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by J C Rutter, S D Ellis & J L Hine

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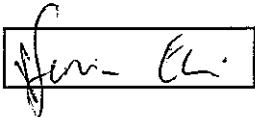
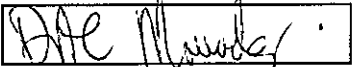
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FACTORS AFFECTING THE AVAILABILITY OF RURAL MOTORISED TRANSPORT SERVICES IN TWO SUB- SAHARAN AFRICAN COUNTRIES

by J C Rutter, S D Ellis, & J L Hine

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APPENDIX 1: MALAWI VILLAGE LEVEL QUESTIONNAIRE AND INSTRUCTIONS FOR COMPLETION

APPENDIX 2: HOUSEHOLD LEVEL QUESTIONNAIRE AND INSTRUCTIONS FOR COMPLETION

APPENDIX 3: VEHICLE OPERATOR QUESTIONNAIRE AND INSTRUCTIONS FOR COMPLETION

EXECUTIVE SUMMARY

Rural poverty in the developing World, especially in Sub Saharan Africa, is closely linked to poor communications and poor access to essential facilities. Access comprises four key components:

- Extent and quality of infrastructure
- Siting of facilities relative to residential areas
- Availability of transport services
- Affordability of travel to facilities in terms of time and/ or money

Between October 1997 and December 1998 TRL conducted three DFID-funded survey exercises to address the latter two issues. Two of these surveys were done in Ghana in collaboration with the Building and Road Research Institute of Ghana and the Department of Planning of the University of Science and Technology, Kumasi. The third was carried out with the help of the Malawi Rural Travel and Transport Programme. The instruments for data collection were:

- A checklist to obtain information on village parameters such as population, essential facilities within the village and availability and access to transport services. This information was gathered during group participatory discussions within the villages visited.
- A questionnaire aimed at individual household representatives to determine household size, livelihood, income and other indicators of prosperity, transport requirements and trip frequencies with respect to trip purpose, cost and mode.
- A questionnaire aimed at vehicle operators to obtain information on the extent of tripmaking, goods charges and passenger fares, and factors affecting their businesses such as seasonal deterioration of roads, competition, access to vehicle repair and maintenance facilities, regulation and access to credit facilities for vehicle purchase.

Six or seven Districts were chosen for study from each of the two countries visited. Selection of study areas was made over a wide cross section with respect to:

- Level of economic prosperity,
- Climate,
- Agriculture,
- Terrain characteristics,
- Proximity to, or distance from, the lakes Malawi and Chilwa,
- Population,
- Location of the districts relative to the respective region and
- Extent of road network

Within each district, villages were chosen over a wide range of accessibility from those located on main roads to those accessed only by unmotorable tracks. In total, 97 villages were visited and 697 householders were interviewed. Additionally, two villages were investigated in a peri-urban district of Ghana close to the country's second largest city,

Kumasi. A total of 262 vehicle operators were interviewed in market towns and villages. The main findings were as follows:

- Many rural villages are not directly served by motorised transport. On average, the access point for vehicles is 4.4 to 5.2km distant from the village.
- Population density has a large impact on the cost and provision of rural transport services and accessibility to social and economic amenities. The Ghanaian study shows better services associated with higher population densities as evidenced by fares, goods charges, waiting times for vehicles and frequency of vehicles serving the villages.
- Wide variation exists between the districts surveyed, within both Ghana and Malawi, with respect to household prosperity as indicated by income and total known expenditure per capita. On average Malawi is poorer than Ghana and considerably less use is made of motorised transport in the former. Within Ghana the northern and southern sectors of the country also differ widely with respect to prosperity and use of motorised transport, the north being poorer.
- In both Ghana and Malawi female-headed households are in a minority. There is also a tendency for these to be poorer than male-headed households.
- Scatterplots of household tripmaking versus income and fares generally show very weak relationships and little sensitivity of tripmaking to changes in income or passenger fare. Elasticities of demand are presented in terms of the percentage increase in tripmaking resulting from a 1% increase in income or a 1% decrease in fare. On the whole, there is little sensitivity in tripmaking to changes in either parameter. Data analysis indicates that a 1% increase in household income produces only a 0.035% increase in number of motorised trips to market in Ghana. Virtually no positive relationship was found between income and tripmaking for Malawi.
- Household tripmaking generally showed weak negative relationships with fares. Elasticities of demand indicate that a 1% decrease in fares produces a 0.159% increase in tripmaking in Ghana and the corresponding figure for Malawi is 0.102%. Exceptionally, use of bus travel in Malawi shows considerably more sensitivity to fare changes, with an elasticity of 0.876%.
- Vehicle operators gave time spent waiting for spares as a major reason for vehicles being off road. This was especially the case in Malawi, which lacks spares or repair facilities on the scale of the Kumasi Magazine in Ghana.
- Fuel prices are greater for vehicle operators in Malawi than in Ghana
- Vehicle operators quote better quality roads as the main factor that would improve their businesses.
- Data on passenger waiting times for vehicles, the time vehicles have to wait for a full load of passengers and the distances to essential out-of-village facilities,

indicate a tendency for the areas where density of demand is lowest to be less well served by motorised transport.

These findings are discussed in the light of a (tentative) model of modal choice and travel patterns in relation to degree of poverty or prosperity. While there can be little doubt that considerable improvement in rural infrastructure is necessary for any major improvements in accessibility to rural transport services and efficiency of operation of these, road interventions alone may be of only limited help to poorest sections of the rural community. Other, complementary interventions are required to assist rural poor with personal mobility.

A solution is required which will guarantee minimum service provision at fare levels affordable to the very poor which should also allow for an increase in operational efficiency.

Such a solution might be a possible Public Private Partnership whereby operators bid (in terms of the minimum incentive payment/ subsidy they would require) for route licenses. Minimum fare levels and trip frequency would have to be agreed. In return excess capacity (particularly of the old, unsafe and polluting vehicles) may be "bought out" and the incentive payments agreed.

Possible solutions to provide the long term financing of incentive payments might include the following:

- Payments could come from the recurrent government budgets or from the revenues generated from the newly established Road Funds that have been set up, primarily to finance road maintenance.
- Donors could set up a separate fund that could be invested to service payments in the longer term.
- The fund administrators could negotiate and come to an agreement with the appropriate local authorities controlling local rural transport that payments would only continue provided certain performance criteria are met.

FACTORS AFFECTING THE AVAILABILITY OF RURAL MOTORISED TRANSPORT SERVICES IN TWO SUB-SAHARAN AFRICAN COUNTRIES

ABSTRACT

Between October 1997 and December 1998 the Transport Research Laboratory (TRL) conducted three Department for International Development (DFID) -funded survey exercises in Ghana and Malawi to study the travel patterns of rural households, the constraints to their mobility and constraints to the providers of rural transport services.

Wide variation with regard to the extent of motorised tripmaking was found between Malawi and Ghana and also within each of the two countries. In Malawi, with generally less motorised tripmaking activity, the cost of travel is generally more expensive, in absolute terms and, especially in relation to household income. The availability of rural transport services, as shown by such parameters as passenger waiting times for vehicles and frequencies of vehicle services into the villages, is related to the density of demand as indicated by district population density.

A tentative income based model of mobility is presented. It is recognised that road investments can be an expensive intervention relative to the incomes of those affected and there may be no guarantee that the poorest members of the community will benefit other than through the direct effects of transport cost savings on the economics of crop marketing. Complementary measures are required in order to increase the personal mobility of the very poor. In order to take a more holistic approach to the alleviation of poverty through transport measures, it is suggested that direct interventions should be made to encourage the provision of transport services at low fare levels for the most disadvantaged rural communities. A possible Private-Public Partnership solution is suggested.

1. INTRODUCTION

1.1 BACKGROUND

Transport is a basic need and is of particular importance in rural areas of developing countries, making available to rural inhabitants the goods, services and facilities for their daily needs, and for economic and social development. Rural poverty and isolation of communities in the developing world is closely linked to poor communications and poor access to essential facilities. Access comprises four key components:

- Extent and quality of infrastructure (roads, tracks and paths)
- Siting of facilities relative to residential areas
- Means of transport, i.e. availability and diversity of vehicles
- Affordability of travel to facilities in terms of time and/or money

Despite the fact that the role of an efficient rural transport system in the current process of economic and social development is self-evident, most transport policies of developing countries, particularly in Sub-Saharan Africa, fall short of clear strategies to address rural transport problems.

Distances to social and economic facilities are greater in rural communities than urban or suburban ones, particularly in sparsely populated regions. In Sub-Saharan Africa much of the effort in improving accessibility has been biased in favour of improving road infrastructure. While the importance of this cannot be denied, less attention has been focused on the availability of rural transport services, i.e. on vehicle numbers, vehicle diversity, frequency of service, reliability of service and affordability of passenger fares and goods charges. In many areas vehicle ownership is rare, the choice of vehicle types is low, and what vehicles are available are usually in very poor condition. Much of the trips made by villagers to facilities located many kilometres outside the village for such purposes as education, visiting health facilities and marketing bulky quantities of crops and other goods is done by the time consuming and inefficient mode of headloading and on foot. A study by Ellis (1996) showed that transport costs in Ghana and Zimbabwe were substantially higher, in real terms, compared with three Asian countries, Thailand, Sri Lanka and Pakistan.

While demand for transport of passengers and goods is generally met in cities and on interurban routes, villages lying off the main roads tend to receive only very infrequent transport services.

The close siting of key facilities to residential areas has been mentioned above as a priority. Examples of this would be development of community woodplots and digging of wells closer to households to reduce time and effort in firewood and water collection (Barwell, 1996). Nevertheless, the economic prosperity of a nation's rural community at the regional, village and household levels is dependent on the exchange of goods, agricultural produce and labour between it and the townships. This entails the movement of people and materials over large distances and hence the need for relatively fast vehicles of higher load and passenger-carrying capacity. At the household level, the time saved as a result of using faster, more frequent and affordable transport services can be channelled into more efficient production and marketing of farm produce and other goods and hence greater prosperity and a higher standard of living.

1.2 AIMS OF THE STUDY

This study looks at the supply and demand problems of rural transport in two Sub-Saharan African countries, Ghana and Malawi, chosen because they differ so much in terms of geographical location, physical factors (e.g. climate, terrain) and general level of prosperity. It seeks information on household travel patterns and other factors affecting mobility, the constraints faced by the vehicle operators themselves and how these things interrelate. What is sought in particular is the *elasticity of travel demand* i.e. the relationship between supply of, and demand for, public transport services and affordability, or the ability of households/household members to pay for these services.

In addition, the study seeks to gain a better understanding of the availability of rural transport services at the village level. This includes the frequency of motorised transport

into the village, waiting times and rural peoples' perception of their access to transport services.

The study primarily focuses on travel outside the village and, hence, on longer distance travel and access to motorised services.

In Ghana the Building and Road Research Institute (BRRI) and the Department of Planning of the University of Science and Technology, Kumasi, collaborated with TRL in such matters as the recruitment of survey staff, data collection, and analysis of vehicle operator data. Similar assistance in Malawi was provided by the Rural Travel and Transport Programme (RTTP), of the Government of Malawi District and Local Government Administration, based in Lilongwe.

1.3 PROFILES OF THE SURVEY COUNTRIES

1.3.1 Ghana

Ghana, with an area of 238,537 sq. km and a population of 17 million (1995 estimate), is located in West Africa, on the Gulf of Guinea Coast, and is bordered by Togo, Burkina Faso and Cote D'Ivoire. Much of the centre and south of the country is divided by Lake Volta, artificially created by damming the Volta River at Akasombo to provide much of the country's electricity from hydroelectric power. Its climate is tropical and vegetation ranges from dry savannah in the far north to rainforest in the south. There are no mountainous areas and the terrain is gently undulating throughout most of the country.

Formerly known as the Gold Coast, Ghana attained independence in 1957. In the 1970's and 1980's the general decline in the Ghanaian economy, exacerbated by high inflation and a shortage of foreign currency exchange, was accompanied by a virtual collapse of the country's transport infrastructure. In response to this the Government of Ghana launched its Economic Recovery Programme (ERP) in 1983, aided by support from a number of Donor Agencies, including the International Development Agency and the World Bank. Included in this programme were a number of major projects to rehabilitate trunk, urban and arterial roads and feeder roads. While the programme led to the desired upswing in the economy and general improvement in mobility there was no significant improvement in *rural* mobility. This has been largely as a result of the high cost per capita of constructing standard all-weather roads in the poorer, more sparsely populated regions such as the Northern, Upper East and Upper West Regions where the network density of feeder roads is as low as 0.028km/sq.km. As a result many areas are without year-round motorable roads.

In the northern sector of the country the transportation of farm produce, farm inputs, water, fuel and other items is largely by headloading or bicycle. Traditionally, it is only the men who ride bicycles in the rural areas. Women are almost entirely restricted to headloading and spend as much as 12 to 15 hours a day in this highly inefficient mode of transport activity.

1.3.2 Malawi

Malawi is a small landlocked country, being 900 km long, varying in width from 80 km to 160 km and covering an area of 118,484 square km. Administratively, the country is divided into three regions, i.e. north, centre and south which are further subdivided into 26 districts. Tanzania, Zambia and Mozambique border the country.

Geographically, Malawi is dominated by Lake Malawi, which is 568 km long and 16 km to 80 km wide, accounting for 20 percent of Malawi's total surface area. The country has a varied topography of mountains and rivers, which have a direct effect on the climate with temperatures ranging from 14°C to 23°C along the lakeshore and Shire River Valley areas.

Malawi has a population of some 11 million people with several ethnic groups and a population growth rate of 3.1 percent per annum. Agriculture is the backbone of the economy of Malawi as it employs about 90 percent of the population. Malawi is not endowed with mineral wealth and there is little mining. There is very little fishing for export and relatively little industrial production.

The rural population of Malawi suffers from poor availability of both motorised and non-motorised transport and rural road infrastructure. As a result, traffic volumes are low and inevitably waiting times for transport can run into hours or even days in the more remote locations. Even if there are passing vehicles, there is a good chance that they are already too full to take any more passengers or freight. In contrast to the scarcity of transport in rural areas, it is common to find many vehicles queuing in urban areas waiting for passengers and freight.

The transport and communications sector is a crucial area in the development of landlocked Malawi in order for goods to be moved into and out of the country. In this regard the policy of the current Government is to provide this service as much as possible. The rural transport sub-sector has not received adequate attention from the government during the last 30 years. However, it is now being fully recognised by the government with the forthcoming country-wide Malawi Rural and Transport Programme which seeks to contribute to the reduction of rural poverty through improved people's accessibility to socio-economic services and facilities.

2. METHODOLOGY

2.1 THE QUESTIONNAIRE STRUCTURES

2.1.1 The household level questionnaire

This was made up of seven main sections and responses were sought from a range of household types in the village (See Appendix 2):

- *Demographic and household composition* seeking general information on each household, including age, sex and marital status of the head of household (not necessarily the interviewee), the numbers of men and women (18 years old or over) and number of children under 18.
- *Household income and livelihood.* This section attempts to gather information from which an indicator of the household's level of prosperity can be estimated. The interviewee is asked for the household's gross annual or monthly income. Questions are included in this section seeking information on the household's main source of income and whether or not any contribution is made to household income from household members with particular non-agricultural occupations.
- *Expenditure.* It is expected that most households cannot state any figure for their gross income, or, at least cannot give any accurate estimate for this. Therefore data has been collected on a number of items including food (including subsistence value of the food if they grow, rather than buy, their own), other consumables, clothing, health and education fees.
- *Possessions and property characteristics.* This section aims to gather further information which could be used to deduce the household's income category. Ownership of bicycles and other vehicles, particularly motorised ones, radios, television sets etc. show a greater level of prosperity than in a household which owns very few or none of these items. Also included in this section are questions about the type of house construction and fuel used for cooking and lighting. A household which lives under a metal roof, uses kerosene for cooking and lighting is likely to be in a higher income category than one living under a thatched roof, uses wood for cooking and candles for lighting.
- *Travel patterns.* The interviewee is asked questions about number of trips, journey times, trip distances, mode of travel and fare, if any, relating to 11 different activities; Short trips within the village were not included. The issue of gender in Ghana, as in many other Sub-Saharan African countries is important and therefore trip making is split by gender.
- *Goods transport charges.* The relationship between goods charges per unit of quantity per km and distance for motorised transport is sought. Additional information included the type of goods, the units carried (e.g. large bag, small bag, basket etc), number of units and trip purpose (from which trip distance can be obtained, referring to the previous section on travel patterns) is tabulated.

- *Reasons for dissatisfaction with motorised transport services.* This section aims to rank the importance of a number of different reasons why householders do not make more use of motorised travel/transport.

2.1.2 The participatory mapping checklist or village level questionnaire

It is necessary to process information on travel patterns from household questionnaires from a particular village in the context of the facilities available in that village and the accessibility of facilities external to the village. On arrival at each village, prior to interviewing individual household members, a meeting was held with the village headman, assemblyman, schoolteacher and/or other senior village members firstly to obtain permission to carry out the interviews and then to collect information such as:

- Village size
- Location of the nearest water source, markets, schools, religious centres etc
- Agriculture: type (whether subsistence and/or commercial) and extent, main crops, number and duration of harvests and crop storage facilities
- Type and quality of roads linking the village with the outside world and
- Type and frequency of motorised transport services into the village

In a typical household interview the interviewee might say that he or she travels, for example 20km to the nearest market by bus. If the village is linked to the main road by an unmotorable feeder road 5km long and the nearest point that motor vehicles come to the village is the junction of the feeder road with the main road, then allowance has to be made for this and the interviewees' response corrected to 15km.

2.1.3 The vehicle operator questionnaire

This is divided into eight or nine sections depending on the country:

- *General information* relating to vehicle type, ownership, load capacity (passenger number and or weight of goods), crew composition, use (whether for passenger or goods transport) and type of operation (whether on a "for hire "basis or on regular routes). This section contains, in addition, fairly detailed questions on the routes on which the vehicle is driven relating to road quality, distance, time, trip frequency, passenger and goods charges and how these differ between the wet and dry seasons.
- Sections 2 and 3 are aimed at drivers of passenger and goods vehicles to acquire information on *demand for their services* and *how and where goods vehicle drivers find their loads*.
- A section (4) to get more detailed information on *seasonal constraints* on vehicle operators.

- *Vehicle operating costs and maintenance.* Questions relating to vehicle age, tax, insurance, fuel type and costs, responsibility for maintenance and servicing, frequency of servicing, vehicle utilisation and availability of spare parts.
- *Use of small enterprise services in vehicle maintenance (Ghana only).* The city of Kumasi, Capital of the Ashanti Region, is well known in Ghana for the Kumasi Magazine a large compound of small enterprise shops specialising in various forms of manufacture and repair service. This section is aimed at determining the importance of the Kumasi Magazine to vehicle operators for maintenance, servicing and supply of spares to vehicle operators in the various regions of Ghana visited in this study.
- *Payment for vehicle.* This section seeks to establish how the vehicle has been/ is being paid for, the ease of availability of credit and the reasons for purchase of any particular type or make of vehicle.
- Finally, the interviewee is asked what changes he thinks would best improve his business.

Vehicle operator interviews were carried out in towns or villages with a market on market days. In Ghana, prior to commencement of interviews, the survey team notified the local branches of the GPRTU (Ghana Private Roads Transport Union) of their activities. The union officials provided much valuable help in finding drivers for interview. Vehicle operators were selected on a less formal basis in Malawi.

3. BRIEF DESCRIPTION OF THE STUDY AREAS

Eight regions were selected over the course of the two field visits to Ghana (Fig. 1), and six regions were selected in Malawi (Fig. 2) differing with respect to such factors as:

- Level of economic prosperity,
- Climate,
- Agriculture,
- Terrain characteristics,
- Proximity to, or distance from, the lakes Malawi and Chilwa,
- Population,
- Location of the districts relative to the respective region and
- Extent of road network

Phase 1 of the survey was carried out in three districts in the forest zone of Ghana, namely:

- Ejura-Sekyedumasi District in the Ashanti Region and
- Wasa-Amenfi District in the Western Region,
- The Afram Plains in Eastern Region.

