into social overhead capital (SOC) under which transport investments can be subsumed. Two unbalanced strategies can be pursued: in the first strategy the investments are channelled in DPA and the existing infrastructure is simply used more intensively until bottlenecks occur and investments in SOC have to be undertaken. The second strategy favours the provision of infrastructure by investing in SOC which is expected to induce directly productive activities (DPA). HIRSCHMAN decided that the first strategy, called development by shortage, is more likely to succeed, because the second strategy, development by excess, favours investments which are essentially permissive.

In the beginning of the 1960s the research of COOTNER (1963) and FOGEL (1964) contradict LIST regarding the strong effects of the steam engine for development. They claim that industrialisation would have occurred without the invention of the railways.

During the following discussion[1] the optimistic view was replaced by the statement that transport investments are a 'necessary but not sufficient' precondition for development. WILSON (1973, p. 208) distinguishes between "(1) the creation of economic opportunity and (2) the response to economic opportunity. The first depends upon the quality and quantity of resources in the regions served, the actual change in transport rates and service and commodity price levels". Various studies show that when prices were falling and yields not increasing, the key to development lay in declining transport costs. If both were not the case the transport investments were permissive rather than causal. "The main factors influencing the response to new transport capacity are: (a) awareness of its potential, (b) the availability of finance, and (c) the magnitude of possible benefits relative to alternative investment options" (p. 210). WILSON states that next to the direct economic impacts spillover effects occur, which are much stronger than the direct reductions in user costs: "The unlimited access of roads in the early stages of development of any region has an awareness effect that serves to induce a larger number of people to take advantage of new economic potential" (p. 211). These changes in attitude are much more strongly influenced by roads than by other modes of transport[2].

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1 HEINZE (1967), FRITZ (1975), GAUTHIER (1973), JÄGER (1972), HOYLE (1973), BARON (1980), HOWE (1980)

2 WILSON does not include Intermediate Means of Transport in his argumentation.

According to WILSON (1973) markets which had been protected by high transport costs, would be exposed to competition with cheap international products after the opening of the region by transport infrastructure. This process could even entail a decline in real incomes. A survey of 50 road projects in Africa conducted by FISCHER (1983) verifies that the effects of roads in the sphere of consumption are stronger and visible earlier on here than in the field of production. The problem of growing regional disparities already mentioned by VOIGT was picked up by MYRDAL (1974): the regional disequilibrium caused by the concentration of the investments on the development poles will be amplified in a circular cumulative process and will not even out as the neo-classical theory claims.

The intensive discussion of the 1960s and 1970s calmed down and gave way to the insight that it is difficult to verify the theories empirically because the nexus between transport investments and regional development can seldom be proved. General theories only make sense if they are spatially and temporally differentiated[3]. HOYLE (1973) differentiates between two phases, one following on from the other: while the "initial transport provision" stimulates the economy[4], induces spatial disparities and forms the future regional structure, the "transport elaboration" has a primarily permissive character and might lead to spatial inequalities if no regional planning measures follow[5]. HOYLE proposes a spatially differentiated observation of

- densely populated regions with good transport endowment,
- rural growth regions with basic endowment,
- rural indifference regions without transport endowment and
- rural depletion regions with basic endowment.

The appearance of the New Growth Theories reignited the discussion about the macroeconomic effects of transport investments again. After ASCHAUER (1989) observed a high productivity of public infrastructure investments in the USA, a number of international studies[6] followed. The studies used multivariant regressions in order to estimate the impacts of different public investments on produc-

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3 One of the most popular studies is on the historical development of the transport infrastructure in Ghana, which was researched by TAFFE, MORILL and GOULD (1970).

4 A good example of the positive impact of a new road is the Andapa-Savamba Road in Madagascar, because the frame conditions were extraordinary: Household income grew significantly, income disparities were reduced and the mobility of people increased.

5 A study of nine projects of rural road construction by ANDERSON and VANDERVOORT (1982) concludes: "The new road projects were followed by a substantial and sometimes dramatic increase in agricultural production..."(S. 13), while the growth was bigger than after an improvement of an existing link. An empirical research by LEE and VONNAHME (1985) about the regional development in South Korea confirms these statements.

6 An overview of these studies is given in Chapter 1 of the World Development Report 1994.

tion. They reveal that infrastructure investments have the biggest production elasticities[7]. EASTERLY/REBELO (1994) computed world-wide country data on infrastructure investments since 1960 and observed a production elasticity of 0.16. The growth was achieved by increasing the social return on private investment, but not raising private investment activities themselves. The authors admit that the crude country data only allows the observation of "suggestive evidence". BINSWANGER/KHANDKER (1992) observe an elasticity of 0.07 for roads in rural India, but other variables like education (0.08), market regulations (0.04), commercial banks (0.03), rural electricity (0.02) and producer prices (0.02) also showed significant effects. JIMENEZ (1994, p.10) criticises these studies because variations in quality or utilisation are not considered and none of the studies could exclude that a common factor influences both infrastructure and growth. In addition, they could not determine whether the investments were the cause or the consequence of the growth.

2.2 Empirical Evidence of Transport in Rural Areas

HOWE's (1984) comprehensive review of 50 evaluation reports during the last decades shows that the assessments were very much dependent on the regional conditions, on the methodologies and criteria of the evaluation. Project impacts were hard to measure, because they show up with a long time delay, they are difficult to separate from the effects of other complementary investments and they are subject to fluctuations (migration, climatic fluctuations etc.). Effects resulting from the transport of persons were bigger than the effects from the transport of goods. In general the access to social services improved, but only small effects could be established in regard to income and its distribution and especially to poverty alleviation (pp. 79). Land tenancy often determines who benefits most from the project. Road investments reinforce the existing social and economic stratification because "it will help wealthier and better informed producers to expand faster than others." HOWE cites the biblical situation that "to whom that has more will be given". A study from West Malaysia confirms these findings: "...55 % of the poorest people were getting only 10 % of the project benefits..."[8]

Economic impact assessments of rural transport interventions are primarily undertaken with the perspective of improving the marketing channels. Rural transport expands the catchment areas of local and regional markets and forms the link to the international markets. Fig. 2.2-1 shows the classification of a national road network under the marketing perspective. The agricultural products are transported using tracks from the field to the farm-stead and are carried from there on earth roads to the local markets or to the central delivery post.

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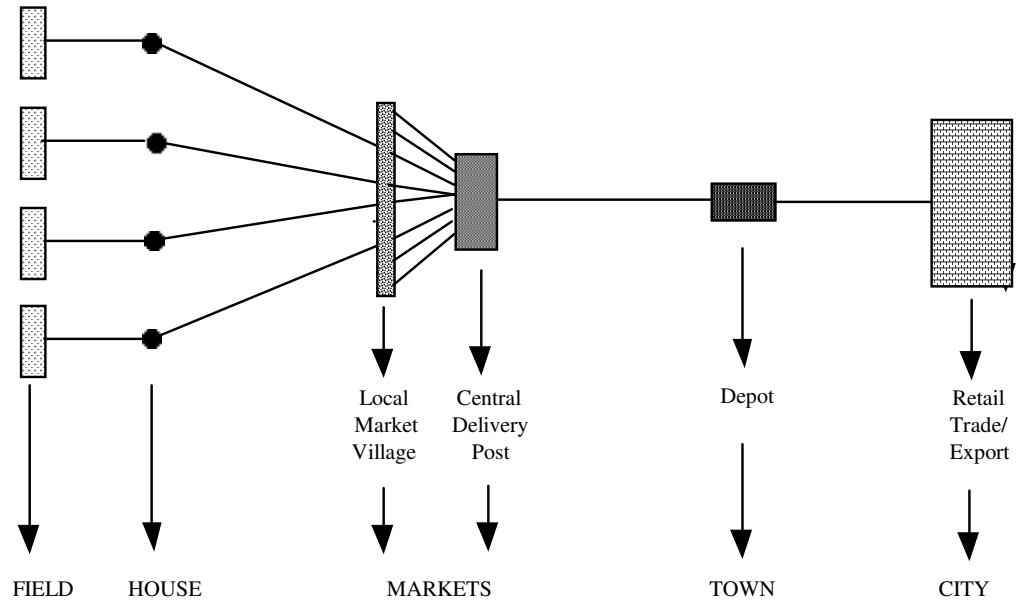
7 Growth of production in percent related to the change of infrastructure in percent.

8 Quoted according to BARTH (1989, p. 27).

From there the crops are transported on gravelled roads to the district town and on tarmac roads to the capital or the export harbour.

