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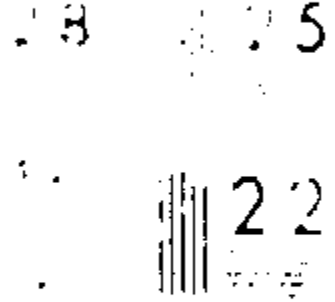
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GUIDE TO LOW-COST VEHICLES FOR RURAL COMMUNITIES IN DEVELOPING COUNTRIES *

by

I.J. Barwell, G.K. Hathway and J.D.G.F. Howe **

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SUMMARY

This report provides an illustrated guide to low-cost vehicles for rural communities in developing countries.

Lack of transport is one of the less recognisable but nonetheless more important aspects of poverty. Acceptance of this relationship has been implicit in the enormous efforts made in the last few decades to develop the rural road and motor vehicle systems of most developing countries. Despite this effort many people, and the majority of the poor, live remote from the trafficked road system and are likely to continue to do so. Few are able to afford either the ownership or even use of conventional motor vehicles. These facts indicate that, if efforts at rural development are not to be frustrated, many rural transport needs must necessarily be met by vehicles very much simpler and thus cheaper than conventional motor vehicles, and that often they must be capable of efficient operation on paths, tracks and earth roads. Contrary to common experience a wide range of such basic vehicles exists, although often their use is highly localised.

This report first discusses the socio-economic reasons why much greater effort needs to be focussed on the development and introduction of low-cost vehicles. An illustrated guide is then given to some of the available options and the technical problems that must be overcome if they are to be more widely used or their efficiency increased. Typical performance characteristics of the range of vehicle options are also presented.

Finally, the report includes a discussion of the policies and programmes that will need to be effected if efficient low-cost vehicles are to be made more widely available to the rural communities of developing countries.

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INTRODUCTION

Lack of transport is one of the less recognisable, but nonetheless more important aspects of poverty. Without access to efficient means of movement the simple tasks of living become drudgery, income earning opportunities are reduced and usage of social and other services denied.

Past Strategies

Governments and aid agencies have always considered investment in transport as a pre-eminent priority. For rural communities past transportation strategies at both national and international level have concentrated on providing access, usually interpreted as access to roads. The major concession to the possibility that developing countries might have special rural transportation problems has been the considerable international effort devoted to "low-cost roads", the assumption being that most small-scale farmers have both reasonable expectation of living close to a road and the means of transporting goods to and from the roadside.(1) In the poorest countries, however, the task of providing even basic roads to serve rural communities is immense, given the very low density of existing networks and the cost of modern road construction. The implication of this situation, and current rates of construction (see Box A), is that the majority of small farmers will continue to live remote from the main road system for many years.

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(1) Curiously there has been little complementary effort devoted to low-cost vehicles: it is only as recent as 1976 that UNIDO and the Intermediate Technology Development Group (UK) simultaneously and separately organised conferences devoted to the subject. UNIDO. The manufacture of low-cost vehicles in developing countries. Development and Transfer of Technology Series No. 3, New York, 1978 (United Nations). INTERMEDIATE TECHNOLOGY DEVELOPMENT GROUP. Proceedings of ITDG Seminar: Simple vehicles for developing countries. Transport Panel, Information Paper 3, London, 1977. (Intermediate Technology Development Group).

BOX: A Road Development and Prospects

- Inflation ensures that almost as fast as the cost of Africa's strategic network is calculated it is out of date. A billion dollars, promised at the Afro-Arab Summit in March 1977, was thought to be adequate to build some 30,000 kms. of highway. Now it is doubtful if it would enable the construction of a third to a half of that length. Recent estimates from Zimbabwe put the cost of upgrading rural dirt tracks to gravel roads at about $42,000/km. For a 3.5m wide bitumen road the cost doubles. Under humid tropical rain forest or desert conditions both of these costs could well again double or even treble. The current cost of the African strategic network is upwards of $10 billion. (1)

- Even in a comparatively wealthy country such as Egypt, 32 percent of vilages are (1981) not provided with earth road access: they are connected to larger villages, and thence the road network, only by footpaths. (2)

- In India (1978) about 70 percent of vilages do not have all-weather road connections, and 55 percent of villages are not connected to any type of road. Under current plans the proportion of villages without all-weather road connection will be reduced to 60 percent by 1990 at a (1978) cost of US $3.5 billion. (3)

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1 HOWE, J. Fact and fiction about Africa's roads. African Business No 28, December, 1980.

2 EL-HAWARY, M.A. and T.Y. EL-REEDY. Rural roads and poverty alleviation in Egypt. Geneva, 1982. (International Labour Organisation).

3 Report of the National Transport Planning Committee, Government of India, May 1980.

In developing road transportation over the past two or three decades, the other major implicit assumption has been that farmers would have free access to motor vehicles, either their own or those of private entrepreneurs or cooperative societies. Conceived in a time of mass production and cheap fuel, this assumption has become increasingly unrealistic as the cost of purchasing, running and maintaining motor vehicles suitable for rural conditions has continued to rise and small farm incomes have remained static or even fallen in real terms. In many developing countries, supplies of fuel, spare parts and vehicles themselves are becoming more difficult to obtain as foreign exchange and credit become increasingly restricted. Moreover, the near global failure of cooperatives to make expensive resources available on a shared basis means that small farmers will continue to have very little access to motor vehicles. (see Box B).

There was no serious questioning of past rural transport strategies, or where they were leading, until the mid-1970 s. Then a combination of effects - the repercussions of the increase in the cost of oil, falling commodity prices, natural calamities and, in some cases, bad economic management - resulted in a re-assessment of the strategies for improving rural transport (see Box C).

These initiatives have helped to emphasise two fundamental facts about rural communities in developing countries.

- Many people live and will continue to live remote from the all-weather road network and the transport services this permits.
- Even in areas with road access many people cannot afford to purchase or use vehicles, especially conventional motor vehicles.

Consideration of this situation leads logically to the question of how small farm productivity, and thus incomes, can be expanded when the complementary expansion in roads and vehicles, upon which they are generally presumed to depend, will be either impossible or very slow?

BOX: B Use of and access to vehicles

- Surveys in Kenya (1971) showed that over 90 percent of rural trips were on foot, 4 percent by bicycle, with just 2½ percent by motorised transport. (1)

- A study in India (1977/78) showed that 73 percent of rural households did not own any type of vehicle nor did 89 percent of households having holdings of less than 5 hectares. (2)

- Another survey indicated that nearly 40 percent of rural households spend no money on travel or transport. (3)

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1 TRENDS IN ROAD USE IN KENYA. Ministry of Transport and Communications, July 1971, p.47.

2 EDMONDS, G.A. Towards more rational rural road planning. International Labour Review, Vol. 121, No. 1. January-February 1982.

3 MADHAVAN, S. Rural transport in Karnataka with special reference to Kanakapura (Bangalore District) India. Research Working Paper No. 7. School of Social Sciences and Business Studies, Polytechnic of Central London, July 1980.

BOX: C Re-assessments of rural transport requirements

- Despite the fact that INDIA has an estimated 13,000,000 bullock carts which account for 67 percent of the goods ton-kms, compared to just a quarter by motorised transport, it was only in December 1976 that the first truly national meeting took place to consider the role of the bullock cart in rural transport and what could be done to improve its use. (1.2.)

- In 1977/78 Soon Jung University/Georgia Institute of Technology undertook the first modern improvements to the chee-ke, a traditional load-carrying frame which is worn on the back and is unique to KOREA. For the majority of small-scale farmers the mountainous terrain, numerous small irregular pieces of arable land, and many streams leaves no choice but human load carriage on the head or back and the chee-ke is the universal means of transport. (3.4.)

- A 1978 study of rural transport in Bangladesh emphasised the dominant importance to the rural economy of non-mechanised means of transport - country boats, bullock carts and tricycles - and the necessity of improving their efficiency. (5).

