

**Improved Food Crop Marketing through Appropriate Transport
for Poor Farmers in Uganda**

Final Project Workshop, Jinja, 13 – 15 December 2004

**Discussion Paper on the Utilisation and
Profitability of Intermediate Means of Transport**

Ulrich Kleih

December 2004

This paper is an output from a research project funded by the United Kingdom Department for International Development (DFID) for the benefit of developing countries. The views expressed here are not necessarily those of DFID.

Crop Post-Harvest Research Programme – Project R8114

TABLE OF CONTENTS

INTRODUCTION

BACKGROUND

COSTS OF DONKEYS IN KASESE

Pack animals

Equipment - Harnesses and panniers

Sheds

Feed

Drugs and veterinary costs

UTILISATION OF DONKEYS IN KASESE

Farmers' transport priorities

Transport of water

Transport of crops

Transport of building material

Transport of firewood

Hiring out of donkeys

Results of the monitoring survey

CASE STUDIES FROM KATAKWI

IMTS MANUFACTURED BY SAIMMCO IN SOROTI

THE PROFITABILITY OF IMTS TESTED BY THE PROJECT

APPENDICES

APPENDIX 1: USE OF DONKEYS IN KASESE DISTRICT –
RESULTS OF MONITORING SURVEY

APPENDIX 2: SELECTED CASE STUDIES FROM IGANGA
SOURCE: MTCEA

INTRODUCTION

This paper focuses on findings of project monitoring visits to Kasese and Katakwi Districts in July and September 2004. This needs to be seen in light of the reports by Messrs David O'Neill and Mustapha Benmaamar which are primarily based on their visits to Iganga and thus complement this paper. Nevertheless, findings from Iganga district are also taken into account here when assessing the profitability of various Intermediate Means of Transport (IMTs) distributed and tested by the project.

The author would like to thank all those who have contributed to this paper with their time, information and otherwise, namely the farmers, artisans, and partners of the various intermediary organisations.

BACKGROUND

At the kick-off workshop in May 2002, Kasese had been selected as one of the project districts together with Katakwi and Pader Districts¹ (Kaira et al, 2002 – Workshop report). This was followed by a baseline study which was undertaken between September and December 2002, during the course of which three Sub-counties were selected for fieldwork, namely Kyabarungira, Mahango, and Nyakiyumbu (Kleih et al, 2003). Subsequently, in 2003 and 2004 47 donkeys have been acquired by the project in Kapchorwa District and distributed in Kasese as explained below. By mid-2004, nine donkeys had died due to various reasons², however three foals had been born in the meantime, and several females were pregnant.

As already indicated in the baseline study (Kleih, *ibid*), the majority of farmers in Kasese District were traditionally apprehensive towards donkeys, which was mainly due to lack of knowledge of the animals. In addition, they had acquired a reputation as being difficult to manage following their introduction through a project in the 1990s that was plagued with lack of sensitisation and follow-up (Iga, 2000). As a consequence, substantial amounts of sensitisation and training prior to the acquisition and distribution of the animals had to be carried out by the donkey and draught animal power (DAP) trainer.

Although it is mostly groups that have applied for the donkeys, it is usually individuals in the group that look after them in a care-taker function. If other farmers in the group want to use them then they have to pay less as compared to non-members. Part of the revenue goes to the caretaker who usually accompanies the animal, and part of the revenue goes into a fund out of which the donkey's welfare is catered for (e.g. health and feed).

¹ Due to the insurgency in Northern Uganda, Pader District was later replaced with Iganga District. Also, only one Sub-county could be covered in Katakwi (i.e. Kapuchan) as compared to the three sub-counties that were covered in Iganga and Kasese District respectively.

² Broken legs, fever, mistreatment, and complications during delivery.

COSTS OF DONKEYS IN KASESE

Pack animals

Purchase of the donkeys by the farmer groups was undertaken as part of a risk-sharing agreement between the farmers and the project, whereby the farmers would be expected to contribute 60% and the project 40%. The farmers would have to make a down-payment representing a quarter of their share (i.e. US\$15,000) and pay the remainder in quarterly, interest-free instalments (i.e. US\$5,000). For farmers and groups considered as very poor it was also accepted that, similar to the heifer re-stocking project, that they could pass on the off-spring of a donkey to a neighbour instead of making cash reimbursements.

Upon their distribution to the farmer groups, the donkeys were valued at US\$100,000 which was their average market price in Kapchorwa from where they had originated. As a result, transport and training costs were not included in the selling price.

Equipment - Harnesses and panniers

Harnesses, panniers or baskets form the main equipment for donkeys as pack animals. It was found that farmers were able to load different types of commodities and goods onto their donkeys, including crops, water, and building material. Following training which they had received from the project trainer on issues such as donkey welfare and utilisation, farmers started to make their own adaptations of the harnesses. For example, empty grain bags were transformed into side pockets for the animals in which they can carry crops, or water jerry-cans (20 litres).

At the same time, farmers are complaining that ropes are breaking too easily. They find that nylon ropes are too expensive, as a result of which they use these only for tying the donkeys' legs. Less expensive - but also less durable - ropes are used for the harnesses. It was suggested to try out locally available material from raffia or sisal. Apparently, women in Katakwi are using these materials for rope making.

According to the farmers, a pair of panniers would cost about US\$10,000 and last one year, whilst a rope costs US\$1,500 and lasts 2 months.

For comparison, as part of the project, harnesses manufactured by the Design Centre of YWAM (Youth with a Mission) in Katakwi were made available in Iganga at a cost of US\$50,000. Although these harnesses were made of durable material and seemed comfortable for the animals, it was also reported that they had not been used because farmers had not received sufficient training. In addition, the price of US\$50,000 per harness was considered as too expensive for small-scale farmers, and in one case rats had apparently eaten part of a harness.

Sheds

Some farmers have constructed sheds for the donkeys to protect them against rain and sun. Local material such as wooden poles and roof thatching were used for the construction of the sheds.

According to the farmers, the construction costs of sheds are of the order of US\$ 15,000 – 30,000 and the sheds are expected to last three to five years.