FEEDER & DISTRICT ROADS		INTERURBAN ROADS		CITY ROADS
On Farm, Farm to House	Farm to Market	Rural Road	National Road	City Roads
Track	Earth Road	Gravel	Asphalted	
< 6 Veh. / Day	6 - 35 Veh. / Day	35 - 150 Veh. / Day	> 150 Veh. / Day	
2 km	5 - 20 km	40 - 100 km	60 - 160 km	



Source: METSCHIES, GTZ in: ABRAHAM (1993), S. 210

Fig. 2.2-1 Classification of a national road system under marketing perspective

The Producer Surplus Theory (Chapter 6.2.1) is often applied to assess the effects of road improvements in rural areas. It is assumed that road improvements entail reduced transport costs which cause an increase in agricultural producer prices and thus generate rural growth. A study of 33 villages of the Ashanti Region in Ghana by the Transport Research Laboratory (HINE 1993) found little evidence that agriculture was adversely affected by bad road access. The improvement of existing road surfaces had negligible impacts on producer prices, while the conversion of a footpath into a road entailed benefits to the order of hundred times greater.

A study by the International Food Policy Institute undertaken by AHMED and HOOSAIN (1990 and 1993) in Bangladesh contradicts HINE by stating that the marketing of agricultural products increased very quickly under the influence of infrastructures. The producer prices were not higher in the easily

accessible villages, but the lower prices for inputs were causing higher production. The roads were favourable as well for the non-agricultural income, the composition of employment and the market integration. HOWE (1994) contradicts this with the argument that Bangladesh already has an excessive network compared to its neighbouring countries. Missing funds for maintenance will cause a fast deterioration of the roads and will limit the positive effects over a short period. The benefits might not be warranted by the long run maintenance costs for the excessive network. On top of this the disadvantages for the poor like loss of agricultural land and water logging have to be taken into account. A regional survey revealed "a number of strong biases against asset-poor villagers' realisation of benefits from road investments compared with the wealthier strata of the village population. This was related to the limited use that asset poor households could make of the roads given their restricted demand for and means of transport..." (pp 22). HOWE judges large scale road investments in rural areas of Bangladesh to be "a huge waste of resources" (p.24)

A number of studies have observed changes in spatial structures due to road construction. The location theory by THÜNEN (1783-1850) can be witnessed nowadays in many Developing Countries. More than a century ago THÜNEN had already observed circular structures of the agricultural land use around the market towns; with increasing distance the intensity of agricultural production will decrease. HOWE and RICHARDS (1984) discovered Thünen's circles in Bolivia[9], HOFMEIER (1970) perceived an intensive landuse along the trunk roads in Tanzania and MILLARD (1973) observed that the total arable land within half a mile from the road was under cultivation, while five miles away this share declined to only 5 %. In the Ashanti region of Ghana, 98 % of the inhabitants were living within two km of the roads (HINE 1993). A study by KOCHENDÖRFER-LUCIUS (1989) observed the influence of transport infrastructure on historical migrations in the Côte d'Ivoire; along the roads the market production was higher, innovations diffused faster because the access to agricultural services and inputs was better than on remote farms. In easily accessible regions land became a scarce resource causing shorter fallow periods, which entailed a decreasing soil fertility and increasing degradation of the vegetation. Therefore the highest productivity was observed in farms with medium accessibility, where the net profits per labourer were twice as high as on remote farms. Thus the locational advantages can be described as a combination of accessibility and agroecological frame conditions. This insight is confirmed by WAGNER (1993) who states that transport investments might entail severe ecological damages, e.g. by overgrazing in semi arid regions. The

9 In the inner circle sugar cane is grown, which has the highest share of transport costs; in the second ring bananas follow and the peripheral regions produce rice, which is easy to store and has low transport costs.

same holds true for humid regions, where road construction entails the migration of farmers into the rain forests, which are often more strongly degraded by agricultural activities than by commercial logging (SIEBER 1988 p. 50).

Some **general conclusions** can be drawn from the theoretical and empirical studies about rural road projects:

- Project impacts are very much dependent on the local frame conditions and are generally overestimated.
- Initial transport provision has stronger effects than transport elaboration.
- Without accompanying measures rural road projects will favour those social groups, which are already better off than others.
- Rural road projects might entail severe ecological damage, especially if the agroecological potential is exceeded.
- It is problematic to select user cost savings as the only criterion for ex-ante evaluations, because spillover effects might have much bigger impacts.

Therefore HOWE (1992, p.13) declares that predictions of the effects of transport investments are rather speculative due to the unpredictable multitude of reactions. Instead of bringing possible benefits to few locations it is preferable to spread the risk. He therefore proposes a cheap strategy of trial and error by building and upgrading as cheaply and extensively as possible. If a response follows further upgrading would have to be undertaken.

2.3 The Role of Non-Motorised Transport in Rural Areas

Next to the road system for motorised transport shown in Fig 2.2-1 a huge network of paths and tracks for non-motorised transport exists in the rural areas of Sub-Saharan Africa. The motorised system did not develop in an organic manner as in the case of Europe, or in hierarchical way as in America, but it was juxtaposed on to the existing network. Nowadays the modern system gives only restricted access to limited areas: transport links to rural areas are either non-existent or are often in a miserable condition. During the rainy season in particular, many rural regions are cut off from motorised access. Persons and goods can only be transported by walking, causing high transport costs in terms of time and money. The limited time budgets and the physical condition of the travellers (especially on the way to medical facilities) are the main restrictions. However, even in the dry season the overwhelming majority of trips are undertaken by walking. The most simple reason for this is that Africa is too poor to afford motorised transport. In 1988 in Sub-Saharan Africa[10] an average of only nine motor vehicles per 1,000 inhabitants were registered (UNCTADA

[10] The Republic of South Africa is excluded.

II, pp 52). This ratio had not increased significantly during the preceding eight years due to