---

1. INDIAN INSTITUTE OF MANAGEMENT. The Animal Cart in the Rural System. Submitted to Ministry of Shipping and Transport. New Delhi (circa 1979).

2. SABHARWAL, M.M. Modernisation of Bullock Cart Transport (Paper to Inter-Agency Meeting on Modernisation of Bullock Cart Transport, New Delhi, December 1976).

3. SEYEUL KIM. A case study on the possibilities of improving the simple traditional farm equipment in Korea, with special reference to the chee-ke. February 1977. Regional Development Institute, Soon Jun University, Taejon, Korea.

4. SEYEUL KIM. Employment generation through stimulation of small industries: a pictorial history of the development of an improved chee-ke. January, 1978. Office of International Programs, Engineering Experiment Station, Georgia Institute of Technology, Atlanta, Georgia, U.S.A.

5. BANGLADESH RURAL TRANSPORT STUDY. Transport Survey Section, Planning Commission, Government of Bangladesh, 1978.

Nature of Rural Transport Needs

One of the main difficulties in answering this question is the general lack of knowledge about the true nature of the travel needs of rural communities, especially the small scale farmers who comprise the majority. Transport needs at the farm level, and the constraints within which they must be met, have very rarely been studied (see Box D).

These studies suggest that many of the transport demands of rural communities could be satisfied by vehicles very much simpler and cheaper than conventional motor vehicles. This is fortunate since even where conditions are favourable to their use, the capital cost of motor vehicles puts them well beyond the reach of all but the wealthy few.

Basic Vehicles

Often basic vehicles must be capable of operating off-road on paths, tracks or the fields themselves and may be defined as:

- the range of devices from aids to goods movement by man himself up to but excluding conventional cars, pick-ups, buses and trucks.

Six broad categories of basic vehicles can be identified:

- aids to head, shoulder and backloading
- handcarts and wheelbarrows
- pedal driven vehicles (bicycles, cycle trailers, tricycles, bicycles with side-cars)
- animal transport (pack animals, animal drawn carts and sledges)
- low cost motor vehicles (often based on motor cycle technology)

BOX: D The rural transport needs of small farmers

- One study in Kenya suggested that most transport needs could be characterised as the movement of small loads [10-150kg units] over relatively short distances [1-25km] (1). On-farm the range of loads was likely to be the same, but the typical distances were shorter [1-13km]. The study in Kenya was also significant in drawing attention to a previously overlooked constraint on small farmer activities: household transport demands. The amounts of water and wood required for household use were noteworthy [50 and 30kg respectively], since it was estimated that their collection occupied 3-6 hours per day.

- Another study in Southern and East Africa confirmed some of the results from Kenya and showed that in an average family of six or seven, one person's sole job is to collect firewood. (2).

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1. WORLD BANK. An investigative survey of appropriate rural transport for small farmers in Kenya. Transportation Department, October, 1977.

2. HALL, D.O. Biomass for energy: fuels now and in the future. Journal of the Royal Society of Arts, July, 1982. No. 5312, CXXX, pg.457-471.

- basic motorised agriculture/transport devices (e.g. single-axle tractors).

Few people seem to be aware of how wide is the potential choice of basic vehicles since information on them has not been collated into any easily accessible form. The element of choice is important since given the variations in incomes, in topographical, road, farming and social systems, and in local resources and capabilities, there cannot be a universal vehicle appropriate to all the rural transport needs of developing countries. Rather the need is for a choice of vehicles whose performance matches need and whose cost is in sensible relation to income.

A world perspective indicates that there are several vehicles, intermediate between primitive human carriage and conventional motor vehicles, that individually enjoy extensive localised use, but are sensibly unknown elsewhere (see Box E). In general the current state of development of basic vehicles is that:

- much good technology already exists which could be widely applied, but whose use is at present very localised;

- where information on such technologies exists it is often obscure, uncollated and certainly unknown to those who could most usefully make use of it;

- some existing vehicle technologies are primitive, being traditional devices which have remained unchanged for many years: almost all are capable of improvement, using contemporary technical knowledge, so as to increase significantly their efficiency and usefulness;

- there remain gaps in the range of existing intermediate technologies suited to developing country conditions.

BOX: E Efficient localised low-cost vehicles

- The chee-ke, a traditional load-carrying frame worn on the back, is unique to Korea. Its main advantage over other human means of carriage is that the carrier can load and lift the device unaided.

- The Chinese Wheelbarrow is of quite different design from the Western wheelbarrow found in most other parts of the world. It has been proved the more effective device, but is not found outside China.

- An alternative to the traditional but inefficient Asian bullock cart is manufactured in India. It uses a pneumatic tyred wheel running on ball bearings, the whole assembly being fitted to a specially fabricated steel axle.

- Although the bicycle is very common in developing countries it is rarely used with a trailer. But the bicycle and trailer is widely used in Europe. For example, for the delivery of letters and parcels the Swiss Post Office uses bicycles and trailers since they are a cost-effective means of transport.

- The motor-cycle and sidecar combination, which is one of the most popular means of moving goods and passengers in rural and urban areas of the Philippines, is not used in this way anywhere else in the world.

- A range of simple locally-manufactured motorised three-wheeled vehicles has been evolved on the island of Crete. Most use an 8 to 12 hp rope-started diesel engine, have a 1000 kg payload and maximum speed of 40-45 km/hr.

The following section illustrates these aspects of basic vehicle development. In considering the illustrations it should be borne in mind that many basic vehicles can:

- be operated on roads of a lower cost than conventional motor vehicles: some may be described as 'two-dimensional' in that they have height and length but no significant width, which makes them suitable for use on footpaths and narrow tracks.

- utilise a significant proportion of local resources in their manufacture and operation.

- provide efficient transport for rural communities intermediate between primitive traditional devices and costly motor vehicles.

THE STATE OF BASIC VEHICLE DEVELOPMENT

"Many people live and will continue to live, remote from the all-weather road network and the transport services this permits". The route element of their transport system consists of earth roads (Plate 1), tracks (Plate 2) and bush paths (Plate 3).

Plate 1. Earth road: Bangladesh.

Plate 2. Track: Tanzania.

Plate 3. Path: Indonesia.

That there is a demand for simple vehicles suitable for such a 'road' system is illustrated by the existence of extremely crude transport aids. (Plates 4 and 5).

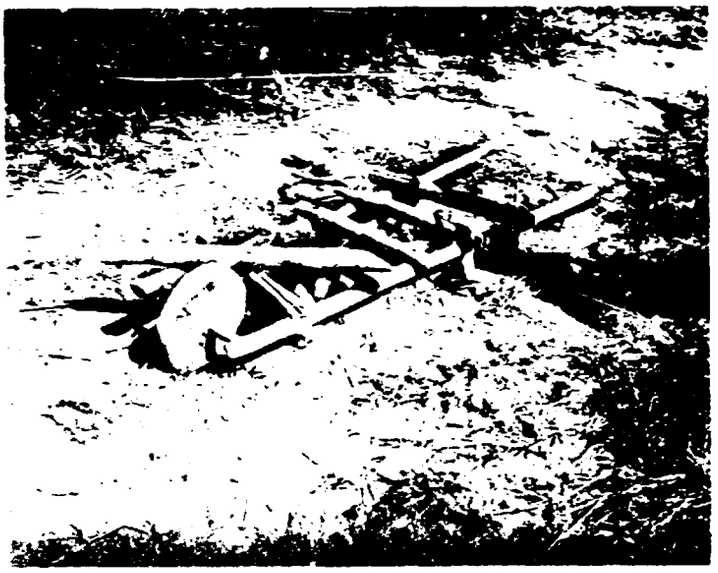

Plate 4. All-wood wheelbarrow: Tanzania.

