

Animal powered transport of goods in a diverse temporal and spatial environment: a case study of Lari Division in Kenya

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Abstract

The donkey has been used since the 1920s to transport goods in Lari area in Central Kenya under diverse terrain and sometimes harsh climatic and road conditions. The range of goods transported has widened over the years to include firewood, building materials and wood products, farm produce, water for domestic use, manufactured goods for household use and fodder for dairy cows. Despite the growth in the range of goods transported by the donkeys and their economic value to the community, little has changed in the last 70 years to ease the load burden on the animals. Goods are still strapped on the animals' bodies and the few carts used are badly designed, poorly maintained and overloaded. Little attention is given to the health and nutrition requirements of the donkeys. This paper presents the findings of a case study carried out in Lari Division, Central Kenya to appraise the status of DAP in the area and identify areas of intervention. The study found that there was great potential of improving the efficiency of DAP in the area by promoting the use of appropriate cart designs, harnessing and proper health care. The paper also recommends the exploitation of other potential uses of DAP such as lifting water from underground wells, land preparation, food and animal feed processing.

Rural transport – an overview

The focus on motorised transport largely ignores the real transport needs of rural communities. Transport demand in rural areas is characterised by low speed and low volume movement of goods over short distances. Simple means of transport such as bicycles are relatively uncommon. The predominant means of travel in rural communities is on foot. Rural people, therefore, undertake a great burden in trying to meet their basic, social and economic needs. Lack of adequate and appropriate transport means, leads to isolation of the rural communities from meeting these needs and thus sustains poverty since services do not reach those that are isolated. This keeps them uninformed and out of contact with opportunities for income generation.

There is now a greater awareness of the scale of the transport burden undertaken by the rural communities, especially in Africa and Asia. Studies in Ghana and Makete in Tanzania show that over three quarters of the time and effort spent on transport in the rural areas is devoted to movement around the house and fields. Trips to the market, grinding mill, health facilities and other places outside the village represent less than 25% of the annual transport effort in these areas (Barwell and Malmberg–Calvo, 1988; Howe and Zille, 1988).

The Makete survey showed that the typical household in this area spent on average more than 2500 hours per year on local transport for subsistence and agricultural purposes (Barwell and Malmberg–Calvo, 1988). This transport burden was largely borne by women, who spend an average of 30 hours a week on local transport compared with

an average of only 10 hours a week for men. Studies undertaken in Ghana and in Tanga region of Tanzania reveal similar transport burdens. In all cases women bore the heaviest burden, in terms of both time and load-carrying effort. Other studies (Kaira, 1983; Curtis, 1986) have also shown that the transport of water, fuelwood and other goods for subsistence needs imposes a heavy burden on rural households in many parts of Africa.

Often, headloading is the only means of moving goods around the farm or village. It is an inefficient and slow means of transport, often causing spinal injuries and other health hazards (Default, 1988).

Animal-based transport offers a more efficient way of moving goods over short distances; has a higher carrying capacity than human-based transport and can therefore move large loads in fewer trips (Table 1). During high labour peaks, animal-based transport can help alleviate time constraints on agricultural production and domestic activities. More efficient transport can also facilitate other income generating activities and can potentially bring social or health benefits, particularly to women, by alleviating the burden of moving firewood and water.

Animal-based transport cannot match the speed or carrying capacity of motor vehicles, but it is affordable, can operate on low quality rural access roads and paths and is pollution free, since it does not require fossil fuel. Since most users rarely need to move loads of more than 1000 kg, animal transport provides an attractive “intermediate” option between headloading and motorised transport.

Table 1: Comparison of typical loads and speed of some transport systems.

	Load capacity (kg)	Typical speed (km/hour)	Load carrying capacity (tonne-km/hour)
Human (headloading)	25	4	0.1
Donkey (pack load)	50	5	0.25
Ox cart	1000	4	4
Two wheel tractor	1000	10	10
Tractor/trailer	3000	20	60
Truck	10000	50	500

Table 2: Average rainfall from Kereita forest station and Matathia railway station.