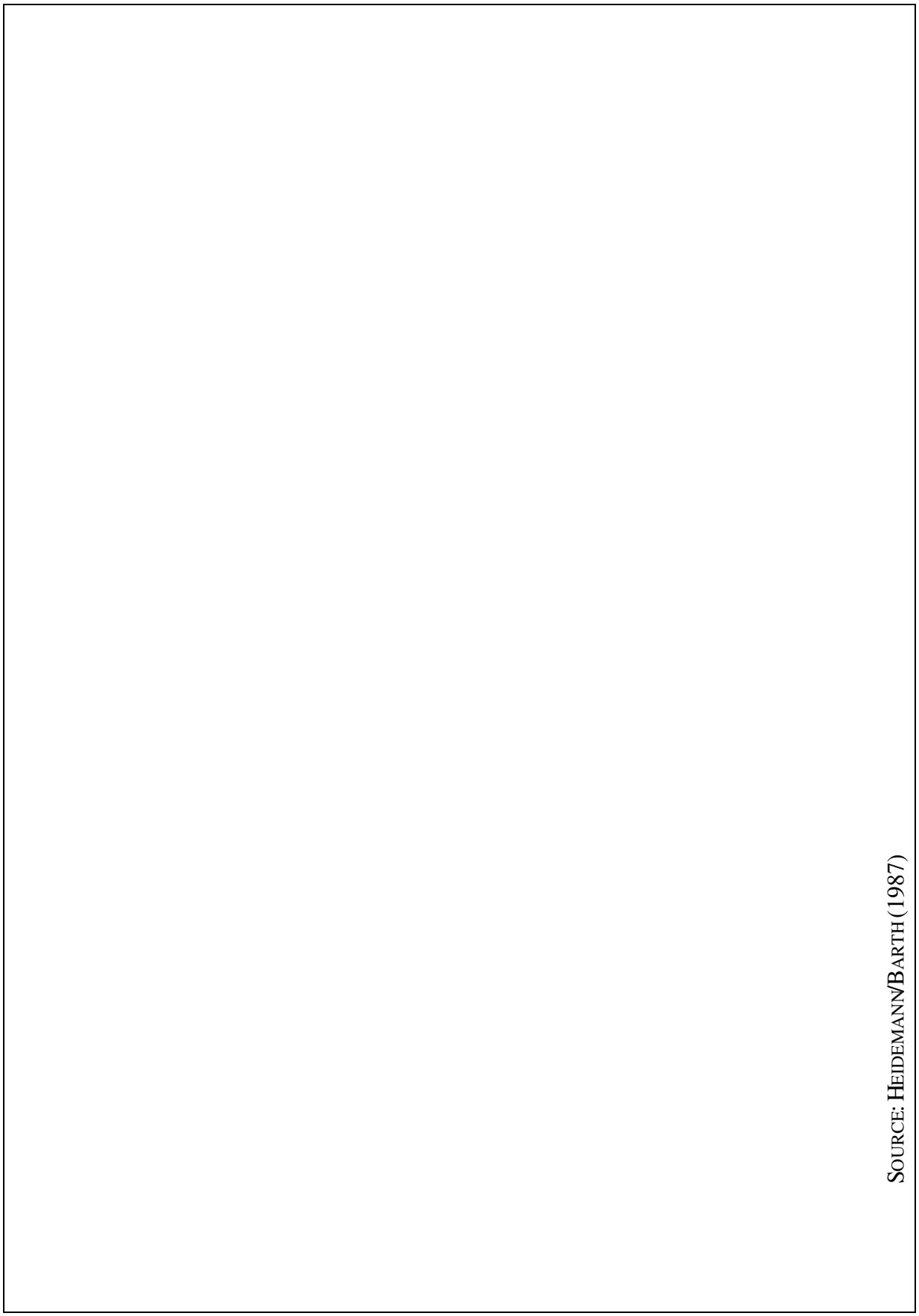


Fig. 2.3-1 Local perception of the rural transport system

the steady economic crisis and the foreign exchange shortage. A transport evaluation on rural roads in Uganda estimates that 75 % of the trips were undertaken by walking, 22 % by bicycle and only 2 % with motorised vehicles. An evaluation in Ghana on rural roads with less than 25 vehicles per day revealed that 90 % of the goods were transported by headload (BARWELL/DAWSON 1993, pp 35). Studies and Projects which only take motorised transport into account neglect the majority of the transport activities of rural households, which EDMONDS and RELF (1984) call the 'transport disenfranchised'.

Box 2-1: Classification of the Rural Transport Network:

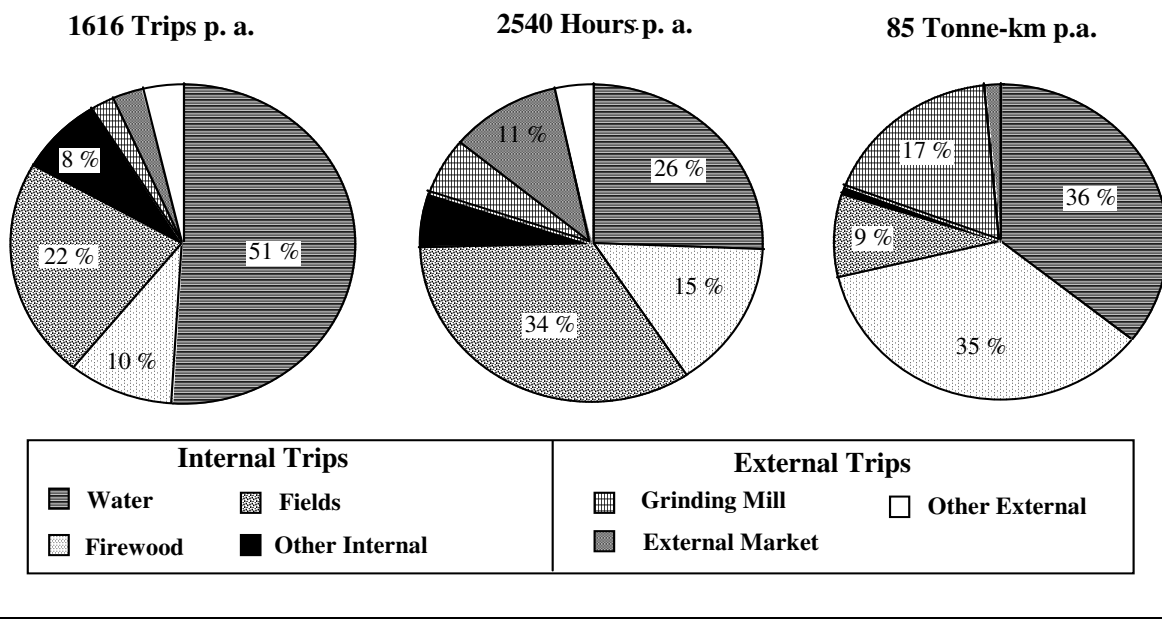
Path:	A narrow cleared way used for walking, sometimes by bicycles and motorcycles.
Trail:	A wider path also passable by pack animals.
Track:	Narrow road with a single cleared lane, dry weather standard, can be used by 4-wheel-drive vehicles and animal carts.
Feeder Road:	Access road to the national trunk road network, often dry weather standard.

Box 2-1 shows that rural transport infrastructure consists of paths, trails, tracks and feeder roads which are predominantly used by non-motorised means of transport. While Fig. 2.2-1 shows the motorised transport system from the viewpoint of a national administrator or expatriate Fig. 2.3-1 emphasises the perception of a farmer whose transport occurs mainly on footpaths and trails between the farmstead, the fields, the water supply, the pastures, the garden, the washing place and the communal centre with market and church. Only a small share of trips are undertaken to the collection points for agricultural produce.

A very detailed study about transport patterns of rural households was conducted in the Makete District (Tanzania), which is described in detail in the Chapters 3 and 4. More than 90 % of the trips and 80 % of the tkm can be regarded as internal transport in and around the village, during which 80 % of the time devoted for transport is spent[11]. A relatively small share of the transport is conducted on roads, which are suitable for motorised vehicles. Transport for water and firewood collection, to the fields and to the grinding mills account for 86 % of the trips, 81 % of the time and 98 % of the tkm. The remaining transport consists of trips to the village centre, to health facilities and

[11] A study by DAWSON (1993, p. 2) in Ghana confirms the outcomes from Makete: The share of internal transport comprises 91 % of the trips, 76 % of the tkm and 73 % of the transport time.

to markets. In 1986/87 most of the agricultural products were marketed in the villages, from where they were carried by motor vehicles[12].



Source: Own graph according to BARWELL/MALMBERG (1989) pp. 71

Fig. 2.3-2 Transport activities in Makete District 1986/87

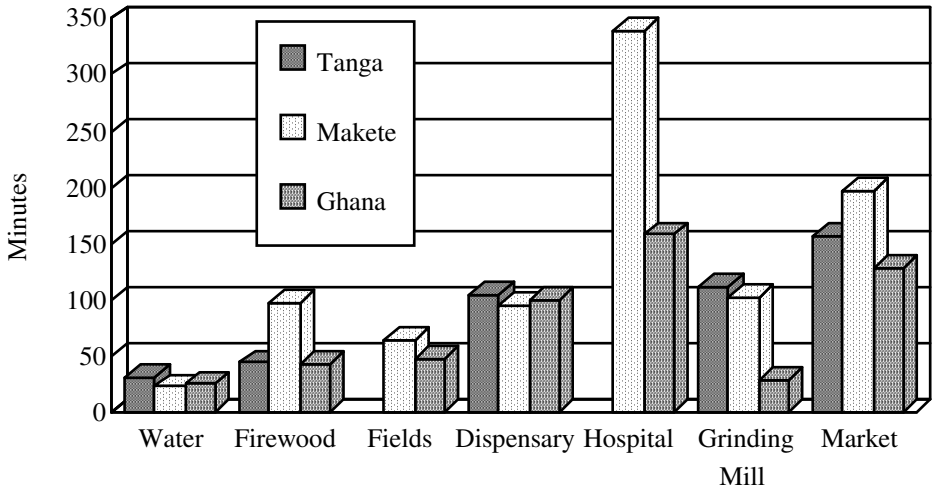
A research by KAIRA (1983) in the Kirinyanga District of Kenya confirms the primarily internal transport patterns of the households. In contrast to Makete, the farmers are marketing their products externally: 80 % of the households transport less than half a ton to the markets using animal carts and headload. Nevertheless, the remainder of the transport takes place in and around the village.

The transport tasks of rural households necessitate enormous transport loads: a rural household needs 40-60 m³ water (110-150 l/day) and 8-10 m³ wood annually (KAIRA p.34). BARWELL and DAWSON (1993, p.17) estimates the annual transport of a rural household in Ghana at 216 tkm. In Makete this amount[13] comprised 87 tkm, with 72 % being carried by women, 9 % by men and 5 % by children (BARWELL/MALMBERG 1989, p. 81). A comparative study in three African countries (BARWELL 1993) states that at least 65 % of the household's transport time and effort is contributed by women. It is for this reason that Ursula BARTH called her dissertation "Frauen gehen lange Wege"[14].