Feed

The donkeys' diet consists primarily of grass which is abundantly available in the area. At the same time, the animals are given supplements such as maize (i.e. bran, cobs or grain), salt and banana leaves. In particular, during harvesting when the workload is heavier donkeys are fed maize grain (e.g. 1 kg of grain/ week, costing Sh300). After the harvest, the donkeys are still fed supplements but smaller rations (e.g. 1 kg of bran every two weeks). In addition, salt costing about US\$500 per month is provided.

Drugs and veterinary costs

Drugs used for the donkeys include sprays against ticks and anti-worm drugs (e.g. tablets, or liquids). Penicillin type drugs are administered when the animals have fever (e.g. bottles at US\$3,500 – 15,000 depending on size).

When they obtained their animals, farmers were trained in some basic veterinary care such as deworming or spraying them on a regular basis. For more complicated procedures, they would have to call a veterinary who may often not be available or have difficulties to reach the village due to the hilly nature of the terrain. Veterinaries usually do not charge for their services, but farmers have to pay for their transport and drugs.

As a result, farmers suggested that perhaps two of their representatives (e.g. one man and one woman) per village should get training in more advanced veterinary healthcare. These farmers would then be expected to help their neighbours as required or pass on their knowledge. Giving injections and assistance to donkeys when giving birth were mentioned as areas where farmers felt they needed more training. Also, it was observed that donkeys lacked regular trimming of their hooves, which sooner or later may lead to lameness of the animals.

UTILISATION OF DONKEYS IN KASESE

Farmers' Transport Priorities

At first, farmers were apprehensive when donkeys were introduced in their villages. In particular, since they had heard 'negative' stories about the animals being difficult to manage they were reluctant to use them. This shows the importance of training of groups and individuals. Following sensitisation by the donkey trainer, and training in animal handling and welfare, farmers started to appreciate the animals. Nevertheless, farmers are still interested in more training as indicated above.

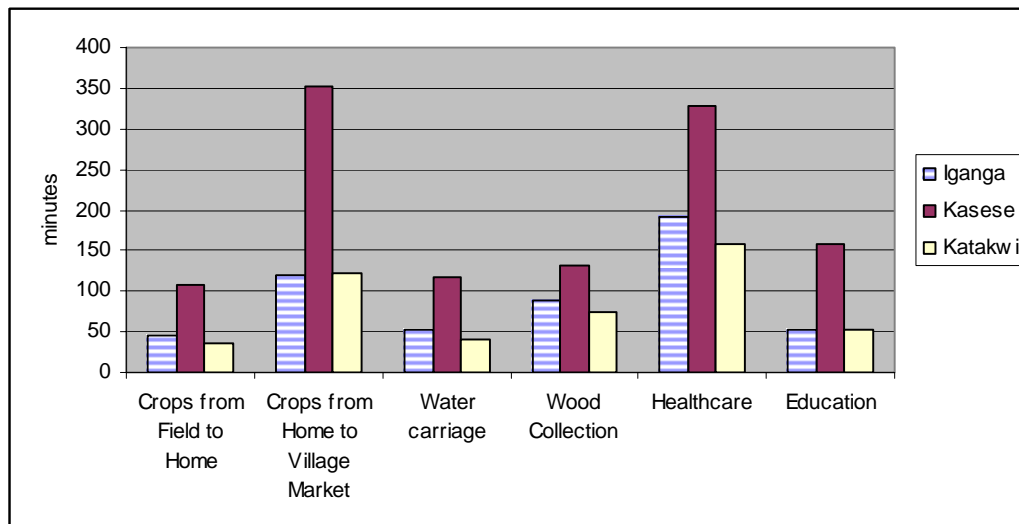
Table 1: Farmers' Priorities in Donkey Utilisation, Kasese District

Transport Priorities	Kyabarungira S/C	Nyakiyumbu S/C	Mahango S/C
1.	Water for domestic consumption	Water for domestic consumption	Water for domestic consumption
2.	Crops to market, and from garden to home	Crops from garden to home	Transport of crops; 2 or 3 times / week; transport for domestic use more important
3.	Building material, incl. water	Crops / goods to and from market	Building material
4.	Fuelwood, occasionally	Building materials, incl. water	Fuelwood, once or twice a week

Transport of Water

In particular in the hilly parts of Kasese District, villagers tend to spend significantly more time on transport related activities than their colleagues in Iganga and Katakwi Districts. For example, according to the baseline survey in 2002, the average return trip time to fetch water is 118 minutes in Kasese compared to 53 minutes in Iganga and 41 minutes in Katakwi (Figure 1). Similar results have been obtained for other domestic transport uses and for the transport of crops from the field to the home and from there to the village market, as is highlighted in Figure 1.

Figure 1: Average Trip Time Using Foot as Main Mode of Transport



NB: The trips for transport of crops from the field to the home store and from the home to the village market refer to one-way trips. The trips for water carriage, wood collection, health care and education refer to return trips.

Source: Baseline study, 2002

When asked how the donkeys were mainly used by the farmers, transport of water for domestic consumption was indicated as top priority in all three sub-counties of Kasese where the project is active. This is also related to the fact that water is being fetched by the household members on a daily basis. It was reported that donkeys would mostly carry two jerricans of 20 litres each on a trip. If donkeys are stronger then they may be expected to carry four jerricans on a trip (i.e. 80kg in total). In particular, women and girls are alleviated by the reduced transport burden as a result of the use of donkeys as pack animals. Depending on the distance, someone who hires a donkey would have to pay US\$100 to 200 per jerrican transported.

Transport of Crops

Transport of crops was mentioned as second most important utilisation of donkeys by the farmers. However, it transpires that the transport of crops from the garden to the farm is particularly important in some communities (e.g. Mahango). This would involve the transport of both food and cash crops which would otherwise be transported by headload. Also, transport of bulky, heavy, crops such as fresh cassava tends to represent a particular burden. The distances usually involved may not be that long (e.g. 0.5 – 2 kms), however the effort ought to be seen in light of the hilly terrain.

Visits to markets are undertaken by villagers on average once or twice a week. This generally involves longer distances (i.e. up to 15 kms). Often crops such as coffee, cassava, beans, and potatoes are transported to the market whilst goods such as sugar, rice, soap and salt are carried on the return journey. Nevertheless, for example some farmers of Nyakiyumbu also stated that they would take fresh cassava to Bwera market and return with dried cassava for home consumption. At the same time, some farmers were reported to take dried cassava to the grinding mill in Bwera (about 10 kms) and transport the flour back to their homes. Sometimes the donkey would be used to transport building material (e.g. cement) on the way back from the market centre to the village.