Figure 1: Map of Ghana showing study areas

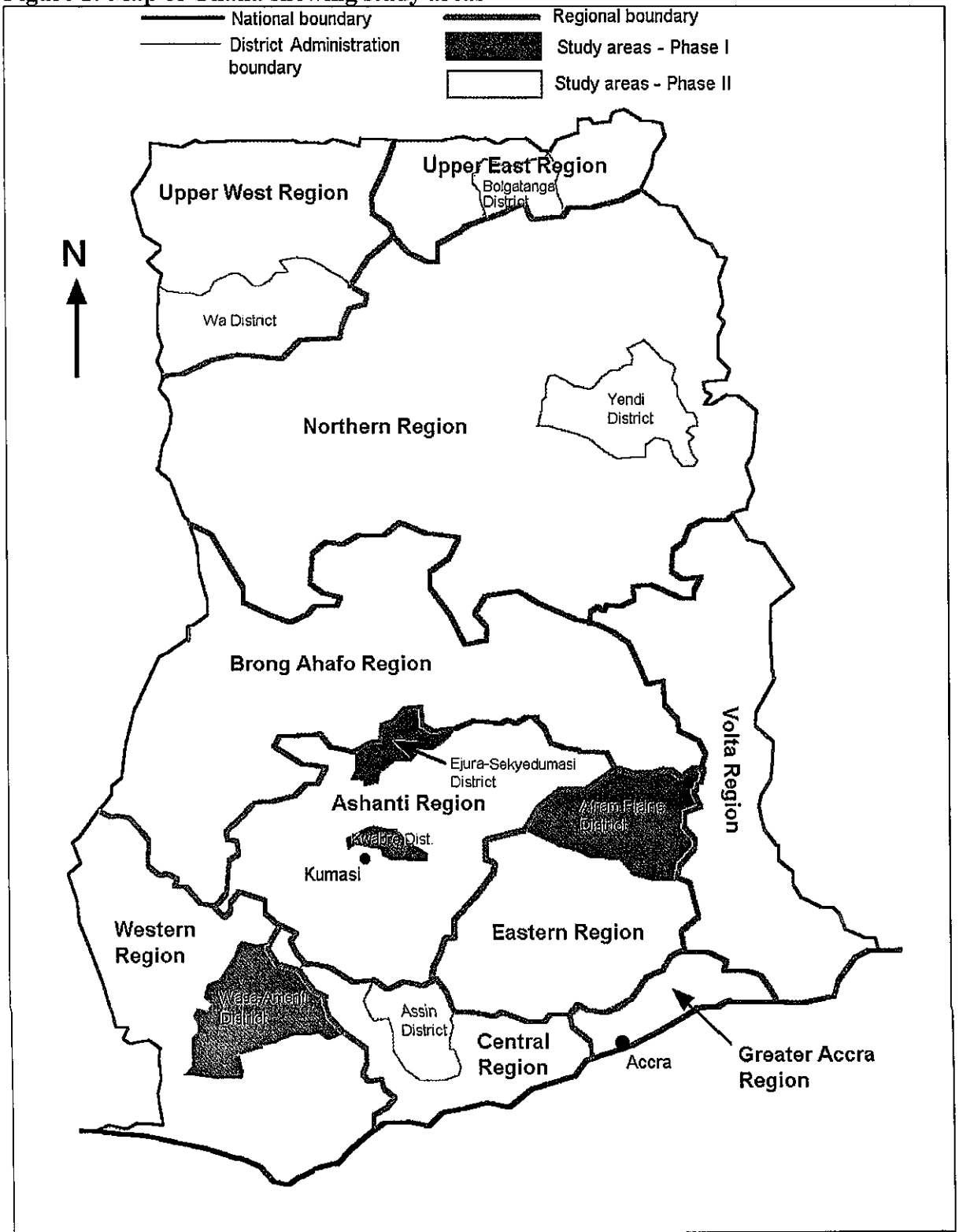
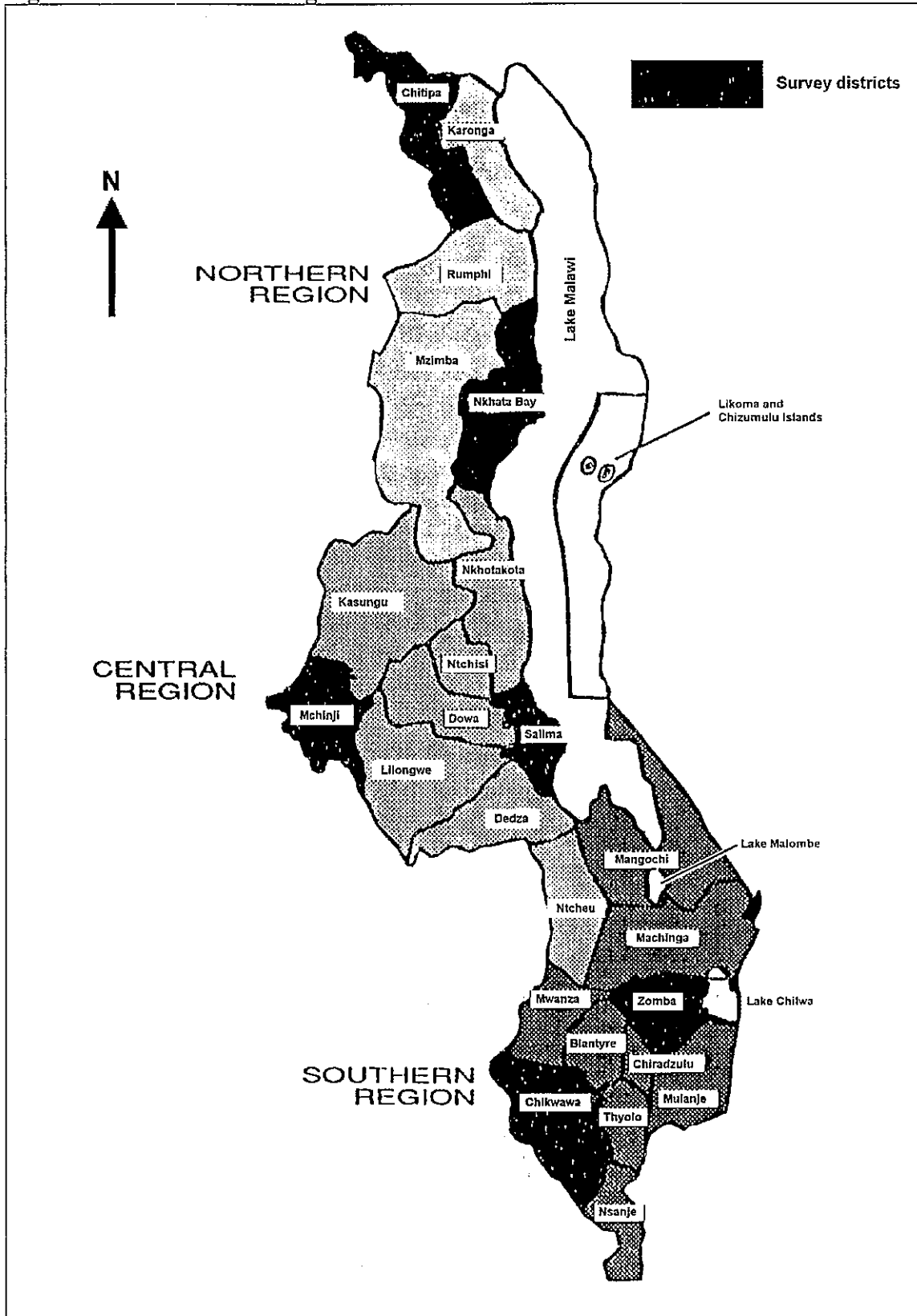


Figure 2: Administrative regions and districts of Malawi



In addition two villages were selected for the household survey in Kwabre District, as an example of a peri-urban location, in Ashanti Region.

In Phase 2 three districts in the northern sector of Ghana, characterised by a semi-arid climate and guinea savannah, and one further district in the forest zone of the southern sector were visited:

- Yendi District in Northern Region,
- Wa District in Upper West Region,
- Bolgatanga District in Upper East Region and
- Assin District in Central Region

In the third and final data collection exercise six districts in Malawi were selected for study (Fig. 2). They are Chitipa and Nkhata Bay in the Northern Region, Salima and Mchinji in Central Region and Zomba and Chikwawa in the Southern Region.

Physical, demographic, economic and infrastructural characteristics for the survey districts in Ghana and Malawi are described in more detail by Rutter et al (2000a & b).

4. COMPARATIVE FINDINGS

4.1 THE VILLAGES: DEMOGRAPHY, AMENITIES AND ACCESSIBILITY

In Ghana the survey covered 55 villages, ranging in size from only 22 to as many as 15,000 inhabitants, and 40 villages were visited in Malawi with between 143 and 25,800 inhabitants. The number of household representatives interviewed in Ghana was 412 while 288 were interviewed in Malawi. In both countries very wide variation in demographic characteristics was found between the districts surveyed, both in terms of village population (Fig. 3) and numbers of households per village (Fig. 4). On average, it appears that villages are larger in Malawi than Ghana (Figs. 3 & 4) and that village size is closely related to district population density (Fig. 5).

Many villages in rural Africa lack direct access to motorised transport and, in the case of those visited in the current survey, villagers have to walk for up to 40km to board a vehicle. On average, the access point, or road junction, was found to be 4.4 - 5.2km distant from the village (Table 1)

A substantial proportion of villages are linked to the outside world only by earth- or gravel-surfaced paths or tracks which are unmotorable by anything other than four-wheel drive vehicles and tractors, and become quite impassable during the rainy season. These routes are subject to severe erosion and gullying which are exacerbated by such vehicles as tractors.

Figure 3: Average village populations by district

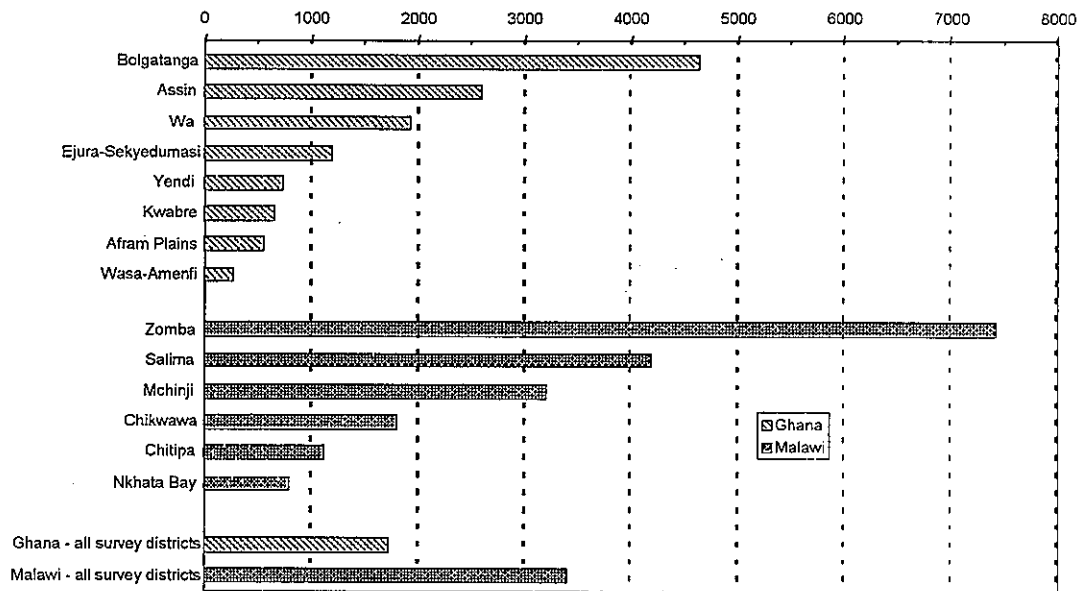


Figure 4: Average number of households per village by district

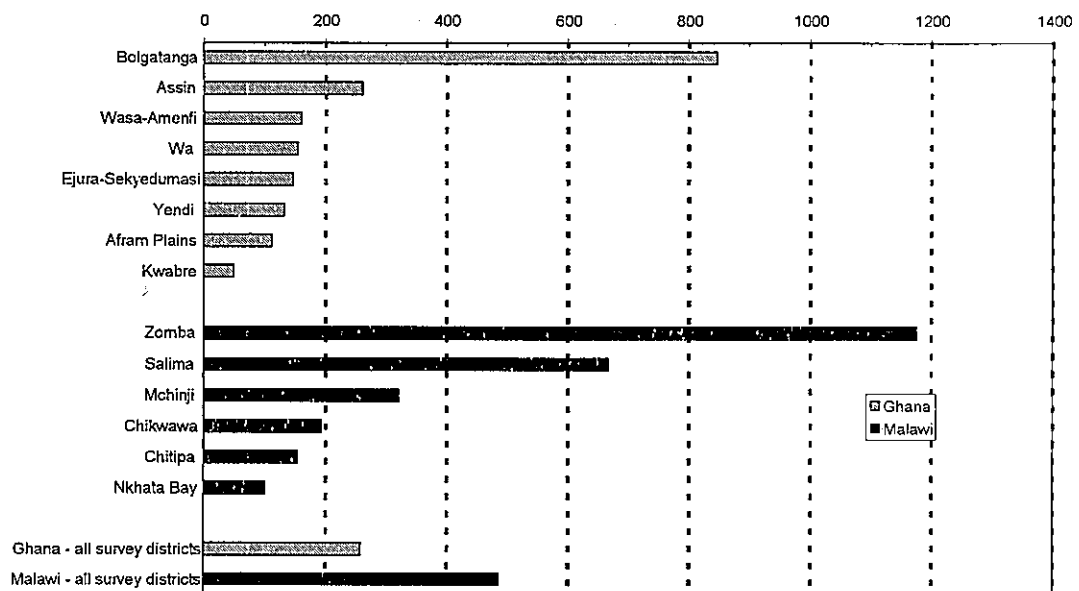


Figure 5: Relationship between district population density and village size

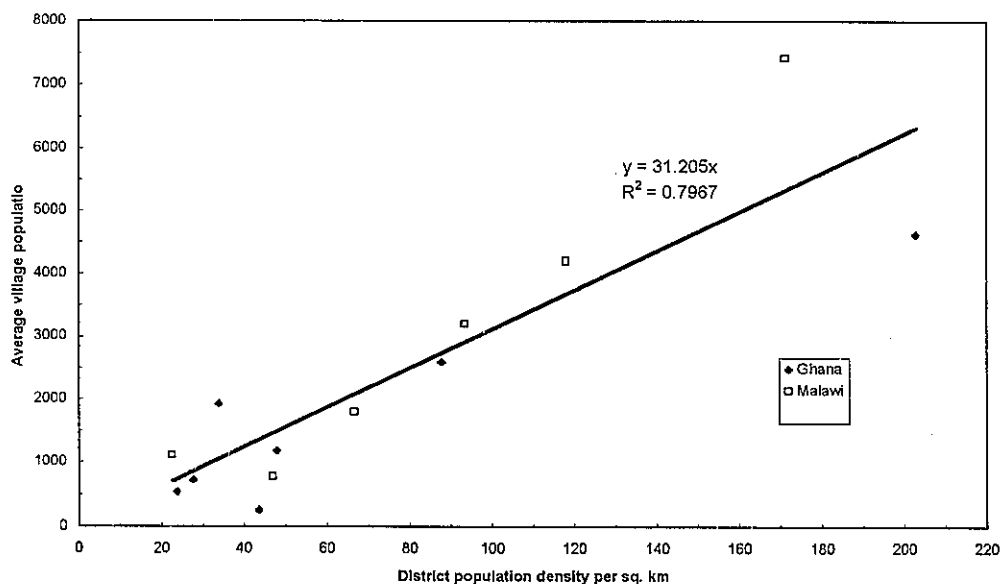


Table 1: Village access characteristics

		Average distance (km) to pickup point for motorised transport	Type of access route to pickup point (number of villages)				
			Footpath	Track	Other ^a	Total	
Ghana	Afram Plains	2.7			3	6	9
	Assin	7.2			2	6	8
	Bolgatanga	7.5			5	3	8
	Ejura-Sekyedumasi	1.3	1		2	4	7
	Kwabre	0.8				2	2
	Wa	6.4			2	6	8
	Wasa-Amenfi	2.2			4	1	5
	Yendi	3.1				8	8
	All districts	4.4	1		18	36	55
Malawi	Chikwawa	2.9	1		6	1	8
	Chitipa	4.1	1		3		4
	Mchinji	8.4	3		3		6
	Nkhata Bay	7.7	3		2	1	6
	Salima	3.8			8		8
	Zomba	5.1			8		8
	All districts	5.2	8		30	2	40

^a Including secondary, tertiary and feeder roads

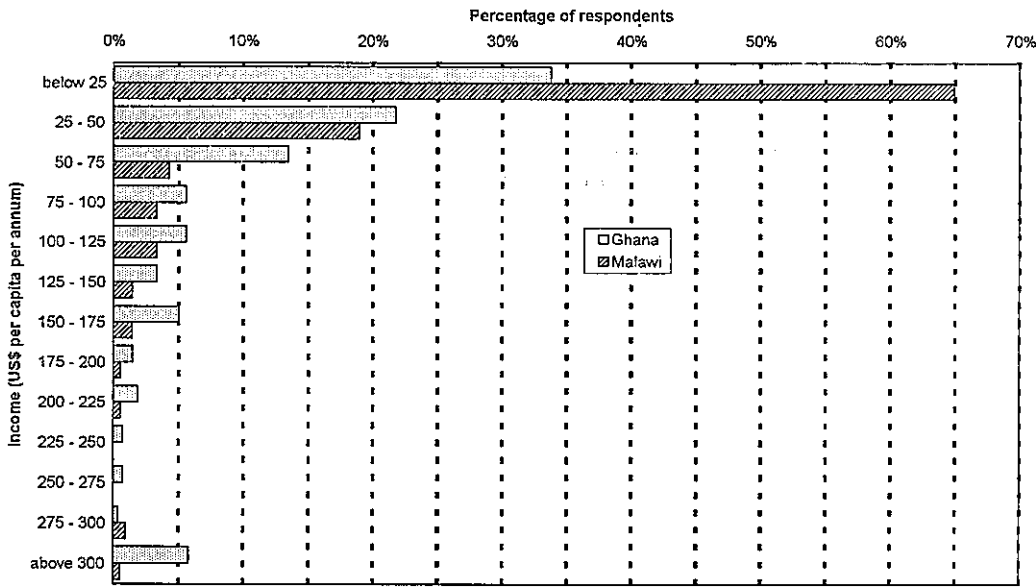
4.2 HOUSEHOLDS

4.2.1 Incomes, livelihood and prosperity indicators

Income is the most direct indicator of household prosperity that can be obtained and this was asked for in the household questionnaire. However, a substantial majority of households examined were farmers, chiefly living on a subsistence basis, who could not give an accurate answer to this question because they do not have a regular income or keep records of their income and expenditure.

A total of 412 householders were interviewed in Ghana and 288 in Malawi. Of these 63% in Ghana and 86% in Malawi were able to provide a figure in response to the question "Can you give a rough figure for the household's income?" (See Appendix 2). Data is analysed in relation to the main source of household income and the gender of the head of household and is expressed in US dollars in Figure 6¹ and tables 2, 3 and 4.

Figure 6: Per capita income distribution



Wide variation in average income (both per household and per capita) exists between the survey districts within each country (Rutter et al, 2000a&b) However, as indicated by overall average household and per capita incomes in Table 2 Malawi is substantially the poorer of the two countries. This is borne out by the per capita income distributions in Figure 6 which shows over 60% of Malawian respondents earn less than \$25 per annum, compared with a corresponding figure of 33% for Ghana. However, relative poverty levels within each country, as established by the method of the Ghana Statistical Service, are similar (Tables 3 and 4). On the basis of household income, just over half the households fall below the poverty threshold and

¹ From October 1997 to April 1998 the Ghanaian currency exchange rate was between 2,216 and 2,289 cedis per US\$. In November/ December 1998 the Malawian currency exchange rate was approximately 43.20 MK per US\$.

roughly a third fall below the hardcore poverty level (Table 3). In terms of income per capita, 60% and 36-38% of individuals fall below the poverty and hardcore poverty thresholds respectively.

Income is shown in relation to main household income source in Table 2. In both countries farming, either for subsistence or the production of cash crops, is the main source of household income in the vast majority of cases. In the Ghanaian survey the main income source for many households was recorded as "food farming", i.e. cultivation of crops such as yams, maize or plantain for subsistence or commercial sale or both. No distinction is made between subsistence or commercial farming. In the south of Ghana many of the households grew Cocoa for commercial sale. In Malawi the majority of farming households grew subsistence crops. In both countries the income from formal employment, which is represented by a very small proportion of households, is (on average) substantially greater than that from farming.

Table 2: Household income and per capita income in relation to income source

	Main income source	No. of respondents	Average household income (US\$)	Average income per capita (US\$)
Ghana	Farming	381	764	87
	Small enterprises/ Trading	9	311	42
	Formal employment	5	1,851	110
	Livestock farming	4	203	34
	Fishing	1	3,791	172
	Other	11	501	68
	All	411	767	86
	Malawi	Farming	186	148	26
Small enterprises/ Trading		25	268	50
Formal employment		17	312	74
Beer brewing		16	155	44
Casual labour		15	44	9
Fishing		9	231	100
Remittances		4	86	17
Forestry		3	469	53
Handcrafts		3	74	13
Other		10	93	21
All		288	169	34

The majority of households (80 - 87%) encountered in the surveys of both countries were male-headed (Table 3). There is a tendency for female-headed households to be poorer than male-headed households. In Ghana 74% of female-headed households fall below the poverty threshold compared with 52% of male-headed ones on a household income basis. Correspondingly, for Malawi these figures are 59% and 50%. This distinction is seen to a far less marked extent in the per capita calculations shown in Table 4.

