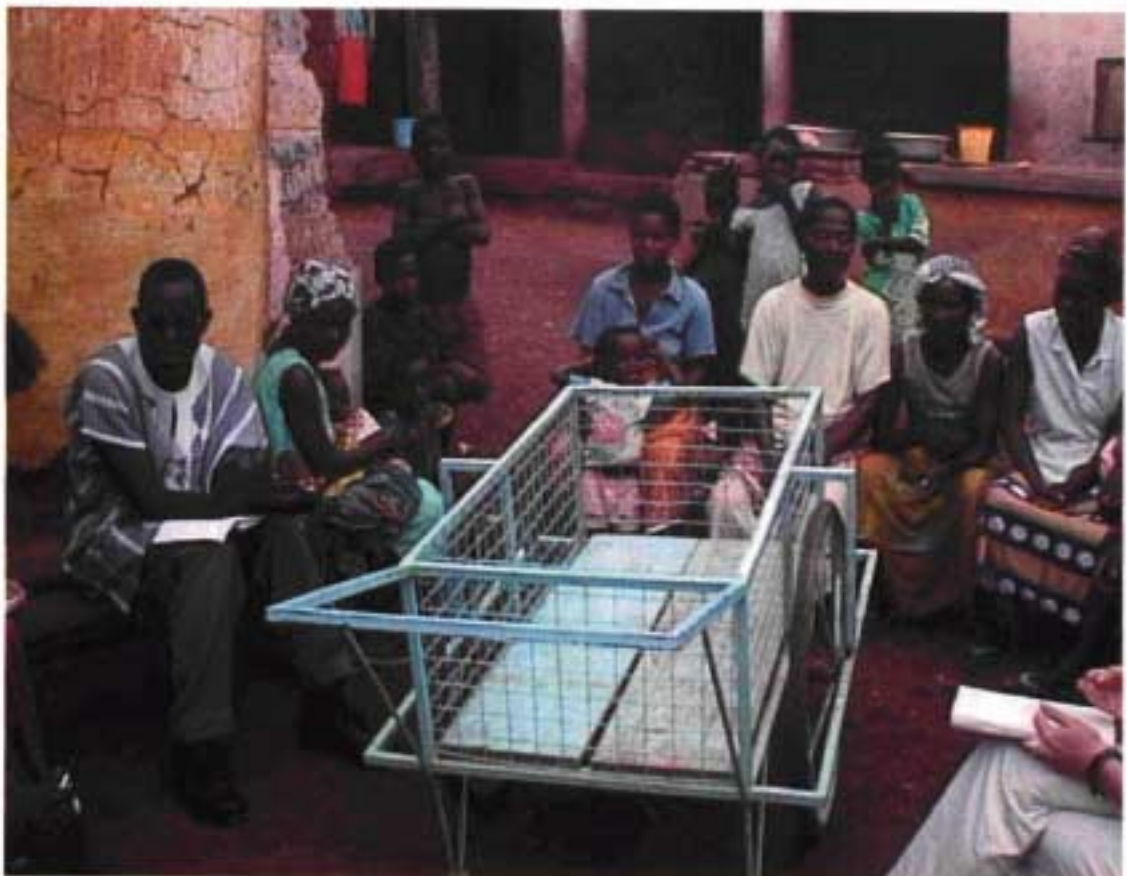


**Action research to evaluate the impact on livelihoods
of a set of post-harvest interventions in Ghana's off-
road settlements:**

***Focus on Intermediate Means of Transport
(IMTs)***

Report of the

IMT Ghana Project Technical Support Visit



by

Pascal Kaumbutho

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IMT Ghana Project Technical Support Visit

Compiled for

Natural Resources International:
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List of acronyms and abbreviations

IMT	Intermediate Means of Transport
KENDAT	Kenya Network for Draught Animal Technology
GBP	Great Britain or Sterling Pound
GC	Ghanaian Cedi
NRI/CPHP	Natural Resources International / Crop Post-Harvest Programme

Executive Summary

A visit was organized with the objective of exchanging rural transport and IMT technology transfer experiences between Kenya and Ghana. Of interest was the research and rural development aspects of technological and socio-economic issues regarding exposure to and subsequent adoption of IMTs. The Kenyan experience was called for, with regard to gauging the technological aspects of the IMTs in question with special regard to the problems encountered with the project hand cart, recently introduced by the Ghana project.

It was apparent from the visit that the Ghana IMT project is getting operationalized in a country and in areas with very fascinating and real challenges to provision of rural transport services and particularly the adoption of IMTs. The generally forested environment has seen little impact of urbanization on rural village life, save for a few over-loaded and occasional taxis and small trucks hauling all manner of agricultural produce, livestock and people.

During the short review visit it was not possible to ascertain why some IMTs, like the bicycle and the wheel-barrow, which are relatively common in other parts of Africa remained relatively exotic to the Ghanaian villages under study.

The collaborative and participatory approach adopted by the IMT project team involving the district leadership, government agencies, NGOs and other rural transport stakeholders is well placed. The government structures and projects in place such as the Feeder Roads Programme and the Village Infrastructure Programme, already in place, make the IMT Project a most timely one for rural development advancement information and provision.