Certain crops are not transported by all farmers using the donkeys. For example, in one village it was reported that passion fruit and bananas will be damaged if transported by donkeys. On the other hand, a few farmers in Mahango stated that passion fruit can be carried by donkeys if properly packed. This indicates that improvements can be made as far as packaging material and handling practices are concerned.

In general, it is estimated that crop prices are about 20 – 30% higher at the market centres compared to farmgate prices as Table 2 illustrates. Nevertheless, prices also depend on the food supply situation. If certain food crops such as beans are scarce in the villages due to low production then their prices may even be higher than in the market centres.

The existence of the donkeys allows the farmers to transport larger quantities of crops to the market. In particular, if the price differential is sufficiently large then the farmer can make a net benefit. This is demonstrated in the following two examples of Table 2, which are based on the transport of beans and cassava from the farm to the market. It is estimated that the net benefit of transporting 80kgs of a crop is of the order of US\$6,000 per trip if the price differential is US\$100 per kg, and US\$2,000 if the price differential is US\$50 per kg. Obviously, if the crop is

higher value (e.g. coffee) and the price difference is greater, then the net benefit of transporting crops to the market is even higher (e.g. USh10,000 per bag or more).

Table 2: Benefits of Transporting Crops to the Market

	Option 1: Transport of Beans	Option 2: Transport of Cassava
Farmgate price of crop, per kg	300/=	200/=
Price at market centre, per kg	400/=	250/=
Price differential, per kg	100/=	50/=
Carrying capacity of donkey	80kg	80kg
Value added by transporting one bag of crop to the market	8000/=	4000/=
Opportunity cost of donkey	1000/=	1000/=
Time value of farmer accompanying donkey	1000/=	1000/=
Farmer's net benefit per 80kg bag transported to the market	6000/=	2000/=

Table 3: Prices of commodities per kilogram at home and in the local markets by Sub County

	Cotton	Cassava		Maize		Beans		Coffee		Passion Fruits		Garlic	
	General	Home	Market	Home	Market	Home	Market	Home	Market	Home	Market	Home	Market
Mahango	600=	300=	500=	200=	250=	400=	500=	1200=	1400=	-	-		
Kyabarungira	600=	200=	250=	100=	300=	300=	400=	1200=	1400=	-	-	6500= per basin	7000= per basin
Bwera	600=	200=	250=	150=	200=	300=	400=	1200=	1400=	5000= per basin	7000= per basin	-	-
Nyakiyumbu	600=	-	-	-	-	-	-	1200=	1400=	5000= per basin	7000= per basin	-	-

Source: Geoffrey Okoboi, Benson Taiwo, Cecilia Agang (July 2004), Research Project on Decentralised Market Information Services, Comparative Case Study carried out in Four Sub-Counties of Kasese District on Farmers Use & Access To Market Information and Sources of Information

NB: - It should be noted that due to unreliable weather in Mahango maize and beans are being bought by local traders from Kasese town and sold within the sub county. As for cotton, these prices refer to the lower parts of the Sub-counties which are located in the Rift Valley.

Transport of building material

Community members reported that construction costs are lower now since donkeys are used for the transport of building material. For example, donkeys are used for carrying bricks that are required for the construction of schools. Depending on their size 20 – 40 bricks would be transported three to five times per day from the site where they are burnt (about 0.5 – 1 km away) to the construction site. Usually, the transport of 100 bricks would cost about USh 1000. In addition, sand is also transported. If a 50 kg bag of cement is transported over a longer distance from the market town to the village than this may be charged at USh2,500.

It was reported that construction costs are lower now in the villages because of the donkeys and the reduced need for human portage. When asked for the impact on the porters' livelihoods, villagers replied that the porters have now found alternative employment in construction and other professions. For example, schools and also health dispensaries are constructed in many locations as part of major Government initiatives.

Also, water is transported by donkeys for construction purposes. For example, the construction site of a school in Kyabarungira was located on top of a hill whilst the water source was at the bottom of the valley about 1 km away. Two to four 20 litre jerricans are usually transported per trip (40 – 80l). The transport of water would be charged at USh 100 - 200 per jerrican if the donkey is hired out.

Transport of firewood

Firewood is also transported occasionally but this appears to depend on the distance involved and the amount of money users have to pay. Generally, fuelwood is not collected on a daily basis, but only once or twice a week. If the forest is not too far away (e.g. about 1 km) then women are likely to save the money and carry the wood themselves. Also, it was reported that firewood has to be cut into small pieces so that it does not obstruct the animal carrying the load.

Hiring out of donkeys

The aspect of income generation is important if Intermediate Means of Transport (IMTs) are to be introduced into the communities on a financially viable basis. The purchase of IMTs such as bicycles, donkeys, and ox-carts necessitates that the future owners are in a position to pay for the new vehicles or animals. If they do not have sufficient amounts of cash available then they will require loans which need to be paid back. In the context of most farming communities, there exist the following options to pay for the IMTs or the loans needed to acquire them:

- a) Savings
- b) Increased income through increased agricultural production
- c) Start of alternative income generating activities
- d) Hiring out of the animals

Considering these options in the context of Kasese farmers, option (a) of using savings to purchase donkeys appears possible for farmers if they are organised in groups and have a saving scheme in place. As a result of this, a well-organised savings group may be able to pay the full price of a donkeys at once (e.g. USh100,000). Other groups may at least be able to make a down-payment but still require credit for the remainder of the purchasing price (e.g. 50 – 75%).

Option (b) of increasing agricultural production with donkeys appears to be limited in Kasese, as the animals cannot be used in the hills for ploughing. In addition, due to demographic pressure there is already a constraint on arable land available to farmers. As a result, the increase in production is likely to be relatively small, and only possible if more labour is available because of less human portering requirements, or if more and better inputs are being used for production as a result of the donkeys (i.e. including manure, or fertiliser that is transported by the animals). On the other hand, the option of agricultural production increases exist in particular if animals can also be used for ploughing (e.g. oxen in Iganga District).