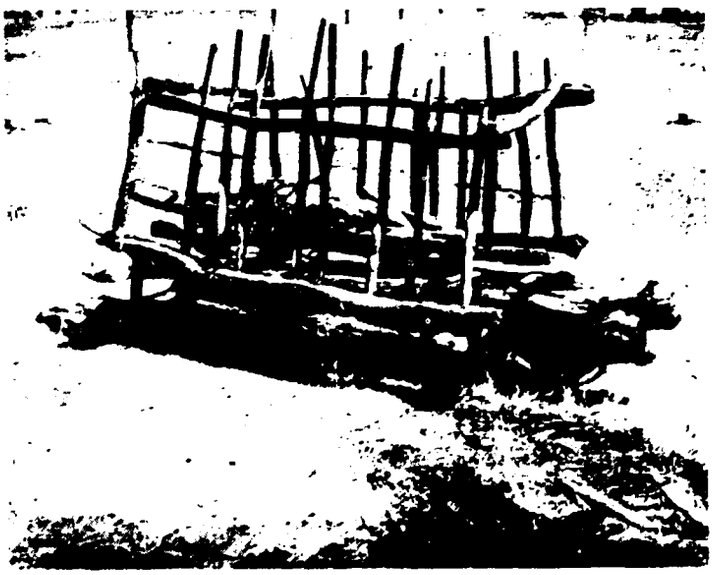

Plate 5. Ox-sledge: Botswana.

The nature of the rural route system often constrains the type of vehicle <u>able</u> to use it efficiently. (Plates 6, 7 and 8).

Plate 6. Traditional chee-ke: Korea.

Plates 7 and 8. 'Two-dimensional' transport: Jakarta.

The following illustrations depict a selection from the range of existing basic vehicles starting with the most simple, slow and cheap, and progressing to those that are generally faster, have greater load capacity but are more expensive.

Aids to Head, Shoulder and Backloading

The Asian carrying pole (Plate 3), made from bamboo, is very carefully designed so as to prevent movement of the load as the carrier walks: this is particularly important for the transport of liquids. It is widely used in some parts of Asia, but not others, and is also unknown in Africa.

Plate 3. Bamboo carrying pole: Bangladesh.

The chee-ke (Box C and E and Plate 6) is another traditional device which enables the carrier to convey remarkable quantities of farm produce. With the aid of a supporting staff he can load and lift the chee-ke unaided. The chee-ke is used to transport goods through rice paddies and over rough narrow mountain paths impassable to more conventional vehicles. Plate 10 illustrates an attempt to improve the efficiency of the traditional chee-ke.

Plate 10. Improved chee-ke: Korea.

Wheelbarrows and Handcarts

A relatively common basic vehicle is the wheelbarrow. This device, adopted almost universally throughout the western world (Plate 11), is in fact not as efficient as its Chinese counterpart. (Plate 12).

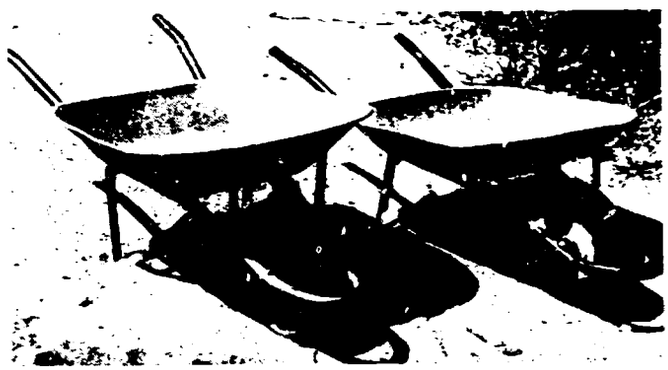

Plate 11. Western Wheelbarrow.

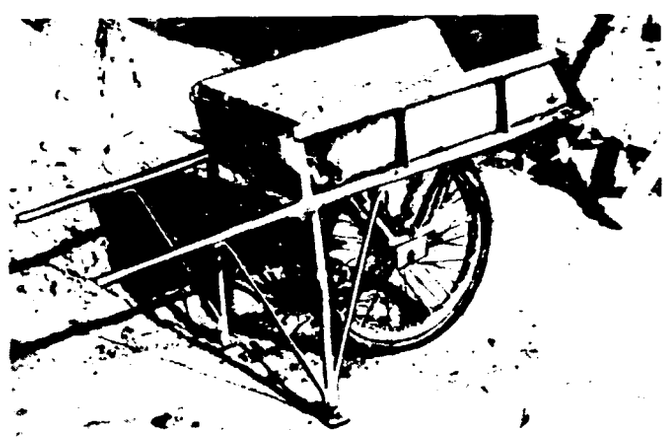

Plate 12. Chinese Wheelbarrow.

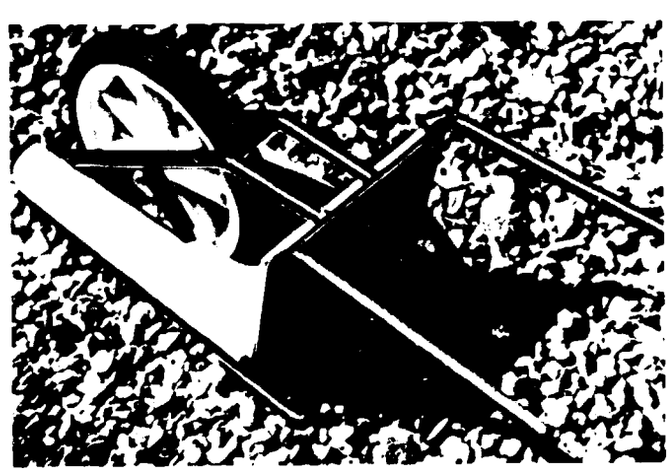

Plate 13. Small Farms Transport Vehicle.
The Chinese Wheelbarrow has a large diameter wheel to aid movement over rough ground. Most of the weight is carried by the centrally placed wheel rather than as in the west, by the relatively weak arms of the person pushing. Plate 13, the Small Farms Transport Vehicle, is being developed by I.T. Transport Ltd.

A development of the wheelbarrow is the two-wheeled handcart, also common in China (Plate 14), and widely used in other countries although often they are of primitive construction and do not function efficiently. (Plates 15 and 16).

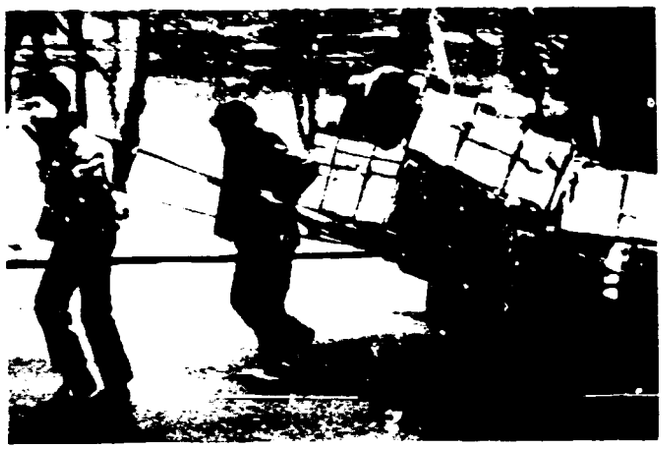

Plate 14. Handcart: China.

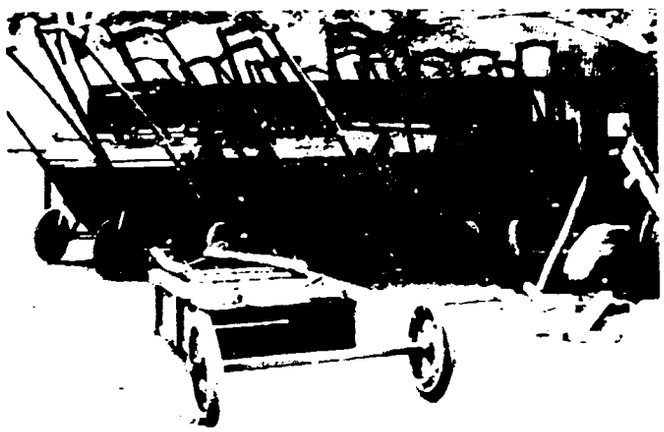

Plate 15. Handcarts: Bangladesh.

