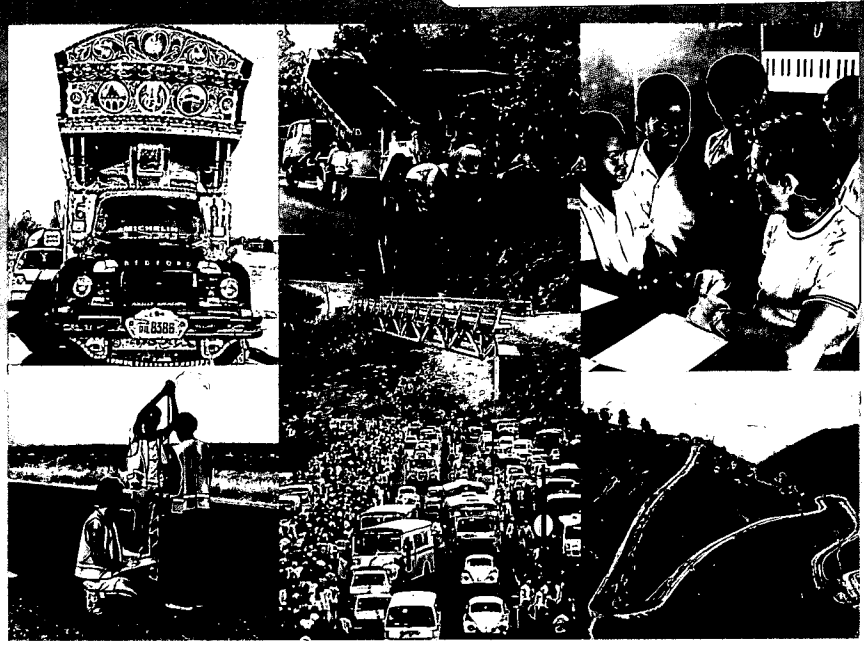

A comparison of freight transport operations in Tanzania and Indonesia

by J L Hine (TRL)
J H Ebden and P Swan (Mott Macdonald)

TRL Report 267

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TRL REPORT 267

A COMPARISON OF FREIGHT TRANSPORT OPERATIONS IN TANZANIA AND INDONESIA

by J L Hine (TRL), J H Ebden and P Swan (Mott Macdonald)

Subsector:	Transport
Theme:	Increase the efficiency of national and regional transport systems
Project title:	Reducing the cost of freight in Africa
Project reference:	6240

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CONTENTS

EXECUTIVE SUMMARY

Previous research has shown that during the mid 1980's road freight transport costs in Francophone Africa were in the region of four to five times the costs of freight transport in Pakistan. Data collected from other countries confirmed that in general African transport costs were much higher than in Asia. In order to investigate further the differences in freight transport costs and efficiency between Africa and Asia, and to help identify measures which might reduce costs, a comparative study of road freight transport operations was carried out in Tanzania and Indonesia.

The main data collection of the study was through roadside interview surveys of truck drivers which was supplemented with a series of structured interviews of transport operators at their offices. In Tanzania 270 roadside interviews were carried out on the main road just outside of Dar es Salaam. In Indonesia 250 drivers were interviewed at two commercial rest stops at Pemalang, about 250 km east of Jakarta on the main northern corridor connecting Jakarta with Semerang and Surabaya. In both surveys data were principally collected from drivers undertaking long distance movements. Average loaded trip distances were found to be 803 km in Tanzania and 898 km in Indonesia. Thirty per cent of trucks were found to be empty in Tanzania while only five per cent were empty in Indonesia. However it is believed that in the latter case, the low percentage of empty running may have occurred because of a bias in the sampling technique (only vehicles stopping at the rest stops were interviewed). Two axle trucks made up 56 per cent of the survey in Tanzania but only 43 per cent in Indonesia. Articulated trucks accounted for 25 per cent in Tanzania and 44 per cent in Indonesia. The ownership structure of the vehicle fleet were similar in both countries with private transport companies accounting for about half of the fleet and private individuals a further quarter.

Although there was little difference in mean vehicle age for two axle trucks the larger vehicles in Tanzania were found, on average, to be two years older than in Indonesia. The annual utilisation of two and three axle trucks was found to be about 60,000 km and 80,000 km respectively for both countries. However, Indonesian vehicles were found to achieve 82,000 km per annum compared with 60,000 km for those of Tanzania. These figures are higher than the utilisation recorded in Francophone Africa but less than that found in Pakistan where all types of vehicles travelled more than 110,000 km per year. In terms of methods of finding loads the drivers reported that freight agents were used in 17 per cent of cases in Tanzania and 18 per cent of cases in Indonesia. In contrast in Pakistan over 60 per cent of all drivers found their loads through freight agents.

Two axle vehicles were found to have a mean load of 5.6 tonnes in Indonesia and 7.1 tonnes in Tanzania. Three axle trucks were much heavier loaded in Indonesia, at 15.6 tonnes, compared with 10.5 tonnes for Tanzania. Articulated vehicles had very similar mean loads (21 tonnes) in both countries. Average vehicle journey speeds were found to be very much higher in Tanzania than in Indonesia. For example, for three axle trucks mean journey speeds of 50 kph were reported for Tanzania compared with only 15 kph for Indonesia and 24 kph in Pakistan. The high journey speeds and differences in load factors helped to account for the much higher fuel consumption (per tonne km) found for larger vehicles in Tanzania compared with Indonesia. For three axle trucks a mean fuel consumption of 0.06 ltrs per tkm was recorded for Tanzania compared with 0.03 ltrs per tkm for Indonesia and 0.02 for Pakistan.

Tariff rates per tonne km for trucks carrying 3 to 13 tonnes were estimated to be 8.6 US cents (at mid 1995 prices) for Tanzania, 3.8 US cents for Indonesia and 2.8 US cents for Pakistan. For trucks carrying over 13 tonnes the tariff rates were estimated to be 9.6 US cents for Tanzania, 2.1 US cents for Indonesia and 2 US cents for Pakistan. A large proportion of the differences in tariffs between Tanzania and Indonesia appears to relate to the differences in vehicles and fuel prices. For example a common two axle truck in Indonesia costs about 22,000 US $ and about 65,000 US $ in Tanzania. A tractor and semi-trailer costs about 135,000 US $ in Tanzania while a comparable vehicle costs 73,000 US $ in Indonesia. Fuel is particularly cheap in Indonesia at 0.166 US $ per litre compared with 0.435 US $ per litre in Tanzania.

A number of measures were identified which could contribute to lowering transport costs in Tanzania and the rest of Africa. These include:

a) Competition is the main mechanism by which costs are kept under control or reduced within the transport sector. Every encouragement should be given to ensure that there is competition in both the supply of vehicles and parts and that transport operations remain competitive. Efforts should be made to control the power of the formal and informal trucking associations that are common in Africa. The associations often work to restrict supply and share out available demand through vehicles queuing at lorry parks.

b) Efforts should be made to restrict the use of exclusive dealerships in the import of vehicles and spare parts. High cost, high specification vehicles are frequently used in Africa whereas in Asia deliberate attempts are made to import very cheap basic vehicles which are then, if necessary, modified after purchase.

c) In Pakistan delays are minimised, empty running reduced and tariffs kept low by the extensive use of freight forwarding agents which act in competition with each other.

d) A high utilisation can be achieved by using two drivers that drive night and day. Night driving need not be dangerous if a vehicle's lights are in working order and the vehicle drives slowly.

e) Fuel consumption was found to be high in Tanzania partly as a result of high driving speeds. Slow driving speeds not only reduce fuel consumption but can keep parts consumption low and reduce the risk of accidents.

f) One of the main factors keeping costs low in Pakistan relates to the large measure of responsibility given to the driver. He is aware of costs and revenues of the truck he runs because he finds loads, arranges and pays for maintenance pays for fuel and keeps accounts. He is very aware of the benefits of driving slowly and of paying close attention to routine maintenance.

A COMPARISON OF FREIGHT TRANSPORT OPERATIONS IN TANZANIA AND INDONESIA

ABSTRACT

Previous research has revealed that road freight transport costs in Francophone Africa were in the region of four to five times the costs of freight transport in Pakistan. To investigate further the differences in freight transport efficiency and costs between Africa and Asia new surveys were carried out in Tanzania and Indonesia. This report presents findings from these surveys together with comparative data from Pakistan. The results suggest that in Tanzania long distance freight transport tariff rates and overall tariff revenues per tonne-km are between two to five times those of Indonesia and Pakistan for different vehicle types and load weight categories. The report identifies a range of factors contributing to these differences including disparities in input prices, utilisation, load factors, fuel efficiency and maintenance practices. A range of suggested measures are proposed to help improve efficiency and reduce transport costs.

1. INTRODUCTION

Previous research has been carried out which showed that long distance road freight transport costs in Francophone Africa (ie Côte D'Ivoire, Cameroun, and Mali) were in the region of four to five times the freight transport costs of Pakistan. Limited data collected from Central Southern Africa (Zimbabwe, Zambia and Malawi) indicated that high transport costs also appeared to be common in this region of Africa. In contrast, data collected from India and Vietnam showed that other Asian countries also had low transport costs (Hine and Rizet, 1991, Rizet and Hine, 1993).

To investigate the differences in transport costs further, and to identify any measures which might help to reduce costs, it was decided to carry out similar surveys in Tanzania and Indonesia. In the following the results of these surveys are presented together with data from the earlier Pakistan research. A full description of the Pakistan work is given in TRRL Research Report No 314 (Hine and Chilver, 1991).

In Tanzania a structured interview survey of transport companies was carried out in Dar es Salaam and a roadside survey of truck drivers was undertaken on the main road just outside of Dar es Salaam. The surveys were carried out by staff from the Ministry of Works, Communications and Transport in addition to privately hired enumerators.

In Indonesia a structured interview survey of transport companies was undertaken in Jakarta and a survey of truck drivers was carried out at commercial vehicle rest stops at Pemalang, about 250 km east of Jakarta, on the main northern corridor route of Java. The truck drivers interviews were carried out by staff from Institute of Road Engineering (IRE) located at Bandung.

2. ROAD FREIGHT TRANSPORT IN THE TWO COUNTRIES

2.1 TANZANIA

Tanzania has an estimated population of about 27 million. The mainland land area is 881,000 sq km; hence the population density at about 31 people per sq km is relatively low. In 1993 it had an estimated Gross National Product (GNP) per capita of US$ 90, one of the lowest in the world. From 1980 to 1993 the GNP growth rate was 3.6 per cent per annum which was just above the rate of population growth (World Bank, 1995).

Over half of the Gross Domestic Product (GDP) is derived from agriculture and the population is predominantly rural. Industry accounts for about 14 per cent of GDP. Urban economic activity is heavily concentrated at Dar es Salaam; it has about one third of all manufacturing employment. Other important centres include the port of Tanga, Arusha and Moshi in the north, Mwanza on Lake Victoria and along the main TANZAM corridor connecting Dar es Salaam with the Zambian border.

Dar es Salaam accounts for over 90 per cent of the total mainland port traffic of the country. Besides handling most of the domestic traffic Dar es Salaam is also a key transit port taking traffic for Zambia, Malawi, Rwanda, Burundi and eastern Zaire.

In total there are reported to be 82,000 kilometres of national, regional and district roads. Most of these roads are rural earth roads. The main trunk road network is 10,300 km in length of this about 3,800 km has a bitumen surface and 3,300 km has a gravel surface.

In 1986 the Economic Recovery Programme (ERP) was introduced and various measures were subsequently taken to promote economic recovery and development through liberalisation and deregulation. As a result of these measures the private sector was able to undertake activities previously restricted to the public sector. Within the transport sector private companies could market and supply agricultural crops and inputs. Freight tariffs were decontrolled and there was a liberalisation of foreign exchange allocation procedures.

In an attempt to restore the essential road network to acceptable conditions the Integrated Roads project (IRP) was introduced in 1987 with considerable donor support. As a result, there has been a large increase in the funding allocation for roads. For example in 1987/88 US$ 21m of the government development budget was spent on roads, whereas by 1992/93 this had risen to US$ 76.5m, of which 76 per cent was from foreign sources. In June 1993 it was estimated that by the end of 1995 64 per cent of paved (trunk) roads will be in good condition (Ministry of Works, 1993).