The start of alternative Income Generating Activities (IGAs) may be related to new businesses that rely on the availability of transport (option c). For example, brick-making relies on the transport of inputs including water to the site where the bricks are produced, and then on the transport of the final product to the construction site. The use of bicycles for these businesses is limited given the nature of the load. Processing activities may also become more viable as a consequence of improved means of transportation.

As for option (d), donkeys are frequently hired out by their owners / care-takers. In general, members of the group to which the donkey belongs pay only half of the fee, as compared to non-members. Also, as agreed by the groups, only part of the income from hiring out the animals goes to the care-taker (i.e. usually 50%); the remainder goes into a fund created by the group to reimburse outstanding credit or cater for the animal's welfare. The entire hire-out fee goes to the care-taker only if the pack-animals are owned on an individual basis. Owners / care-takers tend to lead the animals when they are hired by other villagers. The reasons for this include lack of knowledge to handle the animals on the part of other farmers, but also most probably the fear that the donkeys will be overloaded. For example, some farmers said that they would not allow other villagers to transport cement on their donkeys.

Fees obviously vary according to the distance and load transported. Table 3 provides examples of transport charges according to type of load and weight. It has been stated that transport charges have reduced in villages where donkeys are used as pack-animals. For example, a villager may charge a neighbour USh300 for carrying a 20 litre jerrican of water from a river to the farmer's home, whilst the charge is likely to be of the order of USh100 to USh 200 per jerrican if the water is transported by a donkey.

Table 4: Examples of transport fees

Load	Distance	Fees (US\$)
Transport of Crops to the Market (e.g. 80kg of dried cassava)	10 km	1000
Water, 20l jerrican	0.5 – 1 km	100
Bricks, 100, 3 trips required	0.5 – 1 km	1000

According to farmers, the average income earned per donkey from hiring out is in the range of US\$1000 – 5000 per week. However, there are cases where owners / caretakers earn more than that, i.e. above 10,000 per week. In this case there may even be a danger that the animal is overused which in turn may affect its health.

Results of the monitoring survey

Table 5 provides results of the monitoring survey in Kasese District, which took place mainly between May and July 2004. It should be noted that most farmers found it difficult to take notes of the utilisation of their donkeys on a daily basis. As a result, for the calculation of average figures only those days have been taken into account where records were available. The total fee incomes are likely to be higher. Also, distances have been recorded as miles and may require conversion.

Table 5: Donkey Utilisation in Kasese District – Results of the Monitoring Survey

	Av Distance / trip (miles)	Av. Time / trip (min)	Av. weight of load / trip (kg)	Trips / day	Average fare income / day (US\$)	Total fare income (US\$)
Average	2.3	77.8	62.4	2.0	551.2	12,175

Impact of donkeys as pack animals

Aside from generating income, it was frequently indicated that the arrival of donkeys as pack animals in the hills of Kasese District has reduced the transport burden on farmers. In particular, women benefit from the fact that the animals are well suited to transport goods for domestic purposes. As mentioned above, this would mainly involve transport of water and crops for home consumption. The use of donkeys as pack animals results in time and energy savings. Often it was stated that the beneficiaries would use freed-up time in productive activities (e.g. increase of agricultural production, or engagement in alternative IGAs), whilst others indicated that the amount of leisure time has also increased. Also, the elderly and children (in particular, girls) have benefited when donkeys are being used by households for transport purposes.

Nevertheless, despite the clearly visible improvements in the transport situation of villages where donkeys have been introduced, farmers of all three project sub-counties have stated that more donkeys are required in that the animals currently available are not sufficient to cater for the transport needs of entire communities. As a consequence of this, fears were expressed that the animals currently in place might be overused.

CASE STUDIES FROM KATAKWI

Case Study: Ms Betty Akudi, Farmer in Kapujan Sub-county, Katakwi District

Ms Akudi belongs to a farmers' group that has 10 members. She is the group's caretaker of three donkeys - out of which one is young - and a cart. The cart was manufactured by YWAM's³ Design Centre and has cost US\$160,000 of which the group has to pay 60% (i.e. US\$96,000) as part of the risk / cost sharing arrangement with the project. The two donkeys, which were procured locally in Katakwi District at the beginning of 2004, cost the group a total of US\$120,000. The cart was delivered three months later.

She takes care of the donkey's welfare which includes spraying against ticks and trimming of hooves. She uses the animals mostly over distances between 1 and 3 km.

She used to headload until she obtained the donkeys but since then, according to her, "headloading is finished for her". As a result she feels much healthier now. In the past headaches, back and chest pains were common, as a consequence she took pain-killers such as Panadol. For example, given that she has a relatively large family, she had to carry every day 10 jerricans of water (i.e. 200 litres) from the tube-well to the home. This would now be transported by the donkey and cart in a 200 litre drum in one go. In particular, when the children were at school she had to carry the water by herself, obliging her to make at least five return trips of about 2 kms. In addition, when she produces *waragi* for sale, she requires additional amounts of water (i.e. another 200 litres per day).

Also, she regularly used to carry headloads of cassava weighing 30 to 40 kgs from her garden to the home. Especially during the harvest it was common that she had to go up to six times to her garden that is about 1 km away and collect the roots. Now, by using the cart, she can transport the same amount at once, as a result of which she has more time for resting. Only if there is no road or track to her garden then she would use panniers. Otherwise, she uses the cart. Given that the rains were not good during the last season the harvest is not good and there is not much to sell this year.

She also uses the cart to transport firewood. Given that this is relatively far away (i.e. 7km one way), she would collect 6 – 7 bundles that would last her for up to a month. She would walk slowly with the donkey when the cart is fully loaded.

As for her transport priorities, she indicated the following:

- Transport of crops from the garden to the house (e.g. cassava, millet, sorghum, groundnuts, etc).
- Water, every day 200litres using a drum and the cart;
- Firewood;

She charges farmers who are not group members if they want to hire the donkey-cart. For example, the transport of 50 bricks would cost US\$1,000. Other group members can come and use the donkey cart without paying.

³ Youth with a Mission, NGO

She has earned about US\$70,000 net over a six-month period by hiring out the cart (e.g. transport of building material). The expenses were of the order of US\$40,000 the biggest part of which was for tyres (about US\$30,000), feed supplements (about US\$5,000) draw bars (US\$2,000), and ropes (US\$3,000). The tyre repairs were made at the nearest trading centre, whilst the draw bars could be replaced at home. The money that is left after cart maintenance and donkey welfare is used for domestic purposes.

