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TO: THE DIRECTOR OF AGRICULTURAL RESEARCH AND TECHNICAL SERVICES,
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Copy: The National Resource Co-ordinator, Agricultural Engineering and Soils, Soil Survey,
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REPORT OF DR. ARNOLD WENDROFF'S VISIT AND THE HAND CARTS.

Dr. Wendroff arrived in the country towards the end of the third week of April, 1998.

From that time he has been actively participating in the construction and evaluation of the hand carts. He has also been in contact with several organizations in mostly in Lilongwe in trying to look for ways of manufacturing and distribution of the hand carts. All these culminated in a round up meeting in which researchers, academics, manufacturers, distributors, policy makers, and importers were invited to map the future of the hand carts in Malawi.

Please find attached a summary of what was done and what is intended to be done in order to make the hand cart readily available to users in Malawi.

Wells F. Kumwenda.

For: DEPUTY DIRECTOR OF RESEARCH AND TECHNICAL SERVICES

TIME TAKEN TO PUSH A LOAD 100KG IN HAND CART (MINS)

NAME	SEX	AGE	WEIGHT	WALKING	EARTH	TARMAC
DYSON CHAMBIJA	M	41	60	14	13	14
EZALA WONDE	M	34	59	14	14	15
MARITA NYANYE	F	22	60	13	15	15
MSADALIRA NASONI	F	33	60	13	12	12

TIME TAKEN TO PUSH A LOAD 150KG IN HAND CART (MINS)

NAME	SEX	AGE	WEIGHT	WALKING	EARTH	TARMAC
DYSON CHAMBIJA	M	41	60	14	13	14
EZALA WONDE	M	34	59	14	14	14
MARITA NYANYE	F	22	60	13	21	16

MSADALIRA NASONI	F	33	60	13	13	15
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TIME TAKEN BY SCHOOL CHILDREN TO PUSH A LOAD 50KG IN HAND CART (MINS)

NAME	SEX	AGE	WEIGHT	HEIGHT	TARMAC
CHIPILIRO KAMPIRA	M	12	35.95	148.4	13
HOPSON THANGATA	M	8	22.40	133.2	14
MARITA YOTAMU	F	8	20.40	123.8	15
FANNY KALUWA	F	12	34.40	144.5	12

Their parameters and results are indicated in the Table 1 to 3 above show that even children could contribute in easily transporting goods from one place to the other.

The maximum load the adults can lift and transport in a wheelbarrow was 50kg above this the load was difficult to balance and push.

In a test to lift and carry things on the head most adult men reported that they could comfortably lift and carry only 20kgs while the women could lift and carry up to 30kgs.

The heart beat of the adult people was beating about 50% faster after pushing the cart loaded with 150kgs over a distance of one kilometer.

It was also amazing to see children pushing loads which was 2.5 times their body weight very easily. They pushed loads of 50kgs but they also the 12 year old could push 100kgs very easily.

As can be seen from the table above, the cart could be driven by people of various ages starting from children of 8 years to adults.

It can not be stressed too highly that the key to the introduction of handcarts in Malawi lies with the commercial sector. If the wheel-axle sets (with their associated washers, cotter-pins, axle clamps and bolts) or complete carts are available in retail shops, our informal market surveys indicate that they will be purchased with alacrity.

Before this can happen, however, the importers must be encouraged to explore sources of wheels and axle sets. The best quality at the lowest price is what is to be strived for.

Sample wheels must be imported, carts fabricated, and evaluated under field conditions. Various sizes of wheels need to be evaluated, both for different applications, as well as for different applications.

The market will determine the types of wheels imported and distributed in Malawi. However in all cases, the importation of adequate quantities of spares (tyres, tubes, bearings) must accompany the basic wheel-axle sets. It appears that just as in the automotive sector, a variety of handcart styles and sizes will be utilized.

The applicability and amount of customs duties applicable to these wheel axle sets needs to be ascertained, and if it is possible, to be either eliminated or reduced.

The economic impact of handcart availability on smallholder farms needs to be assessed. Baseline surveys need to be conducted of smallholder transport methods, and compared to transport patterns when handcarts are employed. Such investigations suggest a collaboration with the Centre for Social Research in Zomba, as well as the Department of Rural Development at Bunda College. Studies should compare similar farmsteads using human-carriage of goods (headloading), bicycles, and ox and donkey carts. Utilization patterns,

amount of and types of materials carried, and availability factors need to be examined. Development policy should take these findings into account, and, if the results are as we predict, should concentrate on the encourage the utilization of handcarts rather than the present policy of ox- and donkey-cart advocacy.

New and innovative uses and designs of handcarts should be explored and tested. Design competitions might be held, open to the public as well as among agricultural and engineering students and personnel.

In particular, the use of carts for carrying appreciable amounts of water for both domestic use as well as for small-scale irrigation (as for vegetable gardens) should be explored.

Perhaps it will be feasible to line a cart with plastic sheeting so as to enable water to be carried directly.

The results of these investigations need to be disseminated to the lay and professional communities, via the agricultural extension service, the press, and professional journals. It should be kept in mind that this technology is applicable across sub-Saharan Africa, and it is to everyone's advantage to disseminate this technology as rapidly as possible. Malawi will be seen as being in the forefront of farm machinery and rural transport innovation.

The possibility of local (Malawian or elsewhere in SSA, as Zimbabwe or RSA) manufacture if some or all of the wheel-axle set components should be explored, although this seems to be a long-term objective. The market will first have to be demonstrated before any entrepreneurs invest capital in component factories.