Table 3: Household income in relation to gender of head of household

		Average household income (US\$ per annum)	Number of respondents	% below poverty threshold	% below hardcore poverty threshold
Ghana	Female	534	34	74%	38%
	Male	793	227	52%	32%
	Total	759	261	55%	33%
Malawi	Female	164	49	59%	29%
	Male	170	199	50%	32%
	Total	169	248	52%	31%

Table 4: Per capita income in relation to gender of head of household

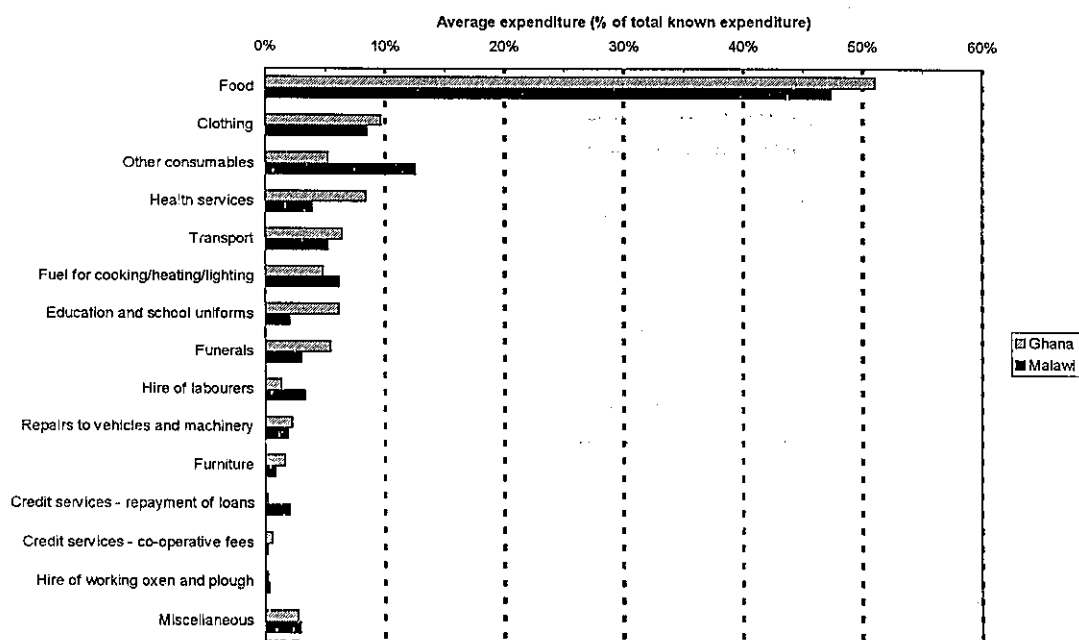
		Average per capita income (US\$)	No. of respondents	% below poverty level	% below hardcore poverty level
Ghana	Female	66	34	62%	41%
	Male	89	225	60%	36%
	Total	86	259	60%	36%
Malawi	Female	45	43	63%	33%
	Male	31	168	60%	39%
	Total	34	211	60%	38%

4.2.2 Household expenditure

The inaccuracies inherent in the collection of household income data have been described earlier at the beginning of Section 4.2.1. A more accurate indicator of prosperity may be household expenditure derived from an item-by-item breakdown. Interviewees were asked how much per day, per week, per month or per year they spend on fourteen items of expenditure.

The overall average expenditure on each of these, as a percentage of total expenditure, is shown in Figure 7 for Ghana and Malawi. The overall expenditure pattern differs between the two study countries, but in both cases clearly the main item is food with well over 45% of the household's income spent on this. A smaller proportion is spent on such things as clothing, health services, transport, education, funerals in Malawi than in Ghana. Expenditure on transport in Ghana is 6.5% of the total, compared with 5.3% in Malawi. The average Ghanaian household spends proportionately less on hire of labour, repayment of loans and fuel for cooking, heating and lighting. A possible explanation for the latter may be the difference in climate between Ghana and Malawi. Both are located in the tropics, but most of the survey areas in Malawi are at a higher altitude, and therefore cooler than those in Ghana. Fuel for heating will therefore be a concern in these parts of Malawi, but not in Ghana.

Figure 7: Breakdown of household expenditure by item



4.2.3 Other indicators of household prosperity level

Other attempts to find an indicator of household prosperity included an assessment of the type of construction of the household residence and bicycle ownership. In Southern Ghana a family would typically live in a single hut with, perhaps, a courtyard where all the domestic tasks, such as food preparation etc. were carried out. Here, it was a fairly simple matter to note the type of wall or roof construction or whether or not the doors and windows had frames. A typical household residence in the north, however, consists of a circular arrangement of several dwelling huts, outhouses and grain silos joined by a wall at the circumference. These buildings show a mixture of construction characteristics. For example, many of these buildings might have thatched or mud roofs while one or two others might have an aluminium roof.

From the present study bicycle ownership cannot be used as an indicator of rural household prosperity in Ghana when making comparisons on a national scale. While household bicycle ownership was found to be comparatively rare in the south most households visited in the north had several bicycles each and this is in no way reflected by income levels.

From the survey in Malawi it was found that most households own radios, bicycles and other assorted household items. Findings on the dwelling units of all surveyed households show that 26% were built of burnt bricks while the rest were either of mud bricks, wattle and daub or mud. Eighty five percent of dwelling units were grass thatched, 14% had iron sheets and only about 1% had sisal with cement roofs. The poverty situation is such that households are unable to afford the purchase of metal sheets.

4.2.4 Travel patterns

Householders were asked about their out-of-village trip making activities with respect to twelve major purposes and these are ranked in order of importance, as indicated by the number of trips per household per year in Figure 8. A very small percentage of trips are for miscellaneous purposes such as attendance at meetings and communal labour. A difference in household tripmaking priorities is seen between Ghana and Malawi. However, in both countries the biggest reason for travelling is for buying and selling at the markets. On average each Ghanaian household makes about 95 market trips per year compared with only 65 in Malawi.

Figure 8 shows the modes of transport involved. The majority of trips are made by non-motorised means, chiefly walking or cycling. Mixed motorised/non-motorised trips are undertaken in situations where direct vehicular services into the villages are lacking and people have to walk part of the way to board a vehicle to their final destination. In both countries (only in the north, in Ghana) draft animal power is used for such purposes as market trips and transport of harvest. Motorised transport is used to a significant extent in Ghana, more so in the south than in the north (Rutter et al 2000a), but hardly at all in Malawi.

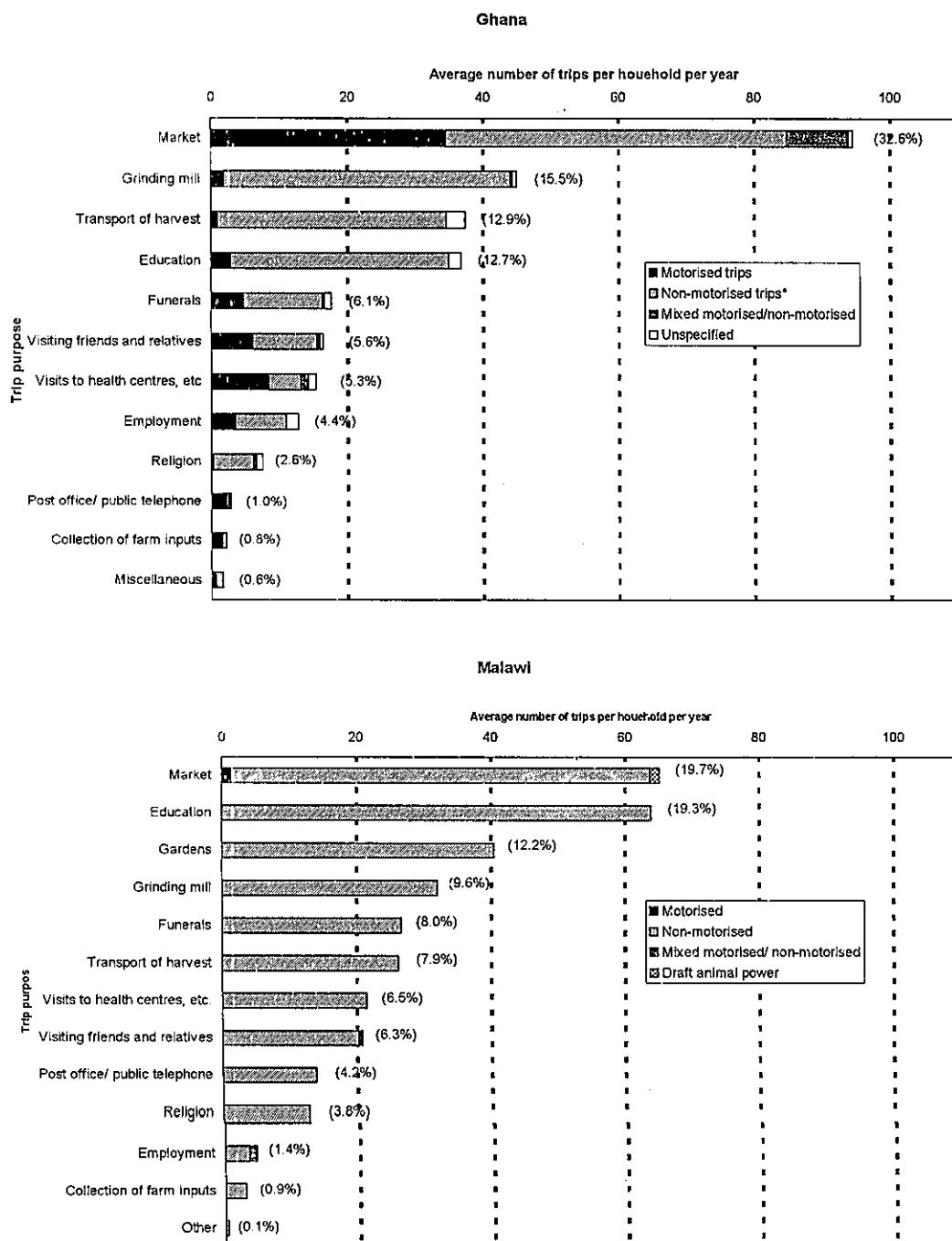
One-way trip distance and times are shown for out-of-village trips by trip purpose in Figures 9 and 10 respectively. Generally, trip distances are reflected by trip times. The ranking of trip purposes in order of time and distance are very similar for both countries. Social trips, including funerals, which feature very prominently in terms of frequency (Fig 8), are the longest in both countries. At the other extreme, trips to the grinding mill, to school, for religion and for employment, are the shortest. The major difference between Ghana and Malawi, illustrated in Figures 9 and 10, is that, trips generally for nearly all purposes are shorter in Malawi, both in terms of time and distance. Given the lack of use of motorised transport here this may reflect the shorter distances people are prepared to travel without such means. This is borne out by the indication that, in both countries, distances to grinding mills, religious centres and for the transport of harvest are essentially the same and that little or no motorised travel is involved in any of these trips.

Trip distances to health facilities, grinding mill, education, collection of farm inputs, transport of harvest, market and social visits obtained from the Malawian survey are generally comparable to those obtained from an earlier survey in this country of the districts of Dedza, Mwanza and Mzimba, conducted by the Pilot Integrated Rural Transport Project in 1996.

4.2.5 Travel patterns in relation to household income, expenditure and gender

Findings from the household interviews indicate that most or all household members undertake various trip purposes to varying degrees. Household members were categorised as men or women 18 years or more old and children less than 18 years. Distinction was made between boys and girls in the Malawian, but not in the Ghanaian,

Figure 8: Out-of-village travel patterns by trip purpose and mode



surveys. In Sub-Saharan Africa women play a prominent role in much of the household's tripmaking.

While the collection of farm inputs is male-dominated women account for a significant proportion of most other trip activities and those to the grinding mill are nearly all made by women. The latter is an important consideration from the point of view of this gender group, when it is considered that the average one-way trip distance is 7 km (Fig. 9) and the average one-way trip time is approximately one and a half hours (Fig. 10). Nearly all trips to the grinding mill, particularly in Northern Ghana (Rutter et al, 2000a) and in

Malawi (Rutter et al, 2000b), are made by non-motorised means, and for women this invariably means walking a considerable distance with a heavy load. Clearly, direct benefits in time and hence, income-generating potential would be gained by the introduction of some form of Intermediate Means of Transport (IMT) that could be used by women.

Figure 9: Average one-way trip distance (km) by trip purpose

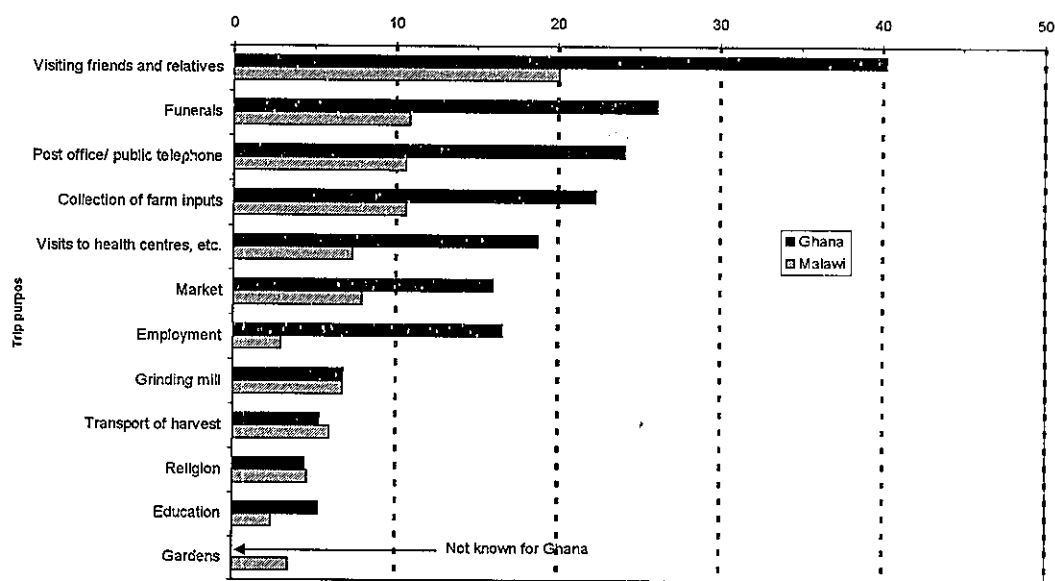
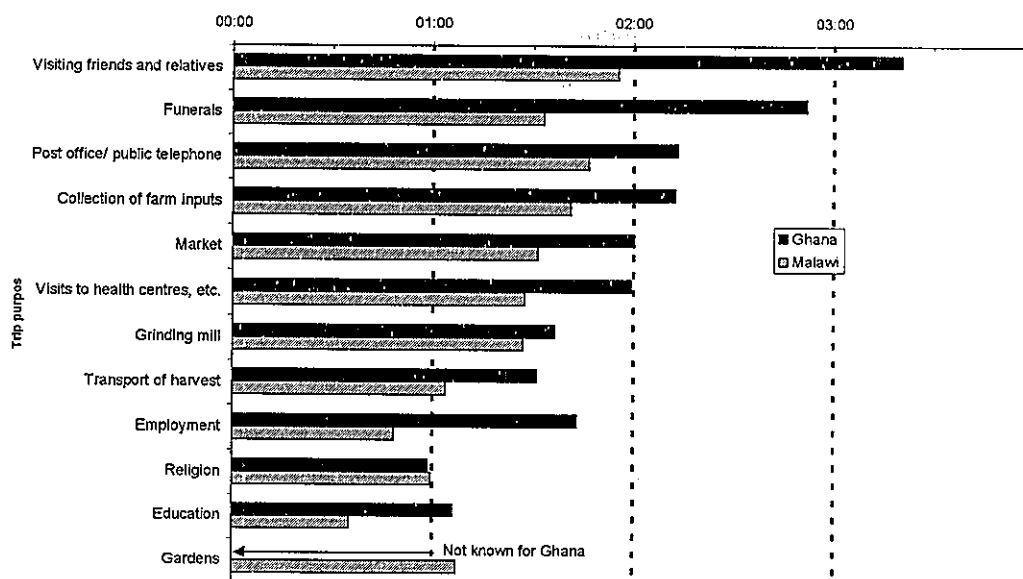


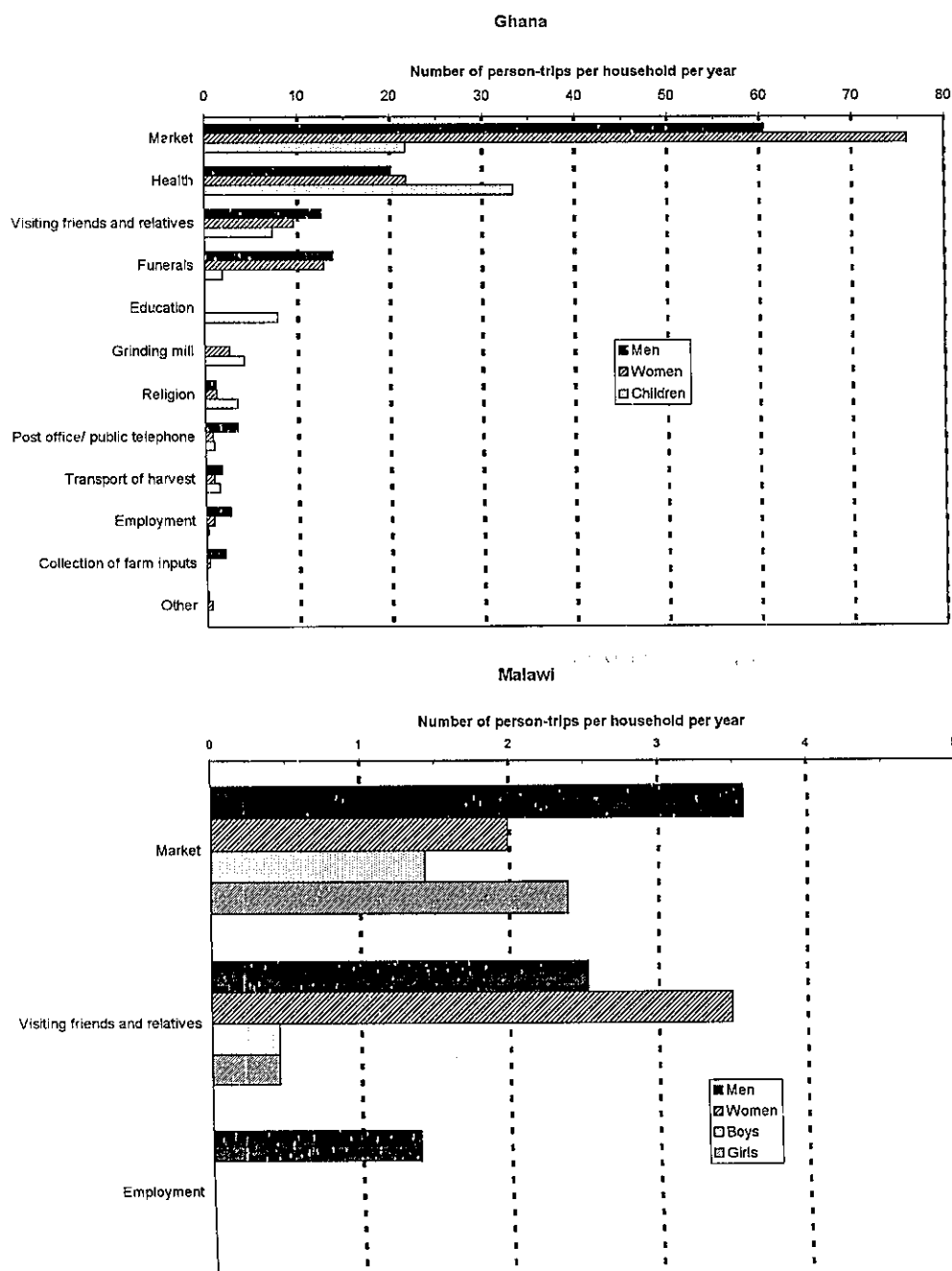
Figure 10: Average one-way trip time (hh:mm) by trip purpose



What is described in this section relates entirely to out-of-village travel patterns. It should be borne in mind that much of the travel requirements of villagers, especially for tasks such as water and firewood collection and trips connected with tending gardens and fields and harvesting, are also within the village. A substantial proportion of this burden is likely to be borne by women.