Now she has more time to rest. As a result she feels healthier now.

Case Study: Mr Geoffrey Etongu, Kujju Sub-county, Amuria County, Katakwi District

Mr Etongu is a farmer, 40 years old, married, and has two children. He has A-level education and a Diploma of the Soroti College of Commerce. His mother is also living in the household.

His grandfather already had donkeys which were used as pack animals for the transport of cotton. In addition, his grandfather had bulls and a cart. However, when the cart broke down in the 1960s it was impossible to repair it in the village because welding was required, and transport was not available to take the cart to the next urban centre.

Mr Etongu currently owns two oxen for ploughing and two donkeys plus cart for transport. He has purchased the animals and the equipment between 2000 and 2002 mostly with savings from a previous job; the bulls cost about 210,000 each, the plough US\$125,000 plus US\$2,500 for transport; the donkeys (two pregnant females) cost US\$100,000 each.; the donkey cart cost US\$160,000 and was purchased from the Design Centre of Youth With a Mission in Katakwi.

As for the animals' welfare, the bulls need deworming twice a year, costing US\$3,000 per bull. Salt is required as a supplement - a block lasting 3 months costs 5,000. Otherwise, the oxen feed on pasture, which is plentiful. The donkeys also require deworming twice a year which costs US\$2,000 per animal.

As for the maintenance of the cart, he is quite happy with the design. The wheels are based on double-bicycle wheels on each side which are additionally protected by used motorcycle tyres. About US\$20,000 per annum are required for cart maintenance (e.g. punctures, spokes, boards). The fact that everything can be done at village level is of advantage. He wanted to buy another cart from the Design Centre but held off due to the insecurity in the region in 2004.

With one pair of oxen he can plough one acre in two days (6 – 11 am). He charges 20,000/= when hiring out the oxen for ploughing a used field, and 35,000/= for ploughing a virgin field. He usually accompanies the oxen as part of the ploughing team. A helper who also comes along would get 1,000/= per day.

In a normal year, he would plough 12 acres for his family and another 8 acres for neighbours and his helpers. Almost all crops require two ploughings in Katakwi.

His income from ploughing is about US\$150,000 per annum. Maintenance of the plough costs 4,000/= for every 10 acres ploughed.

The donkeys are only used for transport using the cart (i.e. they are not used as pack animals or for ploughing).

His transport priorities for the donkeys are as follows:

1). Transport of water. 20 jerricans of 20 litres each can be transported in one go. This is sufficient for 3 days. As a result, the 3 km journey to the water source only needs to be made twice a week. He collects the water himself. The children would do it when they are on school holidays;

(2) Hiring out for the transport of crops for villagers. On average, this would take place once a week, depending on the crop and the season. For example, fresh cassava would be transported more during May to July; sweet potato between October and December; sugarcane between December and March, and cotton between November and March. He estimates his weekly income from transport at about US\$3,000 on average.

Most of the transport is to the market, which is about 10 kms away. The transport fees depend on the distance. For example, he would charge for the transport of a 100 kg bag as follows:

4 – 6 km:	1,500/=
6 – 10km:	2,000/=
10 – 15 km:	2,500/=
above 15km:	3,000/=

Transport fees may be more expensive if vehicles cannot access the area; as a result he may charge up to 5,000/= for transporting one bag.

(3) Transport of crops produced by himself. (a) transport from the field to the home, and (b) transport to the trading centre which is 3 km away. In particular, the demand for cassava is high in Districts such as Kotido and Moroto, as a result of which he also produces dried cassava chips. In addition, women may also buy cassava from him for gin production.

Although he has donkeys, only one of them pulls the cart whilst the second one walks next to it. He would not hire the donkeys out for the transport of construction materials, fearing that the animals' health would suffer due to overloading of the cart. Transport of firewood is not a problem since it can be found nearby. As a result, the carts are unlikely to be used for this purpose.

IMTS MANUFACTURED BY SAIMMCO

Soroti Agricultural Implements Machinery Manufacturing Company (SAIMMCO) Ltd. belongs to the Alam Group of Companies and is currently Uganda's only modern engineering workshop capable of manufacturing large quantities of agricultural implements and tools, including various types of carts. The carts available at SAIMMCO include ox-carts, bicycle carts, and ambulance-bicycle carts. Table 6 shows the number of carts sold between 2000 and 2004.

Table 6: Number of Carts sold by SAIMMCO between 2000 and 2004

	2000	2001	2002	2003	2004 until Sep	Total
Ox-carts	7	11	11	3	42	74
Bicycle carts	0	34	9	2	0	45
Ambulance- Bicycle carts	0	0	0	19	0	19

Source: SAIMMCO, September 2004

Despite the increase in sales of ox-carts in 2004, the total number of carts sold by SAIMMCO between January and September 2004 (i.e. 42 pieces) is still negligible when compared to the total number of farm households in Uganda. Also, compared to this the company have sold about 5,000 ox-ploughs during the last few years, mostly to Government (e.g. Karamoja), and also to NAADS (e.g. Soroti and Lira) and NGOs (e.g. World Vision in Soroti and Arua; Oxfam in Kitgum).

The cart model offered by SAIMMCO is a sturdy cart mainly made of metal including the wheels. The standard model costs US\$600,000 per cart ex-factory. The bearings are made of wood and cost US\$24,000. However, although the factory managers expect that the bearings require replacing every one to two months, a farmer in Katakwi owning a SAIMMCO cart for more than 10 years, confirmed that he had to replace only one bearing on the cart during the entire period. He uses the cart extensively in the transport of crops such as groundnuts.