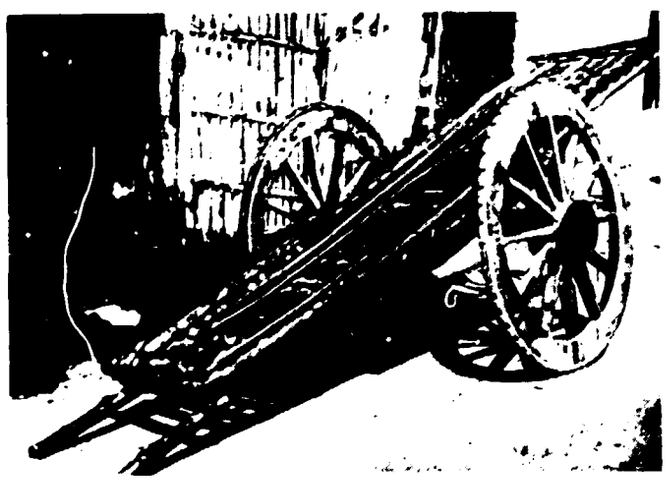

Plate 16. Handcarts: India.

Pedal Driven Vehicles

Pedal driven devices have been in existence for only about 100 years. The most successful is the ordinary bicycle now found in hundreds of millions throughout the world. Although designed as a means of personal transport, it is used in many ingenious ways for the carriage of goods. (Plates 7, 17, 18, 19 and 20).

Plate 17. Bangladesh.

Plate 18. Malaysia.

Plates 19 and 20. 250 kg. of cassava moved 30 kilometres by bicycle: Indonesia.

The double front forks seen in Plates 7, 19 and 20 are a local attempt at strengthening. This illustrates that the bicycle was never designed to be used in the way that it is in many developing countries, and that it has evolved very little since its introduction in the 1930's.

A more efficient way of carrying goods with a bicycle is to use a trailer. The Swiss Post Office delivers a considerable proportion of its letters and parcels using vehicles of the type shown in Plate 21, despite the sometimes poor climatic conditions. (Plate 22).

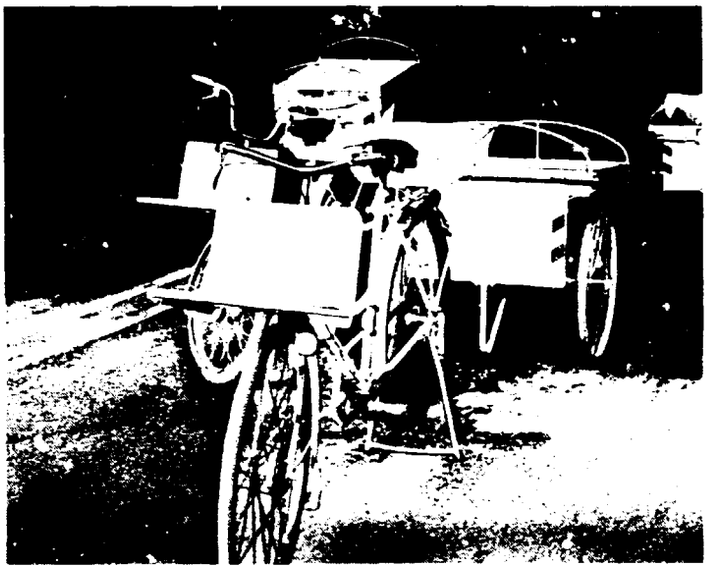

Plate 21. Swiss Post Office bicycle and trailer

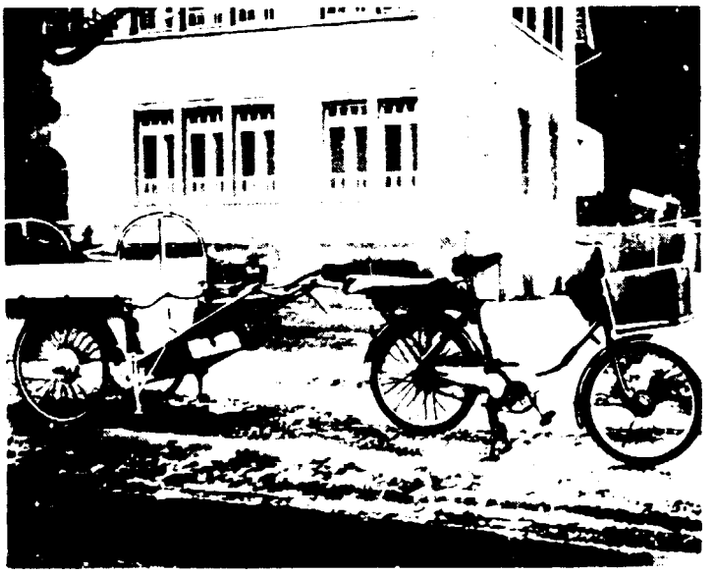

Plate 22.

It is noteworthy that in one of the wealthiest countries in the world, the bicycle and trailer is used as a cost-effective means of transport.

The bicycle can also be used with a sidecar (Plate 23), which is particularly useful for carrying very long loads.

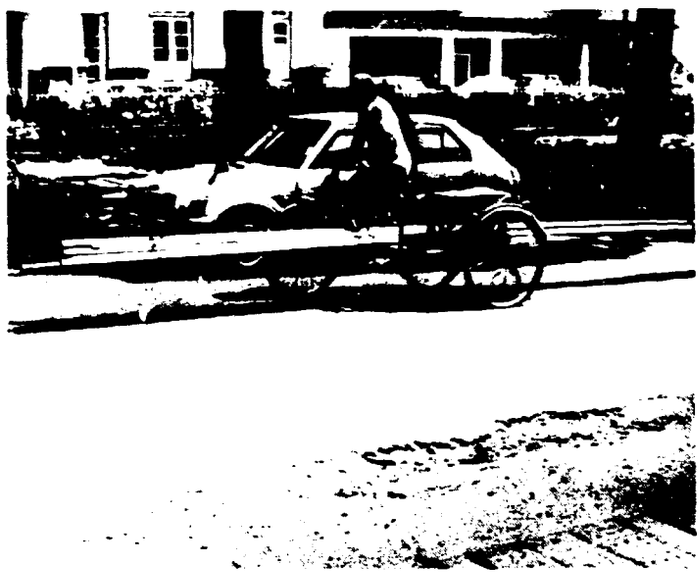

Plate 23. Bicycle and sidecar: Indonesia.

The three-wheeled bicycle, or tricycle, can be found in a number of forms (Plates 24, 25 and 26), however existing designs are heavy, over-geared and under-braked, and have poor performance, safety and durability records.

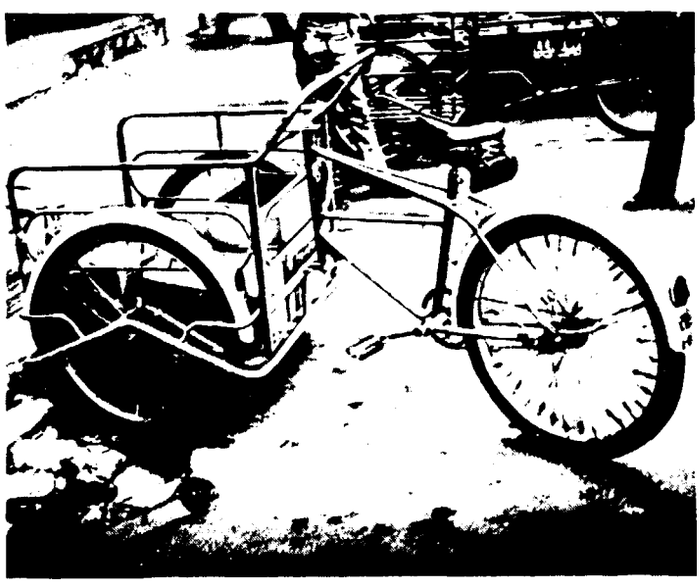

Plate 24. Tricycle: Mexico.