Within Tanzania the total transport sector accounts for about six per cent of GDP and, in view of the importance of transit traffic, about 15 per cent of foreign exchange earnings. Road transport accounts for over 70 per cent of freight movement in the country. It has been estimated that in 1993/94 total road freight transport demand was composed as follows:

international road freight:	750 m tonne-km
inter-regional road freight:	2850 m tonne-km
intra-regional road freight:	150 m tonne-km
total road freight:	3750 m tonne-km

International road freight mainly consists of transit traffic to and from Dar es Salaam. There are believed to be about 60 private Tanzanian companies operating in this sector. They tend to use high capacity trucks and have typical fleet sizes of between 10 to 30 vehicles. During 1994 and 1995 demand is believed to have fallen as traffic destined for Rwanda and Burundi has switched to using the port of Mombasa while Malawi traffic has switched to using Mozambique ports.

Inter-regional road freight accounts for about 75 per cent of the total freight transport demand. A high proportion of this movement is between regional centres and Dar es Salaam. Most of the companies operating in this sector are private with a high proportion of transporters only owning one truck. Most of the trucks used have two axles with load capacities of ten tonnes or less.

The intra-regional market only accounts for a small proportion of freight movement. This component of traffic mostly consists of short distance movement between district and regional centres and villages. Most transport is by smaller capacity two-axle trucks. The public sector has a higher proportion of the market than for the longer distance movements. Public sector transporters comprise cooperatives, parastals and the Regional Transport Companies (RETCOs).

The exact number of freight vehicles in Tanzania are not known but, for vehicles of three tonnes and above, it may now be the region of 15,000 compared with an estimate of 10,300 in 1986 and 13,200 in 1991. Over the last 20 years there have been a number of reports which have argued that there was a shortage of transport capacity in the country. (Examples include the 1975 Fourth Highway Project, the 1977 World Bank's Trucking Industry Rehabilitation and Improvement Project and more recently the 1993 Road Transport Study for the National Transport Corporation). The arguments used to support this case have included the severe difficulty of finding trucks in rural areas, the numbers of immobile vehicles without spare parts and an analysis based on estimated demand compared with estimated capacity assuming certain levels utilisation. To help tackle this problem there have been various donor assisted programmes to improve the procurement of vehicles and spare parts. Besides the World Bank's 1977 project there have been import support schemes financed by UK, Italy, Sweden and India as well as programmes supported by the Nordic countries, International Finance for Agricultural Development (IFAD) and Japan.

A recent report has argued that supply now exceeds demand, particularly for intra-regional transport. The evidence for this is that freight transport rates have fallen in real terms and that the import of new trucks has declined from the peak levels in 1992 (National Transport Corporation, 1995).

2.2 INDONESIA

Indonesia has an area of 1.9 m sq km and, in 1993 a population of 187 million. However more than 60 per cent of the population live on the island of Java which has an area of 132,000 sq km. Java's population density is very high at about 877 people per sq km. In 1993 it had an estimated GNP per capita of US$ 740. Between 1980 and 1993 it had a GDP growth rate of 5.8 per cent per annum and a population growth rate of 1.7 per cent per annum. In contrast to Tanzania in 1993 agriculture only accounted for 19 per cent of GDP while industry accounted for 39 per cent. The Jabotabek region, an area around the capital, Jakarta (pop. 6.5 m) is the most important economic region of the country. On Java other important towns are Surabaya (pop. 2 m), Bandung (pop. 1.5 m) and Semerang (pop. 1 m).

Within Indonesia coastal, shipping, road and rail all play an important role. For example in 1991 the following inter-urban domestic freight modal split was estimated for Java:

	billion tonne-km
Road	27.6
Rail	1.1
Coastal shipping	42.1
Total	70.8

Long distance road freight transport tends to be chosen over rail and coastal shipping for non bulk commodities because of speed and reliability.

During the 1980's, the annual vehicle fleet grew at an annual rate of 9 per cent. To accommodate the growing

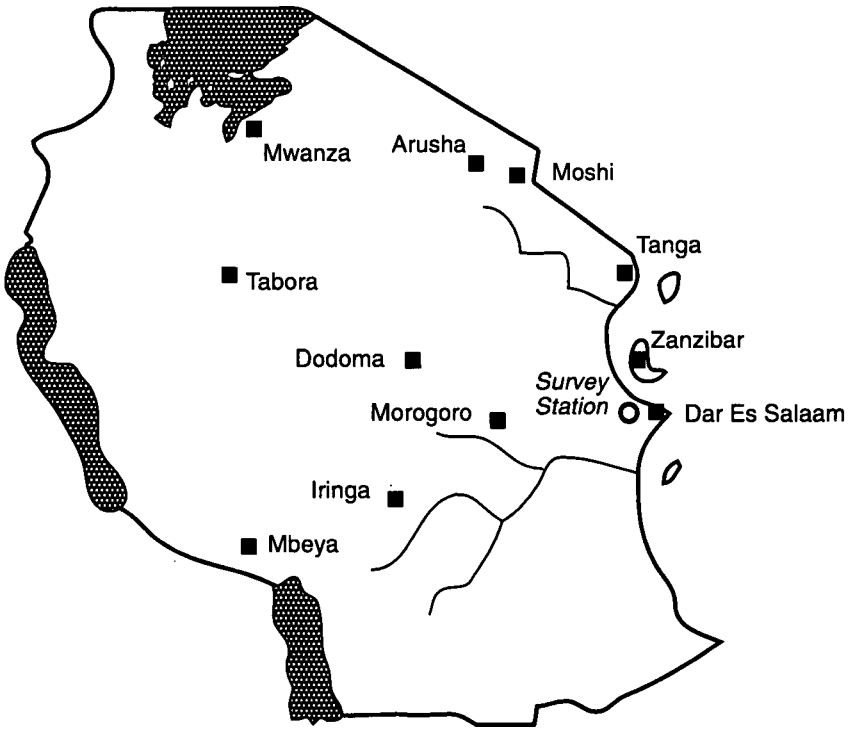

Fig. 1 Map of Tanzania

traffic volumes there has been a considerable expansion in the classified road network from 160,000 km in 1979 to 260,000 km in 1992 (of which 17,700 km are national roads and 34,100 km are provincial roads). In addition it has been government policy to significantly increase expenditure on the road sector over the last ten years. The five year highway sector development plan, Repelita V (1989-94) placed a strong emphasis on the rehabilitation and maintenance of the national and provincial road network. In real terms the 1995/96 expenditure is expected to be around three times the level of 1984/85. During the period 1991-1994 expenditure on maintenance and betterment for the national and provincial network has averaged around US$ 1 billion. This represents around US$ 19,000 per km, a very high figure compared with other developing countries.

On Java all of the national and provincial roads are paved and most are in good or reasonable condition. For example, in 1993 it was estimated that 53 per cent of their length was below 4 IRI (International roughness index) while a further 30 per cent of their length was between 4 and 6 IRI. Congestion is now a major problem in Indonesia, for Java the average annual daily traffic level (AADT) on national and provincial roads was estimated to be 3900. By 1994, 374 km of urban and inter-urban high capacity toll roads were built principally to serve the Jakarta area (Ministry of Works, 1993).

In 1990 it was estimated that there were one million trucks in Indonesia. Since 1985 government control of road and sea freight tariffs has been relaxed and now prices are set by the market. Although route licences are required for freight vehicles to cross provincial boundaries in Java the regulations have been relaxed and it is not thought to cause major economic distortions. Own account trucking operators are believed to account for more than half of all road transport. The majority of for hire operators own only a small number of vehicles although there are some operators who own relatively large fleets. The market is generally believed to be competitive.

3. THE SURVEYS

In Tanzania 270 roadside interviews were carried out with truck drivers on the main road just outside of Dar es Salaam on four separate days in late July and August 1995. In total 28 per cent of trucks passing the survey point were stopped. A map of Tanzania showing the location of the major towns is given in Figure 1.

A range of questions were asked about the origin and destination of the journey, the load, tariff, vehicle utilisation, operating costs and ownership of the truck. This survey was supplemented with information from about a dozen structured interviews with transport operators in Dar es Salaam where more detailed questions were asked about operating costs and management practises. Example of the questionnaires are given in Appendix A.

Although driver cooperation was good, their knowledge on

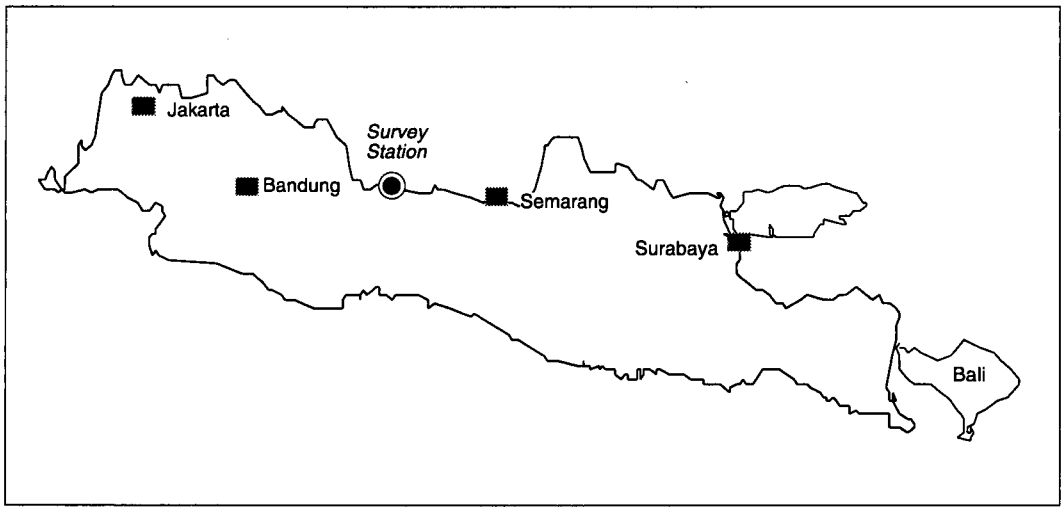

Fig. 2 Map of Java

operating costs was rather limited and some of the data was difficult to interpret. While some transport operators were willing to cooperate with the structured interview others were not. There appeared to be suspicions that the interviewers were acting on behalf of the tax authorities!

In Indonesia 250 interviews of truck drivers were carried out at two commercial vehicle rest stops at Pemalang, about 250 km east of Jakarta on the main northern corridor connecting Jakarta to Semerang and Surabaya. This road is one of the busiest in Indonesia with an estimated traffic flow of nearly 15,000 vehicles per day. Over the three day period approximately 1.6 per cent of the passing trucks were surveyed. A map of Indonesia showing the location of the survey station and major towns is given in Figure 2.

The interviews were undertaken during the first three days of December, 1995. The interview form (translated into Bahasa Indonesia) was almost identical to that used in Tanzania (see Appendix A). The data was supplemented with ten structured interviews with transporters in the Jakarta area. Cooperation with both drivers and transporters was good, although again it was not possible to collect much detailed information on operating costs.

4. SURVEY RESULTS

For ease of comparison, the results of the two surveys are presented together as far as possible. Where appropriate data from the Pakistan freight transport study are also given.

4.1 TRIP CHARACTERISTICS AND VEHICLE TYPE

As can be seen from Table 1 there was a close match in the total number of trucks surveyed travelling to and from Dar es Salaam. Loaded distances from Dar es Salaam were higher than those travelling in the opposite direction. With a mean loaded trip distance of over 800 km the survey is representative of long distance trip movements.

Because of the location of the survey all of the trucks were going to or from Dar es Salaam. About 13 per cent of the loaded trucks surveyed were travelling out of the country; Zambia, Kenya and Rwanda were the most important origins and destinations. A wide range of internal origins and destinations were recorded. Out of the 186 loaded

TABLE 1

Tanzanian truck survey

Direction	No.	Loaded trucks mean trip distance km	No.	Empty trucks mean trip distance km
To Dar es Salaam	85	598	48	629
From Dar es Salaam	101	979	31	285
Total	186	803	79	478

TABLE 2

Indonesian truck survey

Direction	No.	Loaded trucks mean trip distance km	No.	Empty trucks mean trip distance km
To Jakarta	114	924	8	651
From Jakarta	103	859	4	1125*
Total	217	898	12	809

*distances based on very small sample

surveyed trucks the most important origins and destinations were: Mwanza (19), Mbeya (19), Tanga (18), Morogoro (16), Iringa (12), Dodoma (11), and Moshi (10).

