THE MALAWI CART: An Affordable Bicycle-Wheel Wood-Frame Handcart for Agricultural, Rural and Urban Transport Applications in Africa

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Abstract

An affordable bicycle-wheel wood-frame handcart has been developed in Malawi for use by smallholder farmers and by city dwellers for whom animal drawn carts are unaffordable or impractical or both. The Malawi Cart makes use of readily available materials and can be built by any carpenter possessing common hand tools. This paper explains why handcarts are needed, how the Malawi Cart was developed, aspects of handcart manufacture, describes preliminary testing and evaluation in Malawi and Kenya, and sets forth strategies for getting the handcart into widespread use in sub-Sahara Africa.

Introduction

"Although development efforts have created extensive road networks [in much of sub-Sahara Africa (SSA)], wheeled transport remains unavailable to most farmers, … The inability to transport their crops to market prevents many farmers from entering the market economy" (Wendroff, 1993). Without access to efficient and affordable transport, farmers in eastern and southern Africa have little choice but to "carry farm inputs and produce on their heads and shoulders," work that is "slow, difficult and tedious" (Kumwenda, in press). If African farmers, restricted by the limitations of human muscle power, are ever to succeed in extending their cultivation beyond the subsistence level (Dibbits, 1993; Kumwenda, 1999), it will have to be by making use of wheeled devices to increase their work efficiency. Animal-drawn vehicles are far beyond the means of most African farmers. Human-powered handcarts, however, are not. Both affordable and efficient, handcarts are not only a viable alternative to draught-animal carts, but in many settings are preferable to them.

Smallholder farmers live on their farms and engage in a variety of agricultural and non-agricultural transport activities. It has been estimated that the typical SSA household spends 200 to 450 hours per year on agricultural transport, and 600 to 1,500 hours per year on domestic transport, mainly in providing itself with water and firewood. "About 75% of the transport activity involves short trips, less than 6km, in and around the village e.g. to and from the fields" (Dennis, 1993). Water collection is a daily activity in most households, and firewood is gathered every few days. Both tasks are almost exclusively carried out by women using headloading (Barwell, 1996). This burdensome domestic transport uses up time and energy that could otherwise be applied to productive agricultural activity. Its never-ceasing demands leave African women with that much less leisure time (Bishop, 1995) and erode that much further their quality of life (Clarke, 2000).

Although the purpose of encouraging the widespread use of draught animal carts ('oxcarts' for the purpose of this paper) is laudable, it is likely that, continuing into the foreseeable future, only a minority of SSA households will be able to own such carts. The factors limiting oxcart acquisition include "limited availability of draft animals, … [limited] credit availability, … [limited] food and water supplies, lack of equipment and spare parts and land shortages." "The human population is so high in some areas that there is insufficient land for animals such as donkeys" (Kumwenda, in press). Added to all of this is the scarcity of imported steel for oxcart construction (Sosovele, 1999; von Keyserlingk, 1999).

European farmers and missionaries introduced oxcarts into much of SSA in the early 1900's (Simalenga, 1993). That they did not also introduce handcarts of some sort, probably has to do with the fact that, unlike Asians, "Europeans did not generally use human traction for long hauls" (Matthies, 1991). It has been plausibly argued that Western notions about men's and women's "natural" place in society have also operated to discourage the introduction into SSA of technologies that would lessen women's burden of work (Spring, 1995). Both of these factors may still be impeding the introduction of handcart technology to SSA.