Despite the recent change of management, SAIMMCO still face a number of challenges if they want to significantly increase the number of carts sold. These include the following:

- The company currently does not have a distribution system covering the bulk of the country. Besides their factory in Soroti, it only has outlets in Kampala (Market Street), Kabale, and Mbarara. In this context, SAIMMCO are prepared to accept dealers if they want to become their representatives. The company would be prepared to sell at a discount to them but would require cash payment.
- In particular outside towns, repair services for SAIMMCO carts seem to be insufficient. As a result, dealers, garage owners, or local artisans require training, equipment and supply of spare parts to fulfil this role.
- It is recognised that the transport of bulky carts is expensive and may discourage potential buyers. In view of this, SAIMMCO management

indicates willingness to share the transport costs. Also, bulk transport can be arranged if lorries can be filled with carts (e.g. 8 carts may fit onto a Fuso lorry);

- The cart model currently on offer has metal-rimmed wheels which appear quite durable. However, these wheels also have some constraints such as:
 - They sink into the ground if a field is wet and the cart is filled with a one-tonne load;
 - According to farmers, oxen struggle to pull a full cart on sandy soil;
 - If the wheels break then farmers face difficulties to find repair services since welding is required and transport of the carts to a town may be too expensive;
 - The narrow wheels are likely to damage the road surface in wet conditions.

In view of these points the company ought to be encouraged to test affordable, new models that are based on rubber tyres. Apparently, there existed a rubber-tyre model in the past, however its cost of US\$1.2 million was considered as too expensive for farmers. New models ought to be tested based on designs available in other parts of Africa including Kenya. The Nairobi based NGO KENDAT (Kenya Network for Draught Animal Technology) might be able to assist in arranging exchange visits for SAIMMCO engineers.

In sum, SAIMMCO face two major challenges that the company needs to tackle if the output and sale of carts is to be increased in future years. These include (a) an improved marketing and distribution strategy, and (b) testing and manufacturing of alternative cart models that are affordable for small-scale farmers.

SAIMMCO recognise that finance and credit are important if farmers are to take up their carts. However, this is a point beyond their control, and they hope that financial intermediaries can fulfil this role.

THE PROFITABILITY OF IMTS TESTED BY THE PROJECT

This section discusses the findings of a profitability analysis of the various IMTs tested by the project in Iganga, Kasese and Katakwi. The following four options are assessed:

- Option (a): 2 oxen and cart, plus plough
- Option (b): 2 oxen and cart
- Option (c): 1 donkey and cart
- Option (d): 1 donkey as pack animal

All four options are based on the assumption that farmers will require a loan to purchase the IMTs, and that real interest rates (i.e. once inflation is taken into account) are of the order of 12% per annum. Loans would have to be provided by projects or local NAADS schemes, given that according to farmers most micro-finance institutions have conditions that are not appropriate for agricultural enterprises (e.g. interest rates are high, and loans have to be paid back on a weekly basis although farming is a seasonal activity) and banks very rarely give credit to farmers.

As for labour costs, the calculations provide for two alternatives whereby, (a) it is assumed that farmers would either have to pay someone to look after the animals or there is an opportunity cost on their time, and (b) the labour costs are not valued because farmers do not have to pay someone, or looking after the animals does not represent an opportunity cost for them.

Option (a). Owning an ox-cart is advantageous if the farmer also owns a plough and has access to sufficient amounts of land (i.e. about 8 acres minimum). This underlines the multi-purpose function of draught animals such as oxen. Even if the farmer has to pay for someone to look after the animals on a daily basis (i.e. US\$365,000 p.a.) there is still a profit (US\$194,000) to be made if the loan is spread over three years. If the farmer does not pay someone and does not have to forego alternative income opportunities when ploughing or transporting with his/her pair of oxen, then the annual net income possible is of the order of US\$559,000 per annum, taking into account income from hired transport, ploughing, extra crop production, and gains through better market access. The related calculations are based on a 3-year loan and a 10-acre farm, details of which are shown in Tables 7 and 8.

Option (b). If farmers do not own a plough then the income from the oxen and cart has to come entirely through transport activities such as hiring out the cart, or gains through better access to markets. In particular, if a farmer has to pay for labour then the net benefit of oxen and cart ownership is likely to be negative (e.g. US\$296,000 as calculated in the case study). Farmers or other entrepreneurs will only be able to make a profit (i.e. US\$69,000 p.a.) during the first three years (i.e. loan period) if they do not have to pay for labour. Only once the loan is paid back then they will be able to generate larger annual profits which can be of the order of US\$211,000 (if labour is costed) to US\$576,000 (if labour is not costed).

Option (c). Similarly, an enterprise based on a donkey and donkey cart can only be profitable during the loan period (i.e. 2 years in this case) if the entrepreneur does not have to pay for labour. In this case the annual net benefit can be of the order of US\$128,000 until the loan is paid back, and up to US\$480,000 in the following years.

Option 4. The case with donkeys as pack animals is very similar, in that the animals are only profitable if farmers do not have to pay for labour (e.g. USh500 per day). In this case it is estimated that about USh48,000 of net benefit are possible during the loan period which is assumed to be one year. Once the credit is reimbursed then an annual net benefit of USh210,000 is possible. In addition, the pack animals would be expected to be extensively used for domestic purposes such as the transport of water for household consumption. Donkeys are particularly useful for mountainous areas such as Kasese District, or for resource-poor farmers who have only limited access to land.

Table 7: Profitability of Intermediate Means of Transport (IMTs)

	Ox-cart plus plough (2 oxen)	Ox-cart (2 oxen)	Donkey cart (1 donkey)	Donkey as pack animal (1 donkey)
Capital Costs				
Animals	640,000	640,000	100,000	100,000
Kral or shed	10,000	10,000	15,000	15,000
Harness, panniers			30,000	30,000
Yoke plus chain	18,000	18,000		
Cart - 'Iganga -model' (incl. transport)	550,000	550,000	450,000	
Plough - SAIMMCO	120,000			
Annual Operating Costs				
Feed supplements	30,000	30,000	15,000	15,000
Salt	20,000	20,000	5,000	5,000
Deworming	12,000	12,000	6,000	6,000
Spraying animals	12,000	12,000	6,000	6,000
Injections	10,000	10,000	5,000	5,000
Cart maintenance and repair	40,000	40,000	30,000	
Plough maintenance and repair	10,000			
Harness maintenance			3,000	3,000
Labour / farmer's time	365,000	365,000	182,500	182,500
Cost Summary				
Total capital costs	1,338,000	1,218,000	595,000	145,000
Pay-back period of loan (yrs)	3	3	2	1
Interest rate (in real terms)	12%	12%	12%	12%
Annualised capital costs	557,075	507,113	352,060	162,400
Annual operating cost	499,000	489,000	252,500	222,500
Total annual costs	1,056,075	996,113	604,560	384,900
Annual Income from IMT's				
Transport - Hired out	200,000	500,000	450,000	200,000
Ploughing (20 acres)	400,000			
Extra crop production	450,000			
Gains through better market access	200,000	200,000	100,000	50,000
Total annual income	1,250,000	700,000	550,000	250,000
Annual Net Benefit (total income - costs)				
If labour is costed	193,925	-296,113	-54,560	-134,900
If labour is not costed	558,925	68,887	127,940	47,600
Annual Net Benefit once Loan is paid back				
If labour is costed	751,000	211,000	297,500	27,500
If labour is not costed	1,116,000	576,000	480,000	210,000

NB: For details see explanations overleaf.