The five main IMTs the project is promoting are the bicycle, wheelbarrow, hand cart, push truck and the power tiller. These can be put to relatively different but some common uses as well. How they are used depends on the needs of the user, and factors such as speed, distance, payload size, capital cost, repair and maintenance, prestige etc. Adoption of the IMTs will depend on both technological and socio-economic factors.

The **bicycle** available in Southern Ghana has the flexibility of appropriateness for load haulage, use of a cycle trailer, extended seat, pannier etc to explore between researchers, manufacturers, dealers and promoters alike. Adoption will compete between use for leisure by men or for agricultural based haulage by men or women.

The **wheelbarrow** has design criteria to explore such as a thinner local body and non-pneumatic and puncture proof, solid rubber wheel. These determine price with the solid wheel most expensive and influence adoption. Adoption for agricultural, water and household energy transport may face the mental block, which may associate use of wheelbarrows with building site operators alone.

The **project hand cart**, a new introduction has faced may puncture problems and now needs to be tried with a different but ordinary bicycle, other than custom made rim. A motorbike wheel will also be tried. Other possible innovations may be the double axle and the PVC bearing with grease cups to keep the dust out and allow wobble-free wheel functioning. Testing will need to be supervised to ensure adequate tyre-pressure operation.

Training in manufacture of puncture-proof tyres by Kenyan collaborators will help in the manufacture and use of most IMTs in question. Kenyan experience has shown that punctures can be a major deterrent to IMT utilization efficiency in rural areas.

The four-wheel **push truck** is totally indigenous, manufactured from re-circulated car parts. The truck is commonly seen in urban centres and is popular for short-distance operation on relatively good roads. The push truck appeared most popular with the village users probably because it was not new to their eyes. The push truck will be interesting to research under the IMT project, because of the interest it generates among potential users. The truck is relatively inexpensive compared to what it can do and the capital cost involved.

The **power tiller** is a multi-purpose unit with exploitable gains in tillage operation. It is however more profitable in transport use. Researching the power tiller will need to be cautiously done as its use is sensitive to rural business productivity and user management, both of which may be hard to come by in rural areas.

It is recommended that the research team cautiously research the IMT usefulness and in a holistic way. While the project has all the ingredients for this to happen, it may for example be worth remembering that spontaneous adoption may not come within the life of the project due to many considerations such as age and gender of users, general exposure levels of communities, industrial vigour for entrepreneurship and critical mass building, among other factors. This in essence is an important part of the research project.

The project should also remain open-minded to other means of transport such as motorcycles, donkeys and animal drawn carts, all of which are used in the northern districts of Ghana. Some of the approaches recommended in the adoption process are such as group ownership.

Village level and inter-village IMT use competitions are recommended as some of the ways of generating the necessary publicity, leadership support and impact assessment criteria. This development aspect of the project needs to be part of the research towards defining best-practice in IMT promotion and subsequent adoption.

Introduction and background

Ghana has an ongoing Intermediate Means of Transport (MT) Research project supported by Natural Resources International / Crop Post-Harvest Programme (NRI / CPHP). The Ghana project titled " *Action research to evaluate the impact on livelihoods of a set of post-harvest interventions in Ghana's off-road settlements: focus on IMTs* " commenced implementation in February 2000. A sister project is due to start in Kenya (April 2001), at the same time as another one in Uganda.

As the Ghana project has progressed, a need was felt for technical assistance and experience sharing with Kenya. On a need to learn and share with the Kenya experience on IMTs and their technology transfer approaches, the Ghana Project Team Leader invited the author of this report to Ghana.

The critical issues centred around how the IMT choice, design quality or flexibility, ongoing placement trials and utilization could be best advanced. Of particular interest was the hand cart designed by Ron Dennis of IT Transport and manufactured by GRATIS of Ghana. This cart was experiencing a large number of punctures which almost rendered it unusable.

A trip to Ghana was organized and made possible by the support of NRI / CPHP Programme Manager.

Terms of reference for the visit

The visit and assignment were guided by the following TOR:

1. To visit at least one of the five study villages in the coastal zone and assess trafficability of access routes and village paths for IMTs in the light of Kenyan experience.
2. To advise on tyres for and other modifications to the GRATIS built handcart for use by women in the study villages.
3. To review the standard IMTs available in coastal Ghana (push truck, wheelbarrow, Phoenix bicycle, power tiller) and advise
 - a) on their current potential and
 - b) the potential of improvement through simple modification (e.g. panniers for bicycles).
4. To participate in at least one village workshop

The visit activities

The visit was spent exchanging with various collaborators of the Ghana IMT project. The exchange was enhanced by participating in the previously scheduled village stakeholders workshops in the form of users' field-days. The objective of the workshops was to expose the users to the range of IMTs so that they had the necessary information to assist them in making objective decisions on how to plan to acquire the IMTs.

At the workshops held in each of the participating (project) villages, potential IMT users were provided with all the user and acquisition information necessary. The range of IMTs were demonstrated with intensive discussion of the advantages and disadvantages of each. The package included:

- 1) a wheelbarrow,
- 2) male and female user, Phoenix bicycles
- 3) a hand cart,
- 4) a 4-wheel push truck and a
- 5) power tiller with trailer.