Altitude	Name of station	Years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
2438m	Kereita forest station	45	80	68	116	318	226	70	49	61	45	105	164	93
2288m	Matathia railway station	24	55	50	96	314	253	44	20	39	28	67	164	91

Donkeys have become a popular means of transport because of their ability to survive on small amounts of feeding material. They are also tough and resistance to diseases compared to cattle and live longer.

Donkey transport in Lari Division, Kiambu District, Central Kenya

Background Information

Lari division in central Kenya is located between latitudes 0° 50' and 1° 40' South of the equator and longitudes 36° 35' and 36° 43' East (GOK, 1975; 1976). Rainfall varies with altitude from 700mm at the lowest elevation (1760 m asl) to 1400 mm per year at the highest point (2610m asl). The main agro-ecological zones are the upper and lower highland zones. The rainfall is generally well distributed throughout the year as shown by data from representative rainfall stations in Table 2 (Jaetzold and Schmidt, 1983). The division is served by the new Rironi-Naivasha, old Rironi-Mai-Mahiu-Naivasha and Kimende-Githunguri tarmac roads. Rural access roads connect to these three tarmacked roads. Other infrastructure are centres of commerce, trade and markets, educational and health facilities.

Based on the 1989 census, current projections estimate the Division's population at 81 623 people growing at an annual rate of 1.8%. The majority of these people depend on small scale farming where they grow various types of cash and subsistence

crops and keep livestock in their small holdings. The crops grown include 23 vegetables, five legumes, five root crops, four cereals, two commercial flowers, 12 fodder crops, 18 fruit and five other crops (Mangale *et. al.*, 1999). Most of these are grown for the urban markets in Kenya.

Data from the District Agricultural Office in Kiambu show the Division to have 16 708 small farm holdings and 106 large farms. Compared to other Divisions in the District, Lari contributes the highest proportion (50%) of all the main cash crops produced by the small scale farm holders. Lari also contributes the highest output of pyrethrum and potatoes (GOK, 1994).

Case study methodology

The survey was conducted between May and June 1999 in Lari Division, Central Kenya. The aim of the survey was to determine the role of donkeys in the areas economy and welfare of the community. During the survey, market and trading centres, milk outlets, slaughter houses, domestic water collecting points and major outlets to the forests were visited. The survey team also covered the road network in the Division and observed the various modes of transport for goods. A random sample of individuals and groups across the Division were interviewed on transport issues. Data was collected on the history of donkey transport and its role in the areas commerce, gender attributes, care provided to the animals, problems encountered and possible solutions and the unexploited potentials.

Results and discussion

The rural access roads connecting to the all weather roads were poorly maintained and were practically impassable by vehicles during the rain seasons. Donkeys played a vital role at such times to ferry farm produce and other goods from the fields to main roads where vehicles would be waiting. Most of the transport vehicles were owned by people from outside the Division. In spite of the presence of donkeys, women were still observed carrying huge loads of farm produce on their backs to market places and firewood from forests to homesteads. The common mode of donkey use was by pulling carts. Nearly all the carts owned were made locally using local materials with the exception of the axles which were obtained from discarded vehicles. The bodies of the carts were usually made from timber or wooden poles obtained locally but a few carts were made of metal. The cost of a wooden cart was about Ksh 5 000 (US\$ 70) when fully operational.

The total number of donkeys in the Division was estimated at between 8 000 to 10 000 which gave a ratio of about one donkey for every two households. (i.e. of the total number of households, 30% owned donkeys).

The donkeys were sourced from outside the division and were invariably male. An adult donkey ready to work cost about Ksh 5 000. Generally the donkeys were put to full use at the age of three years after informal training carried out by the owner. The donkey was then expected to remain in active working life until well over eight years of age.

The donkeys were employed in various activities ranging from ferrying farm produce to market centres or to road sides; fetching water and fire wood, and transporting building materials. The donkeys were used daily during peak periods especially during harvesting time when farm produce had to be transported to the household and

market places. The peak periods coincided with the wet seasons when the farm areas were inaccessible due to poor roads and wet conditions. During off-peak season, the donkeys were underemployed as they worked for two or three times a week, usually for about three hours per day.