Table 8: Profitability of Intermediate Means of Transportation (IMTs)

Explanations to spreadsheet:

To be discussed at workshop

	Ox-cart plus plough (2 oxen)	Ox-cart (2 oxen)	Donkey cart (1 donkey)	Donkey as pack animal (1 donkey)
Labour / farmer's time	This assumes a farmer has to pay someone to look after the animals. Alternatively, it corresponds to farmers' opportunity cost of their time (e.g. foregone income)			
Cost Summary				
Total capital costs	Sum of capital costs (i.e. all investments)			
Pay-back period of loan (yrs)	This assumes the farmer has to take out a loan in order to be able to make the investments. Here the pay-back period corresponds to the duration of the loan.			
Interest rate (in real terms)	This assumes an interest rate minus the inflation rate			
Annualised capital costs	This corresponds to equal annual repayments of the loan based on pay-back period, instalments and interest.			
Annual operating cost	Sum of all the annual operating cost elements			
Total annual costs	Sum of annualised capital and operating costs			

Income from IMT's				
Transport - Hired out	40 days at 5000/= per day	100 days @ 5000/= per day	150 days @ 3,000 per day	200 days @ 1,000/= per day
Ploughing - Hired out (20 acres)	20 acres @ 20,000/= per acre			
Extra crop production	It is assumed that the family owns 10 acres of land 4 of which have been cultivated. Due to the use of the plough an additional 6 acres can be cultivated yielding 3,000kg of maize valued at US\$150/= per kg net (i.e. after deduction of other production costs such as weeding).			
Gains through better market access; i.e. transport of crops to market where price is higher than at farmgate	Assumes transport of 2000 kg to market and price diff. is 100/=	Assumes transport of 2000 kg to market and price diff. is 100/=	Assumes transport of 1000 kg to market and price diff. is 100/=	Assumes transport of 500 kg to market and price diff. is 100/=

Net benefit (if labour is costed)	Shows annual net benefit (income) of enterprise if labour is costed.
Net benefit (if labour is not costed)	Shows net benefit of enterprise if labour is not costed, i.e. farmer does not have to pay for it, or considers the extra-time necessary as spare time which was previously unused.
Annual Net Benefit once Loan is paid back	Shows annual net benefit (income) of enterprise once loan is paid back, i.e. only the annual operating costs are taken into account

**Appendix 1:
Summary Table: Use of Donkeys in Kasese District**

Name of animal	Av Distance / trip (miles)	Av. Time / trip (min)	Av. weight of load / trip (kg)	Trips / day	Average fare income / day (USh)	Total fare income (USh)
Weti	2.1	71	53	2.5	192	5,000
Maryas	2.8	49	83	6.1	853	13,650
Thubuke	2.5	83	81	2.0	1708	20,500
Boss	3.3	87	95	1.7	2569	41,100
Thukwatikanaye	2.8	71	63	1.9	736	13,990
Wahekire	2.6	56	74	1.5	813	18,700
Katakwi	1.6	X	105	1.9	596	14,300
Sibasimire	1.4	61	39	1.4	904	22,600
Musoki	3.0	64	111	2.9	607	8,500
Nalubeeza	0.8	52	47	1.8	97	3,000
Katakwi	3.4	73	104	1.8	1830	40,250
Nevia	1.3	15	82	1.9	342	11,300
Thwautsiaine	1.8	X	85	1.9	635	14,600
Kabode	3.8	121	52	1.5	167	2,500
Queen	4.4	201	66	1.9	571	4,000
Joy	3.3	65	53	1.5	200	2,000
?	2.3	86	81	1.5	114	1,600
Disco	3.9	159	57	1.6	179	2,500
Hop	7.9	244	93	1.5	500	7,000
Jevis	0.6	43	34	1.9	164	14,300
Raurone	0.6	49	35	2.1	77	5,300
Book	1.3	51	35	2.9	381	18,300
Atenyi	1.4	75	43	1.4	332	24,900
Joy	1.5	57	43	2.1	230	9,900
Pocket	0.7	31	44	2.0	89	6,200
Matere	1.1	X	24	1.4	142	6,400
Iga	0.8	47	44	1.3	405	8,500
Big Pen	0.6	35	20	1.0	0	-
Average	2.3	77.8	62.4	2.0	551.2	12,175

NB (X): Trip time does not include three monitoring forms that did not specify time.

Appendix 2: Selected Case Studies from Iganga – Source: MTCEA

BUSWIRIRI YOUTH DEVELOPMENT ASSOCIATION. (MAKUUTU SUB-COUNTY) CASE STUDY.

Farmers Name	Mpaata Kositant
Age	28 years
Family	Female 1 Male 7
Location	Buswiriri Village
Distance to market	0.5 miles

ACTIVITIES.

1. Ploughing
2. Animal Husbandry]
3. Cattle rearing]
4. Poultry
5. Grow, maize, beans, and cotton growing

Land size	4 acres
Major crop	Maize
Equipment	Ox- Plough, hand hoe.