What is also remarkable is the amount of time needed for transport purposes. In Makete an average household uses seven hours per day (50 hours/week) for

[12] Chapter 3 shows that meanwhile the situation has changed in favour of external marketing.
[13] The big difference stems from the smaller size of the average household in Makete.
[14] (1989): Women Have to Walk A Long Way.

transport activities. Fig. 2.3-2 compiles the average walking time for one way trips of different study areas in Tanzania and Ghana. The average time used for a return trip to the water supply comprises 45-60 min, an activity which is fulfilled in a few seconds in Industrialised Countries. Tab. 2.3-1 gives a comparative overview of the household time devoted for transport in 5 study areas in Sub-Saharan Africa. The total time devoted to transport ranges from 1,100 to 2,700 hours per year or 0.8 to 2.5 hours per adult per day. Domestic transport accounts for 44 % to 64 % of total transport time. The high number of external trips in Rural Lusaka can be explained by the location of the study area i.e. close to the Zambian Capital, where employment and services can be obtained.



Source: Own graph according to DAWSON (1993) p.3

Fig. 2.3-3 Average walking time (One way)

The time burden for domestic transport tasks reduces the remaining time for welfare increasing activities. In labour intensive economies this allocation of time is a drain on the households labour resources. Time constraints may have severe negative impacts on productivity, especially during peak working periods, e.g. in the harvesting season. JENNINGS (1992, p. 29) reports that many women in the Makete District "indicated that they had additional shambas (fields) which they could cultivate if they had additional time". RIVERSON et al (1991, p. 82) argue that "female labour availability in terms of quantity, seasonability, location, labour quality and incentives, is therefore the key to agricultural improvement." According to the International Food Policy Research Institute, the lack of labour is the salient reason for the low agricultural production: "Africa's poor record on food production is largely due to labour constraints ...

These serve to reduce labour input into agriculture, slowing the expansion of area cultivated as well as the yields per acre."[15]

	Zambia		Uganda	Burkina Faso	
	Kasama	Rural Lusaka	Mbale	Kaya	Dedougou
Domestic Transport	1,120	1,201	1,508	669	624
Agricultural Transport	330	75	197	197	456
Services and Social Purposes	287	1,435	633	258	179
Total Transport Time	**1,737**	**2,711**	**2,338**	**1,124**	**1,259**
Hours per Adult per Annum	695	717	899	296	279
Hours per Adult per Day	1.9	2.0	2.5	0.8	0.8
Source: BARWELL (1993) p.7					

Tab. 2.3-1 Annual transport time per household

Conclusion:

In his famous book "Rural Poverty Unperceived" Robert CHAMBERS (1980) linked rural indigence firmly to isolation. BARWELL[16] explains the term isolation as follows: "If a rural area cannot be easily reached, if people living in the rural area cannot easily travel, if the flow of goods and services in and out of that area is physically difficult, unreliable or expensive ... these are the characteristics of isolation." Isolation reduces

- the productivity because the access to agricultural extension services is hampered,
- the educational level due to lower school enrolments,
- the access to public health services,
- the access to external markets,
- the producer prices due to high transport rates and
- the access to non agricultural income.

Following the "vicious circle" theory, lower education and health standards will entail a lower level of productivity and thus generate smaller incomes, smaller savings and lower capital formation.

2.4 Towards an Appropriate Rural Transport Approach

RIVERSON et al (1991) evaluated 127 rural transport projects conducted by the World Bank between 1965-1990 and comprising 160,000 km rural roads. They state that rural transport bottlenecks have contributed to the failure of structural

[15] MELLOR (1985) quoted according to BARTH (1989) p. 14

[16] Ian Barwell's introductory speech at the First Africa Meeting of the Forum for Rural Transport and Development in Lilongwe, Malawi November 1993.

adjustment programmes. Therefore the authors stress the "urgent necessity to develop a coherent Rural Road Strategy":

- Low cost design of rural roads to provide essential access.
- Labour based construction and maintenance of the infrastructure.
- Creation of a decentralised unit taking care of the planning, financing, construction and maintenance of the infrastructure.

In addition the transport policy should be adapted to the needs and economic means of the rural population through:

- Promotion of affordable Intermediate Means of Transport (IMT).
- Implementation of a network of paths, trails and tracks, which can be used by the IMT and which complement the existing road network.
- Realisation of transport avoiding measures.
- Provision of transport services.

An Appropriate Rural Transport Approach combines motorised and non-motorised transport interventions. The following four chapters present the salient features of this approach.

2.4.1 Promotion of Intermediate Means of Transport

Intermediate Means of Transport (IMT) "are defined as those means of transport which are intermediate in terms of initial cost and transport characteristics ... between the traditional methods of walking and headloading and conventional motor vehicles... (and) ... intermediate in time, i.e. they are a stage in the process of developing a traditional to a modern transport system." (HOWE 1994, p. 5). A number of studies concerning IMT[17] have been carried out in many Developing Countries. They emphasise the economic role which IMT can play in the development process. Intermediate Means of Transport are more appropriate for local transport, because they

- are relatively cheap to purchase,
- have a low level of maintenance,
- can operate on paths, tracks and trails, which are inexpensive to construct and maintain,
- are designed for small and medium loads,
- can often be produced locally and thus
- need less foreign currency.

Tab. 2.4-1 gives an overview of the available means of transport in Developing Countries. An optimal combination of IMT and motorised vehicles can be found by taking the regional frame conditions into account: cash income, transport needs, endowment with infrastructure, distance to markets, climatic and morphological conditions, etc. While motorised transport can carry bigger loads over longer distances, the IMT are appropriate if many trips with shorter

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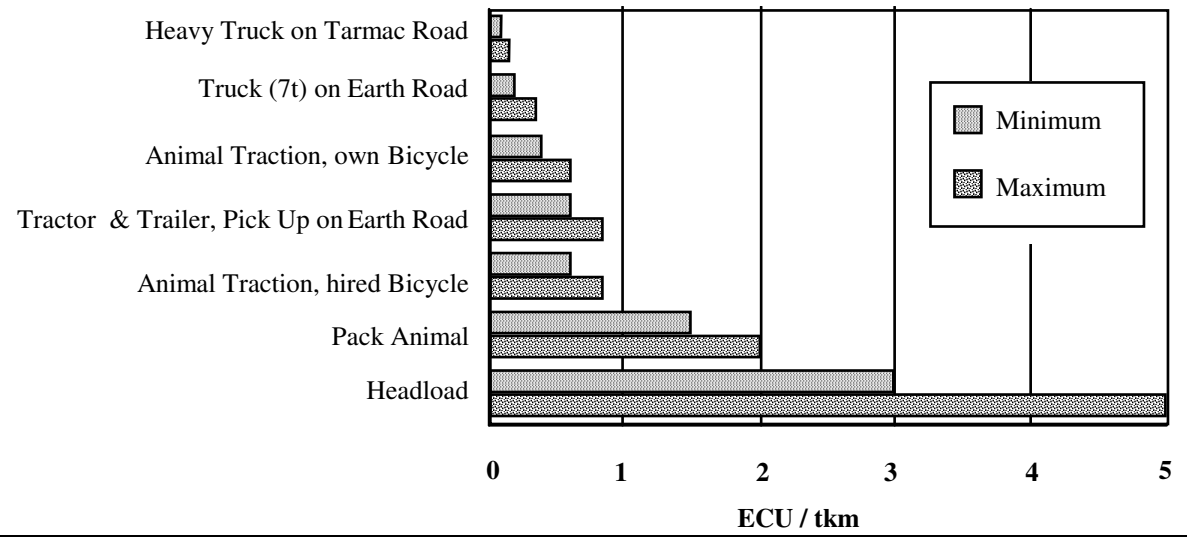
[17] AIREY (1992), BARWELL (1993), BARWELL et al (1985), BARWELL/DAWSON (1993), De Veen (1991), DENNIS/HOWE (1993), EDMONDS/DE Veen (1993), HEIERLI (1993), HOWE(1994), MALMBERG (1994).

distances have to be undertaken. Wheelbarrows and handcarts are suitable if bigger loads have to be moved on a flat terrain and on short trips around the farm stead. Bicycles are able to transport medium loads up to 40 km with a reasonable speed of 10 km/h. Sidecars or trailers can augment the load on flat terrains up to 150 kg, and animal drawn carts up to several tons. Pack animals are more appropriate where the morphology is accentuated or the tracks are not suitable to be passed by the above mentioned vehicles. Also motor cycles can be appropriate because they are able to pass on narrow footpaths and are comparatively cheap. Tractors can be used for different tasks (ploughing, pulling, transport) mainly on shorter distances, while pick ups or trucks are unbeatable on long distances.