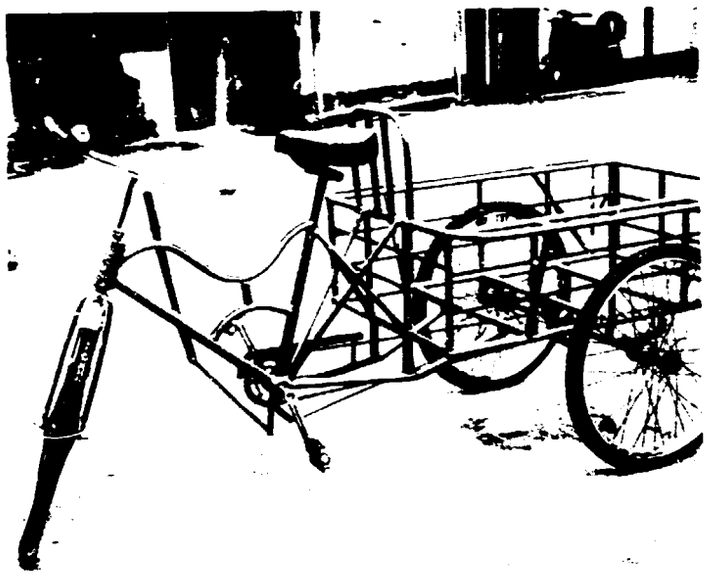

Plate 25. Tricycle: Taiwan.

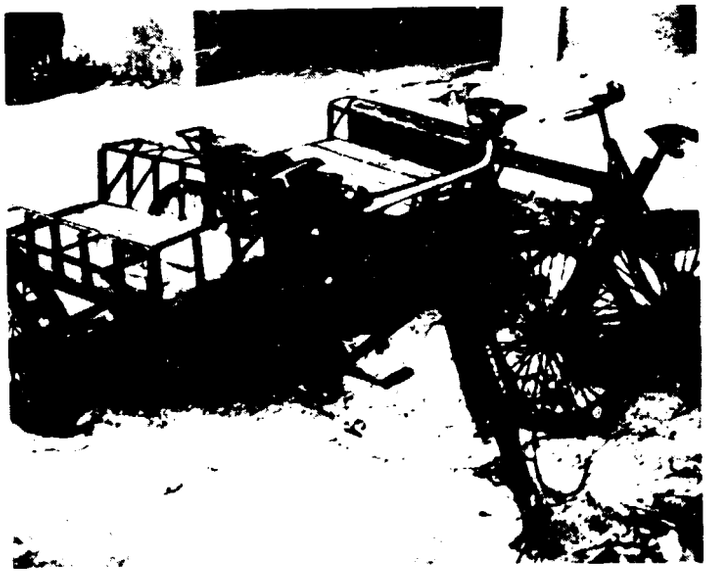

Plate 26. Tricycles: China.

The Oxtrike, being developed by I.T. Transport Ltd., is a radically new design of tricycle with a wide variety of uses. (Plates 27, 28 and 29). Features of the Oxtrike include:

- powerful brakes on all three wheels,
- a simple differential allowing both rear wheels to be driven,
- a three-speed gearbox (optional),
- robust chassis construction.

In order to facilitate small-scale manufacture in developing countries the chassis is formed by welding straight lengths of square section tube, the number of machined parts is minimised, and standard bicycle parts are used wherever appropriate.

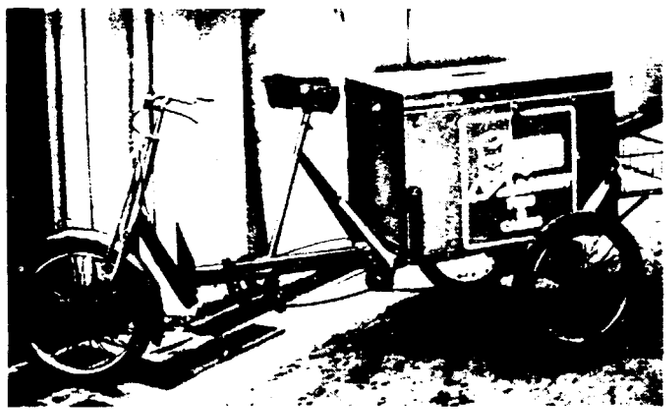

Plate 27. Oxtrike: Kenya.

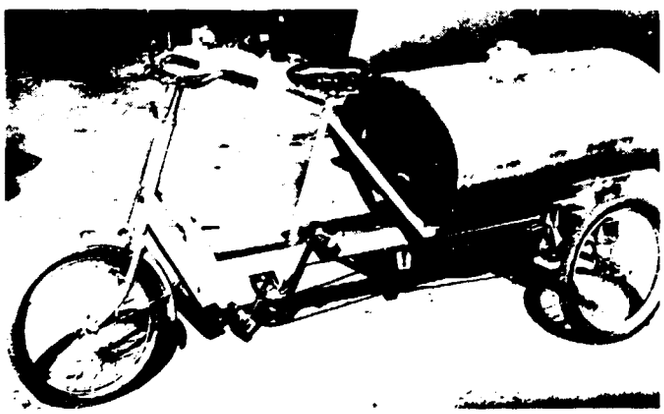

Plate 28. Oxtrike: Sri Lanka.

Plate 29. Oxtrike: Malawi.

Animal Transport

An alternative to man powered devices are those using animals as the motive force. Goods may be carried on the animal's back in panniers (Plates 30 and 31), which is particularly useful in mountainous terrain.

Plate 30. 100 litre waterbag panniers: Ethiopia.

Plate 31. Panniers for rock, wood or bags: Ethiopia.

Another form of animal transport is the sledge (Plate 5). It is interesting to contrast the crude form of sledge used in Botswana (Plates 5 and 32) requiring six large oxen in order to move a relatively small pile of firewood, with the simple wood or bamboo sledges used in the Philippines (Plates 33 and 34). In the latter one carabao (water buffalo) is able to transport three bags of fertiliser without difficulty.

Plate 32. Animal sledge: Botswana.

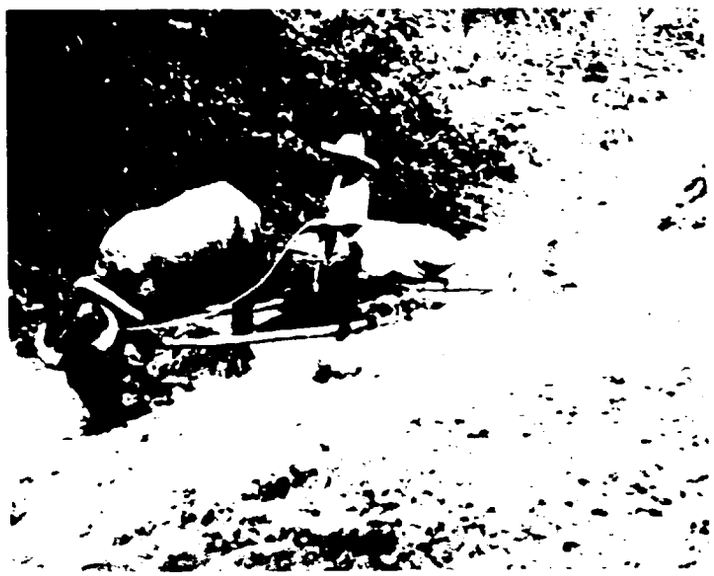

Plate 33. Animal sledge: Philippines.