IMPACT OF PROJECT

BEFORE	AFTER
Hand carrying and bicycles	Improved use of ox- carts, bicycles and less head carrying
A season 0.75 to 1 acre (maize)	Increased acreage Of 5 acres on wards to about 10 acres under crops.
Income generation Was low because they were depending on sale of farm produce that was low.	Increased level of income from 4bags to 12bags
Women: Head carrying of farm produce, cooking looking after children and collecting fire woods and water.	Reduced off the burden farm activities on improved health due to less head carrying exercise.
Children: Held family with domestic work, Head carrying maize for the field, water collecting And fire collection.	Reduced water collecting by children is reduced and labour on tillage.
School fees: It was very difficult to raise because there was no an income generation.	School fee due can now be raised as there is some source of income generation.
Medical fee- it was also difficult to raise	

DISTANCE VS COST.**GARDEN TO HOME**

	Distance	Load	Charges
Bicycles	0.5 mile	1 bag of maize of 100kg	700/=
Ox-cart	0.5 mile	5 bags of maize of 100kgs @ 500/=	2,500/=
Pick – up	-	-	-

HOME TO MARKET

	Distance	Load	Charges
Bicycles	1 ½ mile to market	1 bag of maize of 100kgs @ 1000/=	1000/=
Ox- cart	1 ½ mile	5 bags of 100kg @ 700/=	3,500/=
Pick –up	1 ½ mile	10 – 15 bags @ 500/=	5000/= - 7000/=

**NAITANDU BAKUSEKA MAJJA FARMERS GROUP.
(MAKUUTU SUB-COUNTY)
CASE STUDY**

Farmers Name Onyango Rose

Age 28 years

Families size 10 Female 3 Male 7

Location Naitandu Nakafunvu Village

Distance to market 3 miles

ACTIVITIES

1. Ploughing
2. Grow maize, cassava, potatoes, beans,
3. Cattle rearing
4. Poultry
5. Sorghum

Land size 2 acres

Major Crops maize & cassava

Equipment: Ox – Plough, & Hand hoe

IMPACT OF PROJECT

BEFORE	AFTER
Bicycles and head carrying	Use of ox - cart
Maize and cassava 0.5 to 1 acre	Ploughing 1 acre to 3 acre.
Income generation: selling of produce i.e. maize, cassava, bean etc.	Cassava for group gardens to sale the product 0.75-acre.
Women: participate in agric and domestic work,	Increased acreage, reduce head carrying on farm produce, reduced farm labour.
Children: Helping the family in farm activities, Head carrying of water and collecting firewood.	Children are now used to ox- cart and head carrying of water has reduced.
School fees: It was difficult to get school fee because there was no an income.	School fee of the term is now ok because they do not get problem in school paying.
Medical care: since low income it's difficult to raise money.	Improved medical care by sale of high farm produce.

DISTANCE VS COST**GARDEN TO HOME.**

	Distance	Load	Charges
Bicycles	0.5 mile	1 bags of maize of 100kgs @ 700/=	700/=
Ox-carts	o.5 miles	5 bags of maize of 100kgs @500/=	2,500/=
Pick – up	-	-	-

HOME TO MARKET

	Distance	Load	Charges
Bicycles	1 ½ mile to market	1 bags of maize of 100kgs @ 1000/=	1,000/=
Ox –cart	1 ½ mile	5 bags of maize 100kgs @ 700/=	3,500=
Pick – up	1 ½ mile	10 – 15 bags @ 500/=	5000/= - 7000/=

**NAITANDU BRICK LAYERS (MAKUUTU SUB COUNTY)
CASE SDUTY.**

Farmers name Waiswa Alice

Age 36 years

Family size 10 Female 2 Male 8

Location Naitandu Village

Distance to market 0.5 miles

ACTIVITIES.

1. Maize growing
2. Rice
3. Vegetable
4. Cassava
5. Beans, cereal growing.
6. Ploughing and local poultry farming

Major crop Maize

Equipment Hand hoe and Ox- Plough

IMPACT OF PROJECT

BEFORE	AFTER
Bicycles and head carrying	Ox-cart and bicycles least head carrying
Maize about 1 acre	Increased from 1 to 3 acres
Income generation: use of Boda – Boda Hire	Hire of ox –cart, selling of bricks and selling of maize.
Women activities: Collecting of water, collecting of fuel wood, cooking, head carrying of building materials and farm produce from garden to home.	Head carrying reduced, due to use of ox-carts.
Children helping their parents in collecting water, firewood, and look after the animals including carrying farm produce on their head and other domestic activities.	There is now use of ox –cart (head carrying reduced and child labour controlled.
School fees: it was difficult to raise.	School fees improved due to group savings and sale of maize, beans and rice including income from ploughing charges. Improved medical care.
Medical: it was difficult to raise and there was a lot of complains about both women and children having pains in their chest and neck	Improved medical care by sale of farm produce get income from ploughing charges. Reduced pain in the chest and neck of the women and children.

DISTANCE VS COST - GARDEN TO MARKET.

	Distance	Load	Charges
Bicycles	Naitandu B to Naitandu A 2 km	Bricks 50 Bricks	1000/=
Ox- cart	2 km	Bricks 150	1.500/=
Pick – up	-	-	-

NAITANDU PINEAPPLE AND MATOOKE GROWERS (MAKUUTU SUB-COUNTY)

Farmers Name Kabaya Patrick.
Age 38 Years
Family size 8 3 Female 5 Male
Location Naitandu Village B
Distance to market 5 miles

ACTIVITIES

1. Pineapple
2. Matoke
3. G. nuts 4 acres intercropping
4. Maize
5. Beans acres intercropping
6. Cassava

Land size 5 acres
Equipment ox-plough and hoe

IMPACT OF PROJECT

BEFORE	AFTER
Bicycles	Ox-cart and bicycles
Production: Matoke & Pineapple 4 acres but intercropped	Production increased from 2 –4 acres
Allocated: Matoke and Pineapple 2 acres	2 - 4 acres Matoke and Pineapple
Income generation: selling of Matoke, Pineapple, G. nuts and beans.	Increase in Selling of Matoke and Pineapple with from 4 acres on wards.
Women: cooking, collecting water, and collecting pineapple suckers by use head carrying.	Proper nursing of the garden by provision of mulching which is transported by IMTs
Children: Help the parents in weeding and domestic work.	They assist parents in garden only on weekdays as most of the time they are in school.
School fees. Was difficult, as the gardens were small.	School fee can be raised from the sell of the increased produce from large acreage
Medical care: It was difficult to raise, and many health problems in the chest, and necks of people.	Medical is now accessible due to availability of income base of the members

DISTANCE VS COST

GARDEN TO HOME

Type of IMTs	DISTANCE	LOAD	Charges
Bicycles	5 km	10 Matooke and 50 Pineapple	3000/=
Ox-cart	Farm to home & near market 5 km	30 Matooke and 250 Pineapple	3000/=
Pick-up	-	-	-