Vehicle	**Load [kg]**	**Speed [km/h]**	**Range [km]**	**Terrain**
Carrying Pole	35	3-5	10	Unlimited
Improved Chee-ke	70	4-5	10	Unlimited
Western Wheelbarrow	120	3-5	1	Reasonably flat, smooth surface
Chinese Wheelbarrow	180	3-5	3-5	Reasonably flat, tolerates rough surface
Handcart	180	3-5	3-5	Reasonably flat, smooth surface
Bicycle	80	10-15	40	Reasonably flat, paths
Bicycle and trailer or sidecar	150	10-15	40	Reasonably flat: wide paths
Tricycle	150-200	10-15	40	Reasonably flat: wide paths
Pack Animal	70-150	3-5	20	Unlimited
Animal drawn cart (oxen)	1000-3000	3-5	50	Reasonably flat: wide track
Luggage on bus	15	30-60	>100	Wide track
Motorised bicycle	100-150	20-30	50	Reasonably flat
Motorcycle: 125cc	150-200	30-60	100	Moderate hills
MC 125cc & trailer or sidecar	250-400	30-60	100	Moderate hills: wide path
Motor tricycle: 125cc	200-300	30-60	100	Moderate hills: wide track
Single-axle tractor and trailer	1200	10-15	50	Moderate hills: wide track
Tractor	10 000	10-15	50	Moderate hills, wide track
Pick Up	1000	30-60	>100	Wide track
Truck	10 000	30-60	>100	Wide track
Source: BARWELL/HATHWAY/HOWE (1982) and METSCHIES (1986)				

Tab. 2.4-1 Performance characteristics of basic vehicles

A salient criterion for the choice of the transport mode are the Vehicle Operating Costs (VOC), which are plotted in Fig. 2.4-1 for Kenya and Malawi. Heavy trucks are cheapest if they operate on tarmac roads and have a high capacity utilisation. Due to the low transport volumes and the bad road conditions many rural areas are only served by pick ups, which have comparable VOC to animal drawn carts and bicycles. Restrictions for the latter vehicles are not the VOC, but the lower speed and the smaller range. Transport around the farm stead has to be undertaken by the expensive headload due to missing infrastructure. Pack animals and bicycles can reduce the transport costs significantly if paths are widened and the surfaces smoothened.



Source: Own graph according to METSCHIES 1990, p.12

Fig. 2.4-1 Transport costs in Malawi and Kenya

The economic effects of IMT have rarely been researched until today. Five field studies in Zambia, Uganda and Burkina Faso lead AIREY (1992) to the following conclusion: "In economic terms these benefits of IMT can be considered as releasing latent factors of production, principally land, and increasing the efficiency with which the existing labour endowment is utilised. IMT enable the household to extend the distance over which agriculture is practised" and they release the household's time requirements, which can be used for productive activities[18]. The households are able to expand their agricultural production by putting more plots under cultivation. The enlarging distance to the fields and the increasing transport loads entail growing transport in terms of tkm and pkm. The use of IMT can reduce these constraints, because they

- shorten the time required for trips to the fields,
- increase the efficiency with which loads are carried,
- reduce the effort and drudgery involved in human porterage,
- reduce the pest damage and spoilage at crop harvest time and
- increase the use of fertiliser.

The use of IMT involves an expansion of agricultural production combined with an increase in productivity. IMT, especially bicycles are often used for commercial purposes, particularly for trading and transport services for persons[19]. BARWELL (1993) summarises the effects of IMT as follows: "Thus IMT alleviate the task of moving large quantities of agricultural inputs and

[18] See as well the discussion in the following Chapter 2.4.2 about the effects of time saving

[19] The study of MALMBERG (1994) gives a good impression about the use of bicycles in Uganda.

outputs, facilitate local crop marketing, support small enterprise activities and provide access to employment and are used for social travel by men."
The question arises why these means of transport were not purchased by the farmers. The reasons are (i) natural restrictions, (ii) lack of awareness and education, (iii) missing production and distribution capacities and (iv) most importantly, missing affordability.

(i) Natural conditions might restrict the use of IMT. The use of bicycles, animal carts, wheelbarrows and handcarts is hampered by steep terrain, while the tzetze-fly, which spreads the sleeping sickness prevents the keeping of pack animals in the low lands.

(ii) Someone who has never seen a bicycle pulling a trailer will hardly know of its advantages, while traditional behaviour can restrict the use of existing IMT. Cattle are often kept for saving purposes and not used as a means of transport. The gender division of roles restricts the use of bicycles by women, while men regard them as social prestige objects. However, "modern" ways of thinking also restrict the proliferation of IMT; because western ideals are penetrating the most remote areas, government officials do not favour these 'primitive' transport systems and the planning still favours motorised transport. Bicycle imports are often charged with an import tax for luxury items.

(iii) The industrial capacities in many African countries do not allow production of IMT, especially bicycles. The production of carts and wheelbarrows could be undertaken by small scale enterprises if the knowledge could be spread. The production and distribution is hampered by the low demand for IMT.

(iv) Missing affordability is probably the main reason why IMT are not purchased. In the Makete District 60 % of the households would purchase a bicycle, 30 % a donkey and 6 % a wheelbarrow if possible. 80-90 % of the households did not purchase their desired IMT, because it was too expensive. In Malawi a rural household would have to spend 19 times its monthly income to purchase a wheelbarrow, 27 for a bicycle and 113 for an oxcart (DEGWITZ 1992, p. 53). Tab. 2.4-2 shows that the price of IMT lies within the range of the annual per capita GNP. Thus, IMT seem to be mostly available to the wealthier classes.

IMT	**Country**	**Cost [$]**	**GNP [$ per capita]**
Animal Cart	Zambia	150-450	450
Animal Cart	Tanzania	150-450	110
Animal Cart	Malawi	up to 1000	200
Bicycle	Tanzania	77-120	110
Bicycle	Burkina Faso	210	330
Source: Dawson/Barwell (1993), p.48			

Tab. 2.4-2 Price for IMT and GNP per capita

There are a few measures which could be taken to promote the use of IMT. A credit system for the purchase of IMT could probably be an efficient means to proliferate the IMT. West Kenyan experience[20] of a credit system demonstrates that farmers were able to repay their debt for an ox cart after only one harvesting period. The existing credit systems usually make it almost impossible for anyone other than relatively well-off business men, who are mainly urban biased to purchase an IMT (CARAPETIS et al 1985, p. X). The experience with rural credit facilities for IMT in some African and Asian countries shows that credit schemes for IMT can be successfully operated[21]. The example of the Grameen Bank in Bangladesh shows how the borrowing arrangements can be efficiently organised. In chapter 5.3.2 the basic concept of a credit system for IMT is described in further detail.

2.4.2 Transport Avoiding Measures

Time constraints hamper the production of rural households. Time can be saved if a part of the household's domestic transport is avoided. Avoidance means the reduction of distances, time, tkm or pkm due to non transport interventions. Households in Industrialised Countries are supplied with water and energy, while African women have to walk long distances to cover these basic needs. In rural areas of Developing Countries, capital is missing to undertake these enormous investments into the infrastructure, not only because of the general poverty, but also because of the scattered settlement structures. In order to reduce these costs central installations like water supply points can be installed. Biogas supply can be used only if animals are kept in stables. Electricity is often used for lighting and not for energy intensive cooking, which is still done with firewood or charcoal. The promotion of low energy stoves and the installation of woodlots can efficiently reduce the transport of firewood. The decentralised location of public service units like grinding mills, health centres, input

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20 IT Transport (1989), ITDG Kenya Animal Cart Project

21 In Burkina Faso credits are distributed by the Caisse Nationale de Credit Agricole to village groups and the repayment rates are close to 100 %. In India the Integrated Rural Development Programme provides credits and a 25 % subsidy for the purchase of IMT. In 1992-93 loans of $ 331 million were distributed. In 1993 the Bangladesh Rural Advancement Committee distributed credits worth $ 3 million mainly for the purchase of rickshaws through village associations. A 96 % repayment quota was achieved. In the decade following it's inception in 1976 the Grameen Bank funded the purchase of 15,212 rickshaws, animal carts, and bicycles. Here the repayment quota is 98 %. In Sri Lanka loans were given by the Intermediate Technology Group through farmer societies, while in Zimbabwe credits are only given to farmers who did not receive any loans before. Most of the credit schemes do not demand any collateral and the nominal interest rates range between 11 % and 21 % with a repayment time of 3-7 years. Further information: International Forum for Rural Transport and Development, Forum News, Vol. 2, June 1994.

distribution- and marketing points also reduces travel distances. The efficiency of these investments depends on the number of households living within the catchment area.
The Tanzanian Government tried to decrease the costs of rural infrastructure supply by forcing the households to move into compact settlements. This enabled the farmers to shorten their travel time to the rural facilities, but increased the distance to their fields. The acceptance was low and many people moved back to their old homesteads, even if their houses had been destroyed. A strategy of population concentration can only work if IMT facilitate the transport to and from the fields and if the village services are substantially improved. If population densities are low it might be cost efficient to offer mobile services or promote cheap facilities, which can be used in the household (low consumption stoves, hand grinding mills etc.).