Basic information on the Indonesian survey is given in Table 2. Here it can be seen that slightly more trucks were surveyed going towards Jakarta than in the opposite direction. Only a very small proportion (5 per cent) of the trucks surveyed were empty. This is well below what might be expected from other freight surveys. Because the survey was not a pure random roadside survey (in which trucks are stopped at random) but was dependent on interviewing trucks already stopped at the two commercial truck parks it is possible that the survey was biased towards long distance loaded trucks. In addition, because the survey was conducted well away from major urban areas, it is to be expected that fewer empty trucks would be surveyed. It is usual to record much higher levels of empty running in and close to urban areas as empty trucks travel between customers and to and from their base depot.

Out of the 217 loaded trucks 112 had origins or destinations in Jakarta while 81 were travelling to or from the Surabaya area. The two next most important origins and destinations were Semerang (18) and Bali (10).

Trip distance distributions for the two surveys are given in Figures 3 and 4. Although there is little difference between Tanzania and Indonesia in the average loaded trip distance (803 and 898 km) it can be seen that there was a much greater variation in trip lengths in the Tanzanian survey with many very long distance international trips as well as many shorter trips. A high proportion of the Indonesian survey recorded trips between Jakarta and Surabaya which is reflected in Figure 4. Again an element of bias may have occurred in the Indonesian survey as drivers on shorter distance trips may not have wanted to stop for a break.

Information on truck configurations is given in Figures 5 and 6. Here it can be seen that two-axle trucks appear to be more important for long distance transport in Tanzania. In contrast truck and trailer combinations are proportionately more numerous in Indonesia while there is little difference in the proportions of the larger three-axle trucks and the tractor and semi-trailer combinations.

A wide range of vehicle makes were recorded in both countries. In Tanzania the most popular makes were Scania (25 per cent) and Isuzu (18 per cent). In Indonesia by far the most popular make was Mitsubishi with 36 per cent of the total fleet. Japanese makes were far more popular in Indonesia, accounting for 60 per cent of the total, compared with only 32 per cent in Tanzania.

An analysis of data showed that, in the Indonesian survey, there was no clear relationship between vehicle capacity and trip distance. Mean loaded trip distances for two-axle trucks and articulated vehicles were very similar at about 920 km and 900 km respectively, while three-axle trucks appeared to have an average trip distance of about 800 km. In contrast vehicle size appeared to have a marked effect on trip distances in the Tanzanian survey. Two-axle trucks travelled the shortest distances while articulated vehicles travelling from Dar es Salaam, (with a high proportion on international trips) had mean journey distances of more than double those of the two and three-axle trucks. The results are shown in Table 3.

Data on truck body types are given in Figures 7 and 8. Here it can be seen that high sided trucks are more important in Indonesia. In the Tanzanian survey tankers were an important component of the traffic while very few were recorded in the Indonesian survey. The latter probably reflects a peculiarity of the northern corridor route as tankers appear to be more commonly observed on other routes in Java.

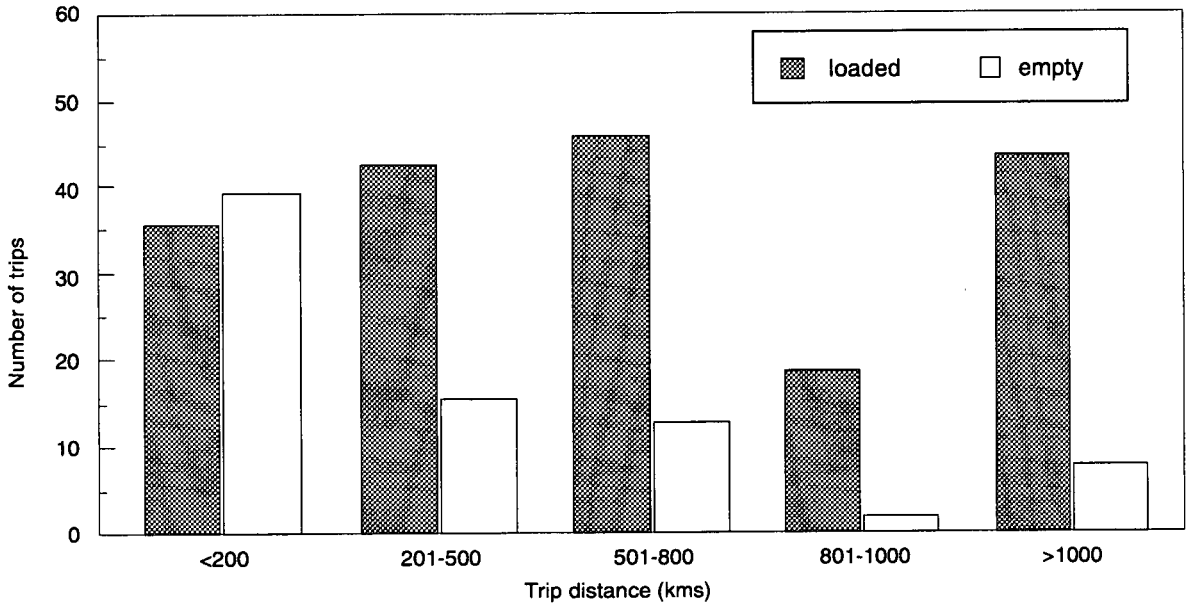

Fig. 3 Number of trips loaded/empty by trip distance - Tanzania

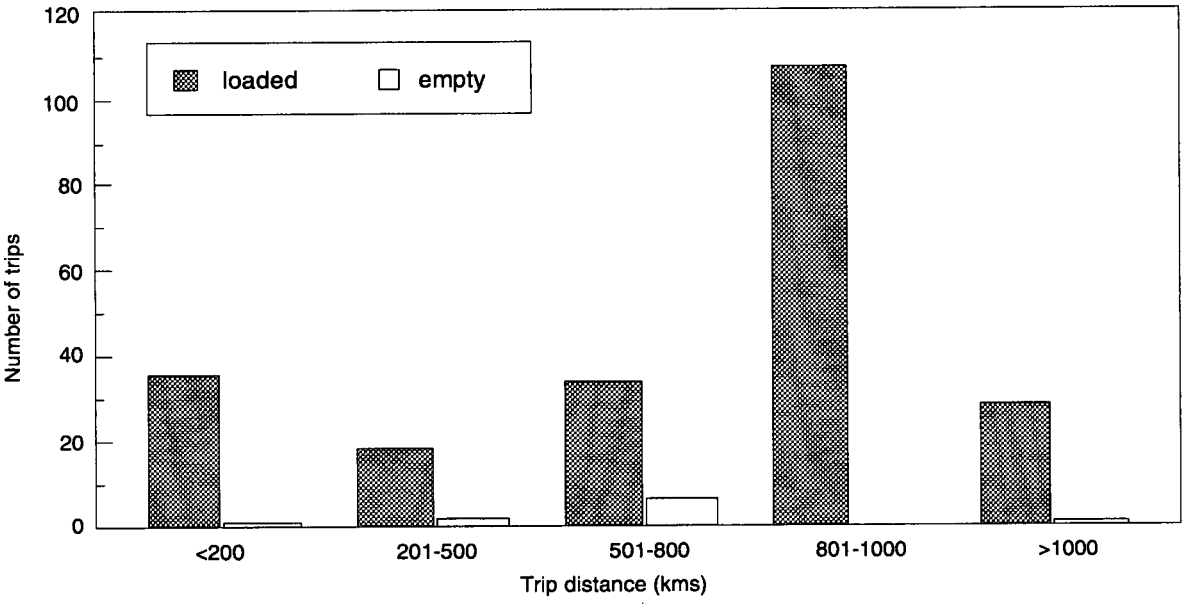

Fig. 4 Number of trips loaded/empty by trip distance - Indonesia

TABLE 3

Tanzania: Mean loaded trip distance by vehicle type

Direction	2 axle	3 axle	articulated
To Dar es Salaam	496	623	728
From Dar es Salaam	616	632	1520
Mean	561	627	1190

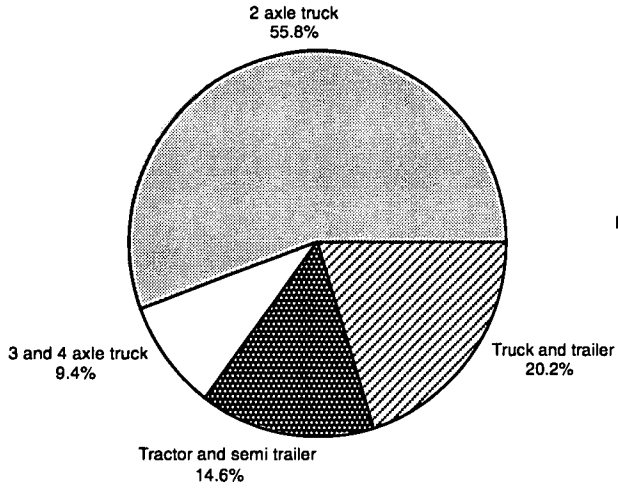

Fig. 5 Truck configurations - Tanzania

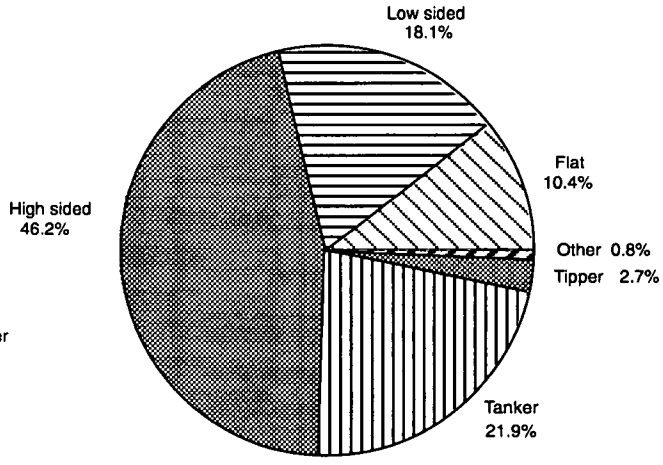

Fig. 7 Truck body type - Tanzania

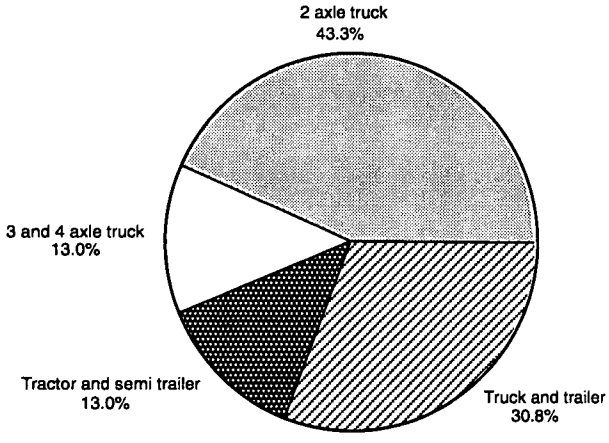

Fig. 6 Truck configurations - Indonesia

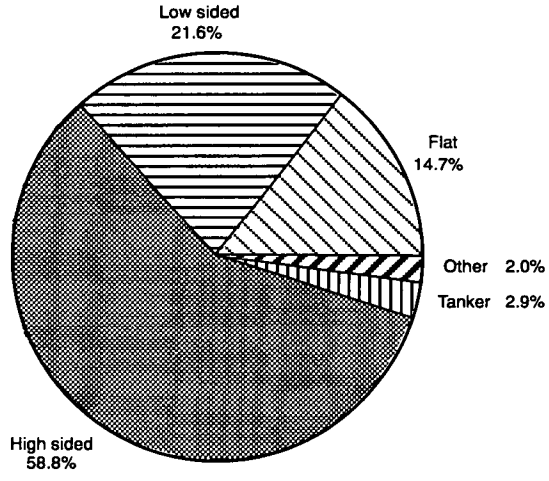

Fig. 8 Truck body type - Indonesia

4.2 TRUCK OWNERSHIP, CREW CHARACTERISTICS AND METHODS OF FINDING LOADS

Information on the patterns of truck ownership are given in Figures 9 and 10. Important similarities were observed in the ownership structure with both surveys recording that half of the trucks were owned by private transport companies. Very few owner-drivers were recorded in either survey, in contrast in the Pakistan survey 20 per cent of drivers had a full or part share in the vehicle.