As the population of the subsistence agricultural community of SSA expands, the need for improved means of transport becomes only more pressing. "Many farmers cannot afford to purchase the draft animal power package" (Kumwenda, in press), in large part because their farms are too small to support draught animals and/or to amortize their expense and that of an oxcart. A growing population within a fixed amount of arable land can only result in shrinkage of the size of holdings. "In 1990, … about 56% of rural [Malawian] households cultivated less than one hectare, and … the mean overall farm size is 1.1 hectare" (Mwinjilo, 1999), further eroding the economic viability of draught animal transport. It is, therefore, unrealistic to make draught animals the exclusive focus of efforts to introduce improved and affordable transport to SSA, unrealistic now and for the foreseeable future. In Mozambique, only 4% of all households own draught animals and only about 1.5% own oxcarts (de Toro & Nhantumbo, 1999). With understandable impatience Sosovele remarks, "after almost a century of activities relating to the development and use of animal traction in Tanzania, many [most] farmers are no closer to adopting the technology" (Sosovele, 1999).

The introduction of affordable handcarts offers an attractive solution to this African transport problem. The number of farm families that can be immediately assisted by the dissemination of this simple technology is many times greater than those that can realistically aspire to oxcart or donkey-cart ownership. If the development community's goal is to enhance the transport capabilities of as many Africans as possible, in the shortest time and in the most cost-effective manner, we must soberly reassess the market potential for animal-drawn vehicles and consider the substantial merits of handcarts.

Handcarts vs. Draught-Animal Carts

I do not mean to argue against all efforts to introduce animal traction into SSA. However the current and foreseeable economic situation of most African smallholder farmers precludes them and will continue to preclude them from purchasing and maintaining draught animals and the agricultural implements they pull. And as the SSA population increases and average farm size decreases, the ability of farm families to support their own draught animals is bound to decrease. Handcarts can help to fill this transport void.

<u>Cost</u>: In Malawi in 2000, per capita income in the subsistence-farming sector was roughly MK 3,600 Malawi Kwacha (MK). That same year, an oxcart manufactured in the workshop of the GTZ-sponsored Phwezi Technical College was MK 24,000. Since an oxcart is useless without an animal to draw it, it took substantially more than MK 24,000 for a Malawian farmer to acquire such a cart and put it into service. Moreover, as Kinsey has observed, "engineers have apparently found it impossible to come up with [agricultural] equipment innovations which increase productivity enough to cover their own costs on the very small farms which prevail in Malawi" (Kinsey, 1984). Apart from hiring out his vehicle, the ability of an oxcart owner to amortize his investment is very limited. In view of this large disparity between cost and income, it is unrealistic to expect that the means of most Malawian smallholder farmers will increase sufficiently to enable them to afford oxcarts. In the early 20th century U.S.A. "horses and carriages were only for the well-to-do" (Aronson, 1952). This is equally true of oxcart ownership in present-day Malawi and in the rest of SSA, and it will remain true for some time to come.

By contrast, in 2000 the cost of a bicycle-wheel handcart--the Malawi Cart---manufactured by the Livingstonia Technical College was MK 2,400, one tenth that of an oxcart. In terms of cost, then, handcarts are clearly one solution to unmet transport needs, not only in Malawi, but also throughout SSA.

<u>Utilization and Convenience</u>: Oxcarts are heavy and cumbersome. The animals that draw them require continued feeding and care, on the job and off. Their rate of progress of 3-4 km/hr is less than human walking speed, and at 800-1000 kilograms (Dennis, 1993) their carrying capacity is generally well above the average farmstead load. Capacity loads will generally be limited to harvest times and to episodic construction projects. All of this means that, for the great majority of trips on smallholder farms, an oxcart will be filled to only a small fraction of its capacity.

The size, manageability, load capacity, and ease of use of a handcart are, by contrast, much better fitted to a smallholder farm's everyday transport needs. It is far more convenient and time-saving to lift the handles of a handcart and wheel it off than to locate the draft animal, harness it, and drive the cumbersome vehicle to one's destination. At the end of the trip, there is no need to unharness, pasture and stable it. "Unlike the horse [or donkey or ox], it is not a source of care or anxiety" (Aronson, 1952). Although Aronson refers to the adoption of the bicycle in the U.S.A of 1867, his observation is equally applicable to the use of handcarts in SSA in 2002.