The question arises whether the time savings stemming from reduced transport will be used for production increasing activities. A theoretical consideration about the use of the household's time budget is shown in Fig. 2.4-2. The farm households can use 16 hours of their daily time budget[22] for labour on the fields, for leisure and for the households' domestic tasks like water and firewood collection. The amount of time used for household tasks determines how much time is left for leisure and for labour. In the initial situation, household tasks **restrict** the maximum available time for leisure and for labour to L_{maxR}. The production frontier P_R indicates how much output can be produced with different inputs of labour time within the given time restriction L_{maxR}. The decision of how much time is used for crop production and how much leisure time remains can be visualised by a set of indifference curves I_1, I_2 ... I_n, each of them symbolising a different level of utility of a given utility function. The farmers will choose the indifference curve I_R in order to find the optimal production O_R, which necessitates a labour input of $L_{maxR} - L_R$ and leaves leisure of L_R. The point O_R is an optimum because any other point of the curve P would be on an indifference curve with a lower utility: a further growth in the labour input would not increase the production enough to compensate for the reduced leisure time. On the other hand an increased leisure time would entail lower production which reduces the utility. Thus the household chooses the optimal point O_R according to its own preference.

The above mentioned initial situation shows the individual choices of farming households under time restrictions. A different situation occurs after transport **avoiding** measures have reduced the time requirements for household tasks; the maximum labour time moves from L_{maxR} to L_{maxA}, the production frontier shifts from P_R to P_A and a new indifference curve I_A is chosen resulting in an output of O_A. The graph shows that the saved time will be partly used for

[22] The remaining eight hours are spent with sleeping.

leisure, but the remaining time is used to increase agricultural output. The inclination of the indifference curves determines how much of the 'saved time' is used for additional labour. Thus a reduction of the household's transport time will entail a production increase.

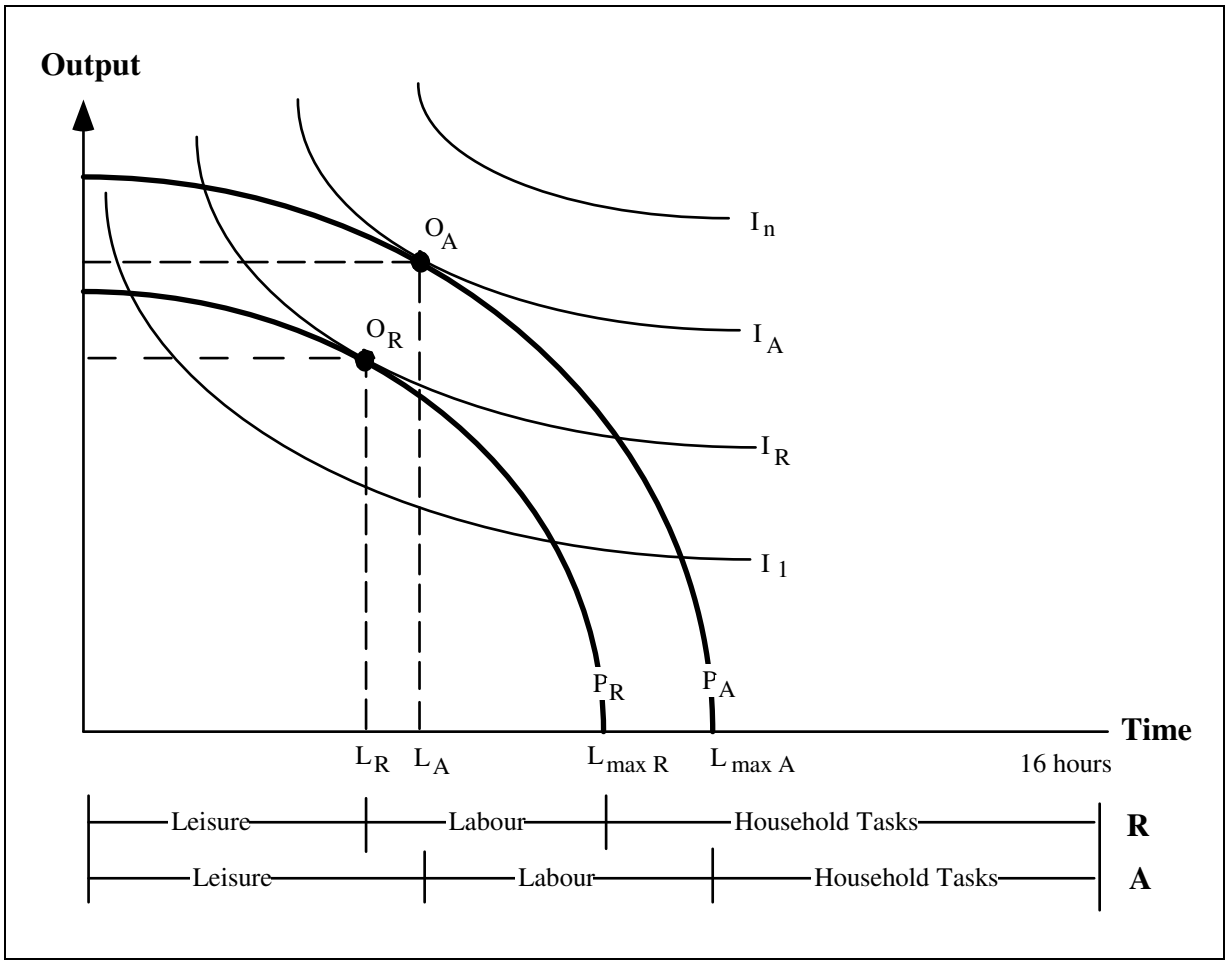

Fig. 2.4-2 Effects of reduced time requirements for household tasks

A study in Bangladesh by AHMED et al (1995, p.10) on the effects of a hypothetical introduction of IMT corroborates these theoretical assumptions: rural households would use 44 % of the saved time to increase their working time and only 18 % for social activities or leisure. 27 % would be used for additional domestic activities, which can not otherwise be carried out due to time constraints. The more the households were engaged in commercial activities, the more time they spent on work.

As women are subject to the most severe time constraints transport avoiding measures should concentrate on the reduction of female transport tasks. JENNINGS (1992 p.24.) states that women face substantial economic constraints, "that their investment in other economic activities will be only feasible if such activities enable them to meet basic needs such as food, clothing, shelter in a more efficient manner." Women will not necessarily use the saved time and

energy to increase agricultural production: MALMBERG (1994, p. 38) states that women would enhance the welfare of their family by using more time for household tasks such as child care, cooking etc. Therefore transport avoiding measures can also be warranted by the increase in the family's welfare. However, more recreation time or the reduced drudgery in transport may contribute to a rise in productivity of field labour, because physical energy is less depleted or more quickly restored.

In addition, other non-transport effects such as improvement of the health and environmental situation by the installation of water supply and reforestation occur. BARWELL (1993) observed that the level of utilisation of health facilities increases significantly if it is less than one hour's travel time from the homestead. A review of studies on agricultural productivity concludes that "...there is growing evidence of positive effects of health and nutrition on labour productivity of at least poorer individuals in Developing Countries"[23].

2.4.3 Construction and Maintenance of Rural Transport Infrastructure

The majority of rural transport activities are undertaken on local paths and trails, away from the motorable network. Their bad conditions can hamper the mobility, the load carrying capacity and the trip duration (DIXON-FYLE/FRIELING 1990). The salient restrictions are the crossing of rivers, steep terrain and bad conditions of the paths and trails. Especially during rains the paths become very slippery making trips in steep terrain a dangerous undertaking. The improvement of paths by the construction of simple bridges, drainage systems and hand rails can remove many of these problems through simple and cheap measures; transport security thus increases, bigger loads can be carried and trip duration shortens. The paths can be widened to trails if pack animals or bicycles are available or widened to tracks if the terrain allows the use of animal drawn carts. This network should be a complement to the road system and should secure transport in and around the village. In addition, it should be easy and inexpensive to construct and to maintain.