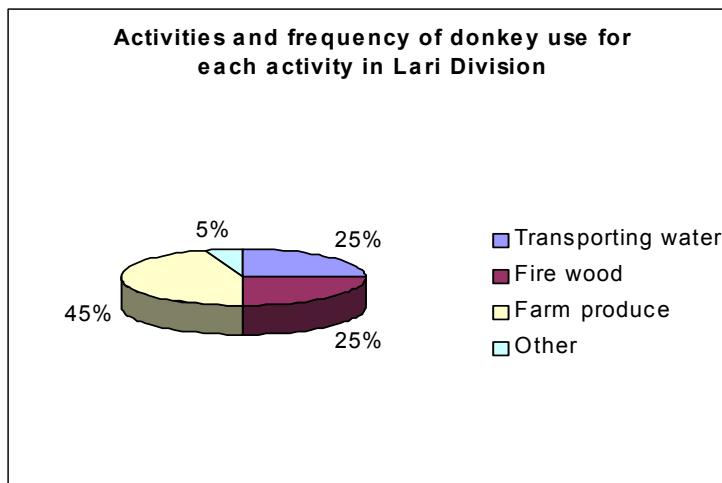
Economic and gender issues

Although the economic viability of the donkey transport was not ascertained, it was clearly evident that donkey transport provided a source of income and employment to the local people. Based on simple arithmetic, a donkey operator or owner could earn as much as Ksh 120 per day (based on one trip per day carrying 6 bags of farm produce @ Ksh 20 per bag). They could even earn more by ferrying firewood from the nearby forest to market centres charging Ksh 30 per load of firewood. One cart could handle between 6 – 7 loads of firewood. Since most of the transportation took place early morning, the operators had the rest of the day to engage in other useful activities.

During peak periods, the donkeys were occupied at least five days a week. Assuming an average income of Ksh 120 per day, donkey operators could expect to earn about Ksh 2 400 per month. Assuming 30% of the purchase price goes to maintenance costs for both the donkey and the cart, the owner could expect a 4–6 Month return period on the investment. This analysis however does not take into account the operators time (salary) and the depreciation of the donkey and the cart.

Women were less likely to benefit from the economic activities brought about by the donkey transport since ownership and control lay largely on the hands of men, except in households with single mothers and widows. Consequently women were still seen transporting large loads on their backs. In some cases, shared roles were observed where men transported farm produce from the fields to the

Figure 1: The various activities for which donkeys are used and the frequency of use for each activity



market and left the women to sell them. Heavy loads such as building materials (stone, timber, poles etc.) or handling of carts over difficult terrain was left to men while women and children were more involved in the transportation of firewood and water or leading the donkeys home after delivering the loads to their destinations.

Perceived constraints into the efficient use of donkeys.

A number of constraints became apparent through the interviews and from observations. The major ones were:

- *Difficulties in obtaining spare parts:* There was general lack of spare parts for donkey carts e.g. wheel bearings. Due to the use of wheel axles from junked motor vehicles, it was difficult to obtain the bearings once they were worn or damaged. There was also insufficient supply of good used tyres and tubes forcing cart owners to continue using extremely worn out tyres.
- *Poor road conditions:* In most areas in the division access roads were in bad condition even for donkey use. On the major roads, there was no provision for donkey carts.
- *Inappropriate harnessing systems:* Most of the harnesses observed were made from nylon gunny bags and strung over the animals neck. This often caused injuries to the animal.
- *Inappropriate cart design:* Although the carts were of simple design, several design faults and omissions were noted. In some cases, the axle was not appropriately placed for balanced distribution of weight. Not a single cart was observed to have any braking system even though the carts were often operated on steep slopes.
- *Lack of proper care and protection:* The donkeys were generally not housed. Instead they were left to roam around unattended in the compound and road sides where they posed danger to motorists. Treatment of the donkeys was left entirely to the Kenya Society for Protection and Care of Animals (KSPCA).
- *Source of hazard and social conflict:* Allowing the donkeys to roam freely on roads and private lands often led to accidents and social conflict.
- *Feed availability:* Lack of feeds was perceived as a problem of concern. Most of the users interviewed did not provide supplementary

feed for their animals. Instead the donkeys relied solely on grazing on road sides and open grounds which had sparse vegetation.