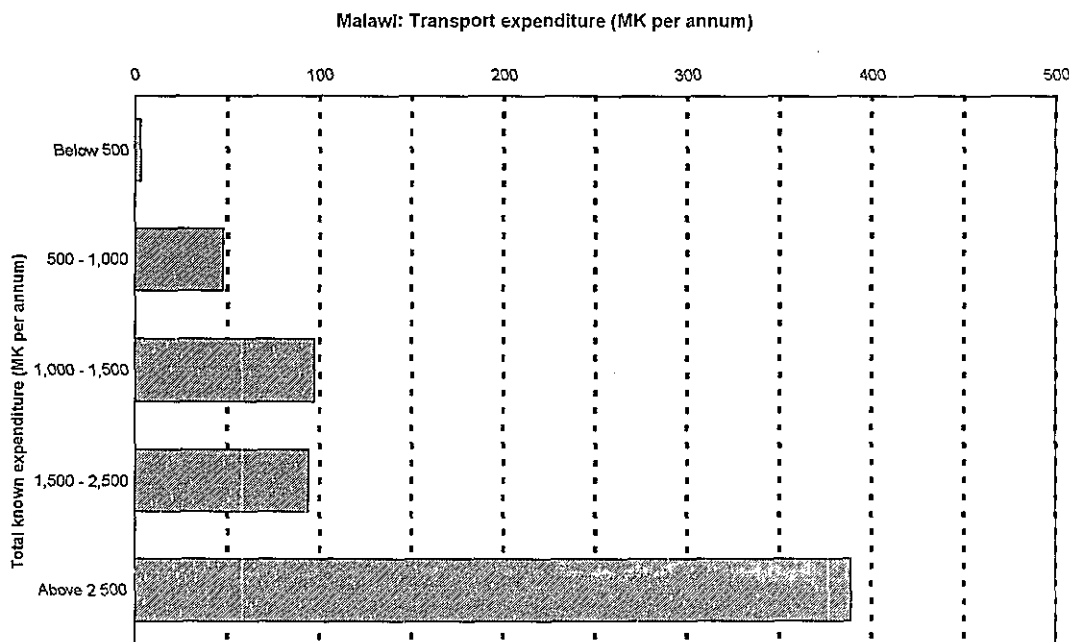
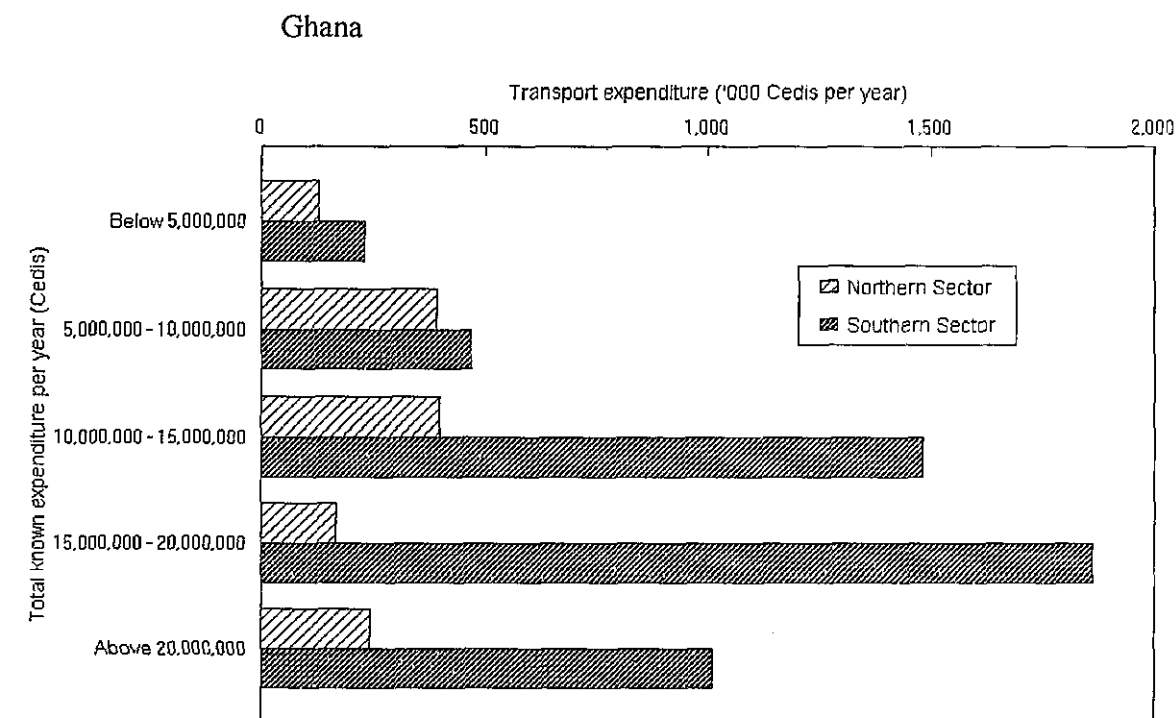
Motorised tripmaking by purpose and gender is shown in Figure 11. Whereas in Ghana some motorised travel is involved for trips of all purposes it is only used to a very limited extent in market trips, visiting friends and relatives and journeys to and from employment in Malawi. Motorised trips for employment are largely male-dominated in Ghana and entirely male-dominated in Malawi.

Figure 11: Gender split of motorised tripmaking by purpose



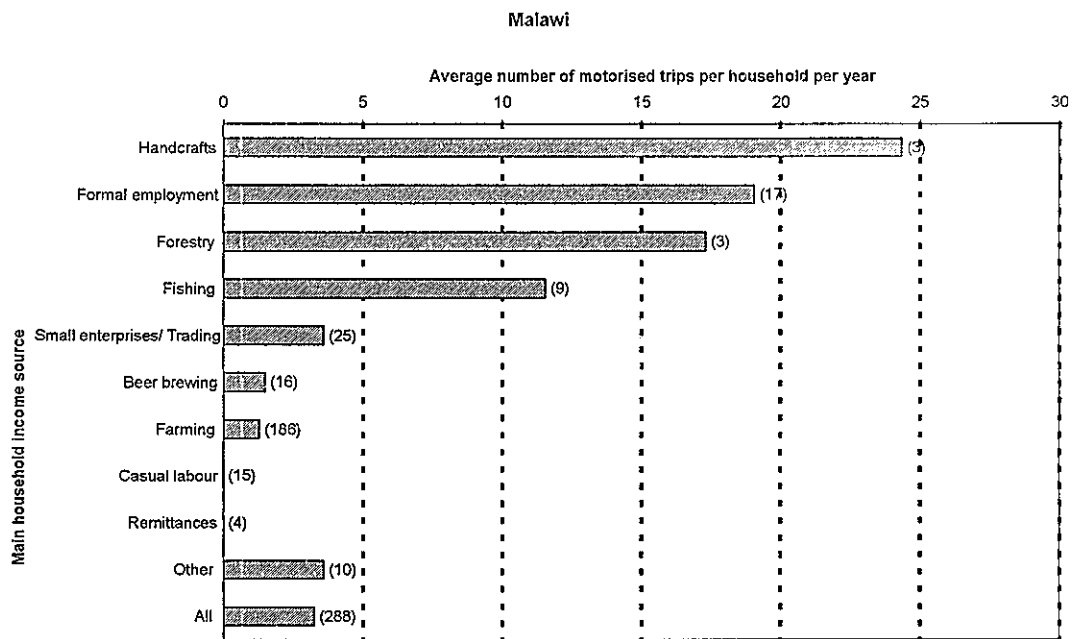
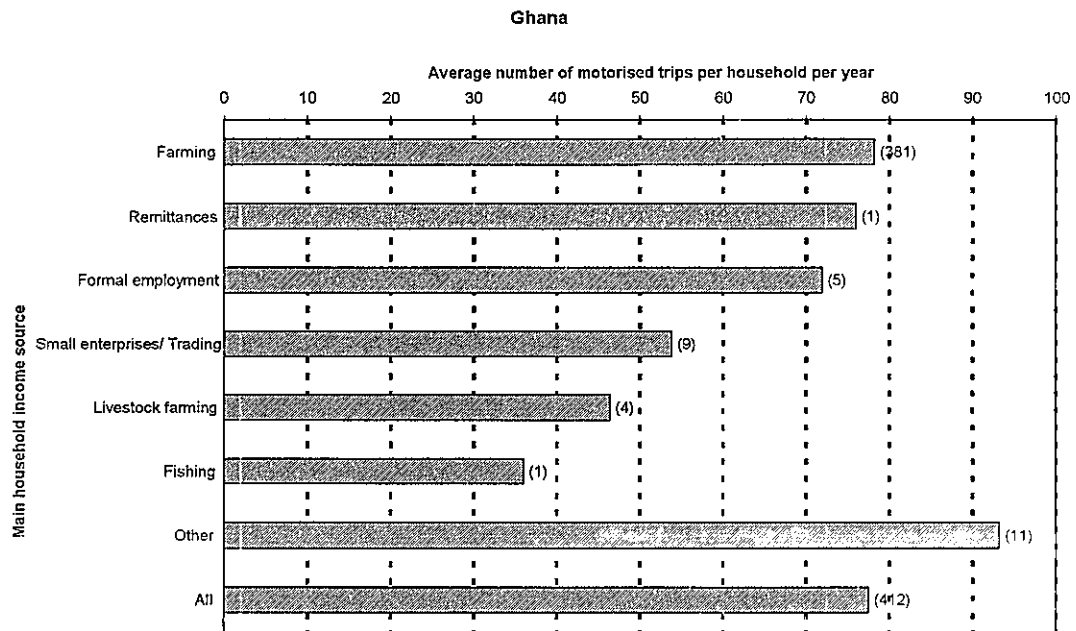
As mentioned previously accurate estimates of household income in Sub-Saharan Africa are difficult to obtain but Figure 12, which shows household expenditure on transport in relation to total known expenditure, gives an indication that use of motorised transport, at least in Southern Ghana and Malawi, is linked to affordability.

Figure 12: Household expenditure on transport in relation to total known expenditure



In both Ghana and Malawi the majority of households interviewed had farming as their main source of income. Other sources of income include formal employment, small enterprises/trading, fishing, forestry and beer brewing. Use of motorised transport is related to income source in Figure 13. Whereas in Malawi the use of motorised transport by farming households is, expectedly less than by those engaged in formal employment this is not the case in Ghana. Much of the farming activity in both countries is undertaken at subsistence level with any surpluses of crops being sold, so a less dependable income is expected from this activity. Cash crop farming takes place in both Ghana and Malawi, but in the former a great deal of cocoa is grown for export, at least, in the south, and so cash crop farming may lead to a better income in Ghana than in Malawi. In Malawi such crops as tea, rubber and macadamia nuts are grown for export but these are the concern of large commercial estates rather than individual households. While 81% of all those sampled in the whole survey were farming households, sample sizes of other income groups, for example 17 households in formal employment in Malawi and a corresponding sample of only 5 in Ghana must mean a considerable degree of inaccuracy in the data for these.

Figure 13: Motorised trips in relation to income source



Figures in brackets indicate sample size

4.2.6 Elasticities of demand in relation to passenger fares and income

Information on the elasticities of demand for travel, in terms of the relationship between the number of motorised trips per year per household and income, passenger fare and goods charges are important in determining policy measures for restructuring transport charges with a view to increasing mobility and accessibility and are a major objective of this study.

When scatterplots are made of motorised trips versus income or passenger fares only very weak relationships were found. The expected decrease in tripmaking with fare is best illustrated by Figure 14, which was derived from data for tripmaking by bus in Malawi. These relationships, based on log-log regression analysis, are defined in Table 5 where:

T = number of motorised trips per household per year
 F = one way passenger fare
 I = annual household income

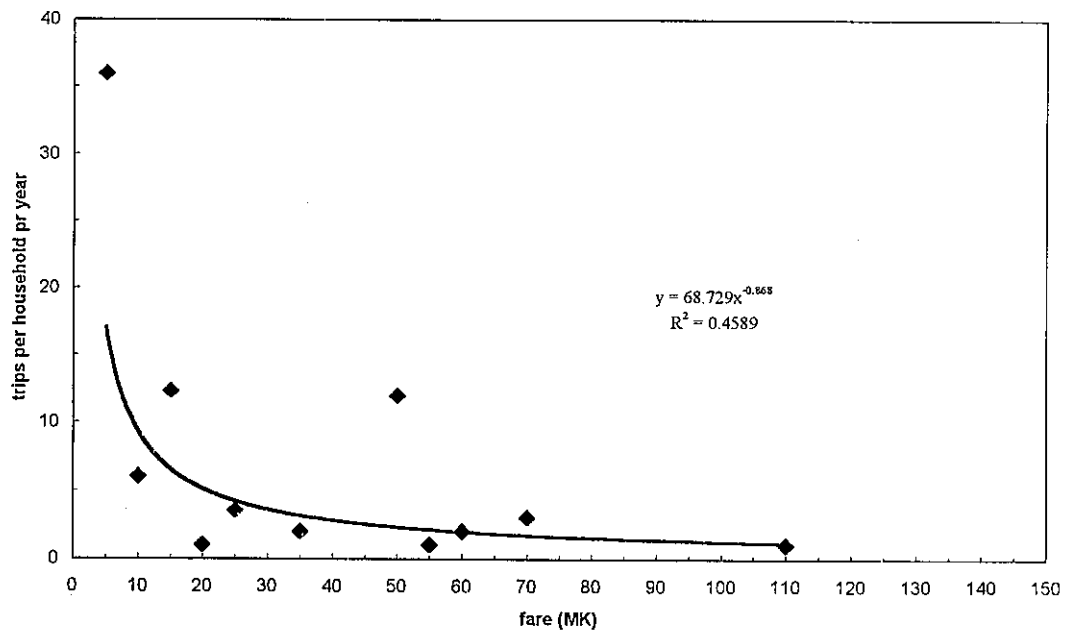
Elasticities are also presented in Table 5 in terms of the *percentage increase in tripmaking resulting from a 1% decrease in fare or a 1% increase in income.*

Table 5: Relationships between extent of motorised tripmaking and passenger fares and household income in Ghana and Malawi and Kenya

Country	Relationship	R ²	Elasticity (%)
Tripmaking vs. income			
Ghana (trips to market)	$T = 39.816 \times I^{0.0356}$	0.0032	0.035
Malawi	$T = 12.442 \times I^{-0.032}$	0.0004	-
Kenya ^a			0.3
Tripmaking vs. fares			
Ghana (trips to market)	$T = 187.33 \times F^{-0.1584}$	0.0239	0.159
Malawi	$T = 13.18 \times F^{-0.1017}$	0.0061	0.102
Malawi (bus only)	$T = 68.729 \times F^{-0.868}$	0.4589	0.876
Kenya ^a			0.6

^a Source: Airey & Cundill (1998)

Figure 14: Relationship between passenger fare and tripmaking by bus in Malawi



4.3 VEHICLE OPERATOR SURVEYS

4.3.1 Vehicle ownership, type and condition

Figure 15 shows national vehicle ownership statistics in Ghana and Malawi. The majority of vehicles were owned by businessmen and farmers which is to be expected when it is considered that the surveys were conducted in a predominantly agrarian setting. In Ghana, at least, the majority of vehicle owners were in the transport business only part-time to supplement income generation from their more established occupations. Those who were exclusively transport operators were in the minority (10% and 2% in Ghana and Malawi respectively).

Vehicle types predominantly encountered included minibuses, lorries, trucks, taxis, buses and pickups (Figure 16). Plates 1 and 2 are included to show the distinction between lorries and the larger, articulated trucks as defined in this study. Within Ghana, minibuses and taxis were more prevalent in the coastal and forest regions open-top trucks and pickups were more widely used in the Afram Plains District and the Northern, Upper East and Upper West Regions, a variation which is dictated by the types of demand for transport services and operating conditions (Rutter et al, 2000a). In Malawi the use of pickup trucks seemed to predominate, accounting for 68% of the total vehicles used by those interviewed in the survey. These are versatile, having a high carrying capacity for goods, but also being used extensively for passenger and goods transport and can be driven on a wide variety of roads and tracks. Indeed, the majority of vehicles were used for both passenger and goods transport. Minibuses and buses accounted for only 7% and 2% respectively of the total vehicles encountered in the Malawian survey. These vehicles operate exclusively in urban areas and on inter-urban routes (RTTP, 1999)

Figure 17 shows the vehicle makes encountered in Ghana and Malawi. In Ghana the makes of a substantial number of vehicles (22%) was unrecorded. These included the traditionally constructed or modified mammy wagons (the equivalent of which is not known in Malawi). Listed in order of predominance the five most popular vehicle makes in Ghana are Benz (19%), Datsun (14%), Bedford (8%), Nissan (8%) and Toyota (7%). In Malawi, however, the latter was the most predominant, accounting for 48% of the vehicles encountered.

Most vehicles had been bought second hand, having undergone a great deal of modification, and were in highly evident need of maintenance and refurbishment.

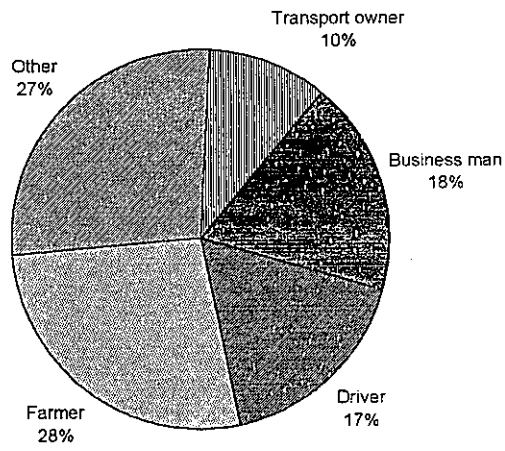
4.3.2 Vehicle use

Vehicle use in both Ghana and Malawi is shown in Figure 18. In Ghana just over half of the vehicles encountered were used for carrying passengers only. Sixteen percent were for carrying both passengers and goods and 19% carried farm produce only.

A contrasting situation was found in Malawi where only 14% and 5% of the vehicles were, respectively, for carrying exclusively passengers or farm produce.

Figure 15: Vehicle ownership

Ghana



Malawi

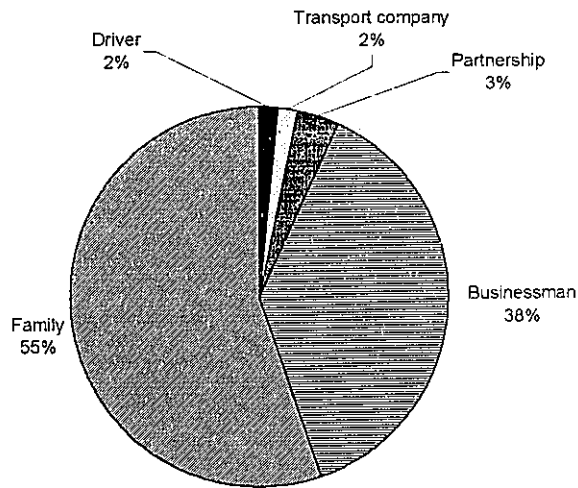
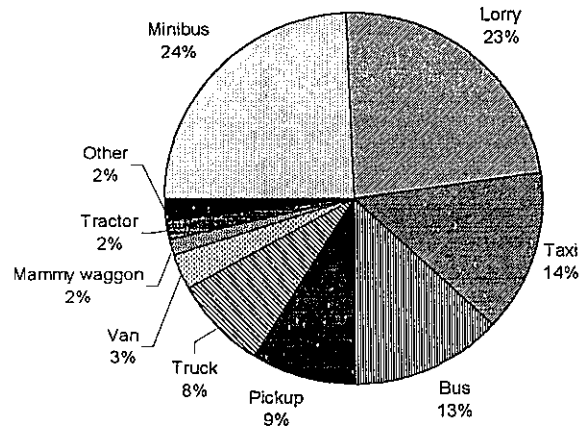
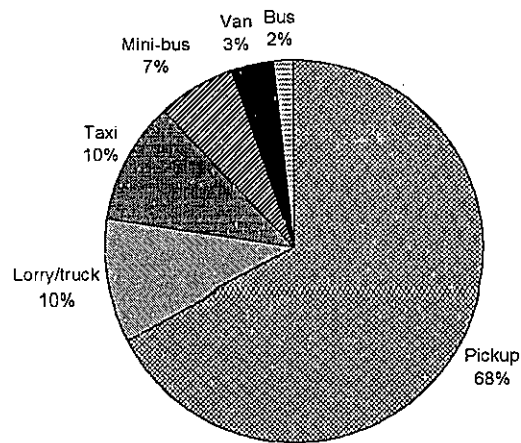


Figure 16: Vehicle types

Ghana



Malawi



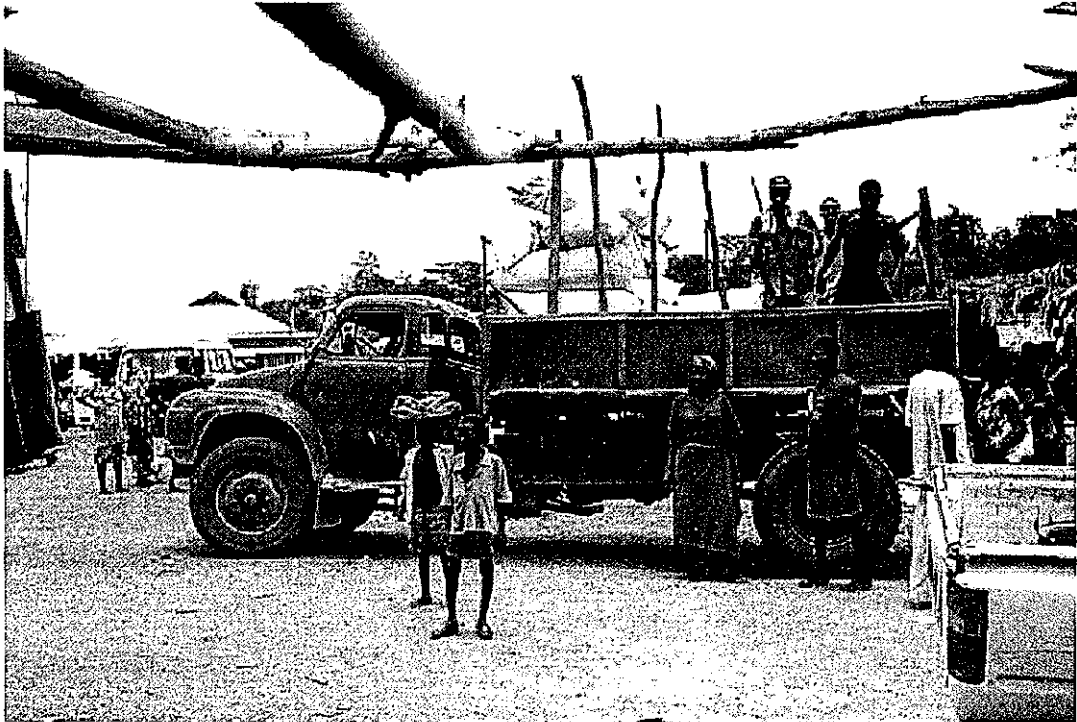


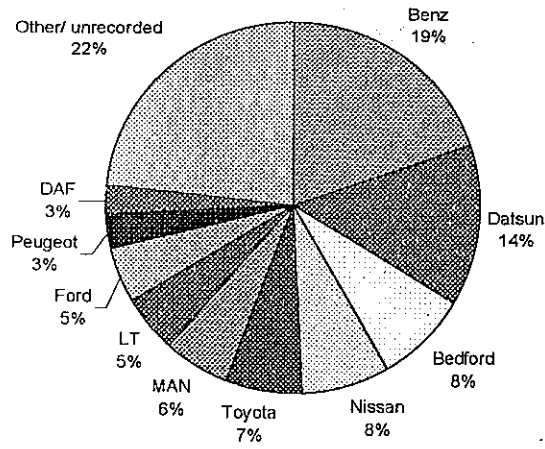
Plate 1: Lorry at a village market in Central Region, Southern Ghana