Gender, Age and Health Considerations: Cattle, oxcarts and bicycles have traditionally been under the control of men. "Animal traction … is a man's technology" (IFAD/FAO, 1998). Yet it is on women that by far the greatest burden—at least 65% (Dennis, 1993)—of domestic carrying tasks falls. Although the bicycle played an important role in emancipating American women (Aronson, 1952), in SSA its use has largely been confined to men. Handcarts, having no association with cattle and far less costly and prestigious then bicycles or oxcarts, in male-dominated African societies stand a much better chance of being allocated to women. Being much lighter and handier than oxcarts, they also much more easily be used by children, who, given the prevalence of HIV infection in SSA, are increasingly having to do adults' work and fend for themselves. Furthermore, a major factor in morbidity and mortality, especially among SSA's children, is the lack of adequate water for domestic hygiene, which contributes greatly to children's diarrhoeal diseases. By making water transport more convenient, handcarts use can make a substantial contribution towards limiting oral-fecal disease transmission. (Kirkwood, 1991)

Materials availability: Oxcart construction calls for rolled steel sections, plate, welding rod, and hard-to-find and expensive steel axle and bearing components. By contrast, except for nuts and bolts, screws and nails, and its bicycle-wheel components—all things readily available at most trading centres—the Malawi Cart is constructed exclusively from locally sawed lumber. This is in keeping with a key element of the idea behind it: that the handcart be readily capable of local manufacture. Such capability is of prime importance in ensuring that the Malawi Cart will be widely available and widely affordable.

Spares and Maintenance: The Malawi Cart handcart design employs ordinary bicycle rear wheels. Spares are available throughout SSA. The cart's frame and body are made of common wood planks, and its metal fasteners (nuts and bolts, screws and nails) are to be had in even very modest trading centres. The skills required for the cart's maintenance are those of ordinary carpentry and bicycle repair; the same is true of the required tools. Tyre repair and replacement, and the truing of twisted rims are the most common maintenance items. The cost of repairs and spares for a handcart is much less than for an oxcart.

Manufacturing requirements: Oxcart construction requires workshops with substantial capital investment in metal fabricating apparatus and electrical supply and with trained metalworkers. In SSA such workshops are few, and are concentrated in towns. In contrast, Malawi Carts can be built by urban and rural carpenters using ordinary hand tools: their construction calls only for modest capital investment. And carpenters capable of making serviceable and affordable handcarts are to be found in even the most rural settings. Although the Malawi Cart incorporates some small steel components, these are either utilized in the form in which they are purchased (fasteners, wheels) or they can easily be fashioned by the carpenter himself from scrap sheet metal (wear and locking plates). The point is that the skills and equipment of a blacksmith are not required. As there are many more carpenters in SSA than blacksmiths, the scarcity of blacksmiths (IFAD/FAO, 1998) poses no constraint on the widespread manufacture of the Malawi Cart handcart design.

Animal purchase, training and maintenance: Oxcarts and donkey carts require draught animals to pull them. These animals must be purchased and trained, fed and watered. Few smallholder farmers can afford such animals: money aside, in many cases their farm plots are inadequate to provide sufficient forage. It is burdensome, furthermore, to feed, water, and quarter draught animals driven to market early in the morning and led back in the evening (Kumwenda, in press). For most city dwellers, ownership of a draught animal is entirely impractical. Moreover, many areas in SSA harbour insect pests and diseases such as trypanosomiasis, that are harmful to draught animals. None of these constraints is applicable to handcarts.

A Handcart Primer

The most common handcart type currently in use in SSA is the wheelbarrow. Wheelbarrows, however, are relatively expensive, have a small volumetric capacity, are unsuited for carrying long loads like lumber or poles, and they require the operator to lift up to half of the weight of the combined load-plus-wheelbarrow and balance it laterally over the one wheel. The solid or semi-pneumatic tyres of most wheelbarrows have a high rolling resistance, provide little shock absorption, and their wheel bearings are crude. Wheelbarrows are, therefore ergonomically inefficient and inappropriate for long-distance transport.