The workshops were highly participatory with representatives of support organizations present to personally highlight the various organizational responsibilities in the technology transfer process. Collaborating organizations and individuals present were such as Village Infrastructure Project (VIP), District Assemblies, Rural Banks, an NGO Self-Help International, an equipment prototype research and manufacture organization, GRATIS, village and church leaders and others.

At each field day the routine agreed between organizations was one where women first and later men, got a chance to view and where appropriate, operate the IMTs. They would make comments and even vote for the preferred option. A plenary discussion followed, led by various organizations, who explained their roles, particularly in creating a conducive environment for IMT use, their acquisition and management.

The gathering would then be addressed by the project Technical Assistant followed by political and village development leaders as well as heads of various organizations represented. For example the VIP explained the role of ensuring paths, tracks and culverts were fixed, so that the IMTs could be effectively used. Self-Help, a local NGO with experience in IMT technology transfer would talk about the range of IMTs and intricacies towards acquiring them, such as group or individual ownership, and implications. A farmer who is a power tiller owner would explain his experience with this relatively expensive IMT. The rural bank representatives would then explain the credit provision process.

Comprehensive discussion followed, to the satisfaction of the potential IMT owners and users. An informed audience with knowledge on advantages and disadvantages of each IMT, how to acquire credit, service and repair etc., contributed, with opportunity to air any wishes or fears, alike.

A week or so later the project team and bank officials returned to each village to receive feedback and orders of the IMTs selected by the users.

Apart from the village workshops my visit time was spent assessing the various local manufacture and repair service potentials available in the villages and in towns such as Kumasi, Swedru and Winneba.

Other times were spent with the hand cart manufacturers, artisans of Kumasi Magazine, hardware and second hand tyre stockists, cycle dealers and hirers, institutions such as Self-Help, the National Vocational Training Institute, donkey users around Kumasi and others.



Left: Villagers view and discuss IMTs with project staff at hand to answer and shed light on the broader picture.

Women and children are prime clientele in the IMT research and promotional plans. Tapping on the openness of the minds of the youth in the introduction of IMTs will add dimensions of sustainable development into the future.

Right: Elders and Leaders watch as users express their wishes, hopes and fears at a village participatory workshop. It is through such fora that IMT promoters gather the necessary data and information with the users at the centre.

It is believed that, with genuine inclusion of users, user organizations, opinion leaders and members of support institutions or organizations, IMT promotional projects are bound to succeed.

General observations

Southern Ghana has an incredible amount of smallholder agricultural potential yet to be exploited. This potential is built around fruit and other tree crop products, in an environment of high agricultural potential. Head loading particularly by women and children is the predominant means of transport at village level. The main alternative but highly limited means of transport for village use appeared to be the modern car in form of a taxi or small truck where available. This is however useable only where there are roads and mostly for getting yam, cassava, plantain and other produce to markets. At rural urban centres (away from city centres) the push truck seemed an important IMT, more so for mobile kiosk operation.

Southern Ghana has a settlement structure and land tenure system where farmers live close to one another in villages and walk to work on farms located a few kilometres away. This settlement structure calls for important rural transport needs and presents a clear case of the need for IMTs, especially at planting and harvest times. Farmers, mostly women who have significant distances to walk to and from farm at the beginning and end of a typical day have tangible transport needs in-between other family roles and chores.

Compared to the Kenya land tenure system of land demarcation, where under the Sunnerton Plan of the mid-sixties saw villages split into individual land holdings, rural transport needs may be more severe for Ghana. However, in Kenya today villages are spread out and gathering farmers for a meeting, takes much more than sounding a ding-dong around the village. Common transport or group ownership of IMTs may also be difficult to organize under the Kenya system. Other rural development difficulties under the Kenya settlement model is the difficulty to say, install a mains electricity transformer or water supply system to users that are removed from one another.

Southern Ghana is endowed with tropical forest and thick tropical bush environment which can curtail use of IMTs between farms and villages. It was however impressive to note that an active feeder roads programme, which is well linked to District development Assemblies is ensuring access for villagers, to local town markets and services. In turn the Village Infrastructure Programme is ensuring rural tracks and trails, foot bridges are existent and well kept for farm to village communication. While it was not possible to ascertain the efficiency of these programmes and the impact of their work, the rural transport scenario and indeed the use of IMTs in Ghana seemed to have all the necessary support structures in place. The IMT project was indeed, but one of several timely interventions.

Comments regarding various IMTs

The various IMTs are described in Chart 1, based on the technological and other observations made about them.

Clearly most of the IMTs were relatively exotic to the users' environment and experience. Even IMTs like the wheelbarrow and the bicycle though relatively common, were not used by most villagers, a surprise for an observer coming from Kenya.

The case of the project hand cart

The hand cart prototype was produced for the IMT Ghana project by GRATIS, a government establishment tasked with designing and manufacture of a wide range of technological prototypes.