Plate 2: Truck at Yendi lorry park, Northern Region, Ghana

Figure 17: Vehicle makes

Ghana



Malawi

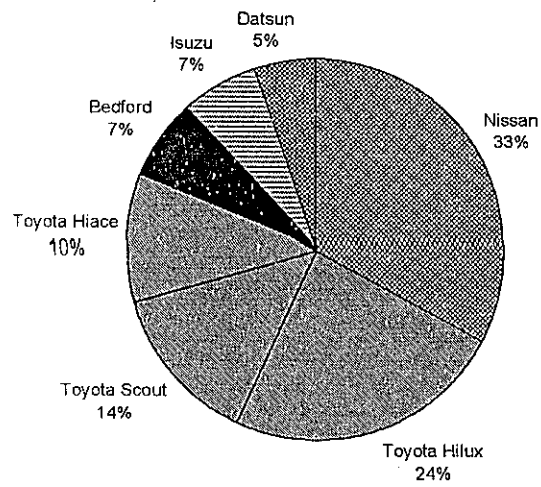
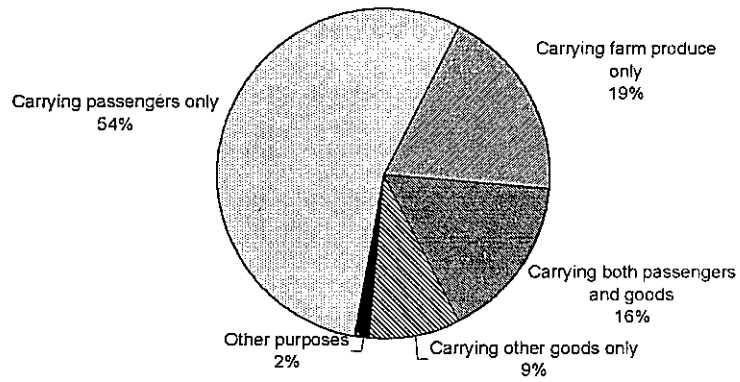
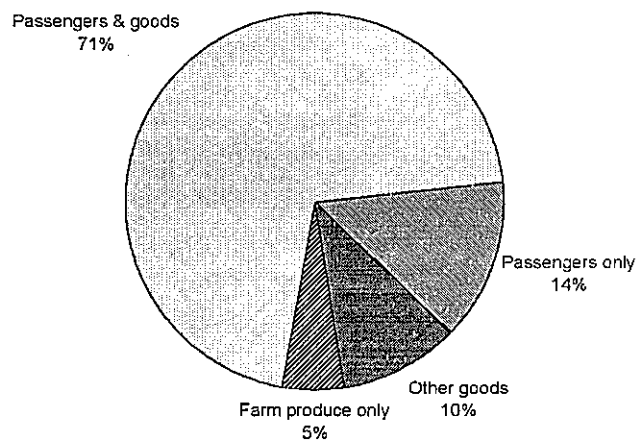


Figure 18: Vehicle uses

Ghana



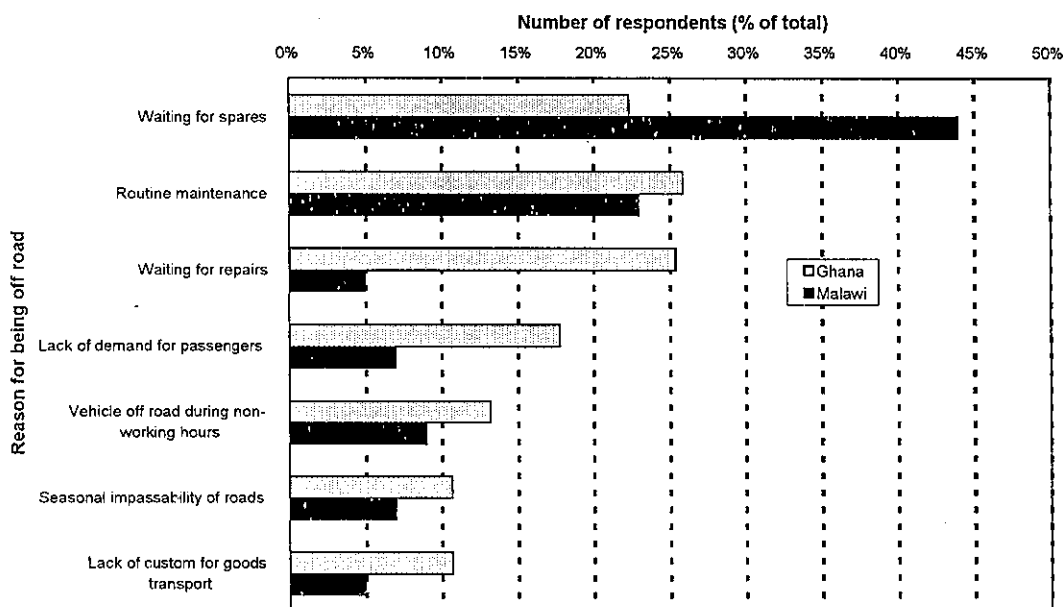
Malawi



4.3.3 Why, and how often, are vehicles off the road?

In most districts of Ghana vehicles were off the road at least twice a week. The reasons given included the vehicle undergoing routine maintenance or repairs, or lack of demand for transport services (Fig. 19). Occasionally, it was reported that a vehicle could also be taken off the road simply to give it a break or to enable the driver take a rest.

Figure 19: Reasons for vehicle being off road



Availability of spares or repair garages in the vicinity of the district were identified as key determinants of the duration of maintenance or repairs carried out on a vehicle. Incidentally, 85% of all drivers interviewed in the seven districts admitted to knowing about the existence of and regularly making use of the services of the Kumasi Magazine for such operations. Naturally, therefore the close proximity of Ejura-Sekyedumasi to Kumasi means that the district had better and easier access to the services, hence the shorter durations for vehicle unavailability in this district.

In Malawi vehicles spent, on average, 57 days of the year, i.e. 16% of the time, off road. Waiting for spares was given as the main reason for downtime and may be, in the absence of any facility on the scale of the Kumasi Magazine, a more acute problem than in Ghana. Well over 40% of respondents gave this as a reason compared to 22% in Ghana (Fig. 19), this was followed by routine maintenance. Only 7% of respondents claimed that seasonal impassability was a major reason for their vehicle being off road.

4.3.4 Seasonal constraints on vehicle operations

Generally all vehicles covered by the survey in the seven districts sampled in Ghana, operate several routes switching from one to another, depending on the availability of demand and the condition of the roads. Such an operational strategy ensures maximum utilisation of the vehicle and income to the operator.

Thus, during the dry season, when even the worst roads are in some motorable condition, drivers could be operating as many as six different routes. Out of these, 1 or 2 routes would be the most preferred and relatively all-weather roads to which the drivers would confine their operations when the others become unattractive either due to lack of demand or impassability following the rains.

The highest incidence of vehicles getting bogged down on the roads (8 times a month) was recorded in the Wasa-Amenfi and Ejura-Sekyedumasi districts. This is explained by the generally poor infrastructure in these districts coupled with prolonged rainy seasons and high annual average rainfall.

In the other districts of Ghana, the majority of drivers interviewed also said their vehicles often get stuck on the roads, rendered impassable by the rains and they also had problems moving up slippery slopes. The overall result was that average journey times increased by at least 40 per cent and few trips were made during the rainy season.

It has been mentioned above that only 7% of respondents from the Malawian survey claimed that seasonal impassability contributed to vehicle off-road time. Nevertheless, most interviewees reported mobility problems as a result of the rainy season; over 70% said their vehicles got bogged down and as many said this prevented trips and that they had difficulty getting up slippery slopes.

The survey teams in both countries occasionally experienced at first hand the problem of impassability of rural roads, even in four-wheel drive vehicles.

4.3.5 Fuel costs

Fuel costs were seen to vary between the northern and southern sectors of Ghana and between districts within the southern sector generally reflecting the differences in prosperity prevailing throughout the country. Overall, diesel was 3.8% cheaper than petrol and this has implications for vehicle running costs depending on vehicle type and make. Considerable differences were found in the proportions of vehicles of different type and make with respect to use of petrol or diesel. However overall fuel economy of a vehicle will be influenced also by efficiency of consumption and this remains a subject for investigation in the future.

With the exception of the cost of diesel in Chitipa, fuel costs were the same throughout Malawi, the cost of petrol being 51US cents/l and that of diesel 45 US cents/l in Chikwawa, Salima and Zomba. No one operating a diesel-powered vehicle was interviewed in Mchinji or Nkhata Bay. The three interviewees in Chitipa who had diesel-powered vehicles quoted prices of 69, 58 and 93 US cents/l. Much of this district is very mountainous with the centre being accessible only by very poor roads and this may be reflected in the variation in the price of diesel.

What is immediately apparent from Figures 20 and 21 is that fuel is substantially more expensive in Malawi than in Ghana.

Figure 20: Cost of petrol (US\$ per litre)

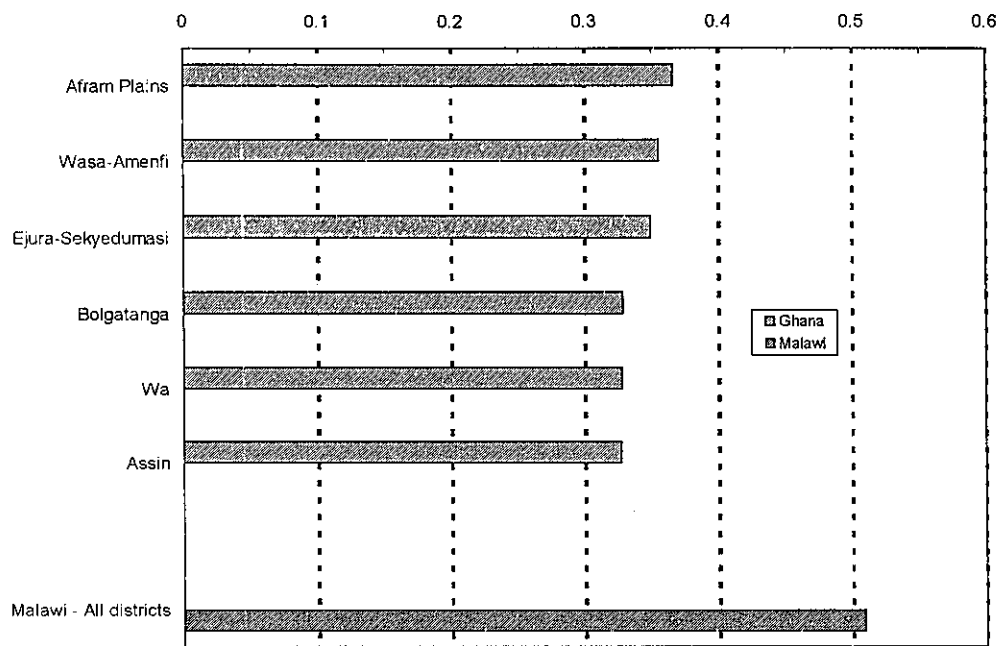
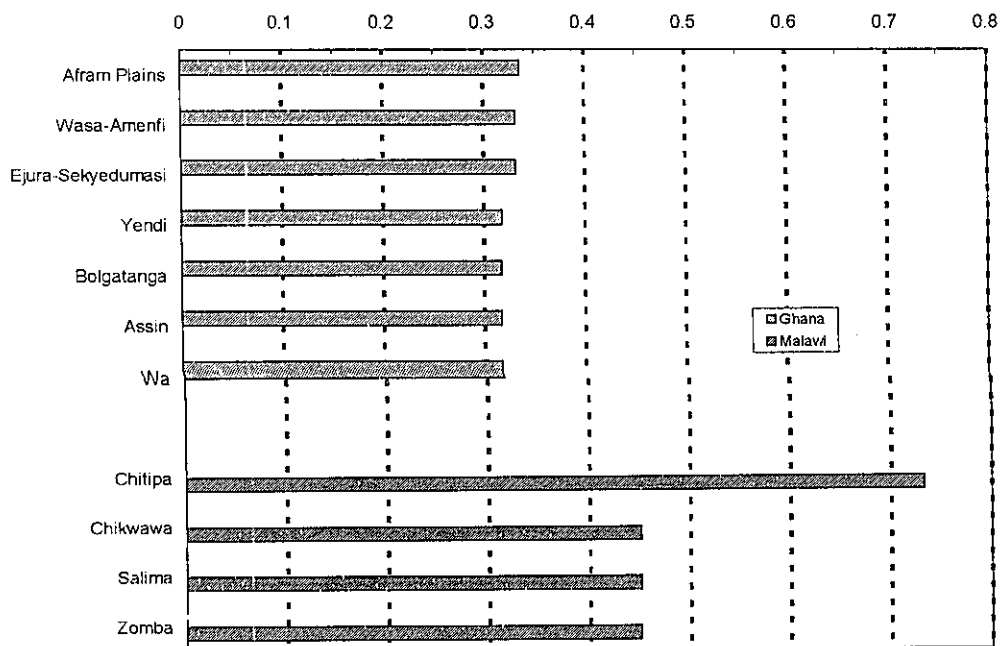


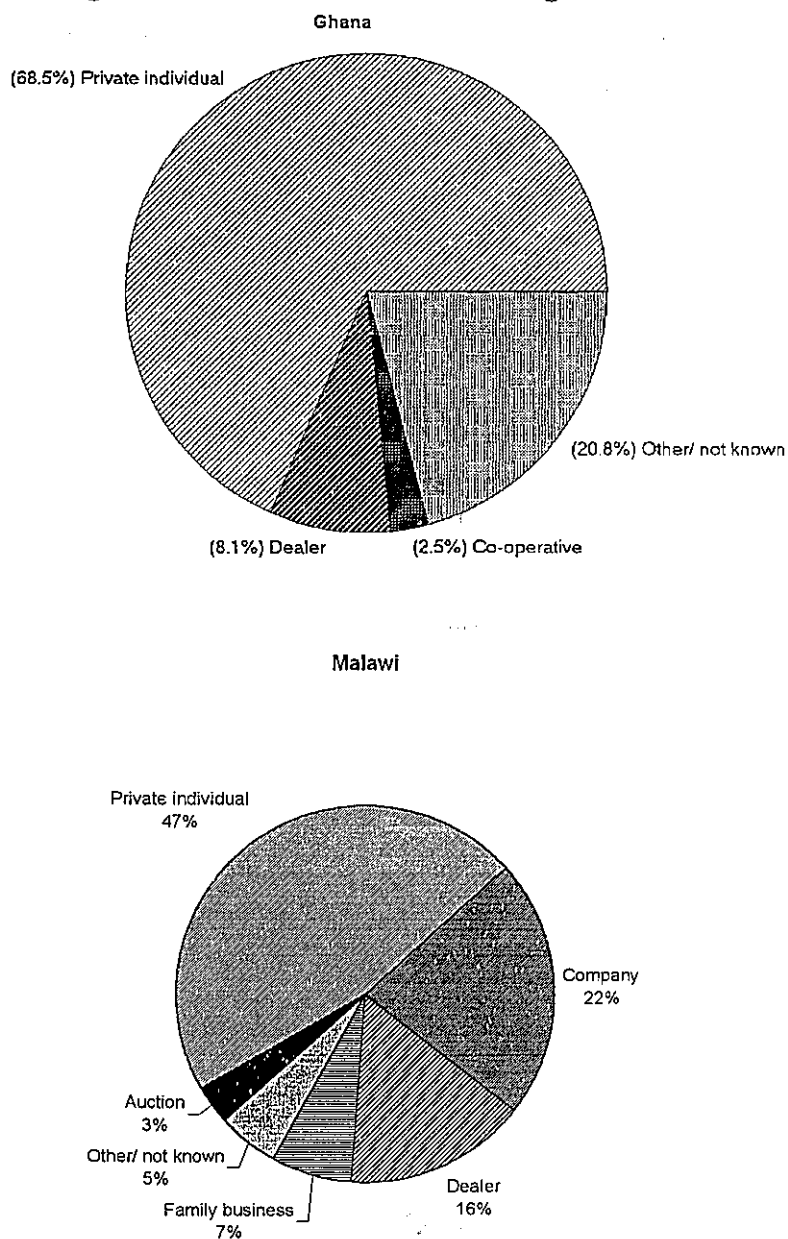
Figure 21: Cost of diesel (US\$ per litre)



4.3.6 Payment for vehicles

Vehicles are bought from such sources as private individuals, co-operatives, companies, dealers and family businesses (Fig. 22). In Malawi, a small percentage are bought at auctions. By far, the predominant means of obtaining a vehicle is from a private individual (68% in Ghana and 47% in Malawi).

Figure 22: Who was the vehicle bought from?



In both countries at least 80% of respondents had paid for their vehicles (Table 6) and over 60% had paid by cash (Table 7). Well under 10% were known to have paid by loan. This may indicate that most operators already have the ready cash to make major purchases, or it may simply reflect a lack of available credit facilities and this remains an area for further investigation.

Table 6: Has the vehicle been paid for yet (percentage of respondents)?

	Ghana	Malawi
Yes	80%	86%
No	4%	5%
Not known	16%	9%

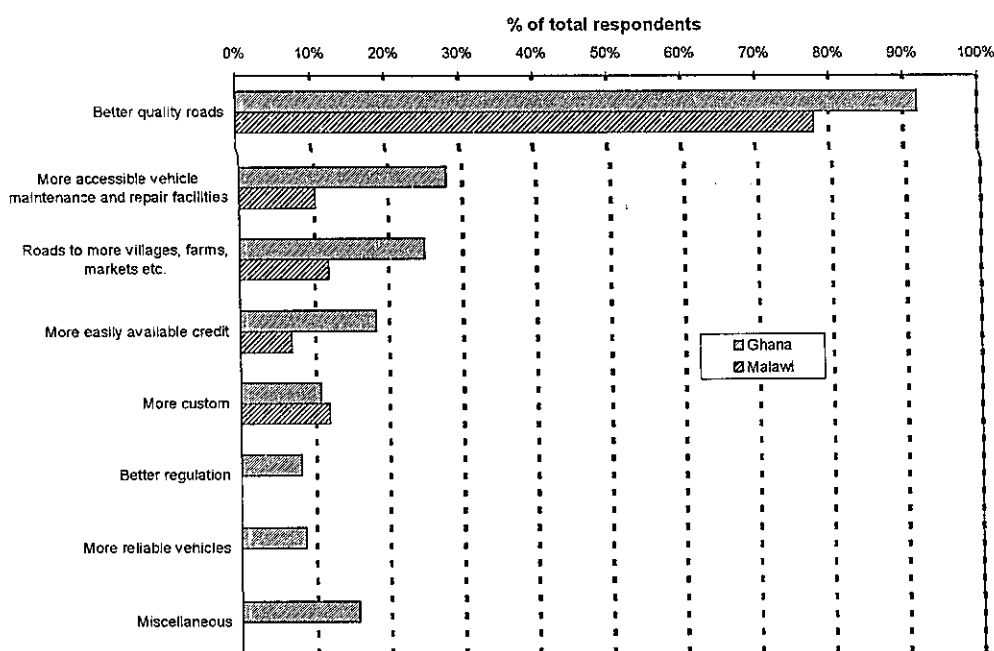
Table 7: How vehicles are paid for

	Ghana	Malawi
By cash	61.9	93.1
With loan	2.6	6.9
Not recorded	35.5	-

4.3.7 Vehicle operators' opinions on what would improve their businesses

Interviews with vehicle operators were rounded off with a summing-up question - What things would improve their business. Figure 23 illustrates the major findings for both countries. Dissatisfaction with the availability of maintenance and repair facilities, the extent of the road infrastructure, availability of credit facilities, the extent of regulation and the reliability of vehicles seemed to be more widely expressed in Ghana than in Malawi. This may simply mean, however, that, in Ghana, vehicle operators are more aware of the potential for improvement than in Malawi. What is clear is that by far the biggest issue of dissatisfaction is the quality of roads as indicated by over 78% of respondents in both countries. Indeed, the Malawian bus operator Stagecoach, based in Blantyre, claims the reason it does not operate in rural areas is the poor quality of the roads and that bus operating costs are 65% higher on secondary, district and village roads than on main roads (RTTP, 1999).

Figure 23: Vehicle operators' views on what would improve their businesses



4.4 SUPPLY AND DEMAND RELATIONSHIPS

4.4.1 Passenger fares

In both Ghana and Malawi considerable variability in passenger fare rates was observed from one district to another.

The differences are probably explained by the influence of local factors, such as general accessibility of the area, the condition of the roads, and also the type and size of the vehicle fleet that operate in the district. In the remoter, more sparsely populated and less accessible areas the cost of running a passenger (or goods) transport service is expected to be substantially greater than in a peri-urban district in close proximity to a major city. This is borne out by the passenger fare rates reported by Rutter et al (2000a) in different regions of Ghana (see Table 8)

Table 8: Passenger fares (cedis) per km^a with distance in Ghana

District	10km	50km	100km	200km
Afram Plains	79.2	51.3	42.0	34.7
Assin	75.0	40.0	30.7	23.3
Yendi	135.0	49.0	32.0	20.7
Wasa-Amenfi	85.8	39.0	28.0	19.7
Wa	98.3	36.0	23.3	15.3
Ejura-Sekyedumasi	62.5	28.7	20.7	14.7
Bolgatanga	79.2	31.3	21.3	14.0
Kwabre	29.2	13.0	9.0	6.3

^a Figures are derived from regression analysis

The type of vehicle too, is a major determinant of fares charged. Due to the convenience and speed they offer, taxis in Ghana are about 1.5 times more expensive than buses and mini-buses, which in turn, are also slightly more expensive than lorries and trucks.