Dennis calculates that, owing to this inefficiency, the typical wheelbarrow load of 80kg carried at 3-4 kilometers per hour, will have a typical daily range of only 5-6 kilometers (Dennis, 1993).

The Chinese-style wheelbarrow, although with its single large-centrally-positioned wheel is far more efficient than the conventional type, is unknown in SSA, being relatively difficult to build, load and balance. The same objections apply to the SFTV (Small Farm Transport Vehicle) developed by I.T. Transport Ltd. and the Intermediate Technology Development Group (ITDG) (Hathway, 1985). Large-scale adoption of this latter design is further impeded by its reliance on welded steel construction.

The two-wheeled handcart is a great improvement over the wheelbarrow: it is more stable, since the weight of a properly loaded one is balanced over the axle (in the case of the Malawi Cart, the axis) connecting the two wheels; it requires neither lifting nor balancing by the operator; and its large-diameter wheels enable it to negotiate relatively uneven terrain. Because a handcart is simply pushed or pulled, when fitted with ball bearing hubs and pneumatic tyres considerable loads--200-250 kg--can be carried impressive distances in it--20-24 km in it (Dennis, 1993). (These figures from Dennis are for handcarts having two wheels on a common axle and generally heavier duty wheels and tyres.)

A wide variety of handcarts are used in and around SSA marketplaces. These are generally of crude construction, employing salvaged components ranging from industrial castors to auto rear-axles. They are frequently so heavy, even without a load, that two men are required to propel them. They are, with few exceptions, unsuitable for agricultural transport around the smallholder farmstead. In West Africa there are numerous handcarts made from welded-steel and employing discarded moped or motorcycle wheels. However as welded steel construction is generally too expensive for subsistence farmers to afford, as used moped or motorcycle wheels are rare, and as spare tyres and bearings for such wheels are expensive, the possibility of widespread adoption of this handcart design is unlikely. A comparison of the simple metalworking shops described in the development literature (Boyd, 1994; Dennis, 1995) with the reality on the ground in most of SSA, further underscores the need to rely on the skills and tools of carpenters for the manufacture of handcarts rather than on those of scarce steelworkers.

Attempts have been made before now to design both independent-wheel and wheel-axle handcarts for use in SSA. But these designs have generally used steel frames (Dennis & Smith, 1995; Maganya, 1997), a fact which makes their implementation highly problematic in terms of both handcart availability and cost. Equally problematic is the indigenous manufacture of wheels (Dennis, 1994; Maganya, 1997). This is so because manufacture in welded steel poses a severe constraint on widespread handcart adoption: only a small number of carts can be produced in this way: the distribution network is limited; the wheels, while rugged, with their solid rubber tyres and plain bearings are ergonomically inefficient; the cost of producing carts to this design is beyond the means of most smallholder farmers.

The Malawi Cart

[NOTE: For additional details and photographs, see the Malawi Handcart Project web site at www.malawihandcartproject.org . The alternative URL is www.geocities.com/malawicart/ .]

The Malawi Cart derives from existing bicycle-wheel-handcart designs, most of which have until now been executed in steel, plywood, or some combination of the two. (Sullivan, 1983; Hathway, 1985; Barwell *et al.* 1985; Dennis & Smith, 1995; Doran, 1996; Stiles & Stiles, 1998). All of these earlier designs have only limited potential for widespread adoption in SSA due to their use of these expensive, difficult-to-work and/or hard-to-find building materials. The Malawi Cart was designed to require only common lumber and two ordinary bicycle wheels. Fasteners are common nails, along with a few wood screws and small bolts. Several large (8mm x 15mm) bolts were used in the prototype, but when such bolts were found to be unavailable in the nearest large town, widely available and cheaper bicycle rear axles were substituted for them in all later models.