The biggest difference observed between the two surveys was that in Indonesia private non-transport companies (operating mainly on own-account business) owned 20 per cent of the trucks whilst in Tanzania this was just six per cent. This difference may well reflect the more diverse industrial structure of Indonesia. Another difference recorded was that in Tanzania state transport companies owned over six per cent of the vehicles while in Indonesia this was less than one per cent.

In both Tanzania and Indonesia there was an average of 1.06 drivers to each truck. In addition there were also averages of 1.06 assistants in Tanzania and 1.16 assistants in Indonesia to help with looking after the load and various other routine jobs required by the drivers. In comparison in Pakistan there was an average of 1.57 drivers and one assistant to each truck.

In Tanzania 85 per cent of drivers were regular employees while 12 per cent were casual employees. Very similar results were recorded for the drivers in Indonesia where the corresponding figures were 83 per cent and 10 per cent.

Information on finding loads (for non-tankers) is given in Figures 11 and 12. Directions from the transport company's dispatch clerk were much more important in Indonesia (54 per cent) than in Tanzania (37 per cent). However in Tanzania 13 per cent of drivers found their loads from truck parks compared with two per cent of drivers in Indonesia. In both surveys, similar proportions of drivers found their own loads (20 per cent) or used freight forwarding agents (17 and 18 per cent).

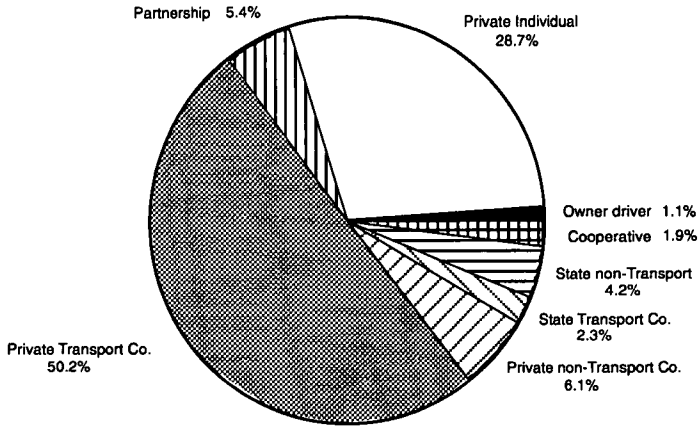

Fig. 9 Truck Ownership - Tanzania

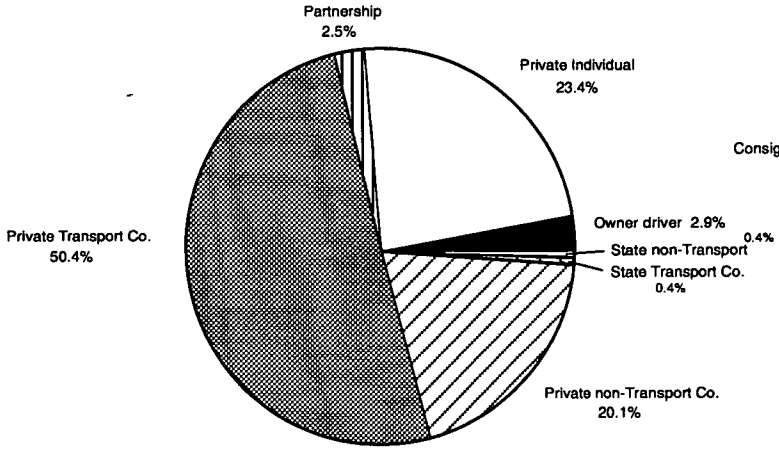

Fig. 10 Truck Ownership - Indonesia

In contrast in Pakistan over 60 per cent of all drivers found their loads through freight agents, of the remainder the vast majority found their own loads. Very little use was made of company dispatch clerks or of truck parks to find loads.

4.3 VEHICLE AGE, UTILISATION, LOADING AND EMPTY RUNNING

Estimates of mean vehicle age, for different vehicle types are given in Table 4. This shows that for the larger vehicles Tanzania has an older vehicle fleet than Indonesia. In comparison at the time of the Pakistan surveys mean vehicle age was 9 yrs.

Estimates of annual vehicle utilisation are given in Figure 13. The figures were calculated from drivers' estimates of their own utilisation. In order to reduce the effect of unrepresentative extreme values the estimates shown for Tanzania and Indonesia in Figure 13 are based on median values. The figures show little difference between Tanzania and Indonesia in three-axle (60,000 and 56,000 km) and articulated trucks (80,000 and 78,000 km) but for two-axle trucks the Indonesian trucks appeared to achieve a higher annual utilisation (82,000 km compared with 60,000 km). In part these differences are a reflection of the mean trip distances of the different types of trucks. Much higher utilisation rates were recorded in the Pakistan surveys where all truck types travelled, on average, more than 110,000 km. Despite this the survey data for Tanzania and Indonesia compares well with the utilisation rates found in Francophone Africa where articulated vehicles achieved only 50,000 km and three-axle trucks 35,000 km per year (Rizet and Hine, 1993).

Information on mean vehicle loads (for non-tankers) is given in Figure 14. Here it can be seen that Pakistan achieved consistently higher loads, for each vehicle type, than the other two countries. Two-axle Indonesian trucks

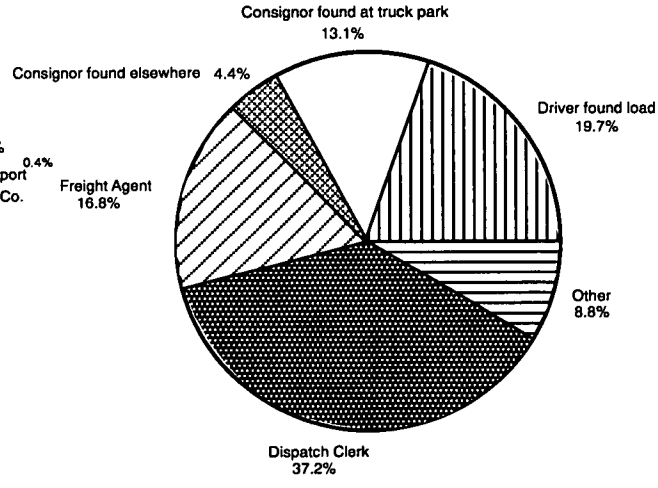

Fig. 11 Methods of finding loads (for non-tankers) - Tanzania

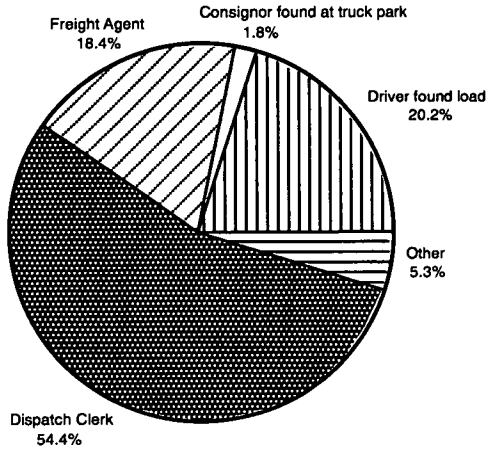

Fig. 12 Methods of finding loads (for non-tankers) - Indonesia

TABLE 4

Estimated mean vehicle age (years)

Truck type	2 axle	3 axle	articulated
Tanzania	7.2	9.0	8.6
Indonesia	7.3	6.5	6.5

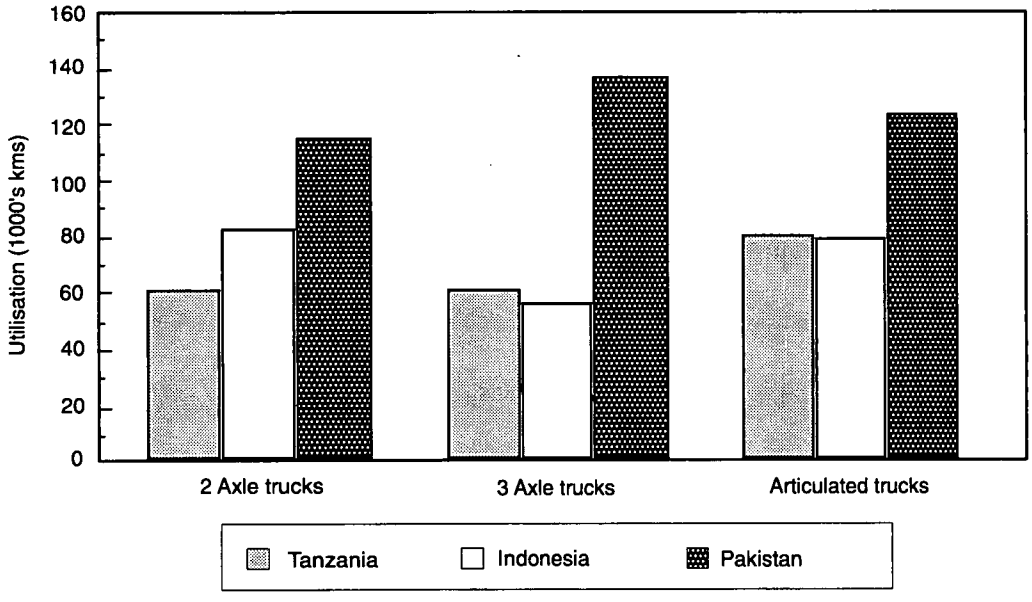

Fig. 13 Annual truck utilisation (1000's kms)

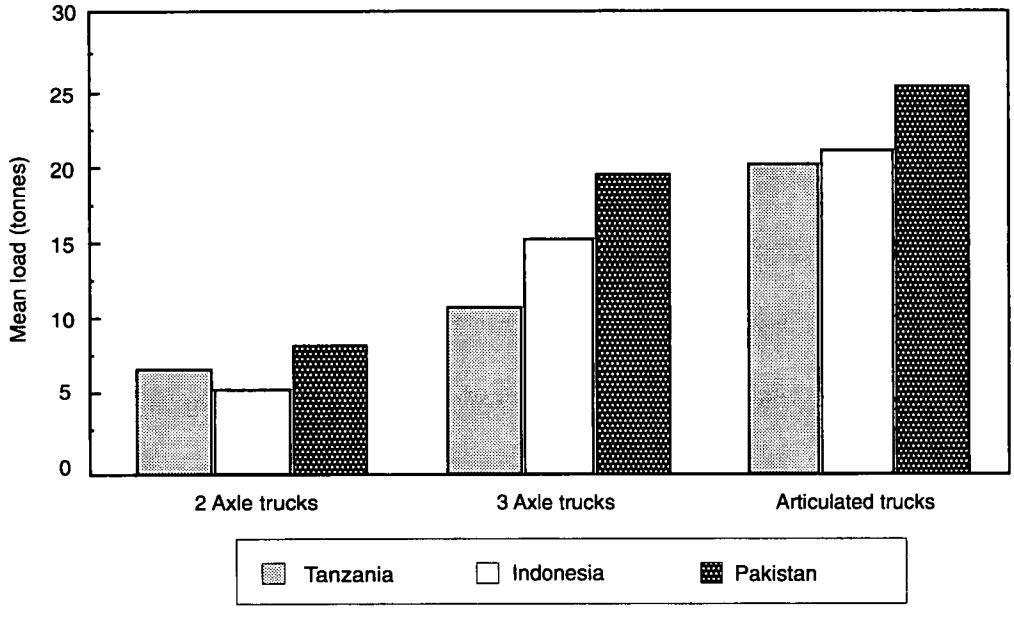

Fig. 14 Mean load (tonnes)

TABLE 5

Extent of vehicle overloading

	mean maximum permitted load tonnes	mean load tonnes	per cent overloaded	mean amount of overloading tonnes
Tanzania				
2 axle	8.5	7.1	0	0
3 axle	16.5	10.5	0	0
artics	33.1	20.6	7	9.8
Indonesia				
2 axle	6.4	5.6	13	2.1
3 axle	14.9	15.6	19	14.2
artics	24.2	21.7	19	8.9