Discussions with GRATIS and users (in the presence of GRATIS) verified that::

- The prototype hand cart was constructed based on the IT Transport design.
- The prototype hand cart has an intolerable level of punctures and this was already discouraging trial users and needed urgent redress.
- The hand cart was used on predominantly murrum surface roads.
- The IT Transport self made rim was thin and with a V-cross-section shape which exposed the thin ply bicycle tyre to tremendous surface pressure. There was also a chance that the tyre had been used with inadequate pressure. The sample unit tyres had visibly separated internal fibre, an indication of internal damage under over-loaded use conditions.
- It remained unclear why an ordinary bicycle can haul up to a 100 kg bag and a passenger on tandem wheels while the hand cart was puncturing easily on adjacent wheels which shared the load, by design. It was possible that, under load, the tyres experienced lateral stresses in turning mode, due to a lack of differential action between the wheels. If punctures persist it will be worthwhile to try the double axle option, which from Kenya experience adds greatly to the manoeuvrability of the carts. With double axle action, tyres operate independent of each other, eliminating lateral stress on the tyres.
- The bearing section would eventually need caps and probably the Kenya-style PVC bearing addition to keep dust away from the grease lubrication and the wobble in operation, respectively.

Chart 1: Assessment of the IMTs under research

<i>IMT</i>	<i>Description and observation comments</i>	<i>Advantages</i>	<i>Disadvantages</i>
Bicycle	<p>Comes in male and female user versions but the make available (Phoenix) is not the load or passenger carrying one, with large carrier seat, manufactured in Asia and commonly used in East Africa.</p> <p>A 2inch wide wheel and larger carrier seat is needed before the units are popularized for agricultural transport. Capacity to manufacture the loading bicycle seat and even the pannier for water or other haulage is available locally in Wenneba and Swedru.</p> <p>Project sample was displayed at GC 400,000 cash, and at 490,000 on one year 22% interest loan from local rural bank.</p>	<p>A versatile IMT easy to manoeuvre in narrow paths and useable for human and load transport.</p> <p>High speed hence conducive to long distance operation with small loads.</p> <p>Loading seat can be strengthened locally or extended to carry more.</p> <p>Pannier installation is possible locally, after minor training.</p> <p>Possible use with cycle trailer.</p>	<p>User needs training to operate.</p> <p>Needy of maintenance skill.</p> <p>Popular version may be male type and not suitable for women riders.</p> <p>Can be easily dominated by men and exploited for leisure other than agricultural use.</p> <p>Load capacity limited and may have to be used in push mode where load capacities and not speed are a prime need.</p>
Wheel-barrow	<p>Commonly comes with a pneumatic wheel and roller or ball bearing all of which can be easily damaged after a few months of use. Solid rubber wheels are available but less common. Imported bodies are common but several attempts at making a narrower local body was observed in several places including at the National Vocational Centre in Winneba.</p>	<p>A versatile means of transport commonly associated with building site transport use in much of Ghana.</p> <p>Easy to operate for all users.</p>	<p>Relatively high cost in imported version whose spares are hard to come by.</p> <p>Limited load and terrain capacity.</p> <p>Low payload capacity.</p>

	<p>Project sample was displayed at GC 200,000 cash, and at 250,000 on one year 22% interest loan from local rural bank.</p>	<p>Good for short distance transport.</p> <p>Useable easily by both sexes.</p>	
Hand cart	<p>A new and unique project introduction targeting light load women users. A version produced by GRATIS after an IT Transport design has recorded a frustrating and near reject level of punctures on the commonly found bicycle wheels on it. The metal to metal bearing section has recorded wobble as well as quickly drying grease lubrication, mainly due to exposure to dust. The unit comes with a wire mesh secured loading 1100 by 650 mm, 420 mm high basket. The body structure is supported on a 1x1 inch square tube frame and runs on a pair of 700 mm external diameter bicycle wheels. The unit is relatively light. In construction.</p> <p>Project sample was displayed at GC 350,000 cash, and at 430,000 on one year 22% interest loan from local rural bank.</p>	<p>Light and easy to use by women.</p> <p>Load when adequate in size is securely loaded in box type, wire-mesh container.</p> <p>Two wheels, unlike the wheelbarrow carry the lateral load component, therefore easy on the shoulders of the user.</p> <p>Low fatigue hence long distance useable.</p> <p>Low maintenance.</p>	<p>Current version is highly prone to punctures.</p> <p>Needs a road or track for ease of usage.</p> <p>Is limiting for ferrying long loads like wood.</p>

<p>Push truck</p>	<p>A 4-wheeler manufactured from re-circulated materials. Has a heavy build with an open loading platform and an articulated (on king-pin) steering and manoeuvring system. Comes without brakes and is relatively heavy for women users, though even men need a push when loaded. Commonly used in urban centres to haul goods over short distances or as mobile kiosk surface for traders.</p> <p>Project sample was displayed at GC 350,000 cash, and at 430,000 on one year 22% interest loan from local rural bank.</p>	<p>High load capacity when aids are at hand to help push.</p> <p>4-wheel stability, easy to operate.</p> <p>Versatile open platform loading capacity good for long wood.</p> <p>Relatively affordable; durable and made from locally available re-circulated vehicle parts.</p> <p>Relatively low maintenance operation.</p> <p>Has a relatively adequate critical mass.</p>	<p>Heavy build and calling for high muscle power.</p> <p>Appropriate for short distance use.</p> <p>Needs a road or track for operation.</p> <p>Not conducive to hilly terrain and areas.</p>
<p>Power Tiller</p>	<p>Comes with a one tonne trailer to haul for transport and the highly versatile options including various tillage and water pumping accessories.</p> <p>Project sample was displayed at GC</p>	<p>Has designed multi-purpose use in tillage and transport.</p> <p>High capacity and speed.</p> <p>Rough ground use operation</p>	<p>High capital cost for a typical user.</p> <p>Needs diesel fuel, high operational cost.</p> <p>Needs high level operation and service skill.</p>