Generally, it can be seen from Figure 8 that very little motorised passenger travel is undertaken throughout Malawi. From non-linear regression analysis a relationship between passenger fare and distance can be calculated for five of the six survey districts (Table 9). Again, considerable variation exists between each of the six districts visited.

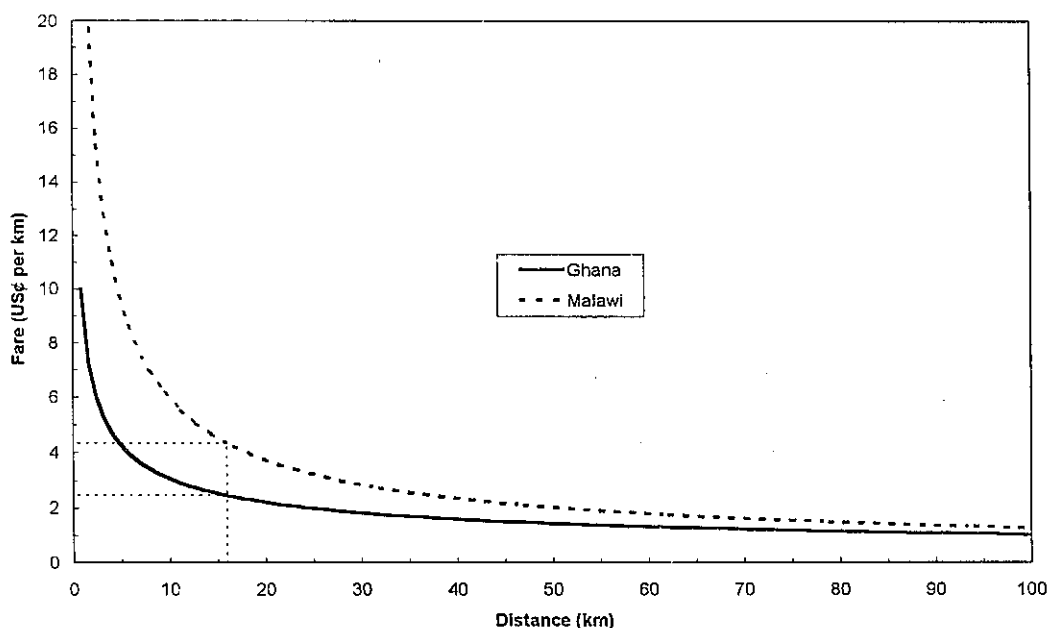
Table 9: Passenger fares (MK) per km^a with distance in Malawi

District	10km	50km	100km	200km
Chikwawa	2.23	1.24	0.96	0.75
Chitipa	1.44	1.04	0.90	0.78
Mchinji	2.87	0.91	0.56	0.34
Nkhata Bay	1.23	1.16	1.13	1.10
Salima	2.54	0.26	0.10	0.04
Zomba	-	-	-	-
All districts	2.49	0.85	0.54	0.34

^a Figures are derived from regression analysis

The cost of passenger travel is compared between Ghana and Malawi in Figure 24. Power trend lines² show that for long distance trips in the order of 100km or more the one way passenger fares in both countries appear to be just over 1 US cent per km. However, much shorter trips are more expensive in Malawi than in Ghana. From Figure 24 it can be seen that, at 16km, the average out-of-village trip distance made by household members, the fare per km in Malawi is well over 50% more than for Ghana. With the lower income levels in Malawi (See Fig. 6) it is clear that motorised travel is less affordable than in Ghana. However, this factor alone cannot account for its lack of use. In addition to being less affordable, motorised public transport must also be less *available* than in Ghana.

Figure 24: Relationship between passenger fare per km and distance – Comparison between Ghana and Malawi



If lack of affordability contributes towards the lack of demand for transport services in Malawi, supply is adversely affected by five main problems (RTTP, 1999):

- 1) Poor quality infrastructure
- 2) Lack of affordability and accessibility
- 3) Inefficient rural transport services
- 4) Poor diversity of vehicle types, and
- 5) Lack of service and maintenance of vehicles in rural areas

4.4.2 Goods transport charges

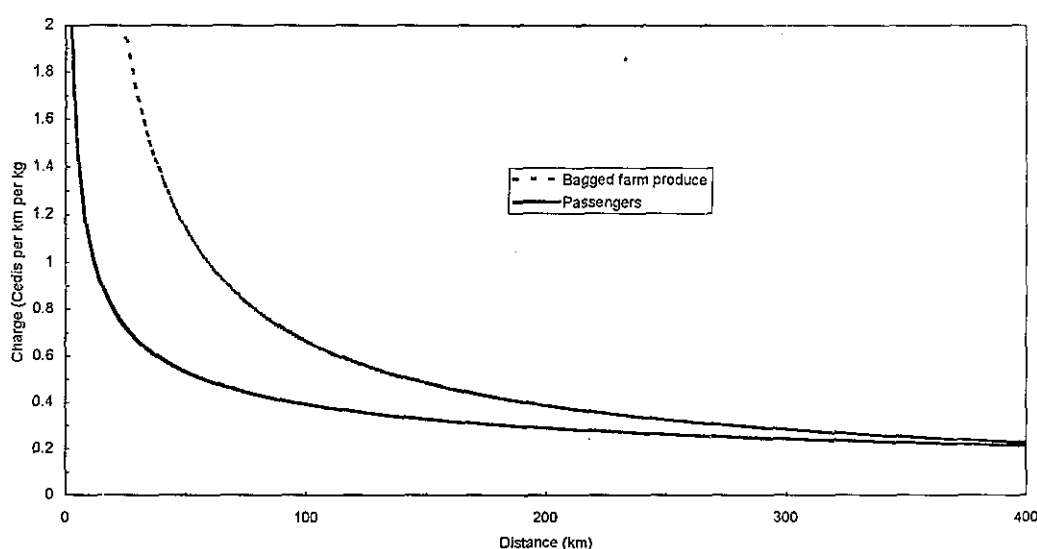
In Ghana the charges for transporting goods in specified standard units were also predetermined by the local transport union although in this case, the vehicle operator still retains and exercises considerable discretion. Thus, goods charges varied widely not only between different districts but even within some districts. Standard units of measure used for grains was a 50kg bag, and in the case of yam, 100 tubers. To a large

² Regression lines in the form $y = ax^b$

extent differences in transportation charges for bagged farm produce between districts reflect those for passenger fares, at least for the longer journeys.

It is interesting to compare overall goods transportation charges with passenger fares on a weight basis. Figure 25 shows such a comparison, from the Ghanaian data, for bagged farm produce, and passengers, assuming the average weight per person to be 70kg. On this basis transport of farm produce is more expensive than passenger transport, particularly for the shorter journeys of less than 100km. However, as distance increases, it appears that both passenger and goods charges tend towards a common asymptotal value of around 0.2 cedis per km per kg. It is likely that, with increasing distance, more of the goods transported will be as bulk loads to destinations outside the district rather than small loads accompanying passengers travelling from their village to the nearest market and that charges for the latter, per kilogram, must be expected to be greater than those for bulk loads.

Figure 25: Comparison of Ghanaian farm produce transport charges and passenger fares on a per unit weight basis



Information on goods charges was not available from the survey in Malawi; hardly any the respondents in the household made use of motorised transport services for goods transport.

4.4.3 Waiting times and accessibility to social amenities

A major objective of the present study is to investigate the relationship between the density of demand for motorised transport services and the availability of these. Taking district population density as a measure of density of demand clear trends can be seen from the data from both countries data when passenger waiting times for vehicles (Figs. 26 and 27) and frequency of vehicles serving the villages (Fig. 28) are plotted against this. In districts such as the Afram Plains (Ghana), Yendi (Ghana) and Chitipa (Malawi) where the average population is below 30 persons per square km villages are, on average

Figure 26: Relationship between waiting time for a vehicle and district population density in Ghana

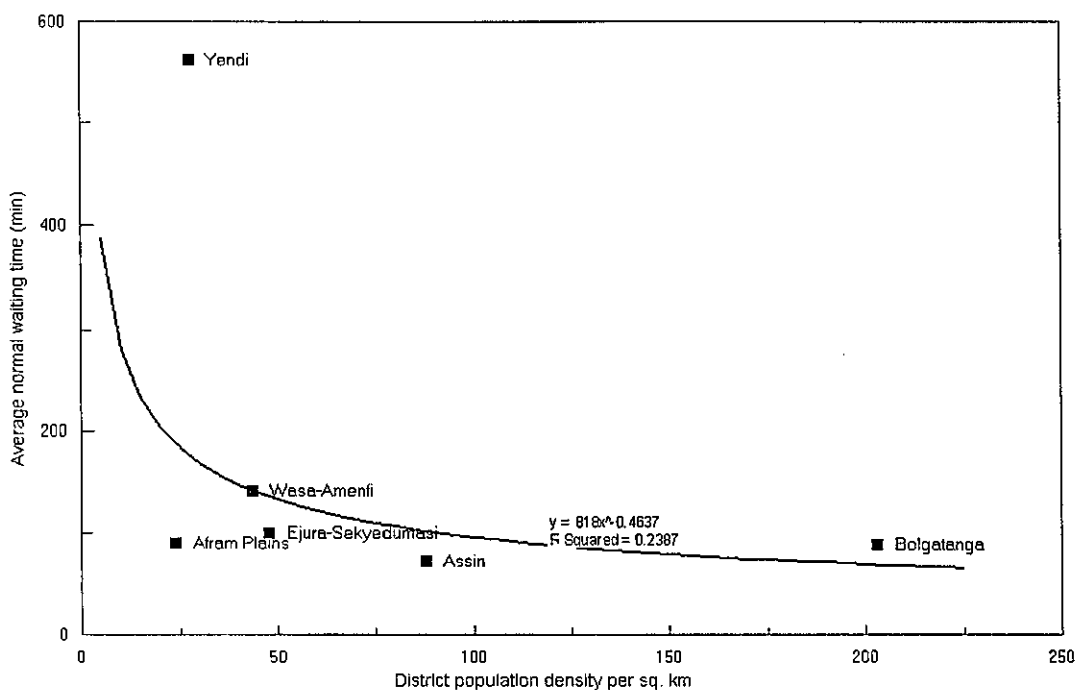
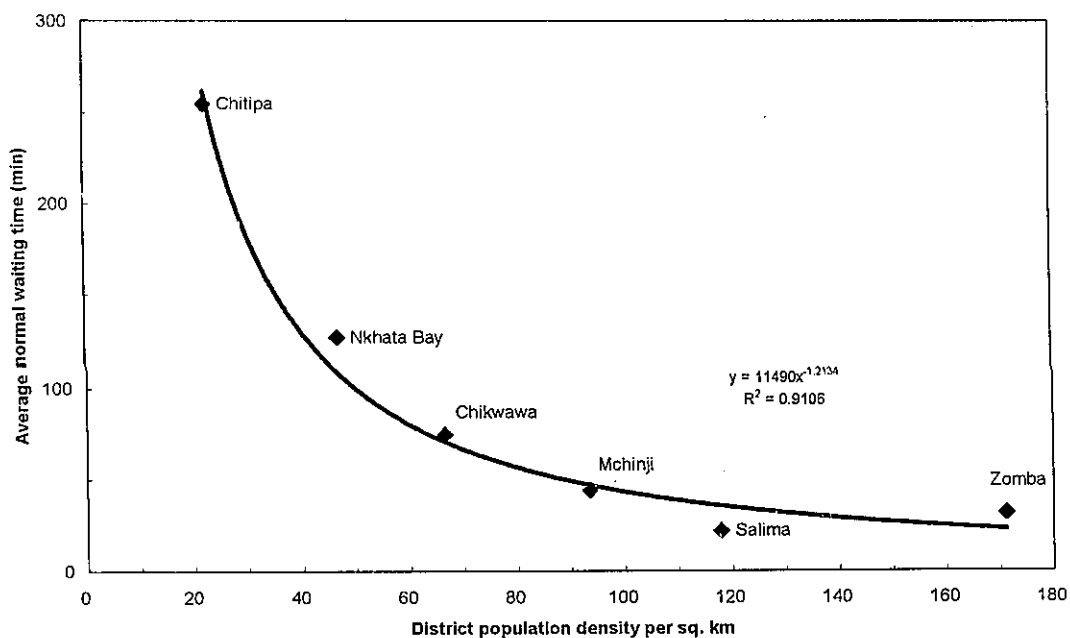


Figure 27: Relationship between waiting time for a vehicle and district population density in Malawi

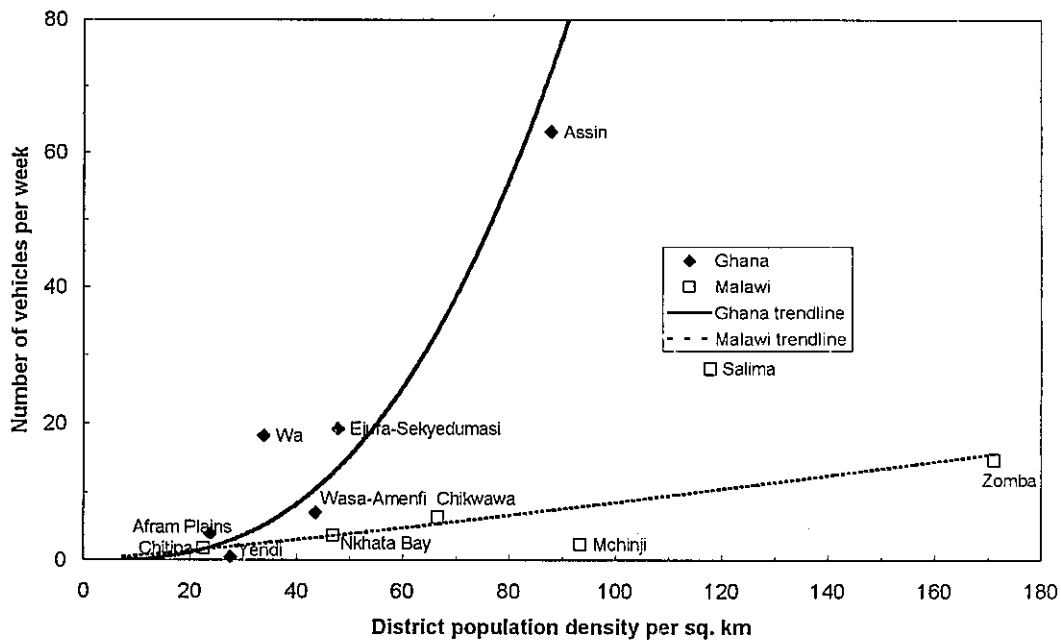


served by fewer than 4 vehicles per week and villagers have to wait for as much as 9 hours, on average, for a vehicle.

At the village level, vehicle frequency data collected in Malawi included non-motorised modes and boats in the cases of villages with lakeside locations. However, vehicle frequencies plotted in Figure 28 include only motorised land transport modes. The lack

of availability of transport services in Malawi, compared to Ghana, is strongly highlighted in this figure where frequencies of vehicle services to villages against district population density are plotted for both countries together. For both countries in districts where there are below 30 persons per sq. km, villages are served, on average, by fewer than four vehicles per week. Whereas in Ghana the data shows a marked rise in frequency of vehicle services with district population density (Villages in Assin district, population density 88 persons per sq. km, are served, on average, by 63 vehicles per day), this trend is considerably less well pronounced for Malawi.

Figure 28: Relationship between number of vehicles per week into/ out of village and district population density in Ghana and Malawi

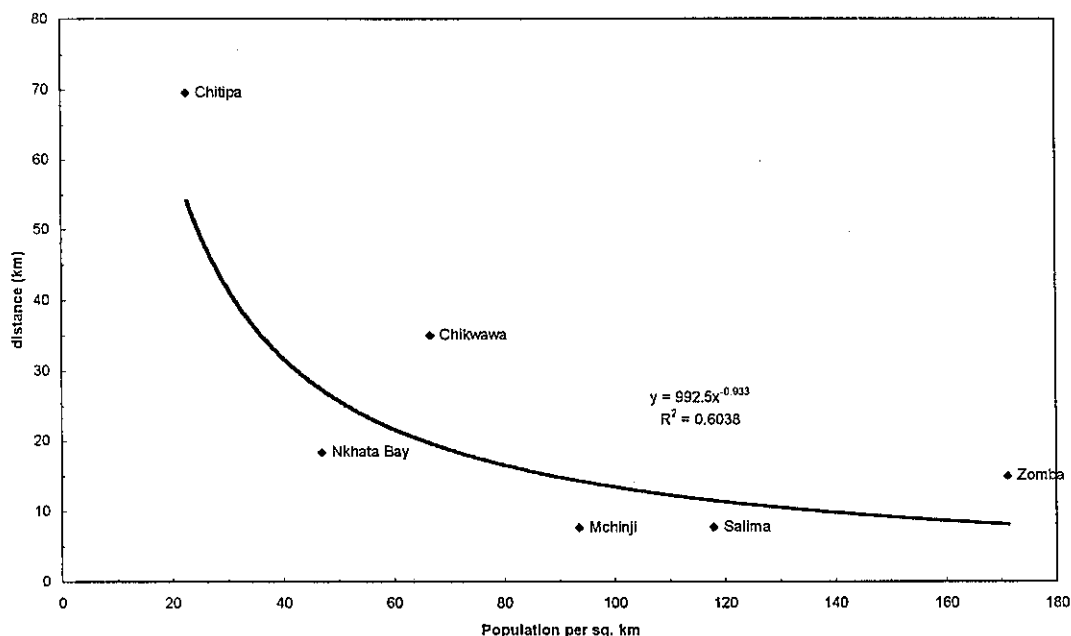


In Malawi the trend of decreasing passenger waiting times for vehicles with increasing density of demand appears to be reflected by shorter times that passenger vehicles have to wait for a full load before moving off (Rutter et al, 2000b).

The relationship of increased availability of motorised transport with density of demand is reflected by data from the vehicle operator study in Malawi relating to accessibility. Businesses and their patrons in the least densely populated areas are likely to be more isolated from essential social and economic facilities. In the section dealing with vehicle operating costs and maintenance the Malawian vehicle operator questionnaire contained an additional question seeking information on how far the interviewee normally travelled from base to obtain fuel. Figure 29 shows a tendency for vehicle operators based in districts of lowest population density to have to travel further to find fuel. On average, operators in Chitipa, with less than 30 persons per sq. km had to travel 70km for this purpose. This district, however, is also one of the most rugged and mountainous and difficult to cross by road.

Rutter et al (2000b) found that accessibility for villagers to out-of-village amenities, as defined by distance to market, the type of infrastructure linking the village with the vehicle pickup point and the quality of the road leading away from that point, also declines with decreasing district population density.

Figure 29: Relationship between accessibility (distance which vehicle operators usually have to travel from base to buy fuel) and district population density in Malawi



5. SUMMARY OF FINDINGS

In order to determine the nature and extent of rural transport services in selected countries of Sub-Saharan Africa two surveys were made in Ghana in 1997 and 1998 followed by one in Malawi in November/ December of 1988. The main findings from data collected by the use of village level and household level questionnaires and questionnaires aimed at vehicle operators are:

- Many rural villages are not directly served by motorised transport. On average, the access point for vehicles is 4.4 to 5.2km distant from the village.
- Population density has a large impact on the cost and provision of rural transport services and accessibility to social and economic amenities. Better services are associated with higher population densities as evidenced by fares, goods charges, waiting times for vehicles and frequency of vehicles serving the villages.
- Wide variation exists between the districts surveyed, within Ghana and Malawi, with respect to household prosperity as indicated by income and total known expenditure per capita. On average Malawi is poorer than Ghana and considerably less use is made of motorised transport in the former. Within Ghana the northern and southern sectors of the country also differ widely with respect to prosperity and use of motorised transport, the north being the poorer.
- In both Ghana and Malawi female-headed households are in the minority. There is a tendency for these to be poorer than male-headed households.

- Scatterplots of household tripmaking versus income and fares generally illustrate weak relationships and little sensitivity of tripmaking to changes in income or passenger fare. Elasticities of demand are presented in terms of the percentage increase in tripmaking resulting from a 1% increase in income or a 1% decrease in fare. On the whole, there is little sensitivity in tripmaking to changes in either parameter. Data analysis indicates that a 1% increase in household income produces only a 0.035% increase in number of motorised trips to market in Ghana. Virtually no positive relationship was found between income and tripmaking for Malawi.
- Household tripmaking generally showed weak negative relationships with fares. Elasticities of demand indicate that a 1% decrease in fares produces a 0.159% increase in tripmaking in Ghana and the corresponding figure for Malawi is 0.102%. Exceptionally, use of bus travel in Malawi shows considerably more sensitivity to fare changes, with an elasticity of 0.876%.
- Vehicle operators gave time spent waiting for spares as a major reason for vehicles being off road. This was especially the case in Malawi, which lacks spares or repair facilities on the scale of the Kumasi Magazine in Ghana.
- Fuel prices are greater for vehicle operators in Malawi than in Ghana
- Vehicle operators quote the main factor that would improve their businesses as being better quality roads.
- Data on passenger waiting times for vehicles, frequencies of vehicle services to villages and the distances to essential out-of-village facilities, indicate that the areas where density of demand is lowest are less well served by motorised transport.

6. DISCUSSION

Within rural areas of developing countries there is a wide range of access to, and use of, motorised transport services. The intensity of use is dependent on income, the availability of transport services (which is in turn dependent upon quality of road infrastructure and the density of demand) and on the level of tariffs and fares. Moderately well off and richer communities will tend to make relatively greater use of motor vehicle transport for visits to market, for employment and for social and medical purposes. In contrast poorer, more isolated, communities will tend to restrict their use of motor transport to the long distance movement of harvested crops.