The Malawi Cart rides on two 28-inch bicycle rear wheels (see photos on page 8 for details). Rear wheels were chosen over front wheels because of their greater strength. They have 40 spokes (as against a front wheels' 36), their axles are longer and thicker and their ball bearings larger. In Malawi, the cost of a rear wheel differs from the cost of a front wheel merely by the price of the four extra spokes. The rims commonly available in Malawi are of the archaic and inherently weak Westwood pattern. Where available, the far stronger Westrick (or Endrick) pattern rims should be employed. Twenty-eight inch wheels were chosen for the design because of their widespread availability and that of their spares, an availability that translates into the lowest possible initial and maintenance costs. For many, and especially for urban uses, 26-inch diameter and even smaller wheels are suitable and even desirable for handcart construction. The tyres should be of the widest and strongest (nylon ply) construction available.

Each wheel of the Malawi Cart is enclosed in a horizontal frame of two planks having holes in their middle for the wheel's axle. The two hub axle nuts secure the wheel in place, and the ends of the frame are formed of wood spacer blocks bolted in place, using bicycle wheel rear axles as bolts. The use of bolts to secure the outboard side of each frame allows the wheel to be readily removed for maintenance and repair.

The two longitudinal wheel frames and their enclosed wheels are held together by two transverse sets of planks sandwiching the top and bottom ends of each frame. The two wider upper transverse planks form part of the floor of the handcart, while the two narrower bottom transverse planks, primarily subject to tension as they resist the splaying outward of the wheel-frames, can be made narrower, thinner and therefore lighter. Both upper and lower transverse members are screwed to the frame spacer blocks rather than into the frame longitudinals, so as not unnecessarily to weaken these relatively highly-stressed members. The prototype and early models of the Malawi Cart were fabricated from locally available hardwood planks, some 2 centimeters thick. They are probably thicker, and therefore heavier, than necessary. The body of the cart could be fashioned of thinner lighter wood, depending on the species of timber available.

The Malawi Cart was designed so that its body--four sidewalls and most of the floor--can be easily removed without tools (it is fastened in place by four wooden swivel catches) to facilitate the carriage of long poles and planks. The design also allows for alternative, purpose-built cart-bodies to be dropped in place on an existing cart chassis. For example, cart bodies for vendors selling cooked meats or baked goods, fruits and vegetables, grain, flour and dry goods, or for radio or watch repair can be built at modest cost and used for hawking goods and services at the market, and then, at home, they can be removed and replaced with the standard box body for use around the homestead. The front wall of the standard cart body, (assuming the cart is pushed and not pulled) is held between two sets of vertical battens so that it can be slid out to enable bulk loads--manure, bricks, sand--to be dumped, rather than having to be lifted out. This feature also facilitates the use of the cart as an ambulance if the patient can be carried in a sitting position. In that case, the removable front serves as a backrest. In the event the patient must lie on his or her back, the cart body can be removed entirely and a bed (or a few planks) placed over the two upper transverse frame members. The Malawi Cart is also readily converted for use as bicycle cart.

Simplicity of construction was a major consideration in the design of the Malawi Cart. No sophisticated metalworking or joinery is called for. Simple wide (ca. 5cm) screwed finger jointing was used to better secure the rear wall of the body to the two sides. All other body joints are by nails to battens. The carpentry skills required are far less sophisticated than those needed to build a chair or table having mortised joints. To build this design, only basic hand tools are called for: wood saws (crosscut and rip), hacksaw, hammer, chisel, plane, brace and bits, screwdriver, spanner, and file. It is expected that, as a rule, wheels for the Malawi Cart will be purchased as separate components (hubs, spokes, rims, rim tape, tube and tyre), and a skilled wheel-builder--commonly found in towns near any bicycle retailer--hired to assemble them at a nominal cost. Fasteners (bolts, nuts, washers, screws and nails) are obtained at the nearest marketplace, lumber from local sawyers. Ideally, hardwood should be used for the cart's longitudinal frames and upper transverse members; for the rest of the frame and body, lighter softwood should be adequate. Well-seasoned lumber is, for obvious reasons, desirable. But as the frames are screwed and bolted together, any shrinkage that may take place there can readily be taken up.