Sub-Saharan Africa has lower road densities than other Developing and Industrialised Countries[24]. Therefore the UNITED NATIONS Transport and Communications Decade (UNCTADA II, p.4) states that "the need to provide reliable access to all economically productive areas and the demands from fast growing populations require selective upgrading and expansion of both the

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[23] BEHRMANN (1990) quoted according to JIMENEZ (1994)

[24] Sub-Saharan Africa: 5 km/100 km², Latin America: 12 km/100 km², Asia: 18 km/100 km², USA: 67 km/100 km², France 149 km/100 km², Germany 178 km/100 km², Japan 297 km/100 km² (UNCTADA II, p.4, Statistisches Jahrbuch für das Ausland 1993). If the road length is set in relation to GNP then Africa has ratios 10 times higher than France and 20 times higher than Germany.

international and the national road networks." The World Bank estimates that the present rural road network needs to be increased up to tenfold if the full agricultural potential of the region is to be realised[25]. RIVERSON et al (1991) criticise the fact that the expensive construction of rural roads has hindered a further expansion of the rural network. Road planning has often focused on route selection and determination of design standards, rather than optimising the given resources. "This has fostered an overdesign and undue emphasis on investment."[26] Most of the benefits of rural roads can accrue without year-round vehicle access as long as service can be ensured during harvesting periods. The cheap design of new rural roads or tracks, spot improvements of existing roads and the installation of effective drainage structures are appropriate measures. "The prime considerations in defining rural road improvements should be reliability and durability rather than width and speed" (RIVERSON et al p. X). The MIRT-Project described in Chapter 3 will show that the construction of low cost roads and tracks can be an appropriate measure to introduce motorised access to remote areas.

Choice of the Construction Technology

Regarding the financial constraints of public budgets, shortage of foreign exchange, low rural income and high unemployment, labour based construction and maintenance of roads can be a rational solution. The World Bank recommends consciously considering labour based road works if the minimum salary is below 4 $ per day[27]. Above this limit a mix of capital intensive and labour extensive works should be chosen. Tab. 2.4-3 lists various labour based road projects and compares them with capital based investments. The first are much cheaper[28], need less foreign currency and create more wage income. HERTEL (1991) reports that labour based projects created 240 % more employment in Rwanda and 320 % more in Ghana. DE VEEN (1984) states that the labour based Rural Access Programme in Kenya needed half of the amount of foreign currency as comparable conventional projects. EDMONDS and DE VEEN (1993, p.7) affirm that in eight Developing Countries labour-based road construction was less expensive than capital based projects, whereas the quality of the results was in every way comparable.

The capital based construction operates with heavy machinery according to the technical standards in Industrialised Countries. Labour-based methodologies

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25 MELLOR quoted in RIVERSON et al (1991) p. 1

26 RIVERSON et al (1991), pp 11. The authors report that some rural roads were planned with a 7m wide carriageway for traffic of 20-30 vehicles per day.

27 Price level 1986.

28 Labour based construction in Kenya is 50-60 % and in Zimbabwe 42 % cheaper than capital intensive works.

try to use as much labour as possible and as little machinery as necessary; this means not to maximise the labour input, but to optimise the employment, which is supported by machinery. Instead of using an expensive grader the labour based works use hand tools, which can be produced in the country. Therefore foreign exchange spendings, which typically range between 70 % and 90 % (HERTEL 1991) of total capital intensive project costs can be more than halved.

Country	Organi-sation	Project	Share wages	Reduction compared to capital intensive approach		Source
				Financial Costs	Foreign currency	
Kenya	World Bank	7,800 km unclassified roads	60-71%*	40-50%	-	Riverson, Gaviria, Thriscutt 1991
Tanzania	ILO	Kilimanjaro	25 %	36 %	-	ILO, Dar Es Salaam
7 coun-tries	ILO/ IBRD		30-50%	15 %	40 %	Riverson, Gaviria, Thriscutt 1991
Rwanda	ILO	Earth and laterite roads		30 %	60 %	Hertel 1991
Ghana	World Bank	900 km feeder road rehabilitation		10 %	50 %	Hertel 1991
Zimbabwe	ILO	18 km rehabilitation	40 %	31 %		ILO (unpublished)
* Since 1980, in the initial phases high costs where caused by consultancy by expatriates						

Tab. 2.4-3 Comparison of labour and capital based road construction

While some authors (HERTEL, RIVERSON et al 1991) regard the involvement of women in labour based road work as generally positive, because income can be generated for asset poor women, BRYCESON and HOWE (1993) are rather sceptical: "Most women are already coping with extremely full work days and earning cash in the low-paid, often arduous work conditions of road sites is not alluring." The female involvement in labour based road works might, in addition entail a reduction in agricultural production.

One of the main features is the involvement of the local private sector in labour based road works. Small contractor capacity can be promoted by training, creating appropriate contract procedures, assistance during the establishment of enterprises and securing constant cash flow during the project (EDMONDS/DE VEEN, 1993). For maintenance works the 'lengthman system' has proved to be efficient, where road agencies contract one individual who is directly responsible for a road segment (COOK et al 1986). During the Kenya Rural Access Roads Program 7,800 km of rural roads were successfully maintained by 'lengthmen' recruited from the villages along the roads.

Some of the construction and maintenance works in Africa are done with unpaid volunteer labour (Self Help). The participation can be regarded as a local development tax. Chapter 5.5 shows that Self-Help labour is often inefficient, the participation is enforced and the social and gender distributions

are unequal. It may be used to construct new infrastructures if the participants benefit directly from the improvements, but maintenance works using volunteer labour are not sustainable in the long run (COOK et al 1986).

Organisation of Maintenance

1988	Good	Fair	Poor
Paved Roads	52 %	25 %	23 %
Unpaved Roads	29 %	32 %	39 %
Source: MASON/THRISCUTT 1991, p15			

Tab. 2.4-4 Road conditions in Sub-Saharan Africa

During the 1960s the African road network was rapidly expanding with the assistance of international donors. Unfortunately, less care was taken with regard to maintenance, which caused a rapid deterioration of these infrastructures. In 1988 more than 70 % of the unpaved roads were in poor to fair condition (Tab 2.4-4). "Hence, while Africa is underequipped in relation to its potential it is overburdened by the little infrastructure that it possesses" (RIVERSON et al p.5). The consequence is an isolation of many rural areas especially during the rainy season. The World Bank estimates that in 1987 Somalia could not evacuate one third of its bumper crop due to bad transport conditions.

One of the major consequences of this lack of maintenance are higher vehicle operating costs (VOC) on the resulting poor roads. In personal transportation the fares on a badly maintained road can be up to 50 % higher than on a good road (KROH 1987 p. 37). Every dollar which is saved on maintenance causes three dollars of higher user costs (SANDHU 1992, p.23). Furthermore, the costs for road rehabilitation could have been prevented by regular maintenance. Therefore "preventive maintenance ... generally has a higher economic rate of return than reconstruction, mainly because of the cost savings from not having to reconstruct deteriorated roads at a later date" (MASON/THRISCUTT 1991, p.22). As an answer to these problems UNECA and the World Bank have launched a "Road Maintenance Initiative" which is aimed at raising the conscience of policy makers and designing policy action programs.

A World Bank Study (MASON/THRISCUTT 1991) estimated the annual costs until the year 2,000 for the rehabilitation and maintenance of the whole Sub-Saharan African road network at $ 1.8 billion, an amount which is probably not affordable. Therefore the authors selected an 'economically justified' priority road network for every country and compiled a number of maintenance strategies (Tab 2.4-5): a continuation of the existing maintenance practices would leave all unpaved priority roads and 80-90 % of the paved priority network in a bad condition - a strategy, which is clearly not desirable. The authors therefore push for the rehabilitation and the maintenance of the whole priority network, which can be financed by reducing the costs for new construction of roads to 20 % or less of total road expenditure. They emphasise (p.23) that the non-pri-

ority network "would remain in fair or poor condition unless or until traffic or other factors warrant rehabilitation". Without external aid about one third of the African Countries will not be able to restore even their priority network to an adequate condition.

Strategy until year 2000	**Priority Roads in bad condition**		**Annual Costs**	
	Paved roads	Unpaved Roads	Mill $/a	Share GNP
Continuation of routine and minimal maintenance	78-91 %	100 %	228	0.2 %
Only roads now in good condition correctly maintained	47-50 %	72-81 %	409	0.3 %
Maintain good roads and restore fair condition roads to good condition	17-29 %	42-47 %	680	0.5 %
Restore the priority network of roads to good and fair condition	0 %	0 %	1,147	0.8 %
Source: Mason / Thriscutt 1991, pp 24				

Tab. 2.4-5 Maintenance strategies for the priority network in Sub-Saharan Africa

Using this perspective it will be difficult to fulfil the demand of the UNCTADA II for the new construction of rural low volume roads. Thus the isolation of many rural areas will probably continue or even increase. However, the creation of low cost infrastructure using labour based methods for construction and maintenance might allow the extension of the 'economically viable' road network.

HEGGIE (1994) regards institutional constraints as the root causes for bad road maintenance in Sub-Saharan Africa. Road administrations can be characterised as follows:

- They lack a clear organisational and management structure,
- qualified staff are missing,
- domestic revenue mobilisation is wholly inadequate,
- financial and management systems are not up to the task of controlling large sums of money,
- the channels to the road administration are fraught with difficulty and funds are frequently diverted.