The key characteristics of poor households in rural areas include isolation, vulnerability to shocks, lack of access to education and health facilities and social and economic exclusion. Improved access to transport services and greater mobility can clearly help alleviate many aspects of poverty. Within the context of rural development, improved transport has, in the past, been primarily seen as a mechanism for improving the returns gained from agricultural production and marketing. The 'Producers Surplus Approach' road planning method (Carnemark et. al 1976) is an example of this.

In recent years the Sustainable Livelihoods Approach (see Carney, 1998) has brought a wider perspective to the understanding of poverty alleviation. The emphasis is now more multidimensional; there is less emphasis on immediate income generation and more emphasis on the value and maintenance of the five types of capital assets (Natural, Social, Human, Physical and Financial) that people can draw upon to build their livelihoods. Improved transport can help increase the value of the asset base of all forms of capital. The role of transport in agricultural production and marketing is well understood (i.e. principally involving natural and financial capital). However transport also has a role in the development of human and social capital. Improved access to clinics, hospitals and schools is an obvious example. There is also increasing recognition that social trip making can also be valuable in helping to maintain a person's social capital and thus help in reducing their vulnerability to adverse changes in circumstances.

In the quest to tackle rural poverty, feeder road investment is a favoured solution of many donors. It can be targeted at poor rural areas where beneficiaries can be identified. It also tends to be very popular with both road agencies and rural communities. However, relative to incomes in the local area, it can be an extremely expensive intervention and without complementary measures there is little guarantee that it will meet its expectations. Some transport interventions, which may be targeted to help the rural poor, are discussed below.

Wide differences in motorised trip rates were found between Ghana and Malawi and also within the two countries. Northern Ghana (three districts surveyed) is recorded as having a trip rate of about five trips per person per year in contrast to Kwabre, a District close to Kumasi in Southern Ghana where the rate that is seven times higher. Average income levels in Southern Ghana are recognised to be much higher than in Northern Ghana. Motorised trip rates are much lower in Malawi. In total, six districts were surveyed in Malawi, only Nkhata Bay had any appreciable motorised trip making. The average for the other Districts (Chikwawa, Mchinji, Chitipa, Salima and Zomba) was in the order of one tenth of a trip per person per year. The extremely low motorised trip rates recorded in Malawi also appear to be common in both rural Zambia and Mozambique. Factors such as infrastructure quality and density of demand will affect motorised tripmaking as well as income distribution. The influence of the latter is explained in terms of the model described in Section 6.1 below.

6.1 A TENTATIVE MODEL OF POVERTY, MODAL CHOICE AND RURAL TRIP BEHAVIOUR

In order to predict how different interventions will impact upon rural communities it is useful to have an understanding of how different groups currently make their transport choices. Unfortunately there are still large gaps in our understanding of this process. There are wide differences within areas and between countries in access to animal transport and other intermediate means of transport (IMTs), and, inevitably any simplified model will have exceptions. Not all members of the same household can be fitted into the same income/access/mobility category. There are marked differences in access to cash between men and women to pay for motorised transport. Likewise although many households may own a bicycle women will often be denied

access to it. Despite these difficulties it is felt useful to suggest the following broad set of typologies.

Group 1: The Extremely Poor. (Including the most vulnerable, such as elderly and infirm and often includes female headed households). These people tend not to travel far, and if they do only infrequently. Walking is by far the most important means of transport. Because of the very limited access to cash they make virtually no use of motorised transport. Regular motorised transport services may well be 10 to 20 km away from their homes. Sometimes long distance trips (over 40 km) will be made on foot and goods may be carried. Due to their extreme poverty, they will have less access to animals and IMTs compared with others in their local community. Their main contact with motorised vehicles is when a truck is employed in long distance movement to take away harvested crops from their village area.

Group 2: The Very poor. This group will travel more frequently than those in Group 1. A limited use may be made of IMTs and animals but walking is still by far the most important means of transport. They will often walk regularly to market up to 10-15 km away and sometimes they will cycle many times this distance. The use of motor vehicles will be principally restricted to carrying harvested produce from the village area. Typically there will be no social use of motorised transport. Regular motorised transport services may still be located 5 km away while a functional road or track will usually be located within a kilometre. Sometimes, (possibly dangerous) long distance trips will be made on the top of, or in the back, of a truck.

Group 3. The Poor. Travel by foot and by bicycle will be the most common methods of transport for this group. There is likely to be increased ownership of and access to IMTs than in Groups 1 and 2. As with Group 2 they will often visit the local market on a regular basis. Occasional and regular use of motorised transport will be made for longer distance (over 20 km) passenger movements. They are more likely to have access to surplus cash with which to pay for motorised transport if they have something to trade at market. They will also use motor transport to go to hospital or to visit relatives. Motorised transport services may be 1 to 5 km away. Buses, minibuses, trucks and trains are used for long distance transport.

Group 4. The Better Off will make frequent use of motor transport on regular basis to go to work, visit markets, friends, social events, clinics and hospitals. Access distance to transport services will usually be within a half a kilometre. They will have access to bicycles and sometimes motorbikes and occasionally an agricultural tractor. Long distance trips will be made by bus, minibus or train, not by truck. As with all the previous groups primary school children will walk to school. They will receive regular/ semi- regular income from paid employment or small informal business.

Group 5. The Rich. There are very few rich who live in rural areas. They will often have houses in the main towns as well as the country. They will make motorised trips on a daily or weekly basis. They will either own cars or make intensive use of taxis. Long distance transport will be made by car, bus, train or by aeroplane. Many of the children of this group are taken daily to school by motorised vehicle. They will usually live close to good vehicle access and to transport services.

6.2 ACCESS TO SERVICES AND THE COSTS OF ROADS AND TRANSPORT

Rural access roads or feeder roads are, by far, the most common developmental intervention to improve rural transport. However they may also be very expensive in relation to the income of the beneficiaries. Expenditures in the range of US \$ 10,000 to 25,000 per km are common. As an example data will be drawn from a new Feeder road improvement project in Ghana. Sixteen roads in Nanumba District of Northern Region were recently surveyed for improvement, the average length was 14 km and the estimated costs were around \$ 10,000 for access improvements and \$ 14,000 for full rehabilitation. The average population to benefit was 2400 people per road. So for access improvements the cost was \$58 per head. Overall the cost of each road is probably of a similar order to the costs of housing the population affected by the road or to the total cash income generated by this population each year. The main engineering purpose of the proposed access improvements was to provide improved passability during the three to four months of the wet season. Although the natural soils are strong there are many small rivers and streams that prevent all year round accessibility. Average daily dry season traffic levels per road were found to be 10 motor vehicles (range 0 to 34 vpd), 187 headloading, 181 walking, and 337 cyclists.

It is sometimes argued that an important part of building access roads is to assist with access to clinics, hospital and schools. As argued above, with current fare levels and transport service availability hardly any "Very Poor" or "Extremely Poor" make use of motor vehicles for personal movement. In a serious situation or an emergency they will of course pay for motor transport to hospital but they may be far from any kind of service, even if located on a good road. Currently total health expenditure in Ghana is about \$8 per head, per annum. Although there are clearly situations in which new access roads may well be an important part of a programme to improve access to health facilities it seems unlikely that Ghanaian health care professionals would see widespread rural road expenditure of more than a few dollars per head for health purposes as a key priority, particularly if there are no other measures to promote increased mobility.

Virtually all rural primary school children go to school daily on foot or by bicycle. Only the rich can afford daily motorised transport. Children going to secondary school may have to use motorised transport. Many secondary school children will, of course, cycle. Often secondary schools are located so far away from their rural catchment areas that boarding is provided and the journeys will be made weekly or termly. There have been many cases where children are prevented from going to school because impassable rivers and streams in the wet season. Clearly road building can have an important input here; however it is likely that there are cases where relatively inexpensive foot bridges could achieve the same result.

The case is sometimes made that school teachers cannot be kept in post without a good quality road. Again, is it the case that the teacher wants the road or does he or she really want a reliable transport service? Currently in Ghana primary school teachers earn about US \$ 77 per month. For a typical rural road there might be say eight primary school teachers to cover the whole road and their combined annual income is US \$7,400 this in comparison with say US \$140,000 for access improvement for the whole road. Educational administrators might argue for

increased road expenditure in particularly difficult areas to help improve their own access to schools and improve rural environment of their teachers. However if the budget was under their own control alternative, more focussed, incentives for teachers could also be considered. There are, of course, many forms of incentive that can be offered to keep a teacher in place, such as free accommodation, free food, enhanced pay or as is sometimes supplied a free bicycle. (A free bicycle for the eight teachers might cost say US \$ 800).

A number of research studies have been carried out to indicate a very wide range of transport costs between different countries. Ellis (1996) estimated that in Ghana a pickup truck had operating costs 4.5 times the level in Thailand. Other studies have found African freight transport costs are between 2.5 to 4.5 times the level of tariffs in Asia. (Hine et al, 1997, Rizet and Hine, 1993). Currently it appears that passenger transport costs in India are in the order of US 0.6 cents per km compared with about US 2 cents for passenger fares in rural Tanzania and Ghana.

Not only are there large differences between Africa and Asia in transport charges there are also substantial differences within and between African countries. It has already been observed that Kwabre (the District with by far the highest motorised transport use) had fare levels one third of the rest of Ghana. Typical fares in Zambia for a 25 km trip have been found to be 70 % higher than the average for Ghana and 60% higher than in Mali (Ellis and Hine 1998).

There are number of explanations of high tariff and fare levels in some African countries. A critically important explanation relates to the low density of demand leading to cartels and the operation of monopolistic lorry and bus parks. There is often a gross oversupply of very poorly used old inefficient vehicles that are kept in business through the practice of transport unions that control lorry and bus parks and insist that customers go to the first vehicle in the queue. High input prices, exclusive dealerships and poor driver training and behaviour are also factors. High vehicle maintenance costs in Africa appear to be a function of unnecessary fast driving often in combination with poorly maintained (pot-holed) roads coupled with a lack of adequate routine vehicle maintenance.

Overall, the data indicates that there may well be significant efficiency gains from a more competitive transport industry in Africa.

7. RECOMMENDATIONS

7.1 A POSSIBLE PUBLIC PRIVATE PARTNERSHIP TO SUPPLY RURAL TRANSPORT SERVICES ?

There are no simple solutions to the problem of lack of access to motor vehicle services. Much of the above suggests that, apart from their impact on wholesale marketing of produce and the provision of pedestrian access over water crossings in the wet season, road interventions alone may be of only limited help to the poorest sections of the rural community. Other, possibly complementary, interventions are required to assist the rural poor with personal mobility. (Labour intensive road

construction activity can, of course, provide a welcome, if temporary, source of cash income for the rural poor.)

The challenge to transport professionals is to develop a solution which guarantees a minimum service provision at affordable fare levels to the very poor. If possible this should be arranged so that the opportunities to increase operational efficiency are achieved. A possible Public Private Partnership might be a solution whereby operators bid (in terms of the minimum incentive payment/ subsidy they would require) for route licenses. Minimum fare levels and trip frequency would have to be agreed. In return excess capacity (particularly of the old, unsafe and polluting vehicles) may be "bought out" and the incentive payments agreed. There would of course need to be policing of the arrangement. Initially the intervention might be focussed on those roads where remote poor communities have no direct access to any motorised transport services.

The costs of incentive payments might be relatively small to guarantee a minimum level of service. In view of the current fares that are charged a subsidy of, say, US 40 cents per km might be expected to ensure a service at a low fare level (say US 0.5 cents per km or less). A 40 km return service of, say, three times per week would cost \$5000 per year. In relation to the costs of building a feeder road this seems a very small cost that could be targeted directly to benefit the rural poor.

There is clearly a problem of how to sustain transport services in the longer term. (This problem is not confined to transport services, there is a huge difficulty with sustaining and maintaining road investment.) If the substantial potential transport efficiency gains can be achieved this might not be a problem. If the efficiency gains cannot be achieved then there might be a need for incentive payments to continue. Most major developed countries including the United States and Britain recognise the problem of access for the rural poor to public transport and as a result public transport subsidies are widely employed.

A range of solutions are possible to provide the long term financing of incentive payments. Payments could come from the recurrent government budgets or from revenues generated from the newly established Road Funds that have been set up, primarily to finance road maintenance. Donors could set up a separate fund that could be invested to service payments in the longer term. The fund administrators could negotiate and come to an agreement with the appropriate local authorities controlling local rural transport that the payments would only continue provided certain performance criteria are met.

The object of the exercise is to enhance the livelihoods of the rural population concerned. A reduced effort spent in headloading and walking for many hours could be usefully deployed in other ways to improve livelihoods and generate a sustainable income. With increasing mobility it is anticipated that access to health care would be improved, vulnerability and isolation reduced, and social and economic interaction increased thus improving the income earning opportunities and well being of the rural community.

8. ACKNOWLEDGEMENTS

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APPENDIX 1:

**MALAWI VILLAGE LEVEL QUESTIONNAIRE AND
INSTRUCTIONS FOR COMPLETION**

AVAILABILITY OF RURAL TRANSPORT SERVICES, MALAWI
VILLAGE LEVEL QUESTIONNAIRE

Questionnaire No.

Part A: Administration

- | | | |
|----|----------------|------------------------|
| 1. | District | Date of interview..... |
| 2. | Village | Enumerator..... |
| 3. | Key-informants | Date checked |
| | | Supervisor |
| 1/ | ..... | 6/ |
| 2/ | ..... | 7/ |
| 3/ | ..... | 8/ |
| 4/ | ..... | 9/ |
| 5/ | ..... | 10/ |

Part B: Village characteristics

- | | | | | |
|-----|--|------------|-------------|----------------|
| 4. | Total population: | ..... |  |  |
| 5. | Number of men (18 years old or over) | ..... |  |  |
| 6. | Number of women (18 years old or over) | ..... |  |  |
| 7. | Number of boys (under 18) | ..... |  |  |
| 8. | Number of girls (under 18) | ..... |  |  |
| 9. | Number of households: | ..... |  |  |
| 10. | Number of female headed households | ..... |  |  |
| 11. | Terrain (circle all that apply): | | | |
| | 1/ Flat | 2/ Rolling | 3/ Hilly | 4/ Mountainous |
| | 5/ Marshy | 6/ Open | 7/ Forested | |

Part C: Village structure

- | | | |
|-----|--|-------|
| 12. | Number of settlements in the village | ..... |
| 13. | Distance of furthest settlement from village centre (kn) | ..... |

Part D: Rural infrastructure (roads, etc.)

- | | |
|-----|--|
| 14. | Distance to nearest pickup point for motorised transport services (including motorable road, railway, harbour or ferry terminal) .....km |
|-----|--|

15. Type of connection to pickup point (circle all that apply)
1/ Footpath 2/ Track Other (what?)
16. Surface of road from pickup point (please tick)
1/ Tarmac 2/ Gravel 3/ Earth
Other (what?).....
17. Passibility of that motorable road (for vehicles)
1/ passable all year through 2/ passable only in dry season
3/ impassable all year round

Part E: 18. Transport services into or near the village

Vehicles	Season	Frequency: How many vehicles per week?	How long does one normally have to wait for a vehicle (days, hours or minutes)?	What is the longest time one has to wait for a vehicle (days, hours or minutes)?	Origin		Destination	
					Inside village	Outside village	Inside village	Outside village
Bus	Wet							
	Dry							
Truck/ Lorry	Wet							
	Dry							
Pickup	Wet							
	Dry							
Tractor	Wet							
	Dry							
Ox cart	Wet							
	Dry							
Boat	wet							
	Dry							
Bicycle	Wet							
	Dry							
Other	Wet							
	Dry							
.....	Wet							
.....	Dry							

19. Does lack of availability of passenger or goods transport service result in:

- Serious delays in evacuation of medical emergencies? (Y / N)
- Spoilage of crops which cannot be taken to market in good time? (Y / N)
- Disruption of social activities (eg. church, visiting friends and relatives)? (Y / N)
- Disruption of economic activities (eg. marketing of farm produce)? (Y / N)
- Disruption of domestic chores (eg. water/ firewood collection)? (Y / N)

Part F: 20. Ownership of work animals and means of transport in the village

Means of Transport	Number of households owning:	Number of vehicles in village		
		Total	Working	Not working
Work oxen				
Ox sledge				
Ox cart				
Donkey				
Donkey sledge				
Donkey cart				
Wheelbarrow				
Handcart				
Bicycle				
Bicycle trailer				
Bicycle ambulance				
Motor cycle				
Tractor				
Tractor trailer				
Car/ pickup				
Truck/ bus				
Boat/ canoe				
Other				
.....				
.....				
.....				
Total				

Key to Tables 21 and 22

Mode	Code	Mode	Code	Mode	Code
Walk	1	Bus	6	Rowing boat	11
Bicycle	2	Lorry or Truck	7	Canoe	12
Motorcycle	3	Tractor	8	Motor boat	13
Taxi	4	Ox cart	9		14
Pickup	5	Sailing boat	10		15

For multiple mode trips enter "+" for "and", "/" for "or", eg. walk or bicycle = 1/2, walk and bus = 1+6.

Part I: Agriculture

23. Crops: harvest seasons, storage facilities and production

Crop	Harvest months		Storage facilities	Output during past year for whole village (Number of large bags, small bags, baskets, etc)
	From	To		
1/ Maize				
2/ Beans				
3/ Yams				
4/ Cocoyam				
5/ Cocoa				
6/ Cassava				
7/ Tomatoes				
8/ Potatoes				
9/ Bananas				
10/ Plantains				
11/				
12/				
13/				
14/				
15/				

Enter months in numerical format, eg. 1 for January, 2 for February, etc.

24. Distance of fields from village centre: from to km

25. Livestock and poultry

Animals	Number in village
1/ Cattle	
2/ Sheep	
3/ Goats	
4/ Pigs	
5/ Chickens	
6/ Guinea fowl	
7/	
8/	
9/	

Part J: Water and Energy

26. Sources of drinking water

Source	Number		Distance of nearest functional source from village centre
	Functional	Non-functional	
1/ Boreholes			
2/ Wells			
3/ Rivers			
4/ Streams			
5/ Ponds			
5/ Lakes			
6/ Water taps			
.....			

27. How many households have electricity?

VILLAGE LEVEL QUESTIONNAIRE: INSTRUCTIONS FOR COMPLETION

In a nutshell information is sought on the following:

- * Village statistics - population, gender distribution, size, number of households etc.
- * Terrain and type of vegetation cover
- * Village structure
- * Rural infrastructure and how this is affected seasonally
- * Nature and frequency of transport services into the village
- * Ownership of work animals and means of transport within the village
- * Travel activities and requirements within and outside the village and, hence, social, domestic and economic facilities available in the village
- * Type of agriculture - crops and/ or livestock

Parts G and H: Travel requirements within and outside the village

The information sought in the second column of Tables 21 and 22 is the number of trips for a particular activity for the average household in the village. If no trips are made in connection with a particular activity write "none", "nil" or "----" and leave corresponding spaces in columns to the right blank. Where trips are made in connection with a particular activity but no information is available regarding time or distance write "NK" (not known)

Information relating to distance, time taken and fare should be for the one way trip only. The fare entered should be the one way fare per person.

N.B.: Transport of harvest: When asked how many trips the household makes for this purpose the reply you may get could be "every day". This may mean every day during the harvest seasons of which there may be two per year, each lasting one or two months. It would therefore be much more meaningful if a rough estimate could be obtained for the number of trips per year for transport of harvest.

N.B.: Travel to employment and education: When data is entered for computer analysis all trips will be expressed on a "per year" basis. If the reply you get is "5 days a week" this does not necessarily mean 260 days a year. The number of trips per year may be considerably less than this when one takes into account such things as public and school holidays.

In the column "Who makes these trips" it asks for numbers of men (M), women (W), boys (B) and girls (G). Although numbers are required at the household level for the purposes of the village level questionnaire it is sufficient to put ticks for the predominant gender and age groups making trips in relation to particular activities at the village level.

APPENDIX 2:
HOUSEHOLD LEVEL QUESTIONNAIRE AND INSTRUCTIONS
FOR COMPLETION

AVAILABILITY OF RURAL TRANSPORT SERVICES

HOUSEHOLD QUESTIONNAIRE

This questionnaire aims at getting some background information on the household, particularly in relation to income and members' transport requirements. All replies are confidential and the interviewer will not discuss one household's replies with any other person being interviewed.

Questionnaire No.:

Date: Interviewer:

District: Village:

1. Household size and composition

1.1 Please can you tell me some things about the head of the household?:

- Sex (M/F)

- Age years

- Marital status (circle where appropriate): single, married, divorced, widowed, separated

1.2 How many men (18 years old or over) are there in the household?

1.3 How many women (18 years old or over) are there in the household?

1.4 How many children (under 18) are there in the household?

2. Household income and livelihood

2.1 Can you give a rough figure for the household's income (circle appropriate time period)?

.....Cedis per day / week / month / year

don't know

2.2 What are the main sources of income (please tick)?

- a) Cocoa farming
- b) Food farming
- c) Remittances
- d) From household members with particular jobs

2.3 If you have ticked (d) in question 2.2 can you give some details of these jobs, who does them and where they are?

Job	Number of men employed	Number of women employed	Is the job based in the village? Yes / No	Salary per person. State whether per week, per month or per year
Teacher				
Nurse				
Cocoa marketing board official				
Driver				
Forestry worker				
Grinding mill operator				
Saw mill worker				
Labourer				
Mechanic				
Carpenter				
Mason				
Retailer				
Waiter/ waitress				
Other				

3. Household expenditure

3.1 Would you be willing to answer some questions on household income? Yes / No

Can you give some details of monthly expenditure on any of the items listed in the boxes below?