Although in 2000 the prototype Malawi Cart cost MK 2,400, material and labour costs are of course variable, as are the costs of imported components. It is difficult, therefore, to give a precise estimate of the future cost of a Malawi Cart. I believe, though, that it is reasonable to expect the selling price of a cart will be under or about half that of a bicycle—an excellent bargain when one considers that, for the small farmer, the cart's utility is far greater than a bicycle's.

As a test of the ability of village-level carpenters to build a Malawi Cart, a rural carpenter was invited to Livingstonia Technical College (LTC) to examine the prototype Malawi Cart and then build a copy at his home. He took measurements and notes, and was given a set of wheels and fasteners. Beginning with raw lumber, he then successfully built a cart entirely by hand in four days' time. The World Bank funded Malawi Rural Travel and Transport Programme (MRTTP) recently purchased sixteen Malawi Carts from LTC for evaluation, and it is planning to "train local artisans/suppliers on the manufacturing of common IMTs e.g. hand carts" (MRTTP, 2002).

The major problem encountered with the Malawi Cart is the tendency of its widely available but relatively weak Westwood pattern rims to buckle when overloaded and making a sharp turn. With their shallow cross-section, Westwood rims are far weaker than the channel cross-section Westrick or Endrick rims. Moreover, the cart's bicycle wheels, with their relatively narrow hubs, are ill-suited to resist the axial forces generated when a handcart make a sharp turn, and unlike a bicycle, is unable to bank into it. The immediate solution is in better driver training--educating handcart operators to avoid making high-speed turns and overloading their handcarts.

Handcart Dissemination Strategies

For getting the handcart into widespread use in SSA, two strategies need to be pursued, the first short term, the second long term. In the short term, because the materials and components needed to execute the Malawi Cart design are all readily available at this time, development efforts should concentrate on interesting as many people as possible in the cart and on turning those potential customers into owners. The longer-term strategy derives from the fact that the Malawi Cart, for all its clear advantages over alternative designs and over transport means currently in use, is still undesirably weak because it relies on ordinary bicycle wheels, and is excessively heavy due to its independent-wheel design. That design was chosen over the superior wheel-axle alternative because it was capable of widespread, affordable implementation in the African here and now. Looking to the future, efforts should be made to convince importers and distributors of bicycle components that there is a strong market in SSA for the kind of heavy-duty wheel-axle sets specifically designed for handcart applications that have long been in use in China, India, and elsewhere in Asia, and that they will profit from importing and distributing such sets.

After the prototype Malawi Cart was built at the Livingstonia Mission in July 2000, an order for ten carts placed with the production workshop of the Livingstonia Technical College (LTC) gave rise to the first attempt at mass production (Chirwa, 2000). The LTC's next order, for eight carts, was from CARE Malawi, for a women's road repair project. CARE's assessment of the cart's performance was that, despite some breakdowns due to twisted rims, "They have been of very great assistance as they provide cheap transport … [and that] overall they are handcarts with very broad applicability" (M. Lemekeza, technical coordinator, CARE Malawi, personal communication, October 4, 2001). The MRTTP placed an order for sixteen Malawi Carts with LTC in 2001, for field-testing at four different sites (MRTTP, 2002). This large order afforded carpentry students at LTC the opportunity to gain further expertise in handcart construction. It would be valuable for other vocational training establishments to follow the lead of the LTC and introduce handcart construction to their carpentry students. I suggest that funding be made available to provide construction materials for such students so that each could build his or her own cart and take it home upon graduation. This will not only give them valuable experience in handcart construction, it will result in their neighbors coming to learn of the advantages of handcart ownership and so create a demand for carts that the graduates can satisfy by building and selling Malawi Carts locally.