	<p>20,500,000 cash or 24,900,000 on a 22% one year interest loan. An option was a two year loan totalling 29,520,000 at sum 44% interest loan from the rural bank.</p>	<p>possible.</p> <p>Long distance operation eg: farm to market and vice versa; possible.</p> <p>Useable in large load transport hire.</p>	<p>Needs roads.</p> <p>Inadequate access to spare parts.</p>
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GC = Ghanaian Cedi 1GBP = GC 9500

Further comments and recommendations

The bicycle

It is common knowledge that bicycle use is growing in Africa, more so for the East Africa region. Compared to Kenya or Uganda, it would appear that Ghana needs concerted effort to increase the use of the bicycle. Spontaneous expansion of the bicycle taxi use in East Africa, which the Kenya NRI project will study has brought about a most effective means for rural transport services. The taxis have been seen to haul all sorts of people and cargo, including agricultural produce and live animals. This is true even where the bicycles have to be used in push mode, due to hilly topography or huge payloads.

The bicycle will remain one of the most versatile intermediate means of transport and the apparent great potential for Southern Ghana will need to be exploited. Bicycles are relatively cheap to buy and easy to manoeuvre even in bush tracks. Like other IMTs, a critical mass is however needed to make them popular and avail repair and other support services such as operator and user interest groups.

The predominant Phoenix bicycle found in most of Ghana is a luxury bicycle and it was noted that there are luxury bicycle hire businesses in Ghanaian towns.



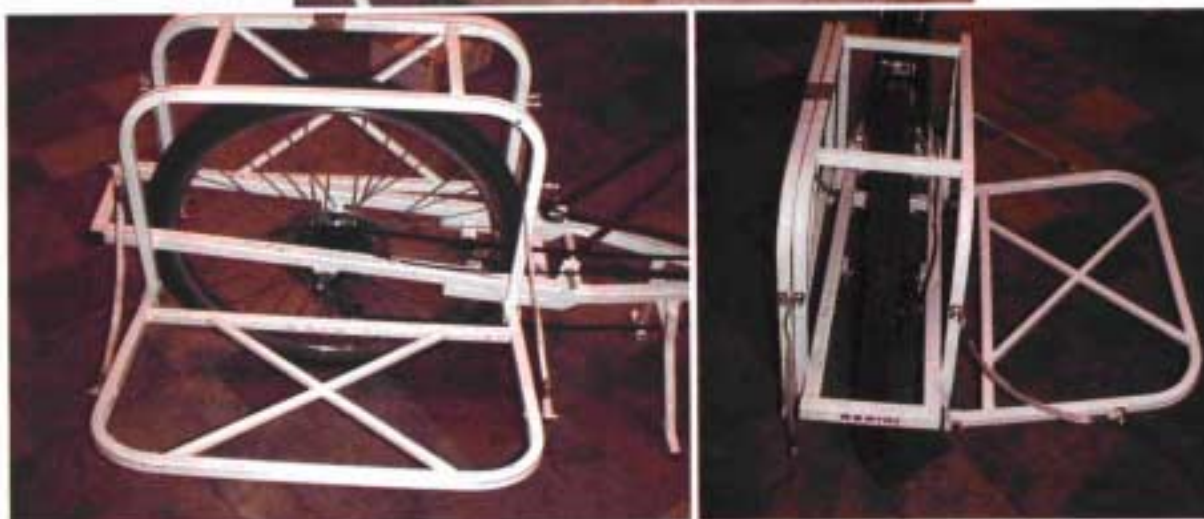
Left: A live pig headed for slaughter house; ferried with little concern for animal welfare, on a rugged bicycle made for load haulage as well as leisure.

Right: The typical large load seat missing on most Ghana bicycles, innovatively extended for tender baby transport. On a bike the man naturally takes the role of entertaining the children as well as taking them to hospital and other destinations.

In many parts of Africa like shown here in Kenya, the Asian bicycle is commonly available at prices that beat local manufacture.. They haul people and loads alike, with great user innovation to fit the particular needs.

It is recommended that the IMT project try out modifications of the Phoenix bicycle by adding a larger sit and rugged wheels which are at least 2 inches wide. An Asian bicycle purposely made for load hauling can be tried through the bicycle business outlets.

To avoid the quick take-over of bicycles by men who may use them for leisure and not to assist women in reducing the transport load and burden, women will need training. Projects elsewhere in Africa, like by Afribike in South Africa and more recently in Guinea have proved that bike riding by grown-ups and more so by women should not be taken for granted. A conscious effort needs to be put in place towards training users. The bicycle and other IMTs gives great independence to users and their placement is definitely worth exploiting.