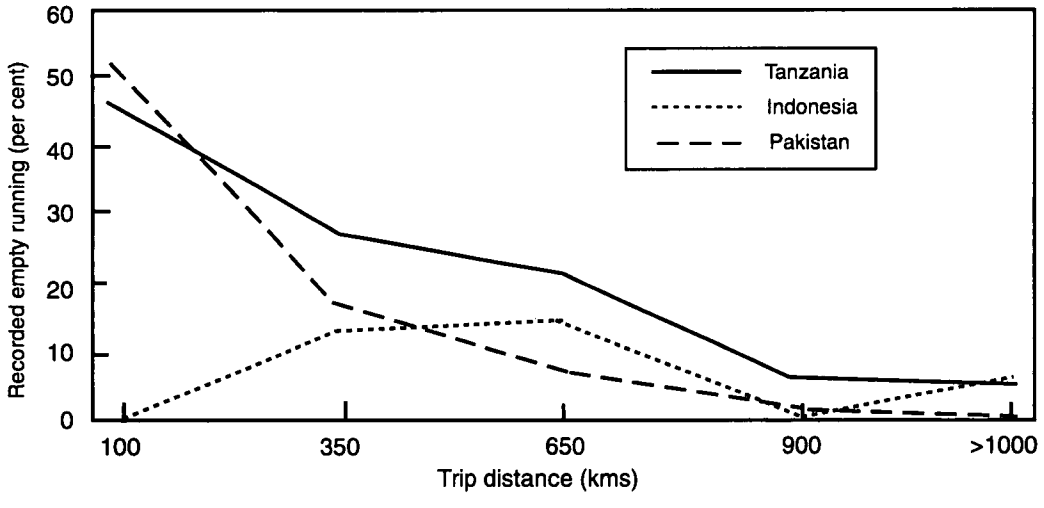

Fig. 15 Recorded empty running (per cent)

were found to have much lower maximum permitted loads than those in Tanzania or Pakistan and this accounts for the particularly low load factors for these vehicles (5.6 tonnes compared with 7.1 and 8.2 for Tanzania and Pakistan). The mean maximum permitted load recorded for Tanzanian three-axle trucks was found to be relatively high at 16.5 tonnes however the mean recorded load (10.5 tonnes) was much lower than for three-axle trucks in the other two countries.

An analysis of vehicle overloading was carried out for Tanzania and Indonesia and the results presented in Table 5. Here it can be seen that Indonesian trucks were much more likely to be overloaded than Tanzanian trucks.

The extent of empty running is shown in Figure 15. Here it can be seen that apart from the shortest trips Tanzania appears to have a higher level of empty running than Pakistan or Indonesia. However because the Indonesian survey was not based on a pure random sample (see Section 4.1 above) there are grounds to suspect that the level of empty running has been underestimated.

In comparison with other surveys the level of empty running in Tanzania does appear to be well below that found in China (Hine et al 1995) and also below that found in Francophone Africa (Rizet and Hine, 1993).

4.4 JOURNEY SPEEDS AND FUEL CONSUMPTION

During the surveys drivers were asked to give their overall journey times, including rest stops, and from this data overall journey speeds were estimated. This data is given in

Figure 16. Here it can be seen that Tanzania has much higher journey speeds than the other two countries. Journey speeds appear to be two to three times those in Indonesia and up to twice the speeds of Pakistan.

Overall journey speeds are a function of a number of factors including rest stops, desired speed under ideal conditions, road geometry and traffic congestion. The relatively high speeds in Tanzania probably reflect a high desired speed in combination with low traffic congestion.

Research carried out by the Transport Research Laboratory in Kenya (Hide et al, 1975) found that spot truck speeds for trucks on good condition wide, flat, straight paved roads without congestion were about 68 kph. In contrast research carried out in Pakistan (Majeed 1980) found that, for a range of sites, the maximum mean spot speeds for trucks was 59 kph while the average mean speed was 52 kph. While research carried out in Indonesia (Bång, 1994) suggested that desired speeds for medium and heavy trucks were 69 kph and 66 kph respectively.

The very low journey speeds found in Indonesia probably relates to long rest times and high congestion. Although much of central Java is mountainous the northern corridor route is fairly flat and in good condition.

Most main roads in Pakistan are flat and straight however they do not have the same high traffic levels as in Indonesia and congestion is not a severe problem. The low journey speeds in Pakistan are much more a reflection of the low desired speeds than any other factor. Rest times in Pakistan are probably not as long as in Indonesia or Tanzania because a majority of trucks have more than two drivers and a high utilisation is achieved as a result.

Fuel consumption is a function of driving speed where minimum consumption for a truck is achieved at around 30 to 40 kph (Hide et al, 1975). Average fuel consumption, per vehicle kilometre, is given in Figure 17. Here it can be seen that Pakistani vehicles have lower fuel consumption rates than vehicles from the other countries. However once the higher load factors are taken into account the differences are much greater. For similar vehicle types Pakistani trucks have fuel consumption rates, per tonne-km (tkm), that are approximately half those of Tanzania and well below those of Indonesia (see Figure 18).

4.5 FREIGHT TARIFFS

Survey data collected on freight tariffs (for non-tankers) in Tanzania and Indonesia are shown in the graphs of Figures 19 to 24. Only a minority of drivers had knowledge of the tariff charged and very little reliable data could be collected for the larger loads in Tanzania. The graphs show a wide variation in tariff rates, per tkm; similar wide variations have been found in Pakistan and in other surveys.

For two and three-axle trucks in Tanzania the average rates found were about 57 Tanzanian shillings (Tsh) (9.3 US cents) per tkm. After adjusting for inflation very similar rates have been reported for inter-district movements in both 1993 and 1994. For example, in 1993 for 7-8 tonnes trucks rates were 63.5 Tsh per tkm; for 10-12 tonnes: 53.1 Tsh per tkm; and for 15 tonnes: 50.5 Tsh per tkm. In 1994 a mean rate of 52.4 Tsh per tkm was recorded (National Transport Corporation,1993 and 1995).

For the heavier vehicles in Tanzania a mean rate of around 50 Tsh (8.1 US cents) per tkm was recorded but, as can be seen from the graph, this cannot be taken as a reliable