	Amount spent	per week/ month/ year/ term, etc?
Food and drink including value of subsistence food		
Other consumables		
Clothing		
Furniture etc.		
Fuel and energy for cooking, heating and lighting		
Repairs to vehicles and machinery		
Health services - Clinics/ hospital/ medicines		
Education and school uniforms		
Credit services - Co-operative fees		
Credit services - Repayment of loans		
Transport		
Funerals		

3.2 Please give details of any other items of expenditure not listed above

Item	Amount spent	per week/ month/ year/ term, etc?

4. Transport, household possessions and property characteristics

4.1.1 Does this household own any of the items listed in the box below

Item	Number	Description (age and make)	Are they in working order?
Bicycle			
Other vehicle (please state)			
Television set			
Radio			
Fan			
Other appliance (please state)			
Upholstered furniture			

4.1.2 Which of the following characteristics does the household property have (please circle appropriate)?:

- Tin / thatched roof
- Mud / mud bricks / concrete block walls
- Are the walls plastered? Yes / No
- Windows with / without frames / no windows
- Doors with / without frames

4.1.3 Do you use wood / charcoal / gas / other (please state) for cooking?

4.1.4 Do you use electricity / paraffin / kerosene / candles / other (please state) for lighting

4.3 Do you frequently use motorised transport for carrying goods or farm produce? Yes / No

Please give details of any goods transported below

Goods	Quantity	Units	Charge per unit	Trip purpose (as in 4.2)

4.4 Are you happy with the number of number of trips you make? Yes / No

4.5 If you have answered No to question 4.3 why don't you make more trips? Is it because:

- There are no transport services into the village?
- The transport services do not come often enough?
- Regular transport services are not on time?
- Passenger fares are too expensive?
- Charges for transport of goods/farm produce are too expensive?
- Vehicles are uncomfortable?
- Travelling is dangerous?
- The vehicles are too full by the time you want to get on
- There is not enough room for luggage, goods or produce?
- Other reasons (please state)?

.....

4.6 Do the regular transport services come into the village? Yes / No

4.7 If you have answered No to question 4.6 can you:

say where the nearest pickup point is?

..... and how far away it is?

.....km ormiles

Do you (please tick): walk or go by bicycle?

Can you say how long it takes you to get there?hoursminutes

4.8 If vehicles do not come into the village is it because:

roads are of poor quality?

there are no roads into the village?

any other reasons (please state)?

.....

.....

4.9 Once you have got to the pickup point:

how long do you normally have to wait before a vehicle arrives which you are able to board?hours.....minutes

what is the longest time you will wait for a vehicle?

.....hoursminutes

4.10 If you have to wait very long for a vehicle how are you able to occupy the time?

.....
.....

4.11 Do you normally have to wait longer for a vehicle in the rainy season? Yes / No

If your answer is Yes how long is your wait?hoursminutes

5. What is the household name?

=====

Please thank the people that you have been talking to, for answering these questions and for giving you the time to complete the survey. We are very grateful for their co-operation.

HOUSEHOLD QUESTIONNAIRE: INSTRUCTIONS FOR ENUMERATORS

GENERAL COMMENTS

Begin the interview by explaining to the household member the purpose of the interview. It is being conducted as part of a study by the Building and Road Research Institute in Kumasi, together with the Department of Planning, UST, and the Transport Research Laboratory, UK, to determine the problems faced by rural villagers in their travel and transport activities outside the village and to find ways of remedying these. Then ask the interviewee if he, or she, would be willing to spend up to 45 minutes or so to answer some questions relating to the household, particularly with regard to income and transport requirements. Explain that the interview is confidential and that you will not discuss the interviewee's replies with any other person being interviewed.

In general, most questions should be filled in unless stated otherwise below. It is highly likely that many interviewees will not be able, or may not be willing, to give an answer to some, especially those relating to household income or expenditure. In these cases put a tick against "don't know" or write "NK" (not known). It is good if you can establish a rapport with the interviewee and gain his or her confidence before asking questions of such a personal nature. Questionnaire entries must be short and concise. Do not repeat what is written in table column and row titles. Leave the entry for Questionnaire No. blank.

QUESTIONS RELATING TO HOUSEHOLD SIZE AND COMPOSITION

Question 1.1:

The interviewee may not necessarily be the head of the household. Sex, age and marital status should be those of the household head, not the interviewee in this case.

Questions 1.2 & 1.3:

Number of men or women (18 years or over) should be all those in the household including the household head and/ or interviewee.

QUESTIONS RELATING TO INCOME AND LIVELIHOOD

Question 2.1:

The information sought here is the household's gross income, not the net annual or monthly savings after all expenditure has been subtracted. If the interviewee is able to give you a figure it is very important to say whether this is per day, per week, per month or per year. The appropriate time period must be circled or underlined.

Questions 2.2 & 2.3:

If (d) in question 2.2 has been ticked, you need fill in only the relevant lines in the table for 2.3. If (d) in question 2.2 has not been ticked ignore 2.3 and go on to 3.1.

Question 3.1:

If the answer to "Would you be willing to answer some questions on household expenditure?" is No, then ignore the tables on that page and go onto question 4.1.1.

If the interviewee has expressed an interest in talking about the households' breakdown of expenditure then go through each of the items listed on the table with him or her. It is important to say whether any amount spent is per week, month, year, etc: Where a figure greater than 0 has been given do not leave the third column of the table blank. If the household does not spend anything on a particular item write "nil", "none", "0" or "-----" in the second column. If the interviewee cannot say how much is spent on any item write "NK". Do not leave the second column blank.

Question 3.2:

If the interviewee mentions any expenses in addition to those listed in 3.1 give short, concise entries in the first column

QUESTIONS RELATING TO HOUSEHOLD POSSESSIONS AND PROPERTY CHARACTERISTICS AND TRANSPORT REQUIREMENTS

Question 4.1.1

Do not leave any space in the second column ("Number") blank. If the household does not own any particular item listed write "nil", "none", "0" or "----". Where the household owns one or more of any item listed do not simply put a tick against that item: enter the number owned.

Question 4.1.2

Observe how the house is constructed with respect to the type of roof, walls, windows and doors. Circle the appropriate choices given in this question.

Questions 4.1.3 and 4.1.4 relating to fuel for cooking and lighting

Circle the appropriate choice(s) given by the interviewee

Question 4.2

Information entered into the table must be short and concise and must relate only to trips outside the village. In the second column must be entered the number of round trips, i.e. there and back. It is important to say whether these are per day, week, month or year.

If household members do not make any trips in connection with a particular activity write "none", "nil" or "----" and leave corresponding spaces in columns to the right blank. If the interviewee cannot say how many trips are made for a particular activity write "NK" in the second column.

Information relating to distance, time taken and fare should be for the one way trip only. The fare entered should be the one way fare per person.

N.B.: Transport of harvest: When asked how many trips the household makes for this purpose the reply you may get could be "every day". This may mean every day during the harvest seasons of which there may be two per year, each lasting one or two months. It would therefore be much more meaningful if a rough estimate could be obtained for the number of trips per year for transport of harvest.

N.B.: Travel to employment and education: When data is entered for computer analysis all trips will be expressed on a "per year" basis. If the reply you get is "5 days a week" this does not necessarily mean 260 days a year. The number of trips per year may be considerably less than this when one takes into account such things as public and school holidays.

Question 4.3:

If the interviewee does not frequently use motorised transport services for carrying goods or farm produce circle "No" and go onto Question 4.4.

"Units" in the third column of the table may be large bags, small bags, baskets, batches of 100 tubers etc. or even whole truckloads.

"Quantity" in the second column refers to the number of bags etc.

"Charge per unit" is what the vehicle operator charges for carrying each bag or basket or whatever, and not the price which the household sells the goods for at the market.

"Trip purpose" in the fifth column refers back to the first column of the table on the previous page.

Questions 4.4 and 4.5:

if the interviewee is happy with the number of trips he or she makes go onto Question 4.6. Otherwise go through the reasons listed in 4.5 and put a tick against one or more according to his or her response.

Question 4.6:

The answer to this is something which will come up in the group participatory discussion. Nevertheless, it may well be worth putting this question to the interviewee. If regular vehicle services do come into the village go onto Question 5.

Questions 4.7 to 4.10:

These relate to situations where villagers have to walk or cycle to another settlement or main road junction to make use of motorised transport services. In question 4.8 (reasons for vehicles not coming into village) do not put ticks against both "roads are of poor quality?" and "there are no roads into the village?"

Question 5

This information is optional. Note that this question is placed right at the end of the questionnaire. It is important to establish a rapport with the interviewee before asking the for the name of his or her household.

Finally thank the interviewee for answering the questions and for giving you the time to complete the survey and express your gratitude for their cooperation.

APPENDIX 3:
**VEHICLE OPERATOR QUESTIONNAIRE AND INSTRUCTIONS
FOR COMPLETION**

AVAILABILITY OF RURAL TRANSPORT SERVICES

VEHICLE OPERATOR QUESTIONNAIRE

Date:.....

Interviewer:.....

Questionnaire No.:

1. General Information

1.1 Interviewer's location

Region/District:..... Village, lorry park, bus station, etc.:.....

1.2 Owner's name:..... 1.3 Where is the vehicle based?:.....

1.4 Vehicle make:.....

1.5 Vehicle type (please tick):

- | | | | |
|-------------------------|-------|--------------------|------|
| a) Bus | .... | b) Minibus (urvan) | .... |
| c) Mammy wagon | .... | d) Lorry (truck)* | .... |
| e) Taxi | .... | f) Tractor | .... |
| g) Pickup | .... | h) Van | .... |
| i) Other (please state) | ..... |  |  |

*If the vehicle is a lorry or truck, please state number of axles

1.6 Is the vehicle owned by (please tick):

- | | | | |
|--------------------------|-------|-------------------------|------|
| a) the driver? | .... | b) a transport fleet? | .... |
| c) a family? | .... | d) a partnership? | .... |
| e) a cooperative? | .... | f) a local businessman? | .... |
| g) other? (please state) | ..... |  |  |
| h) don't know | .... |  |  |

1.7 What is the load capacity of the vehicle?

..... tonnes goods..... passengers Don't know

1.8 How many people crew this vehicle?

.....driversassistants
.....conductorsother (please state)
.....don't know

1.9 Occupation(s) and/ or trade(s) of vehicle owner:

1.10 Is this vehicle used for (please tick one or more):

- a) carrying passengers only?
- b) carrying farm produce only?
- c) carrying other goods only?
- d) carrying both passengers and goods?
- e) other purposes (please state)?

1.11 Does the vehicle operate on (please tick):

- a) a "for hire" basis?
- b) on regular routes?
- c) both on a "for hire" basis and on regular routes?

1.12 Please give some details about the routes you operate on

Route / Season	From	To	Road quality	One-way distance	Time taken for one way trip	Trip frequency	One way passenger fare	Goods charges
1 Wet								
1 Dry								
2 Wet								
2 Dry								

Table continued overleaf

2. If the vehicle is used for carrying passengers please answer questions 2.1 to 2.3.

2.1 Roughly how many passenger board before you leave?

2.2 How long do you have to wait for a reasonable number of passengers?

.....hoursminutes

2.3 Do you operate on fixed routes? Yes / No

3. If the vehicle is used only for carrying large loads of goods or farm produce and not for passengers please answer questions 3.1 to 3.4

3.1 How long did you have to wait for your last load?

..... days hoursminutes Don't know

3.2 Roughly how long do you normally have to wait for a load?

..... days hoursminutes Don't know

3.3 How are vehicle loads normally found?

- a) Driver finds load b) GPRTU finds load
- c) Other methods (please state)
- d) Don't know

3.4 Where are loads picked up (please tick)?

- a) Lorry park b) Farm
- c) Crop storage facility d) Factory
- e) Village centre f) Roadside
- g) Market place
- h) Other (please state)

4. How do seasonal rains affect your operations? Please give details in questions 4.1 to 4.3

4.1 Does your vehicle get bogged down at all? Yes / No / Don't know

If so:

How frequently? times per day / week / month (circle where appropriate)

Does this prevent any trips? Yes / No / Don't know

4.2 Is there any problem getting up slippery slopes at all? Yes / No / Don't know

5. Other factors affecting business

5.1 Please tick other factors which may affect passenger fares, goods charges, routes driven or number of trips in the box below.

	Passenger fares	Goods charges	Routes	Number of trips per week
Demand for services				
Vehicle maintenance				
Quality of roads				
Fuel costs				
Journey times				
Terrain (flat, hilly etc.)				
Regulations				
Other (please state)				

5.2 If you were free to choose, what changes would you make? Please tick in the box below

	Less/ lower/ fewer	Would not change	More/ higher /greater
Passenger fares			
Passenger numbers			
Goods transport charges			
Maximum load for goods			
Type of goods			
Routes			
Number of journeys per week			
Distance travelled per week			

6. Vehicle operating costs and maintenance

6.1 How old is the vehicle?years..... months don't know

6.2 How much tax do you have to pay?:.....Cedis per day / week / month / year
don't know

6.3 What is the cost of insurance for this vehicle? Cedis per month / year
don't know

6.4 What is the fuel (please tick)?

Petrol Diesel Other (please state)

6.5 How much do you pay for fuel?

.....Cedis per litre / per gallon don't know

6.6 Who is responsible for vehicle maintenance and servicing?:

6.7 Is vehicle maintenance carried out at the same place? Yes / No

If Yes where is this done?

.....and is this (please tick one or both):

- major maintenance? - minor maintenance?

6.8 If you carry out your own maintenance where do you get spares from?:

.....

6.9 How often is the vehicle serviced? times per year Don't know

6.10 Would you have the vehicle serviced more frequently if (Circle appropriate):

a) maintenance costs were lower Yes / No / Don't know

b) maintenance could be done more speedily Yes / No / Don't know

6.11 If you have answered Yes to question 6.10 how often would you have the vehicle serviced?

..... times per year

6.12 How often is your vehicle off the road?

..... times per week / month / year (circle appropriate) Don't know

6.13 For how long is your vehicle off the road?

..... days hours per week / month / year (Circle appropriate)

Don't know

6.14 When it is off the road is this largely due to (please tick one or more):

a) Waiting for spares?

b) Waiting for repairs?

c) Routine maintenance?

d) Lack of demand for passengers?

e) Lack of custom for goods transport?

f) Seasonal impassability of roads?

g) Vehicle off road only during non-working hours?

h) Other reasons (please state)

.....

6.15 Are you satisfied with the vehicle maintenance and repair facilities available to you?

Yes / No

6.16 If you have answered No to 6.15 how could they be improved?

.....

.....

7. Use of small enterprise services for vehicle maintenance etc.

7.1 Do you know of the Kumasi Magazine? Yes / No

7.2 Do you use the services of any of the traders at the Kumasi Magazine? Yes / No

7.3 If you have answered yes to Question 7.2 which services do you use? (please tick one or more)

- a) Tyres b) Supply of other spares
- c) Engine repairs d) Bodywork repairs
- e) Other (please state)

7.4 What supplier would you use if the Kumasi Magazine were not available?
.....

8. Payment for the vehicle

8.1 Was the vehicle bought from:

- a) A private individual? b) A co-operative?
- c) A family business? d) A dealer?
- e) Other? (please state)
- f) Don't know

8.2 Was the vehicle when it was bought:

- a) new ? b) second-hand ? c) don't know ?

8.3 Why did you buy this particular type of vehicle (please tick one or more)?

- a) It was affordable to buy
- b) It is cheap to maintain
- c) It is easy to maintain
- d) It is economical on fuel consumption
- e) It is reliable
- f) It has a high carrying capacity (Q. 8.3 continued overleaf)
- g) It can be driven easily on poor condition roads
- h) Other reasons (please state)

8.4 What other vehicle could you have chosen?

8.5 Has the vehicle been paid for yet? Yes / No / Don't know

8.6 What price was agreed on? Cedis Don't know

8.7 When was a price agreed on? month year

8.8 How has the money been paid, or is being paid?

- a) by cash b) by loan c) don't know

If the payment was, or is, by loan please answer questions 8.9 to 8.11:

8.9 Who is the lender? don't know

8.10 How long is the repayment period? years months don't know

8.11 What is the rate of interest? percent per month / year (Circle appropriate)

Don't know

9. One final question

What things would improve your business (please tick one or more)?:

- a) Better quality roads
- b) Roads to more villages, farms, markets etc.
- c) More accessible vehicle maintenance
and repair facilities
- d) More custom
- e) More reliable vehicles
- f) More regulation
- g) Less regulation
- h) More easily available credit
- j) Other (please state)

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VEHICLE OPERATOR QUESTIONNAIRE: INSTRUCTIONS FOR ENUMERATORS

GENERAL COMMENTS

Begin the interview by explaining to the interviewee the purpose of the interview. Say that you are collecting information as part of a study by the Building and Road Research Institute in Kumasi, together with the Department of Planning, UST, and the Transport Research Laboratory, UK, to determine the problems faced by rural public transport and goods vehicle operators and their patrons and to find ways of remedying these. Then ask the interviewee if he would be willing to spend up to 45 minutes or so to answer some questions relating to his business, particularly with regard to such things as routes charges and fares and how these are affected by competition from other operators, the seasonal rains and regulation by such organisations as the GPRTU. Explain that the interview is confidential and that you will not discuss the interviewee's replies with any other person being interviewed.

In general, most questions must be filled in, except where stated otherwise in the following instructions. Where the interviewee is unable or unwilling to give a definite answer, put a tick against "Don't know" or write "NK" (not known). Questionnaire entries must be short and concise.

Where there are tables do not repeat what is written in the column and row titles.

In questions which require a Yes or No answer, e.g. 2.4, circle or underline either Yes or No. Do not simply put a tick at the end of the line.

Leave the space for Questionnaire No. blank.

GENERAL INFORMATION QUESTIONS

Many questions are fairly self-explanatory. Among those that may need some clarification are:

1.5 Vehicle type:

"Bus" refers to the large buses (as distinct from minibuses) which tend to ply mainly the intercity routes. "Vans" are like minibuses, but are for the transport of goods rather than passengers and are therefore not filled with passenger seats. Lorries or trucks vary considerably on size and carrying capacity from the 2 ton trucks to those which are used for carrying very large tree trunks. These can be categorised readily by the number of axles.

1.8 Vehicle crews:

Do not simply enter ticks here. Actual numbers of drivers, assistants etc. must be given.

1.12 Routes:

This question seeks information on routes the vehicle operates on, the quality of road (enter as "good", "medium" or "poor"), the amount of travelling, passenger fares and/or goods charges and how all these are affected by the seasonal rains.

Information relating to journey time, distance, fares and goods charges must be those for the one-way trip. Passenger fare is the one-way fare per person.

Trip frequency is how many round trips, i.e. there and back and must be entered as per week, per month etc.

Distances must be entered as miles or kilometres.

If, for any given route, an item of information is the same in the dry season as in the wet, then simply write ' ' in the appropriate box.

SECTION 2 is aimed specifically at vehicle operators running passenger carrying services and aims to acquire information on demand for their services based on how long they have to wait for a reasonable number of passengers.

SECTION 3 is aimed at operators whose business is based on carrying large, bulk goods loads rather than passengers and seeks information on:

- demand for their services based on how long they have to wait for a load and
- how and where loads are found.

SECTION 4 provides some additional information, to the table in 1.12, as to how seasonal rains affect vehicle operations. If, in Question 4.1, the interviewee is able to say how frequently his vehicle gets bogged down this figure must be entered as per day, per week or per month. Otherwise, enter "NK" (not known).

SECTION 5 aims to collect information on other factors affecting business. For example the operator may have to increase fares or goods charges to offset any increases in fuel prices. When demand for his services is low he may desire to lower fares or goods charges to attract more custom.

Regulations in Question 5.1 may mean, for example, a maximum legal limit for passengers or goods load, set by the Government, for safety reasons.

SECTION 6: VEHICLE OPERATING COSTS AND MAINTENANCE

Question 6.4:

Things such as engine oil should not be entered under "Other". This is a lubricant, not a fuel.

Questions 6.12, 6.13 and 6.14:

"Off the road" means that the vehicle is not travelling, perhaps because of such things as mechanical breakdown, routine maintenance or lack of custom. If, in 6.14, the vehicle is off the road only during non-working hours, tick only option (g) and none of the others.

SECTION 7

The Kumasi Magazine is a very large compound of small enterprise repair shops in Kumasi. Section 7 aims at establishing the importance of this in meeting the vehicle maintenance requirements of vehicle operators in regions distant from, as well as close to, Kumasi.

SECTION 8: PAYMENT FOR THE VEHICLE

This section aims to determine the problems faced by vehicle operators in getting hold of the money to buy vehicles, what are the best vehicles to buy, and what is available in the way of credit facilities for loans.

Question 8.8:

If the vehicle owner has paid for the vehicle by cash (he has paid for it out of his own savings and has not had to borrow money) or the interviewee does not know how it was paid for ignore subsequent questions in this section and go onto Section 9

If the vehicle has been/ is being paid for by a loan, go through Questions 8.9, 8.10 and 8.11.

SECTION 9: ONE FINAL QUESTION

While detailed information on what affects the vehicle operator's business is sought in the preceding sections it is useful to have one final "summing up" question to determine the most important problems they face.

Finally thank the interviewee for answering the questions and for giving you the time to complete the survey and express your gratitude for his cooperation.