The ladies bicycle with the expanded back seat. The seat has several operational options and works as a pannier as well, increasing load capacity several-fold. Experience has shown that the bicycle with the flexible expandable back seat works better than a bicycle trailer which, (unlike the expanded seat) needs a wider track or road, and absolutely flat terrain. The expanded sit does not interfere with the manoeuvrability and rider comfort or caution level as much as does the trailer.

At the least, and with agricultural transport in mind, the Ghana Phoenix bicycle needs intervention through local artisans to add a load carrying seat, hand in hand with training of women to ride. A bicycle pannier option will have added advantage to the users who often have to haul water for domestic use. Some adventurous and youthful lady-champions can be fully supported to exploit the many options for the bike as a way of ensuring that bicycles are seen in use by other potential users. Experience has it that lady bicycles (without the cross bar) are not popular with men while women do not mind riding male bicycles in the long run. For Ghana both options may be tried to start with and the course of development accommodated as it comes. It is noteworthy that Ghanaian women's traditional dress is likely to accommodate the use of bicycles, even if they are of male type.

The Wheelbarrow

The wheelbarrow is a versatile short-distance IMT with the ability to accommodate all nature of small loads. In Kenya wheelbarrows are used to haul water, building materials, produce and even sick persons. Experience in Kenya has shown that the wheelbarrow like other flexible loading IMTs that are mass produced, cannot be beaten in adoption by say water and other specialized barrows made in special shape like to haul two water cans and hardly anything else.

It was a surprise that the imported pneumatic wheel type barrow was common in Ghana. In Kenya, all wheelbarrows in use today are locally made and have solid rubber wheels. Locally made wheel barrows in Ghana were observed to have a price dependent on the wheel type (solid or pneumatic) they came with. The solid wheel made the unit 40 to 60% more expensive. A unit with a solid rubber wheel was seen at Swendru (see Appendix Two) and is therefore not unusual though uncommon. The short visit did not allow for an intensive industrial survey of status for wheelbarrows.

Like the bicycle, the wheelbarrow will remain an IMT worth exploring for Ghana and the IMT project areas as much.

The hand cart

- a) It was recommended and agreed that: GRATIS manufactures a cart with standard bicycle rims which are 2 inch wide and possibly another with motorcycle wheels. After ensuring the correct inflation pressure in use, the new carts will be placed with the users for comparative trial.
- b) GRATIS, University of Durham and KENDAT commonly agreed that a training proposal be written and submitted to NRI/CPHP or DFID/IUDD, to help bring in the apparently much needed Kenya experience with puncture proofing tyres. Support would assist in the training of technicians from key organizations and local artisans. A Kenya trainer would spend a week to 10 days at GRATIS in Ghana, conducting the training. Puncture proof

tyres in Ghana are needed by the hand cart, wheelbarrows and even animal drawn carts. The double axle experience can be passed on during the same course.



The hand cart produced by GRATIS and introduced by the IMT Project

- c) It would be interesting to research whether a version of the hand cart with a sit for the baby, equivalent to a modern-day supermarket shopping cart would be a sellable addition to the design option for the women. It was observed that in all villages visited, the majority of women interviewed were always carrying a baby in their hands or backs.

The project hand cart is costed in Appendix two. The cost of materials were gathered from typical sources for village level local manufacture in Ghana. An artisan selling at 15% net profit is assumed. The unit would be significantly cheaper if mass produced in Accra or Kumasi and sold through national networks. Producing the unit at Kumasi magazine as soon as design problems are solved will be worth trying. This holds true for other IMTs, in search of spontaneity in the adoption process.

The push truck

The Kumasi Push Truck surprisingly recorded special appeal from the villagers. This vehicle which was heavy and relatively difficult to manoeuvre on bush tracks, will definitely need research input to ascertain the sustainability of interest in it by villagers, more so as the imagined interest in other IMTs rises.

It is recommended that researchers watch this unit which received the highest votes from potential users as well as the largest number of registrants under the loan scheme to actually purchase it. It was clear that it was a favourite choice but it was hard to tell whether this indigenous unit was popular because it was commonly seen at town centres or whether the popularity arose from its apparent suitability for agricultural transport.



Push trucks on display for purchasers at Kumasi magazine. Push trucks are made from vehicle re-circulated materials.

The power tiller

As a transport option the power tiller will remain a reserve of the able business person with resources to generate capital cost resources and the needed operational and management skills, backed by access to dependable repair and maintenance services. Such are the ingredients of shortcomings in past tractorization programmes which have failed in much of Africa.

During a short visit to Kumasi, I saw two power tillers hauling wood in the outskirts of the town. From a fact finding mission to Self Help International in Kumasi, it appeared is likely that unlike Kenya there could be a higher level but still limited critical mass of power tillers in Ghana as much as the service provisions that go with them.

An interview with the exhibition power tiller owner who participated at the Village workshops revealed the likelihood that owning a power tiller may not be as rosy as the engine sound that attracted the villagers so much. Maintenance and repair services had many shortcomings, particularly so at the village level where he operated. At the same time the power tiller owner indicated that the transport work was more attractive than tillage work and in

serious business oriented operation the power tiller had good opportunities for service provision.