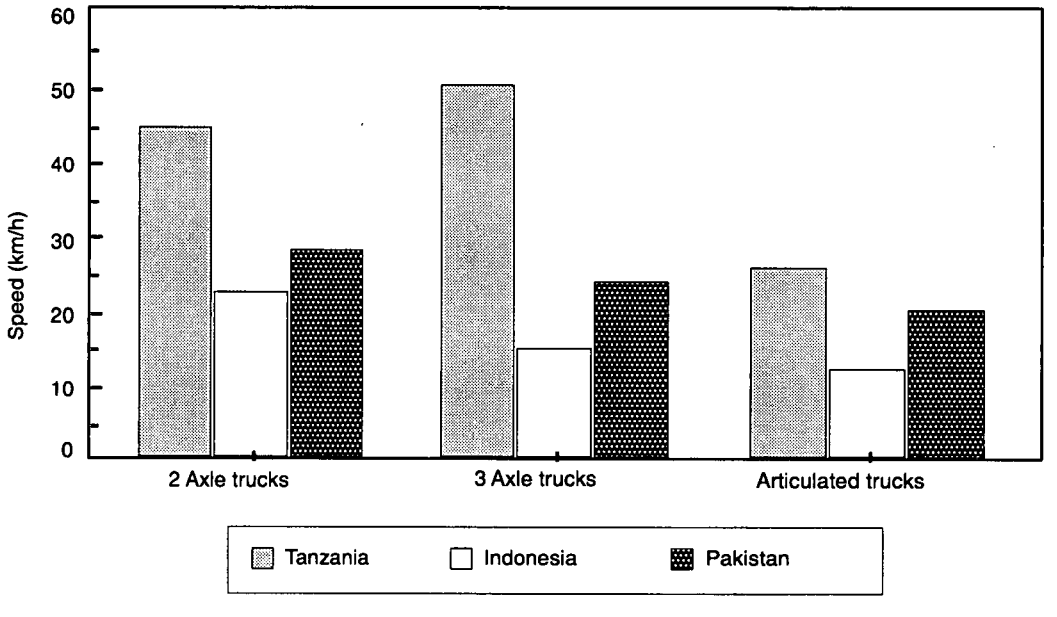

Fig. 16 Average journey speeds

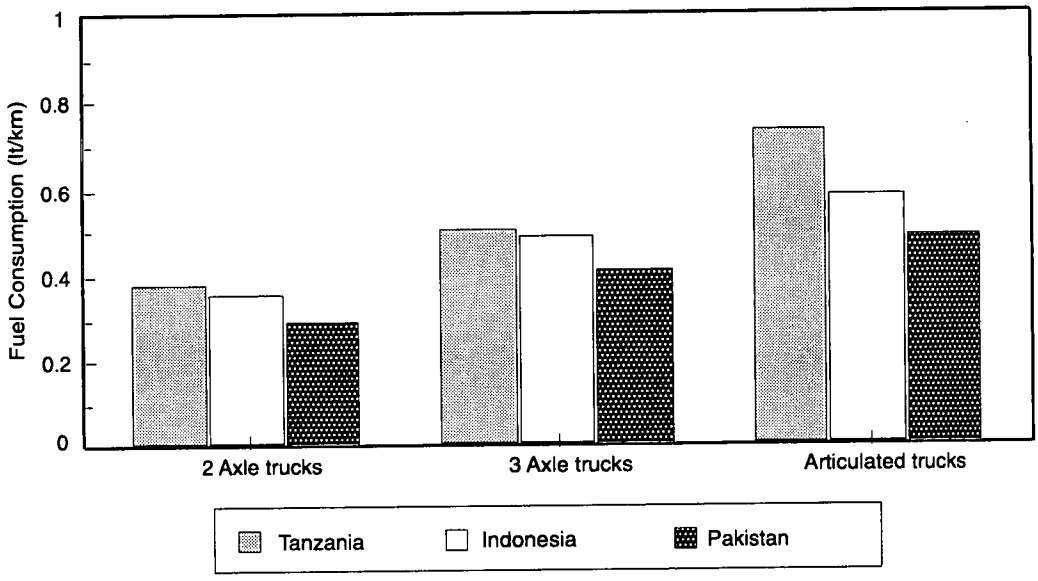

Fig. 17 Average fuel consumption

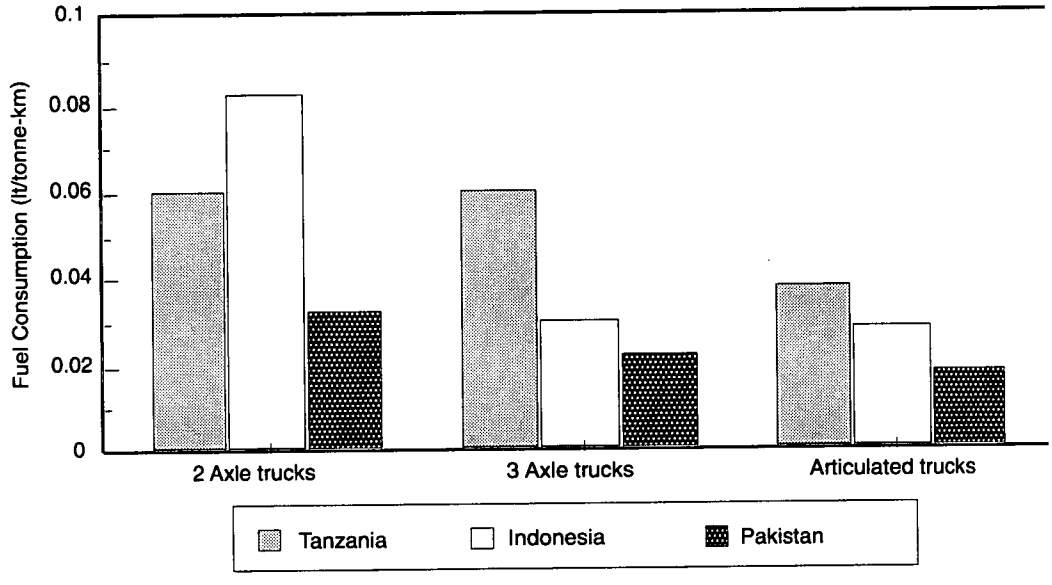

Fig. 18 Average fuel consumption per tonne km

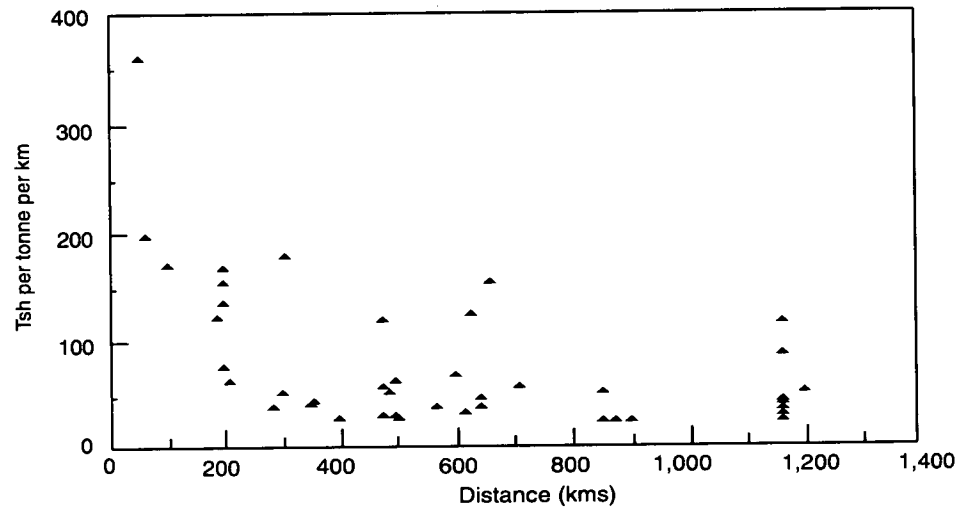

Fig. 19 Tanzanian tariffs for loads between 3 and 13 tonnes

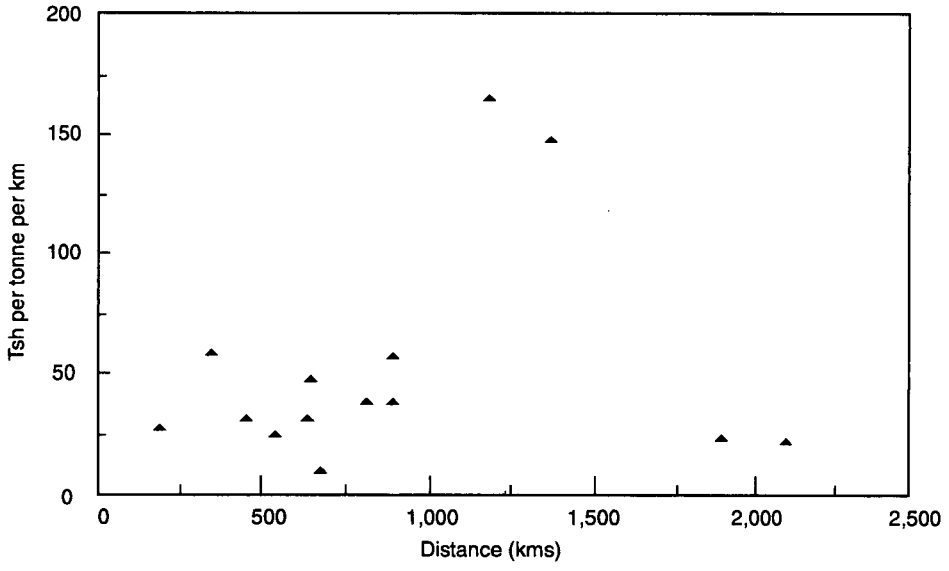

Fig. 20 Tanzanian tariffs for loads greater than 13 tonnes

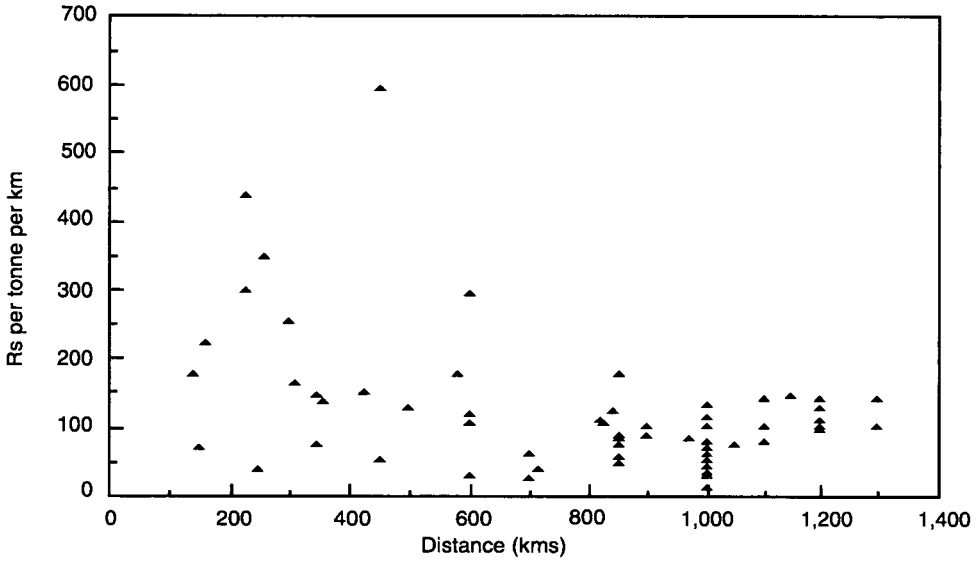

Fig. 21 Indonesian tariffs for loads between 3 and 13 tonnes

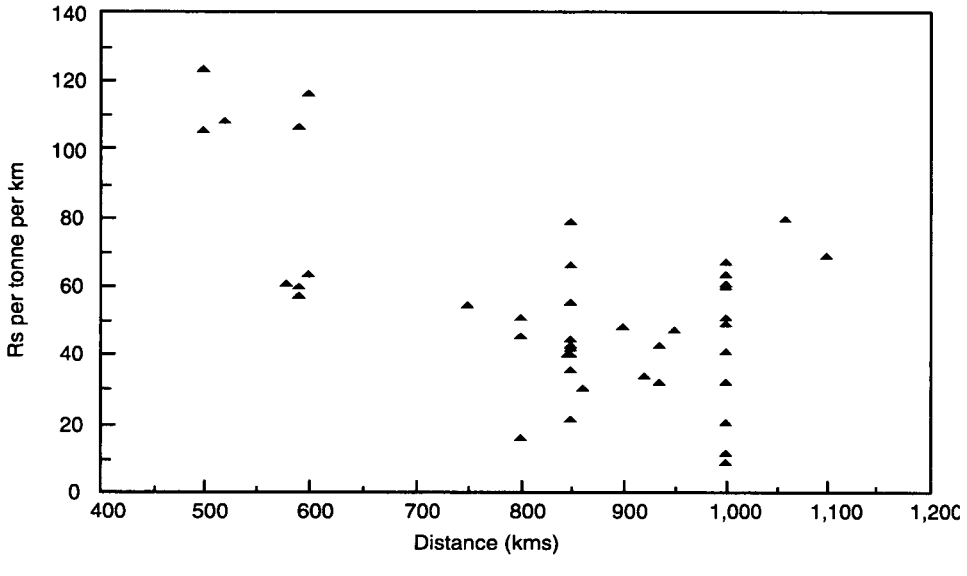

Fig. 22 Indonesian tariffs for loads greater than 13 tonnes

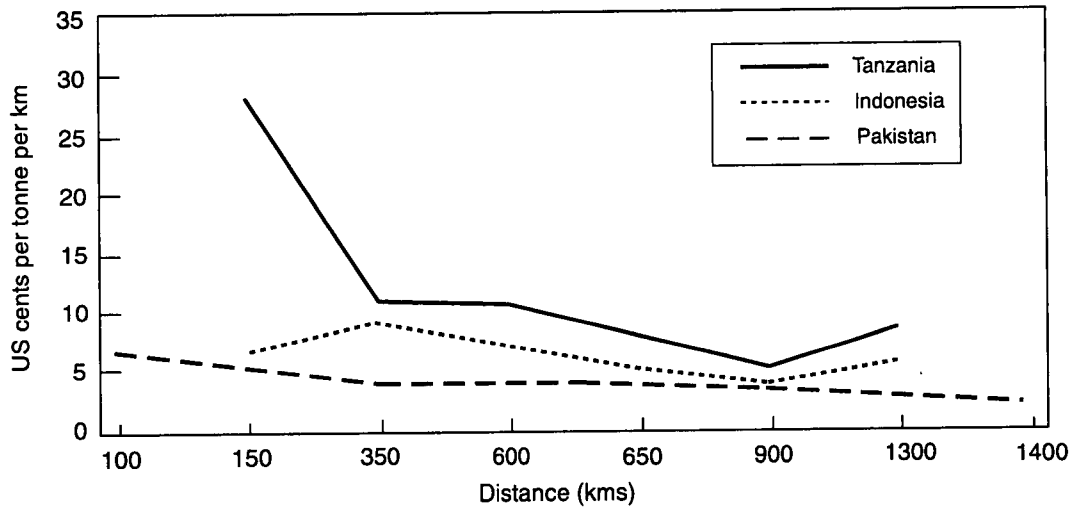

Fig. 23 Tariffs for loads of 3 to 13 tonnes (US cents per tkm)

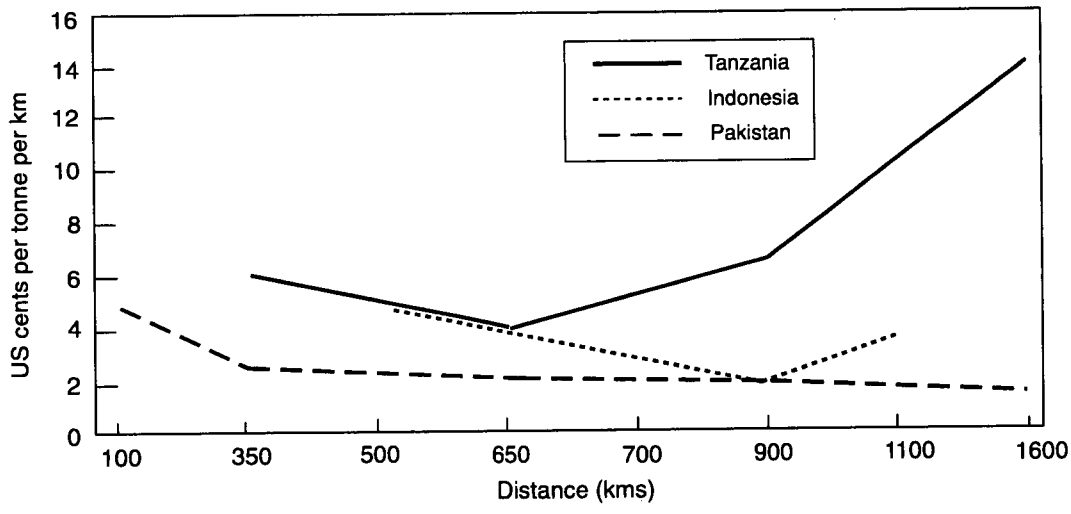

Fig. 24 Tariffs for loads of more than 13 tonnes (US cents per tkm)

estimate. Discussion, held in August 1995, with transporters and representatives of the World Food Programme quoted rates in the range of 33 to 55 Tsh per tkm for the movement of heavy loads on international routes, with an average of about 44 Tsh (7.1 US cents) per tkm. Rates as high as 70 Tsh per tkm were quoted for late 1994 and early 1995 for traffic to Burundi. Many transporters complained that there had been a substantial reduction in international traffic from Dar es Salaam and that rates had fallen as a result.

An analysis of the survey data showed that, for trips of less than 500 km tariff rates for two and three-axle trucks travelling to Dar es Salaam were in the region of 50 per cent higher than for trucks travelling in the opposite direction. In contrast, for trips that were greater than 1000 km and travelling from Dar es Salaam tariff rates were more than twice the rates of those travelling towards Dar es Salaam. For articulated vehicles there were insufficient data to identify any directional differences in tariffs.