- *Small body size of donkeys:* Most of the donkeys observed were of small body (around 140 kg). Since a donkey can only generate tractive effort equal to 15% of its body weight, this would mean harnessing the donkeys in large teams to generate enough power for ploughing. Most of the households owned fewer than three donkeys.
- *Status of donkeys:* Donkeys are often regarded as low status animals. Thus they are not accorded proper care as would be cattle.
- *Lack of access:* Although relatively cheap, many households still cannot afford to acquire donkey transport of their own. Women are particularly disadvantaged in this case. Many of the carts are used for income generating activities leaving women to fetch firewood and water on foot to satisfy domestic needs.

Possible interventions to improve efficiency

The following challenges are suggested as possible areas of interventions to improve and exploit the full potential in donkey power.

- *Understanding the real transport needs of rural communities.* No doubt transport activities play a large role in rural households in terms of time and effort involved in satisfying domestic needs. This role needs to be recognized and dealt with appropriately. Specific attention should be given to easing women's transport burden since they undertake much of the load-carrying in rural homesteads. The issue of access needs to be taken into account. Women have limited ownership and less access to improved transport. This constraint can be alleviated through the provision of credit to enable more women acquire and own donkeys and carts.
- *Diversification of donkey use.* The integration of donkey-based transport (which is already popular) with other farming operations will diversify their use and ensure they are employed through out the year. The design of appropriate harnessing systems, carts and other related technologies is a prerequisite to achieving this goal. Aggressive training and demonstration schedule should be put in place to create awareness and expose farmers to available options and allow them to make choices based on their needs and financial capabilities.

- *Care and protection of the donkey.* The donkey is often held in low esteem and thus not accorded proper care. Issues that relate to donkey welfare need special attention. Protection from bad weather, nutritional requirements and general care are some of the issues that need attention in order to have a healthy animal. The donkey deserves respect.
- *Understand the existing situation.* Too often we have imposed the wrong technologies to users by pretending to understand their problems better. Rather than introduce new technologies, it is wise to borrow and improve on what the user already practices. It is very important to understand the existing situation before introducing any interventions.
- *Share information and experiences.* Sharing information and experiences among stakeholders involved in promoting animal technologies avoids duplication of effort and hastens the process of delivering the right interventions to users.

Unexploited potential

Draught animal power can effectively be used in a wide range of applications so long as the technologies for such applications is developed. Various interested groups, researchers, designers and DAP enthusiasts have designed and developed animal-powered machines to cater for various operations in rural areas.

The University of Hohenheim in Germany, has developed an animal power gear to meet the requirements of different machines such as cereal grinding mills, presses, threshers and water lifting devices. In Zambia animal power has been used for logging while in Tanzania DAP has been used on rural road maintenance. In South Africa DAP has been used in small-scale mining. These are just a few of the possible areas where DAP can be employed.

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Although animal-powered technologies are no match to motorised technologies and may not even be competitive in economic terms, they are often the only solution and option available in remote and inaccessible areas.

Lari Division has numerous wells where the only means of lifting the water is human power. Tillage operations are exclusively carried out using hand tools. It is possible to mechanise these operations using DAP. The mechanisation of tillage operations is particularly promising as this has been successfully done in other areas using donkeys. Although the use of the animal-powered gear to lift water from wells has not seen widespread adoption, it is worth considering.

Dairying is an important enterprise in Lari Division where the cows are kept in confinement. Fodder is collected from the farms through the cut-and-carry system and fed to the livestock after chopping it to small pieces using chauff cutters operated manually. Donkeys can be utilised to drive such machines. Due to proximity of forests in the Division, manual timber sawing is a common practice in the area. Donkeys can be used to mechanise this operation and thus reduce the back-breaking burden placed on the men who derive their livelihoods from sawing timber.

Conclusion

Donkey transport provides an affordable means of reducing the significant burden faced by Lari people in transporting agricultural and subsistence goods. It also provides employment and source of income to the local people.

Integration of animal-based transport with animal-based draught farming systems can offer many synergies, particularly in land preparation, weeding and water lifting from wells and stimulate other income generating activities such as the manufacturing of carts, ploughs and plough parts as well as donkey harnesses.

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