It is recommended that the power tiller use in transport be economically analysed by the IMT project team. This, unlike other IMTs may require a certain critical level of business provision assurance to be sustainable as a source for lucrative business. Unless many operational conditions are right, an expensive unit like the power tiller can quickly turn business opportunity to an ugly source of liability and retardation in development.

Other options as transport means

There are several other intermediate means of transport used in Ghana which may be worth considering after the success of the current selected five have been tried. These are the motorcycle, motorcycle trailer, the bicycle trailer and the donkey cart. Donkey carts are readily available in Kumasi Magazine. Their use in Southern Ghana will however be curtailed by lack of animals due to tsetse fly infestation and other causes.



Donkey power is well provided for, in Central and Northern Ghana. Carts are available like shown here at Kumasi magazine.

Reportedly, the motorcycle is seen in use in Northern Ghana, probably under the influence of neighbouring Burkina Faso. There is no history of the motorcycle trailer but the bicycle trailer was tried in a Self-Help pilot project and condemned by users due to poor workmanship and use environment.

During the visit two happy donkey users were visited in the Kumasi area. Donkey use in Southern Ghana like oxen, may be curtailed by the tsetse infestation in the area.

Use of donkeys for transport in much of the continent is well established. In many localities it is the best "power tiller" available, capable of beating the odds of drought, infrastructure and repair services. The donkey cart is selling in Ghana at a dollar for dollar price which is about a third of the equivalent in Kenya. Unlike Kenya the design of the donkey cart seemed well standardized and wholly produced out of re-circulated materials.

It is recommended that as the IMT Ghana project researches the selected 5 IMT options there will be need to remain open to the development side of things. This will be such that it is possible to increase the number or replace some IMTs, to include say motorcycles and animal traction at later stages of the project. This will depend on the assessments made and progress achieved as assessed at a later stage.

Exploitable potentials

1. There is need for the project to see how to exploit the potential hidden in children and the youth. These have special openness to change and development, brought in from "outside". This indeed is how the IMT placement process may be viewed and the mentioned openness is of real concern in creating the necessary critical mass.
2. There is need for the project to exploit the potentials hidden in group formation and the group approach or capacity. This must however be conducted with caution and borrowing from experiences of organizations such as Self-Help. Training in group dynamics will be necessary, probably by collaborators who are in that business and where group culture has visible potential. This can however be done by the IMT project if it falls under project mandate. The village settlement pattern is worth exploiting and presents real potential in group formation and approach for enhanced access to transport services.

Other aspects

1. At consultative group level the project needs to constantly remind collaborators that the IMT project is a research one; linked to development agents who have a duty to push the development edge of the research findings. The consultative group already in place has an admirable split in roles and mandate and this must be exploited to the full, for sustainable development.
2. As soon as IMTs are placed with village users the research team is advised to try IMT quality capacity care and other user based competition. Competitions between individuals and across villages are a good way of getting to learn the weaknesses and strengths of users as well as the IMTs themselves. Competition atmosphere is an efficient way of monitoring progress and assessing user satisfaction with the technologies. A before

and after placement picture comes clear. Dignitaries can be involved in these field-days with sure entertainment and deep exposure to the problems they may think no longer exist.

Conclusion

The Ghana IMT project is well under way in an area and country clearly needy of improved rural transport services. The findings of the research project are bound to be well received by a country with adequate rural development structures, which seemingly recognize rural transport services as the panacea to enhanced rural development.

Government agencies such as the Feeder Roads Programme and the Village Infrastructure Programme are partners in the project implementation. NGOs, local leaders, rural banks and others are also participating. The collaborative and participatory approach of stakeholders and beneficiaries alike is well in place and is bound to benefit the project implementation and uptake of findings. The organizations form the Consultative Committee of implementers, led by the project staff of University of Durham. Their participation is key to rural development and the IMT placement and take-up success.

The five main IMTs the project is promoting are the bicycle (male and female), wheel-barrow, hand cart, push truck and the power tiller. Adoption of the IMTs will depend on both technological and socio-economic factors.

Compared to Kenya and elsewhere in Africa the *bicycle* will remain one of high potential and worthy of adoption research in Ghana. Options in usage range from selection based on gender, use of a cycle trailer, extended seat, pannier etc. , all of which are exploitable by adequately mobilizing local resources and micro-enterprise service capacity.

The *wheelbarrow* like the bicycle has the flexibility for general use potential and will need to be explored. Multi-purpose use by men and women, choice of tyre and body type are challenging considerations for local manufacturers and promoters.

The *project hand cart*, a new introduction has met the challenge of design and probably user shortcomings. The many puncture problems may have resulted from tyre weaknesses, operational stresses under low tyre-pressure, all of which need to be investigated. Meanwhile work will be put into trying out a standard bicycle tyre or even a motorbike tyre which will be more rugged. Training in puncture-proofing tyres is another option under consideration.

The four wheel *push truck* will apparently remain popular, probably due to its indigenous origins and the fact that it fits in with the past experience of the potential users. The push truck has been seen in urban market places of Ghana for several years and is relatively cheap for its work capacity.