In Indonesia the average rates found in the survey were, per vehicle km, 619 Rupiah (Rs) (27 US cents) for two-axle trucks, 919 Rs (40 US cents) for three-axle trucks and 1178 Rs (52 US cents) for articulated vehicles. Expressed per tonne km the corresponding figures are: 115 Rs (5 US cents), 70 Rs (3 US cents) and 65 Rs (2.9 US cents). In comparison higher rates were quoted by transporters moving containers (2000 Rs per km, and 2300 to 2500 Rs per km for 20ft and 40 ft containers respectively). However higher rates for containers are to be expected because it is often difficult to arrange backhauls for containers.

For loads of 3 to 13 tonnes, Figure 23 shows how tariff rates for Tanzania, Indonesia and Pakistan compare for different distances. The tariff rates are expressed in US cents. The following rates of exchange used were: Tanzania Sh 616 to US$ 1, Indonesian Rs 2285 to US$ 1 and Pakistan Rs 31.32 to US$ 1 with an additional adjustment factor of 2.328 for inflation in Pakistan to convert 1986 prices to 1995 prices. The graph shows that tariff rates in Tanzania are much higher than for Pakistan with Indonesia taking an intermediate position; the differences are most marked for short distance for loads in the 3 to 13 tonne range.

Table 6 provides an overall comparison of freight tariff revenues. Here the tariff revenues quoted are calculated for all trucks, excluding tankers, carrying loads in the different load categories using the following formulae:

tariff revenue per km = total tariff revenue/ total loaded distance

tariff revenue per tonne km = total tariff revenue/ sum (loaded distance* load weight)

The Table indicates that, on an inflation adjusted basis, overall tariff revenues, per tkm, in Tanzania are in region of three to five times those of Pakistan and two to four and a half times those of Indonesia. The differences between Tanzania and Pakistan are comparable with the differences found in earlier studies between Francophone Africa and Pakistan (Rizet and Hine, 1993). For heavier loads (above 13 tonnes) overall tariff revenues in Indonesia are very similar to those found in Pakistan. In this category, the average load factors for Pakistan are less than for the other countries. This is because, at the time of the survey in Pakistan, there was a higher ratio of three-axle trucks compared with articulated trucks than were found in the Tanzanian and Indonesian surveys. For the smaller loads overall tariff revenues, per tkm, are around one third higher in Indonesia than in Pakistan. The main reason for this relates to the much lower loads found in Indonesia.

5. AN ANALYSIS OF VEHICLE OPERATING COSTS

In order to explain the differences in tariffs found in the previous section it is useful to carry out an analysis of vehicle operating costs (VOCs). Inter-country variations in vehicle operating costs are mainly derived from differences in:

a) component input prices

b) vehicle productivity

c) rate of consumption of fuel, tyres and spare parts

In the results of the drivers' interview surveys given in Section 4 differences in vehicle productivity and fuel consumption were presented. In the following sections component prices and tyres and spare parts consumption will be considered together with estimates of how total vehicle operating costs are built up for representative vehicles of the different countries.

5.1 A COMPARISON OF COMPONENT PRICES

In a comparison of Pakistani and Francophone vehicle operating costs it was found that more than half of the difference in operating costs related to the initial difference in component input costs (See Rizet, 1990 and Rizet and Hine, 1993). In Table 7 typical component price data are provided for Tanzania, Indonesia and Pakistan. The exchange rates and inflation adjustments to bring to 1995 US dollar prices are given in Section 4.5. Total taxation (including import duties) on vehicles generally varies according to vehicle size or capacity, its origin and where it was built. In addition in Pakistan the source of foreign exchange finance also influenced the total tax rates. Estimates of tax rates are given in Table 8.

Table 7 shows that, with the exception of crew costs, Tanzania is by far the most expensive for all items. Fuel prices are over two and a half times the price in Indonesia and a third more than in Pakistan (adjusted for inflation).

TABLE 6

A comparison of overall tariff revenues per vehicle and per tonne km, 1995 prices

	Observations No.	Mean Distance km	Mean Load tonnes	Tariff Revenues US cents per km	Tariff Revenues US cents per tonne-km
3-13 tonnes					
Tanzania	44	616	7.8	71	8.6
Indonesia	66	850	5.9	23	3.8
Pakistan	1463	586	8.6	25	2.8
13.1-50 tonnes					
Tanzania	14	907	23.6	222	9.6
Indonesia	47	859	23.6	51	2.1
Pakistan	259	961	21.1	42	2.0

TABLE 7

Comparative component prices (US$ 1995)

Item	Tanzania	Indonesia	Pakistan
Two-axle truck	64,900	22,300	24,200
Three-axle truck	97,400	n.a.	37,800
Tractor & semi Trailer	135,000	73,100	46,500
Truck tyre			
for 2 axle truck	292	142	169
for tractor unit	357	201	261
Diesel per litre	0.438	0.166	0.32
Lubricants per ltr.	2.27	1.66	1.0
Maintenance			
Labour Per hr.	2.11	2.19	0.7
Crew costs per month			
for 2 axle truck	136	219	320
for artic.	203	263	400

TABLE 8

Estimated tax rates (per cent)

Item	Tanzania	Indonesia	Pakistan
Two-axle truck	50	30	35
Tractor unit	5	34	20
Truck tyre	80	23	32
Diesel	3	11	11

Indonesia is a major oil producer and has adopted a particularly cheap fuel policy. The higher crew costs in Pakistan are, in part, a reflection of the higher crew manning levels (see Section 4.2 above).

The comparison of vehicle prices is somewhat difficult because in all countries there is a range of makes and models and in the surveys it was not possible to collect precise specifications. A selection of typical mid range vehicle prices were chosen to be as representative for Tanzania and Indonesia. For Pakistan the Bedford truck (7 tonne carrying capacity) was used as a representative vehicle; at the time of the surveys Bedfords accounted for 77 per cent of the total fleet. In spite of the difficulties in the comparison the differences in vehicle prices are sufficiently large to suggest that in Tanzania truck prices could well be over twice the price of comparable vehicles found in Pakistan and Indonesia. The taxation data presented in Table 8 suggest that the high costs found in Tanzania are not primarily brought about by higher vehicle taxation.

Part of the reason for the very low prices for tractor units in Pakistan relates to the practice of locally converting very simple two-axle trucks into tractor units. In Tanzania (and Indonesia) far more conventional factory made tractor units are in use. In both Pakistan and Indonesia a range of modifications are made to vehicles, after they have left the factory in order to take heavier loads. Modifications include the fitting of stronger springs and the addition of extra steel to strengthen the chassis.

Tyre prices appear particularly low in Indonesia and maintenance labour costs are particularly low in Pakistan. The reason for the latter is that most repairs in Pakistan are carried out at small, informal workshops which have very limited overheads. In contrast more conventional garages and owners' workshops are used in the other countries.

5.2 VEHICLE MAINTENANCE AND TYRE COSTS

In the main roadside surveys carried out in Tanzania and Indonesia drivers were asked to estimate their maintenance costs, but not tyre wear. However the data was felt to be too unreliable to use on its own and so other sources of information were also used to provide estimates of vehicle maintenance and tyre costs. The following four sources of information were used:-

i) drivers' estimates

ii) transporters' estimates

iii) estimates from accounts and written report

iv) estimates derived from the road investment planning models, HDM and RTIM

Tables 9 and 10 give different estimates of maintenance and tyre consumption costs. Survey interviewers in Indonesia reported that they had little faith in the driver's estimates of maintenance costs and an examination of the data confirms that little credence can be given to this data. For example articulated trucks were reported to have lower maintenance costs than two-axle costs, despite the fact that they were over three times as expensive. Drivers' estimates of the maintenance costs of articulated vehicles in Tanzania also appear to be suspect in view of the reported close correspondence with the maintenance costs of two-axle trucks. In contrast the drivers estimates of maintenance costs in Pakistan were found to be both internally consistent (ie variations with vehicle age and between vehicle types) and consistent with written records.

A comparison of the more reliable estimates shows that

TABLE 9

Estimates of vehicle maintenance costs (US cents per km, 1995 prices)

Item	Tanzania	Indonesia	Pakistan
Two-axle trucks			
Drivers	6.4	2.8	2.7
Transporters	5.3	5.8 (12 yrs)	-
Accounts	6.7	4.3	1.8 (4 yrs)
HDM (Brazil)	21.5	7.6	10.2
RTIM	33.6	-	19.5
Articulated trucks			
Drivers	6.7	1.6	4.2 (4 yrs)
Transporters	31.7	3.0 (new)	-
Accounts	-	-	-
HDM (Brazil)	42.4	29.2	26.7
RTIM	74.7	-	-

TABLE 10

Estimates of tyre consumption costs (US cents per km, 1995 prices)

Item	Tanzania	Indonesia	Pakistan
Two-axle trucks			
Transporters	7.3	1.9	-
Accounts	8.2	1.2	1.1
HDM (Brazil)	3.6	1.7	2.5
RTIM	3.5	-	2.9
Articulated trucks			
Transporters	17.5	8.3	-
HDM (Brazil)	-	2.1	
RTIM	9.6	4.0	4.9
	14.8	-	-

Pakistan had particularly low maintenance costs. In Pakistan nearly all vehicles are maintained by numerous informal workshops and the driver is predominantly responsible for organizing and paying for repair and maintenance. In contrast in both Tanzania and Indonesia the transporters' surveys reported that most trucks were maintained by the truck owner's own maintenance yard. In most cases (particularly for the larger fleets) if a truck broke down with a serious problem, some way away from the home base, the driver was expected to contact the base and await for the fleet repair vehicle and a mechanic to assist. This rarely happened in Pakistan.

Application of the road planning models, RTIM (TRL's Road Transport Investment Model, based on research in Kenya and the Caribbean) and HDM (the World Bank's Highway Design and Maintenance Standard's Model based on research in Brazil) tended to give the highest estimates of vehicle maintenance costs which were often difficult to reconcile with the other data and the overall estimates of tariff revenue and operating costs. In estimating the HDM and RTIM maintenance costs shown in Table 9 it was assumed that the main road roughness levels were 4.5 IRI in Tanzania, 3.5 IRI in Indonesia and 6 IRI in Pakistan. While these road roughness values may reflect conditions on the main paved network connecting most of the surveys' origins and destinations it is recognised that much higher values will apply to the unpaved main road sections in Tanzania and Pakistan. If higher roughness values had been used then, obviously, the models would have predicted even higher maintenance and tyre costs.

5.3 A COMPARISON OF OVERALL OPERATING COSTS

Overall approximate estimates of vehicle operating costs are given in Table 11 for two-axle trucks. Because of the lack of reliable data it was not possible to provide the same cost breakdown for the larger vehicles. The maintenance and tyre costs are derived from samples of accounting data. To enable a comparison to be made with tariff revenues, which are assumed to be constant in real terms over the life of the vehicle, the interest rate specified in the calculation of capital costs was assumed to be net of inflation. A three per cent real interest rate was assumed in all cases. The revenue data (expressed per vehicle-km) reflects an assumed level of empty running (25 per cent for Tanzania and 15 per cent for Indonesia and Pakistan).

The data clearly show that, apart from the crew, all of the cost components are higher in Tanzania, when expressed on a per km basis. One of the main factors keeping Indonesian tariffs (per vehicle-km) low relates to the particularly low fuel prices in that country. The Indonesian two-axle vehicles have much lower loading factors than in Pakistan and as a result their cost per tonne-km are higher than in Pakistan (See Section 4.5 for a comparison of tariffs).

If, in the analysis, uncalibrated data from the road planning models HDM or RTIM had been used to calculate maintenance costs then two-axle vehicles would have been shown to be unprofitable in all cases, and by particularly wide margins in Tanzania and Pakistan. In the case of Pakistan this issue has already been examined in detail (See Hine and Chilver, 1994). However there are some indications that for articulated vehicles it would be somewhat easier to accommodate HDM or RTIM derived maintenance costs within the revenue estimates.