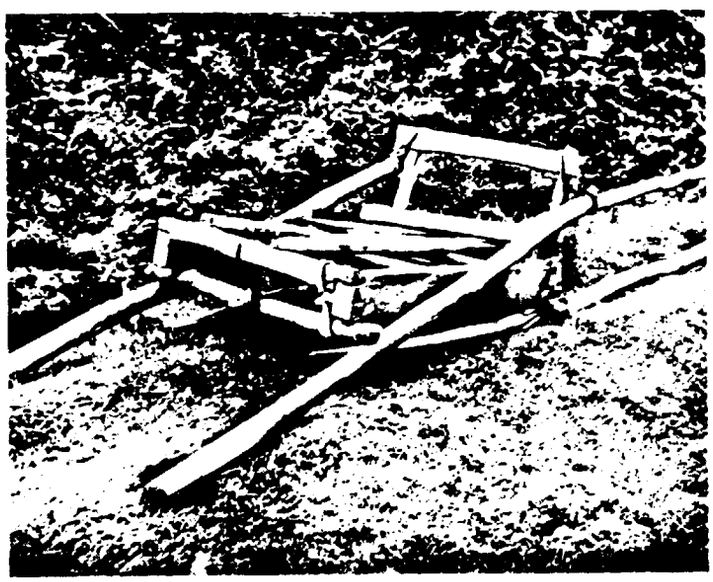

Plate 34. Detail of animal sledge: Philippines.

Animal carts are widely used throughout the Asian sub-continent, but most are crude traditional designs of all-wood construction and limited capacity (Plate 35).

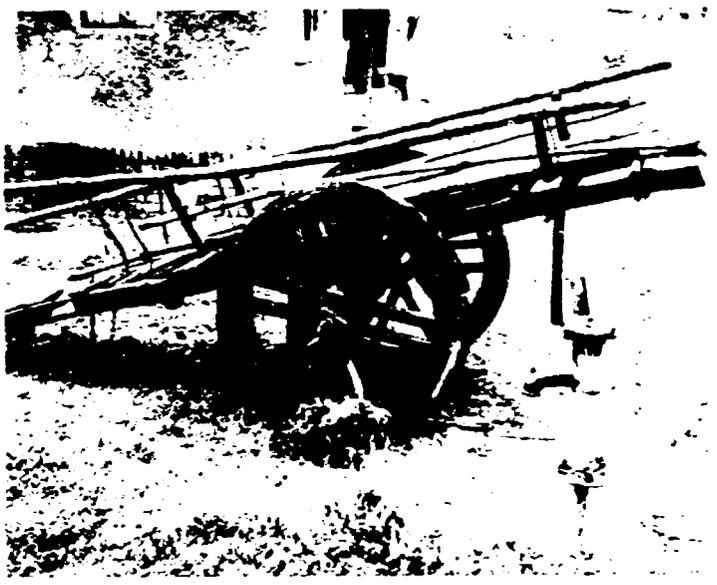

Plate 35. Traditional ox-cart: India.

Harnessing arrangements often provide poor tractive effort and physically injure the animals leading in many cases to an unnecessarily shortened working life (Plate 36). [1].

Plate 36. Traditional neck yoke and (throttle) harness: India.

[1] RAMASWAMY, N.S. Modernising the bullock-cart: present status and problems of the system. Indian Institute of Management, Bangalore, 1977.

The design of the axle/wheel assembly - with efficient, preferably roller, bearings and pneumatic tyres - and harnessing are the key factors in improving the efficiency of traditional, animal-drawn carts. A simple, locally developed, axle/wheel assembly suitable for small-scale manufacture is shown in Plate 36.

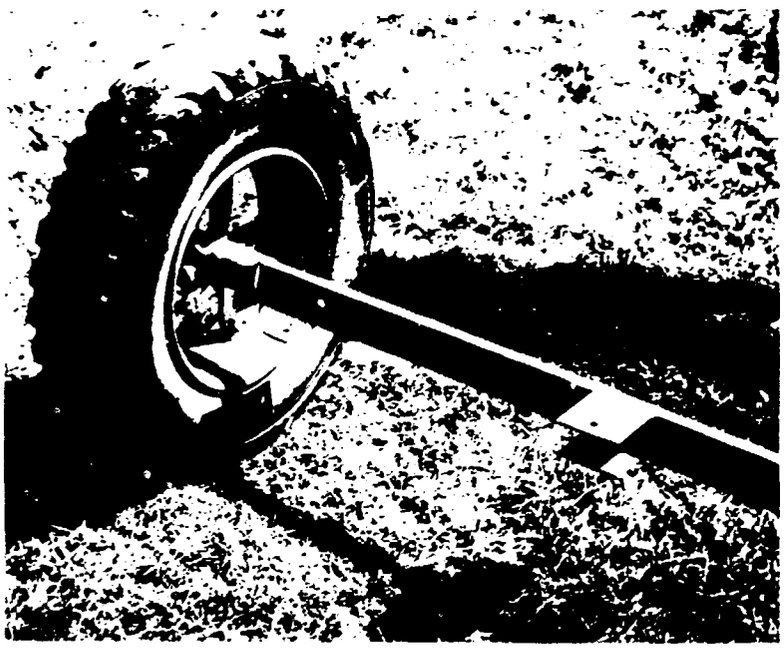

Plate 37. Detail of locally-developed axle/wheel assembly: Tanzania.

More efficient cart designs are available in some countries but their use is mostly localised (Plates 38 and 39).

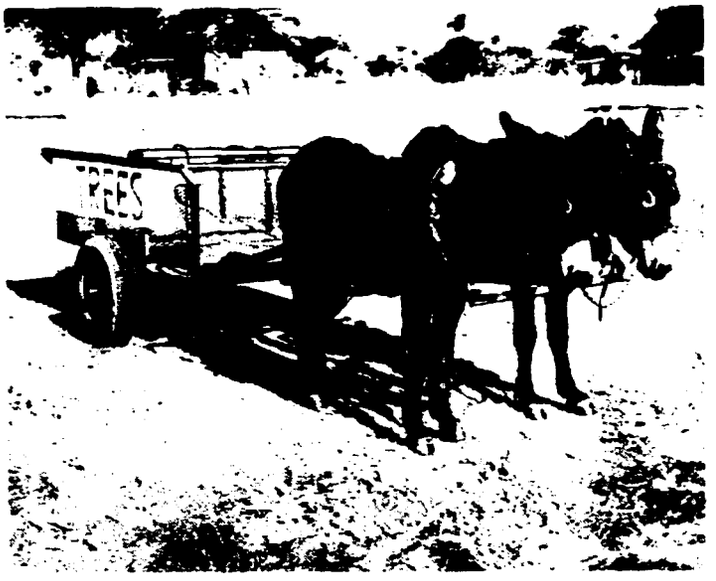

Plate 38. Locally-developed mule cart and harnessing: Mochudi, Botswana.

Plate 39. Single animal-drawn cart with V-yoke: Indonesia.

Low-Cost Motor Vehicles

A wide variety of basic motorised vehicles exist, the simplest of which is a converted bicycle (Plate 40) or tricycle (Plate 41) usually used for passenger transport.

Plate 40. Motor-assisted bicycle and sidecar: Philippines.

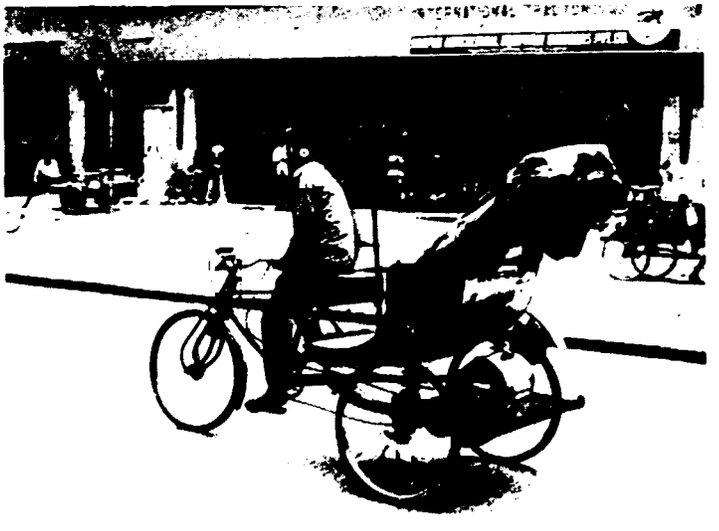

Plate 41. Motor-assisted tricycle: India.