Preliminary field-testing of the Malawi Cart has not been confined to Malawi. The ITDG, Eastern Africa recently completed initial trials of six Malawi Carts in Kenya. In one market town, Malawi Carts were leased to youth groups for transporting market goods and for selling water. Another trial placed carts with two groups of women farmers, who mostly used them to carry irrigation water and manure. The third trial involved youth groups operating commercial transport services; they used their Malawi Carts to carry cement, maize and tomatoes. Summing up the results of these trials, the ITDG wrote: "The handcarts have been well received and have enormous potential. … The carts are also answers to other technology shortfalls like animal drawn carts in Kajiado where not all women own donkeys or in other project areas where not all members own bicycles. … The next step may be to lease out the carts en masse on a commercial basis to test the market after of course addressing the few technical concerns raised by the users" (Macharia, 2002).

It is envisaged that other development agencies and organizations will evaluate (and, where necessary, improve upon) the Malawi Cart design in both urban and rural settings in SSA. Agricultural extension services could play a major role in such an effort by distributing flyers with a dimensioned exploded view of the handcart, and instructions for the cart's construction and use. Agricultural extension field agents could demonstrate handcarts, advise users on their care and maintenance, (especially on the need to avoid overloading) and collect data for handcart assessment.

The Malawi Cart is designed to be made by ordinary carpenters serving local markets, in the same way that carpenters currently satisfy the demand for doors, windows, beds, tables and chairs. Yet while most of these items are manufactured locally, some wooden furniture is produced in factories and distributed over a larger area. In a similar fashion, it is envisaged that, although most Malawi Cart construction will be by small-scale carpenters, some will be mass-produced in workshops with power machinery, and will be marketed by retailers instead of being sold directly to the public by the artisan-makers. Such mass manufacture ought to result in lower purchase cost to consumers, provided the costs of distribution are not excessive. At present, at least in Malawi, the cost of transporting bulky finished handcarts by truck is excessively high. Mass production of pre-cut and -drilled knocked-down cart kits should be one way of reducing shipping costs to a more acceptable level.

The long-range strategy outlined above envisages the Malawi Cart as a transitional technology leading to the introduction into SSA of the conventional handcart design employing two wheels on a common axle. Were these conventional handcart components readily and affordably available in SSA today—as they are in China and India—there would be no need for an alternative, independent-wheel design like that of the Malawi Cart. Those wheel-and-axle components have a much higher load capacity than bicycle wheels. They also have heavier tyres with wider treads that give better flotation on soft ground, and improved puncture resistance. They allow the construction of lighter, stronger, narrower and ultimately cheaper handcarts than the Malawi Cart design. Government and NGO's alike should encourage their importation and distribution. Although initially more expensive than bicycle wheels, their worth would soon be demonstrated and their cost to the consumer quickly amortized.

If the SSA population is unaware of the existence of affordable handcarts, they cannot desire them. As with scented soap, cooking oil and aspirin, advertising has an important role to play in informing the public of a new product, the handcart, that will satisfy not merely a desire, but a serious need. If manufacturers find it cost-effective to advertise premium-priced scented soaps, it makes sense for governments and development agencies to avail themselves of the same means in order to inform the people they serve how handcarts can substantially improve their lives. The advertising techniques developed by African ministries of health, which advocate for the use of condoms to prevent HIV infection, should be adapted to advocate for the use of handcarts as an efficient, affordable means of easing the transport burden, increasing agricultural productivity, and, by increasing the supply of domestic water, materially reducing morbidity and mortality. The bicycle was long ago embraced by Africans who could afford them because it was of such obvious transport utility. There is every reason to believe that, had it been introduced at the same time, the handcart would have been even more enthusiastically accepted.

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Photographs [Taken from the Malawi Handcart Project web site: www.malawihandcartproject.org]

Malawi Cart carrying grain to maize mill
Livingstonia, Malawi (2000)

Malawi Cart Chassis
Prototype (2000)

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