6. POSSIBLE SOLUTIONS TO ENCOURAGE THE DEVELOPMENT OF LOW COST TRANSPORT IN AFRICA

The results confirm earlier research which indicated that African freight transport tariffs and costs were much higher than in Asia. In this case long distance freight transport tariff rates and overall tariff revenues per tonne-km in Tanzania are between two to five times those of Indonesia and Pakistan for different vehicle types and load weight categories. The reasons for the higher costs and tariffs relate to the following combination of factors: higher input prices, higher maintenance costs, lower utilisation, higher levels of empty running and higher fuel consumption. High levels of taxation and higher operating costs due to road condition do not appear to be major reasons for the marked differences in operating costs.

Possible solutions to help reduce transport costs and tariffs in Tanzania might be along the following lines.

a) Encourage all concerned, including transporters, consignors and officials to realize that transport tariffs could be much lower. Competition is the main mechanism by which costs are kept under control however there are reasons which sometimes prevent competition from working. Such factors include poor market information; formal or informal cartels; state controls; a low or fluctuating level of demand; and high costs, or other impediments, of entry into the industry (including high costs of finance).

b) It is not known exactly why initial vehicle costs are so much higher in Tanzania (and in other African countries) than in Indonesia or Pakistan. However there is evidence to suggest that high import prices to Africa are not unique to the transport sector (Yeats, 1989). Overall, vehicle taxation only appears to be a minor factor in the differences in the domestic vehicle prices. It seems that the structure of commercial vehicle supply is far more important. High prices may be the result of exclusive

TABLE 11

Estimated composition of operating costs for two axle trucks (US cents per km, 1995 prices)

	Tanzania	Indonesia	Pakistan
Capital costs	10.6	2.7	1.8
Fuel	15.4	5.8	9.3
Crew	2.7	3.2	3.2
Oil	1.0	0.7	1.0
Maintenance	6.1	4.3	2.2
Tyres	7.8	1.2	1.1
Overheads	6.5	1.8	2.4
Total	50.1	19.7	21.0
Revenue	56.8	20.0	21.8

dealerships in vehicle importing combined with the small market size. Also, some vehicles have been brought into Tanzania under aid terms and hence price competition for these vehicles may have been limited. Often it seems that in Africa expensive vehicles are purchased with very high specifications whereas in Asia deliberate attempts are made to buy very cheap vehicle types and then, if necessary, to locally modify them after purchase. Encouragement should be given to all involved in vehicle purchase to look very carefully at initial vehicle costs.

c) Spare parts costs will tend to be very expensive when exclusive dealerships are involved in keeping a wide stock of supplies for very small vehicle numbers. In Indonesia and Pakistan the large numbers of similar vehicle types help to keep the costs of spares low. In addition it is known that in Asia many parts will be manufactured locally (either in batches in small factories or by a mechanic on the spot) for the local market. It is recognised that locally made parts may not be up to the same standards as imported parts from Japan or Europe. However, in Pakistan operators have found that by running their trucks very slowly, and changing the oil very often, they can run their vehicles both cheaply and safely with using locally made parts. Another benefit of slow running speeds, frequent oil changes and close attention to routine maintenance appears to be a much lower incidence of major engine overhauls than in other countries.

d) Vehicle utilisation can be increased by using two drivers. Pakistani vehicles achieve a high utilisation with two drivers by driving both night and day. A sleeping area allows one to sleep while the other drives. Night driving need not be dangerous if a vehicle's lights are in working order and the vehicle travels slowly.

e) Delays incurred by looking for loads are minimised and empty running reduced by an extensive use of freight forwarding agents in Pakistan whereas in both Indonesia and Tanzania only a relatively small proportion of loads are arranged via freight agents. Tariff levels can be kept to a minimum when freight forwarding agents are in active competition with each another.

Unfortunately freight forwarding agents are sometimes viewed as parasites within the freight transport industry. In fact recognition and encouragement ought to be given to agents for the part that they can play in increasing the efficiency of the industry.

f) In many African countries utilisation rates are kept low and freight rates high by the action of formal or informal associations of truck operators. Although this may not be a major problem in Tanzania Government authorities should be made aware of how such cartels reduce efficiency and increase costs. The power of trucking associations in other countries is most often manifest in up-country locations at lorry parks. They operate to restrict supply, and share out the available demand, through vehicles queuing at lorry parks. To hire a truck a customer has to take the truck at the head of the queue. The customer is prevented from negotiating a lower rate with other vehicles in the queue. Overall operating costs are kept high because the more efficient operators, with low variable costs, are prevented from increasing their utilisation by undercutting other higher cost operators. In this way older vehicles with higher maintenance costs are kept in business instead of being driven out by competition.

g) The survey showed that fuel consumption per tonne km was very high in Tanzania. Part of the reasons probably relate to the higher driving speeds in Tanzania. Slow driving speeds are also likely to have other benefits in both lower maintenance costs and lower accident rates. The Government, transporters and drivers should be made much more aware of the benefits of slow and careful driving.

h) One of the main factors keeping operating costs low in Pakistan relates to the large measure of responsibility given to the driver. He is aware of the costs and revenues of the truck he runs because he finds loads, arranges and pays for maintenance, pays for fuel and keeps accounts. He is very aware of the benefits of both driving slowly and of paying close attention to routine maintenance.

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APPENDIX 1

TANZANIAN ROADSIDE TRUCK SURVEY

1. Questionnaire No._____ 2. Survey Station No._____ 3. Date _____

4. Direction: _____ Dar es Salaam 5. Registration No: _____
(To or From)

6. Truck base _____ Country _____ 7. Truck Make _____

8. Configuration:_____
a) Truck
b) Truck & Trailer
c) Tractor & Semi Trailer
d) Tractor unit only
e) More than two trailers
f) Other

9. Main body type: _____
a) Low sided
b) High sided
c) Flat
d) Tanker
e) Tipper
f) Other

10. No of axles _____ 11. Maximum load _____ tons or _____ litres **Don't know**___

12. Truck owner: _____
a) Driver (sole or joint owner)
b) Private individual
c) Partnership
d) Private Transport Company.
e) Government/State Transport Co.
f) Private non-transport Co. (operating on own account)
g) Government non-transport Co. (operating on own account)
h) Cooperative
i) Other
j) Don't know

13. How many crew are with the truck now?
____Drivers
____Assistants

14. Driver's relationship to truck: _____
a) Driver is sole owner
b) Driver has part share
c) Regular employee
d) Casual employee
e) Rented truck
f) Truck borrowed
g) Don't know

15. In total how many drivers share driving this truck regularly? _____ Don't know ___

16. Over the last month what proportion of total distance was by the driver(s) now with the truck?
____ per cent ___ Don't know

Please estimate the following:

17. Age of truck ____ yrs Don't know ___
18. Average distance driven per week ____ kms Don't know ___
19. Excluding tyres what are the average monthly service and repair costs _____ currency ____ Don't know ___
20. Average fuel used litres _____ per _____ kms Don't know ___
or litres _____ per _____ days Don't know ___
21. Average monthly tariff income _____ currency _____ Don't know ___
22. Estimated current value of truck _____ currency _____ Don't know ___

23. Loaded/Empty _____ (If empty go to question 34)

If Loaded please answer the following questions:

24. Commodity or type of load _____ Don't know ___

25. Load weight/Vol: ____ tons or ____ litres Don't know ___

26. Load origin _____ 27. Load destination _____

28. Journey distance _____kms Don't know ___

29. Total origin to destination journey time (with stops) ____ hrs ___days Don't know ___

30. Between dropping the last load and picking up this load how long was truck empty?
___ hrs ___ days Don't know ___

31. Between dropping the last load and picking up this load how much empty running was there?
_____ kms Don't know ___

32. Estimate tariff for this load _____ currency _____ Don't know ___

33. What method was used to find this load? _____ Don't know ___
a) Driver found load
b) Consignor found truck at lorry park
c) Consignor found truck elsewhere
d) Through a freight agent
e) Instructions from Transporter's dispatch clerk
f) Other methods
g) Don't know

If Empty please answer the following questions:

34. Journey origin _____ 35. Destination _____ 36. Distance ____ kms

37. Estimated empty journey time (with stops) ___ hrs ___ days Don't know ___

38. Empty journey purpose: _____
a) Looking for load
b) Return to base
c) Settle accounts
d) Repairs
e) Personal reasons
f) Other

Thank you for your cooperation.

TANZANIAN TRANSPORT OPERATORS SURVEY

1. Questionnaire No.___ 2. Date _____

3. Company Name _____ 4. Location _____

5. Type of company _____
   a) Private individual
   b) Partnership
   d) Private Transport Company.
   e) Government/State Transport Co.
   f) Private non-transport Co. (operating on own account)
   g) Government non-transport Co. (operating on own account)
   h) Cooperative
   i) Other

6. What is the main type of transport business carried out by the company?
   Please describe:

_____
_____
_____
_____

7. What are the principal commodities moved?

_____

8. What are the main destinations?

_____

9. What proportion of business is obtained by the following ways:

a) Through freight agents	___%
b) By telephone/fax etc from customers	___%
c) By trucks waiting at lorry parks	___%
d) By drivers finding their own loads	___%
e) By carrying goods for the non-transport side of the company	___%
f) Other channels	___%

10. Please list the numbers of different types of vehicles currently in operation with the company.

_____ 2 axle rigids ____ 3 axle rigids ____ Tractors and semi trailers

___ truck and trailers _____ vehicles with more than one trailer

11. Please give examples of the current estimated complete purchase price in Tanzania for new and second hand vehicles (if used):

i) 2 axle truck _____ make_____ max load____tons body _____(new/ ___ yrs old)

ii) 3 axle truck _____ make_____ max load____tons body _____(new/ ___yrs old)

iii) tractor unit1) _____ make _____ hp* ____ gcw* _____tons (new/ ___yrs old)

iv) tractor unit2) _____ make _____ hp* ____ gcw* ____ tons (new/ ___yrs old)

v) semi trailer _____ axles ___ body _____ (new/___ yrs old)

vi) drawbar trailer_____ body _____ (new/ ___ yrs old)

hp = horse power, gcw = gross combination weight

12. Please give examples of the current freight rates to the most frequent origins and destinations served.

i) From _____ to _____ Distance ____ kms Tariff _____ per _____ tons load

ii) From _____ to _____ Distance ____ kms Tariff _____ per _____ tons load

iii) From _____ to _____ Distance ____ kms Tariff _____ per _____ tons load

iv) From _____ to _____ Distance ____ kms Tariff _____ per _____ tons load

v) From _____ to _____ Distance ____ kms Tariff _____ per _____ tons load

13. How are repairs and servicing carried out? _____

a) Own workshop facilities
b) Use of commercial garage
c) Mixture

14. What happens if a vehicle breaks down away from base?_____

a) Driver approaches local garage
b) Driver calls base and own mobile repair truck is sent out
c) Drivers calls base and base arranges for local garage to collect and repair
d) Other, please explain _____

15. In manning the trucks what policy does the firm have? _____ :

a) allocate one main driver to a vehicle
b) allocate two or three drivers to a vehicle for shift work
c) allow many drivers to drive each vehicle
d) Other, please explain _____

16. Does the firm have any restriction on night-time driving? ____ (yes/no)
If there is a restriction what is it and why ? Please explain.

_____

_____

17. Over the last five years have any trucks been stolen from the firm? _____

18. What annual mileage do you expect from your vehicles?

Type_____ a) _____kms/yr

Type _____ b) _____kms/yr

Type _____ c) _____kms/yr

Type _____ d) _____kms/yr

19. For different vehicle types operated by the firm can you give some estimates of current vehicle operating costs.

i) Truck type _____

Tyre price	truck	_____	trailer _____	
A driver's wages and allowances		_____	per _____	
An assistant's wages and allowances		_____	per _____	
Average budget for maintenance & repair		_____	per _____	kms
Average budget for fuel		_____	per _____	kms
Average budget for tyres		_____	per _____	kms

ii) Truck type _____

Tyre price	truck	_____	trailer _____	
A driver's wages and allowances		_____	per _____	
An assistant's wages and allowances		_____	per _____	
Average budget for maintenance & repair		_____	per _____	kms
Average budget for fuel		_____	per _____	kms
Average budget for tyres		_____	per _____	kms

20. What are the main problems facing transport operators in Tanzania and what are the main constraints preventing more efficient transport operations?
Please explain:

_____

_____

_____

_____

Thank you for cooperating with this survey.