The purpose-built moped, scooter or motorcycle are much more widely used than the motorised bicycle and a trailer can be added to increase the load-carrying capacity. (Plates 42, 43 and 44).

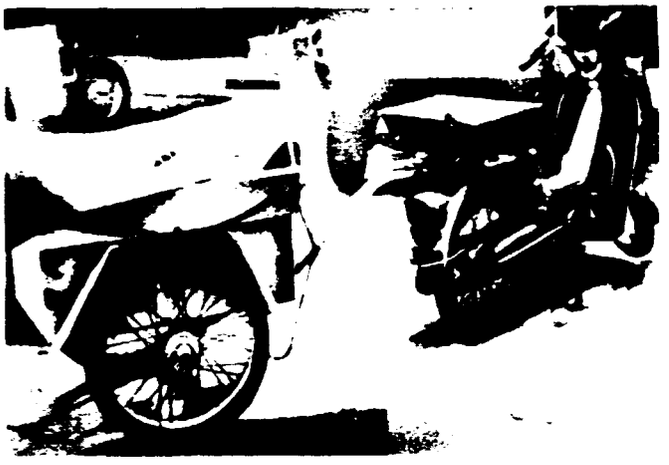

Plate 42. Swiss Postal Service moped and trailer

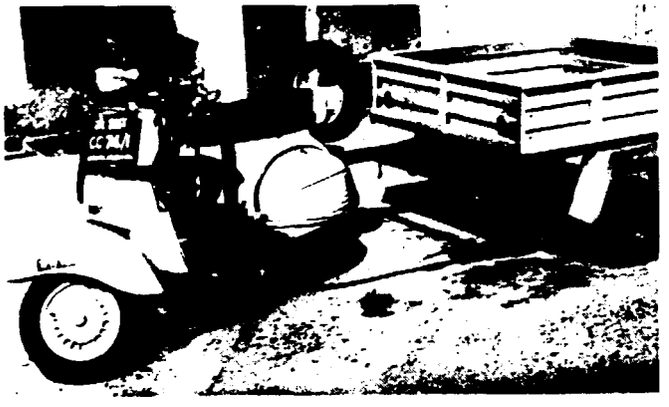

Plate 43. Scooter and trailer: Sri Lanka.

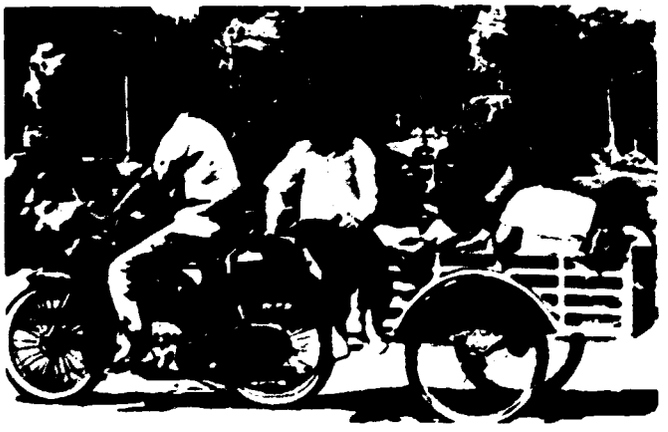

Plate 44. Motor cycle and trailer: Cambodia.

The combination of motorcycle and sidecar is almost unknown outside of the Philippines where it is an important and popular *means of rural passenger and goods transport.* (Plate 45).

Plate 45. Motorcycle/sidecar combination: Philippines.

Various forms of purpose-built motorcycle or scooter based tricycles exist in different countries both for passenger (Plate 46) and goods (Plate 47) carriage.

Plate 46. Passenger scooter tricycle: India.

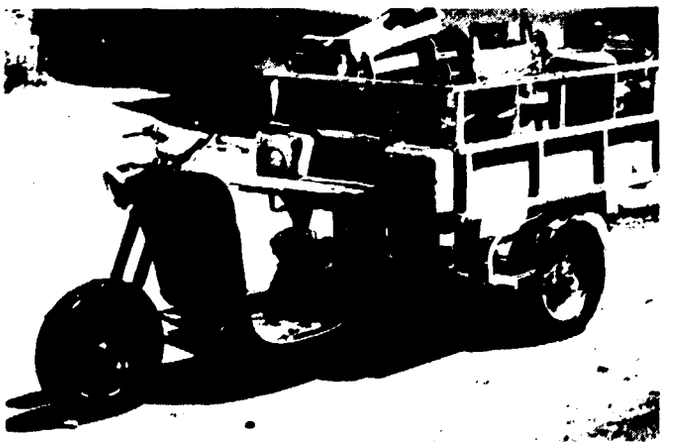

Plate 47. Goods scooter tricycle: Crete.

Basic Motorised Agriculture/Transport Devices

The single-axle tractor, widely used in some parts of Asia, is an example of a power unit, designed primarily for cultivation, which can be adapted to perform a transport function (Plate 48) by the addition of a trailer.

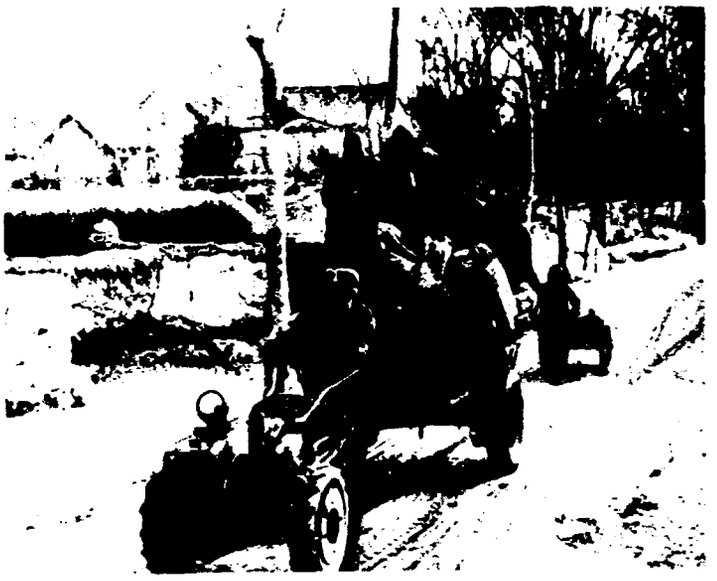

Plate 48. Single-axle tractor and trailer: China.

The concept of using a low-speed, low-power engine has been further developed in Greece to produce a basic motorised vehicle (Plate 49), which fulfills only a transport function. It is capable of being produced locally on a small scale.

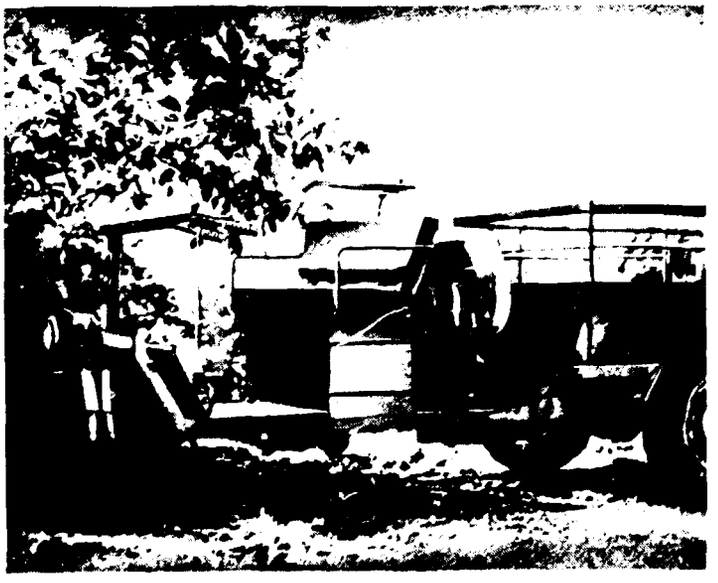

Plate 49. Basic motorised vehicle: Greece.