The *power tiller* is a relatively expensive unit which may not be affordable by a typical village user. However if carefully introduced it may be adoptable in group ownership or by more able business persons who can provide services to others. Management and industrial support services are crucial.

For all the IMTs, the most recommendable entry point is a business environment where the more able are targeted at the start, to in turn provide transport services to others. Overall it is recommended that the research team cautiously researches the IMT usefulness and in a holistic way. All the necessary ingredients of a participatory methodology are already firmly in place, with users at the centre.

The project should however remain open-minded and check for any trends towards spontaneous adoption of the not only the IMTs being promoted but the potentials of others like the motorbike.

Adoption questions of ownership by individuals or groups and other methods towards building a critical mass will need to be researched.

IMT competitions like commonly conducted in Kenya are recommended as a way of checking impact of IMTs on the behavioural changes and livelihoods of users.

The visit was most valuable as it helped build the synergies necessary between the IMT Ghana project and the upcoming Kenya agricultural rural transport project. The planned areas of collaboration and exchange of experiences to share the learning are now clear. This collaboration will climax at the distinct differences of the rural development scenarios of the two countries and Uganda as well.

Appendix one

Individuals and/or institutions interviewed:

Name	Institution and /or address
David Addie Noye, Director; Ing. Ralph Inkook, Manager- Galvanizing Plant project, EDC And	GRATIS Foundation P.O. Box CO 151, Tema - Ghana Gratis@ighmail.com
Forster Boateng, Director; Webster Ansah, Project Coordinator and Benjamin Kusi, Agricultural Engineer	Self-Help International P.O. Box 7231, Kumasi. Ghana Selfhelp@ghana.com
Vincent Akoto Agricultural Engineer: Postharvest	Agricultural Services Directorate Ministry of Food and Agriculture P.O. Box M82, Accra Ghana Aesd@mofa.gov.gh
Adeline Aryeetey Ofori Bah	Village Infrastructure Programme (VIP) P.O. Box M37, Accra Oforibah@ghana.com
Humphrey Kwaku Dodor; District Coordinating Director	Gomoa District Assembly, Central Region P.O. Box 39 Apam Tel. (0432) 22289
1 st Donkey farmer	Outside Kumasi
2 nd Donkey farmer	Outside Kumasi
Benneth Solomon	Kumasi Magazine Push truck manufacturer Osei Kofi's Hub Bearing Store
Emmanuel Amwak	Owner of Power tiller, tractor and motorbike
Thomas Yawson, Centre Manager	National Vocational Training Institute P.O. Box 60 Winneba Tel.(0432) 22136
Mawuli Ablodepe, Push truck and wheelbarrow manufacturer	Mawuli Engineering Works Box 379, Agona Swedru
Various villagers, their leaders or development supporters in Aabra, Lome, Asin Auro and Domia. Rural bank managers	In a field-day, cum workshop or office setting. An opportunity to make observations and discuss issues regarding cross-cultural lines, gender roles, community dynamics, joys, wishes, fears etc.

Appendix two

Costing of the current design of the IMT Ghana Project Hand cart and other interesting costs obtained

The costing is based on the November 2000 cost of raw materials from a typical Swendru Hardware Shop. It was reported that materials bought in Accra can be up to 20% less in price though the cost of transport then sets in.

<i>Material item</i>	<i>Cost per hardware unit, as described below</i> <i>(GC)</i>	<i>Fraction or number needed for single unit hand cart manufacture</i>	<i>Cost of fraction or number needed per cart</i> <i>(GC)</i>
1 inch square tube (RHS)	36,000 for 20 feet (6m) long unit	2 pieces	72,000
Wire mesh	79,000 for galvanized 8ft x 4ft	One half	39,500
1/2 inch steel rod	24,000 for 30ft long	One sixth	4,000
Welding rod	25,000 for 5 kilo box of 3.2 or 2.2 mm rods	One third	8,000
Paint	Minimal required with galvanized wire mesh		50,000
New bicycle wheel	88,000 Assembly cost on stronger version at Swendru	Two units	176,000
Wooden planks			30,000
Labour	40,000 for Kumasi Magazine quotation		40,000
Total cost of producing the cart			419,500
Selling price of hand cart with 15% profit			482,425

Other prices obtained:

Item	Cost (GC)
Wheel barrow cost at Swendru with foreign body (pneumatic tyre)	380,000
Wheel barrow cost at Kumasi magazine with used pneumatic tyre	180,000
Wheel barrow cost at Swendru (solid rubber tyre) and locally made body	250,000
Wheel barrow cost from the Winneba National Vocational Training Institute (with pneumatic wheel on plastic support and roller bearing)	150,000
Cost of a used imported tyre useable on a car, depending on size	40,000 - 70,000
Cost of a condemned (for cars) used tyre, useable for push truck or animal drawn cart manufacture	15,000
Bicycle hiring price in Swendru (for leisure use)	100 per 5 minutes
Single donkey cart at Kumasi magazine	380,000
Push truck price at Kumasi magazine	400,000
Used car axle at Kumasi Magazine	40,000
Power tiller fuel consumption for a tractor relative to the power tiller	4 times
Approximate price of a donkey	300,000