A reform of African road administration seems to be unavoidable. The World Bank (HEGGIE 1994) proposes the "commercialising of African roads" by 'bringing roads into the market place, putting them on a fee for service basis and managing them like any other business enterprise'. The salient feature of the reform is the installation of independent road agencies on the various administrative levels. Four basic building blocks should shape the reform:

- Creating ownership by involving road users: installation of a board of directors with representatives of road transport industry, contractors, consultants, farmer's associations and concerned government departments.
- Stabilise the financial flows by mobilising revenues and linking revenues and expenditures e.g. by the installation of a road fund.
- Clarify the responsibilities among different government departments and road agencies.
- Improve the management by creating a more business-like environment: pay the staff adequately, install effective management structures, where managers can act commercially, introduce auditing procedures, create contracts between the government and the road agency.

HEGGIE proposes a general deconcentration of the road agencies at the national level and a greater aggregation at the local level. Experience (RIVERSON et al 1991, p. XI) has shown that three principals secured a successful planning and implementation of rural roads: (i) Programmes were effectively launched and implemented if road departments had relative autonomy and separate funding. (ii) The participation of agricultural officers and local communities at the planning stage led to better road selection and maintenance and (iii) simple and well established planning procedures encouraged participation and resource mobilisation at the local level. A small centralised agency responsible for regional planning, which is allowed to raise its own funds and receives technical advice and matching funds from the central agency seems to be most effective. These demands were partly implemented in Tanzania. Box 2-2 describes the main features of the reform of the Tanzanian road sector.

Box 2-2: The Reform of the Tanzanian Road Sector

In 1987-88 only 41 % of the total collected revenues from road users was devoted to road maintenance the remaining part being contributed to the general tax revenue. Nevertheless, the actual maintenance expenditure only covered 31 % of the necessary amount to keep the national road network in an acceptable condition. Maintenance received a lower priority than new construction. In 1990 only 15 % of the trunk roads and 10 % of the regional roads were in a good condition, while two thirds were impassable or not maintainable.

The World Bank organised seminars to which public and private sector stake holders were invited in order to raise consciousness about the maintenance backlog; the user groups bluntly said that they would be willing to pay more for roads if they were better maintained. Besides numerous activities in the transport sector, one of the salient results of the Integrated Roads Project, which was initiated by the World Bank, was the set up of a National Road Fund in 1991. Government funding for road maintenance increased by more than three times mainly due to an increase in fuel tax. 10 ¢/litre of fuel are earmarked for the fund, which together with other road charges is exclusively used for the maintenance of roads. 20 % of this fund is allocated to rural roads.

The creation of a semi autonomous Road Agency is envisaged. On top of that a Central and a number of Regional Road Boards are planned. The central board is to include the Chamber of Commerce, Organisation of Engineers, Automobile and Roads Associations.

Missing maintenance mainly stems from an insufficient provision of funds. Fuel prices are often subsidised or kept at a low level for political reasons and no or few revenues can be obtained. The collected revenues from vehicle licence fees are not necessarily used for the roads' sector. One of the salient points of reform is to allow each road agency to collect its own charges and pay them into a fund outside the finance minister's control. SMITH (1991) lists the different possible revenues of national road agencies: (i) general fuel tax, (ii) taxes on vehicles, spare parts and tyres, (iii) distance tax levied on passenger fares and freight charges, (iv) road tolls, (v) non variable vehicle charges, e.g. vehicle registration fees and licences and (vi) non-user taxes, e.g. a sales tax on agricultural produce. Decentralised rural road agencies are only able to levy road tolls (v) and non-user taxes (vi). The remaining cash requirements have to be transferred from the national road fund. The question arises whether under the financial constraints, an adequate funding of rural roads stemming from the national road fund can be possible. Additional local revenue collection to finance the road expenditures seems to be necessary. In chapter 5.5 an example is given of

how the low cost construction of a rural road can be entirely financed with a local road toll.

2.4.4 Provision of Motorised Transport Services

Motorised transport services in rural areas are a necessary complement to the improved rural road network. They enable farmers to carry their products to the markets, to purchase farm inputs, to consume centralised services or to travel for leisure purposes.

In general it can be stated that the quality of the transport services decreases with worsening road conditions with overloaded buses, uncomfortable "seats" on the back of pick ups or trucks, low reliability and service frequency, high accident rates, slow average speed and excessive prices being the salient features of rural passenger transport services. According to World Bank research (CARAPETIS et al. 1984, p.14), state owned companies are performing badly: they have no incentives to change the quality of services, are often working inefficiently, are producing financial deficits, have a low capital endowment, are frequently subsidised, have a bad management system, and poor morale due to low salaries. The Bank states that private companies are working efficiently, are more flexible and show higher motivation due to better payment of the employees. Regulations of the transport market like market entry restrictions, control of routes and the setting of rates, often below the profit margin, hamper the proliferation of private companies. Next to deregulation the provision of credits could promote the operation of private companies, which could also operate with IMT[29].

A comparative study by HINE and RIZET (1991) between three francophone African countries and Pakistan demonstrates that Vehicle Operating Costs (VOC) are not only influenced by the quality of the infrastructure, but also by the efficiency of the transport services: the costs in Africa are four times higher than in Pakistan, where the trucks run twice the number of kilometres, register less empty trips, have lower maintenance costs due to low speeds and the responsibility involvement of the driver. While in Pakistan a competitive environment favours the purchase of cheaper appropriate vehicles, in Africa sophisticated vehicles are bought, which run at low utilisation levels.

This example shows that a privatisation of transport services does not necessarily improve the transport quality if a competitive environment is missing. In Sub-Saharan Africa private companies operate mostly on profitable routes,

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[29] BARWELL and DAWSON (1993, p. 63) report on a milk company in Bangladesh using rickshaws to collect milk from its farmers and cooperatives in India providing bullock carts for the transport of agricultural produce. In San Salvador a 5-ton truck for the distribution of soft drinks by Pepsi-Cola was replaced by a bicycle with a trailer. The distribution was so efficient, that the company decided to test specially built tricycles. (HEIERLI 1993, p. 121)

because the low transport volumes and the bad road conditions in rural areas lower their profits. If they are servicing the countryside they more often than not have a regional monopoly which enables them to charge excessive tariffs, even ignoring state regulations. In these cases the state has an important role in controlling how regulations are met and offering transport services in areas where no private company is present.

2.5 Conclusions

In regard to economic theory transport investments have long been regarded as a direct stimulus to development. This optimism faded away in the 1960s and gave way to a judgement which emphasises the permissive character of transport infrastructure: how the economic opportunities created by the transport investments are used, depends very much on the local conditions. Even though recent macroeconomic country studies emphasise the strong impacts on production, the empirical evidence of regional case studies gives a very heterogeneous picture, where various positive and negative effects of transport investments occur. Road projects often generate a production increase, but they favour these social groups, which are already better off than others. Initial transport provision generates stronger effects than the upgrading of existing infrastructure and rural road projects may entail severe ecological damage. Therefore, the prediction of future effects of transport investments involves strong uncertainties. Thus, a cheap and extensive construction strategy of "trial and error" is recommended in order to reduce the unreliabilities of forecasting.

After the independence of Sub-Saharan Africa massive investments in transport infrastructures were undertaken which were not adequately maintained. In the 1990s the discussion arose as to how the rehabilitation of the deteriorated road network could be financed. Preconditions are new institutional and financial arrangements, which entail a decentralisation of the road administrations, the integration of the road users into a board of directors and financial independence from recurrent government budgets. The right to collect their own revenues can also be important for the financial performance of rural road administrations. Low cost and labour based technologies should be used for construction and maintenance purposes.

The bias towards the 'road & car' approach[30] neglects the needs and abilities of rural households. Recent research demonstrates that households carry a considerable transport burden which requires substantial quantities of time and effort. The majority of trips are undertaken in and around the village by walking on local footpaths and trails. Women carry the biggest transport burden for the

[30] Focus of donors and national decision makers on the provision of infrastructures for motorised vehicles.

household's domestic purposes. Rural households possess practically no motor-vehicles and undertake very few motorised trips. Transport constraints can significantly hamper the growth of agricultural production. Therefore a rural development strategy should not only take care of the road infrastructure but also improve paths, trails and tracks, promote Intermediate Means of Transport, implement transport services and conduct measures which avoid transport.

The following chapters will show that this strategy can improve the economic performance of rural areas. The next two chapters will give an example of the effects of an integrated rural transport project in Tanzania, which took account of the transport needs of rural households.