There have been attempts by the manufacturers of conventional motor vehicles to adapt their products to better suit the needs of developing countries. The Asian Utility Vehicle (AUV) produced in Indonesia and the Philippines (Plate 50) is based on a conventional engine and transmission, but the body, chassis and suspension are designed to be produced without the need for the sophisticated and very expensive equipment of the modern car plant.

Plate 50. AUV: Philippines.

THE PERFORMANCE CHARACTERISTICS OF BASIC VEHICLES

Vehicle	Load (kg)	Speed (km/h)	Range (km)	Terrain	Relative Cost
Carrying Pole	35	3-5	10	Unlimited	-
Chee-ke: traditional	70	3-5	10	Unlimited	10
: improved	70	4-5	10	Unlimited	20
Western Wheelbarrow	120	3-5	1	Reasonably flat, smooth surface.	20
Chinese Wheelbarrow	180	3-5	3-5	Reasonably flat, tolerates rough surfaces.	20
Handcart	180	3-5	3-5	Reasonably flat, very smooth surface.	30
Bicycle	80	10-15	40	Reasonably flat paths.	60-100
Bicycle and trailer	150	10-15	40	Reasonably flat: wide paths.	90-150
Bicycle and sidecar	150	10-15	40	Reasonably flat: wide paths.	90-150
Tricycle	150-200	10-15	40	Reasonably flat: wide paths.	150-200
Pack Animal	70-150	3-5	20	Unlimited	Varies with species

THE PERFORMANCE CHARACTERISTICS OF BASIC VEHICLES (2)

Vehicle	Load (kg)	Speed (km/h)	Range (km)	Terrain	Relative Cost
Animal-drawn sledge (buffalo)	70-150	3-5	20	Reasonably flat: wide track.	Varies with species: sledge zero.
Animal-drawn cart (oxen)	1000-3000	3-5	50	Reasonably flat: wide track.	100-180
Motorised bicycle	100-150	20-30	50	Reasonably flat.	150-200
Motorcycle: 125cc	150-200	30-60	100	Moderate hills.	250-600
Motorcycle & sidecar: 125cc	250-400	30-60	100	Moderate hills: wide path.	350-800
Motorcycle & trailer: 125cc	200-300	30-60	100	Moderate hills: tolerates rough paths.	350-800
Motor tricycle: 125cc	200-300	30-60	100	Moderate hills: wide track.	500-1000
Single-axle tractor and trailer	1200	10-15	50	Moderate hills: wide track.	1500
AUV	1500	50-80	400	Steep hills: wide track.	4000

POLICIES AND PROGRAMMES FOR THE WIDER INTRODUCTION OF LOW-COST VEHICLES

If transport policies in developing countries are to be changed so as to explicitly include measures to promote the provision of lower cost vehicles then it will be necessary to:

(i) change official perceptions of the transport needs of rural communities;

(ii) make influential decision makers more aware of the potential range of proven low-cost vehicles that might be considered in the design and planning of transport services;

(iii) broaden planning procedures so that they reflect a more transport and vehicles oriented, and a less road oriented viewpoint; and

(iv) include more frequently the manufacture of low-cost vehicles as part of efforts to develop small-scale industries developments.

Changing Attitudes

Available evidence suggests that wider usage of basic vehicles cannot be expected because they are in any sense inherently good or efficient. It has taken considerable effort over almost a decade to persuade many developing countries that the use of technologies intermediate between traditional methods and the most advanced in the world is not necessarily

a backward step in development but can be a more efficient use of their existing resources: even now only a relatively small number of countries have active and effective programmes. The expectation must be that a similar effort will be required to gain acceptance for the notion that the introduction of more basic forms of transport could make a significant impact on the movement needs of many rural communities.

There seems to be no logical reason why Governments and aid institutions should not play in the future as dynamic a role in the provision of basic vehicles as they have done in the provision of roads in the past, given that the track and vehicle are complementary and mutually dependent parts of the road transport system. This role might include facilitating and promoting the transfer of relatively successful technologies between countries and in some cases, even within the same country; support for the development of efficient basic vehicles; technical, financial and commercial assistance to local manufacturers; the provision of credit to potential purchasers; and the elimination of statutory and fiscal constraints to the use of more basic forms of transport.

The reasons why such transfers of technology have not taken place spontaneously are unclear, but the evidence points predominantly to lack of knowledge and prejudice. People cannot express a demand for a product of whose existence they have no knowledge. Moreover there is undoubtedly a considerable reluctance in many countries to consider as transport any form of vehicle that is not motorised. This is most evident in the small proportion of resources devoted either to the production or improvement of non-motorised vehicles and in the open biasses against their use.

Changing attitudes will not be easy and suggests that UNIDO and similar organisations will need to play an enabling role with the development of more basic forms of transport. It is <u>not</u> suggested that UNIDO should usurp the function of the private sector, only that it might act initially in a pump priming role. In overcoming the twin obstacles of

bias and lack of knowledge the two most fundamental steps are:

- creation of awareness; and
- transfer of technology.

Guides to the Technology of Low-Cost Vehicles

Experience from studies in the field indicates that few influential decision makers are aware of how wide is the potential choice of basic vehicles because, as indicated, some of them are geographically isolated and information about their characteristics, mode and economy of operation has not been collated into any easily accessible form.

There would appear to be a need for a structured series of publications that offer a guide to the available technical and economic options so far as basic vehicles are concerned, and the planning issues and methods that need to be considered to introduce new options into development projects. Much of the necessary information exists, but it needs to be made more readily accessible. It ought also to be supplemented by detailed case studies of the operational characteristics of some of the more successful basic forms of transport such as those described in Box E, so that practical field manuals can be developed to aid their replication elsewhere.

In initiating the successful local manufacture of low-cost vehicles, the identification of suitable collaborators, and assistance in production technology, management and marketing, are often an essential complement to the provision of design advice.

Design for Local Manufacture

Experience suggests that it is also necessary to adopt a very flexible, local resource orientated, approach to product design. In particular, if costs are to be minimised, especially the foreign exchange element, then:

- It is not possible to separate the design of a product from the likely production processes and skill availabilities.

- Designs must be capable of adaptation to take advantage of components available locally in abundance.

Both of these principles are best illustrated by examples.

Industrial development in a developing country of Southern Africa has reached the stage only of elementary metal fabrication. It is possible to bend, cut, drill, weld and bolt metal fabrications but not to turn, mill, grind or undertake other more complex finishing operations. Thus, a design requiring precision bored or turned bearings would be impractical: it would necessarily involve a complementary investment in special purpose machinery and extensive and time consuming skill training. For the time-being these needs must be designed out of intended products. One means of minimising reliance, for product quality, on local skill levels is by careful attention to the specification of production procedures and jig and fixture design.

A developing country in Asia currently imports hundreds of thousands of 40mm diameter bearings to service the needs of its large mining industry. These, and the corresponding steel shafts, are readily available at relatively cheap prices because of the large quantities imported. A vehicle rigidly designed around 25mm diameter bearings would be unable to take advantage of these cheap components and the relatively small import quantities would almost certainly inflate their price in relation to the stock items. Whilst the general principles of a design may remain fixed, the detailing ought to be based on an inventory of standard locally available components and material sizes.