

# The 'Golovan' one-ox cart

by

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## Abstract

*A recent animal traction survey in South Africa identified a 'felt need' for low-cost, lightweight and modernised animal-drawn carts in many of the areas visited. The University of Fort Hare has obtained plans for an ox cart designed by an Eastern Cape farmer for use on farms and by rural communities. Called the 'Golovan one-ox cart', an example has been constructed, and it is currently being used on the university's research farm to do on-farm work. This paper discusses the technical aspects of the cart and the practicalities of using it for a range of on-farm and rural activities. The cart has a gravel-hauling capacity of about 1 t-km/hr and its use for road gravelling schemes will probably be economical. The technology is compatible with local culture and skills and may offer indirect benefits to rural communities.*

## Introduction

An animal traction survey conducted recently in South Africa found that, in the more remote areas of the country, between 40 and 80% of smallholder farming families currently make some use of animal power (Starkey, Jaiyesimi-Njobe and Hanekom, 1995). Draft animals are used for a wide range of agricultural activities, but the main uses are for transport and plowing.

The survey found that carts are used to carry goods and people and that they are usually made locally from scrap material. No standard designs exist and the cost varies depending on the availability and demand for scrap axles. Most carts are strongly built, but are heavy and consequently can carry only small payloads (Starkey, Jaiyesimi-Njobe and Hanekom, 1995).

Two-wheel carts were observed, pulled by two to four draft animals. The weight of the disselboom and any unbalanced cart weight was transmitted, in the case of cattle, via the yoke to the hump without causing serious discomfort or injury. However, for equines, the force was transmitted

via neck straps to the neck, which often caused problems including injury (Starkey, Jaiyesimi-Njobe and Hanekom, 1995).

During the past three decades considerable effort has been put into developing low-cost, lightweight animal-drawn carts in Africa. Although there has been some success with alternative designs, farmers in Zambia prefer quality carts, which have roller bearings and pneumatic tyres. They are prepared to pay for such carts, even though they are susceptible to punctures (Helsloot, Sichembe and Chelemu, 1993).

Animal-drawn carts can improve rural transport, even though small-scale farmers may not be able to afford them, and in so doing can enhance the quality of life of rural communities.

There is a large unsatisfied demand for carts in many parts of Africa, resulting from production problems which stem mainly from the limited availability of materials and components, in particular good quality wheel-axle assemblies (Anderson and Dennis, 1994).

In South Africa availability, affordability and profitability of animal-based transport systems, and their accessibility to women, are key issues in the development of small farming communities.

The 'Golovan one-ox cart' was designed by an Eastern Cape farmer for use on farms and by small rural farming communities. It has a number of important attributes which make it suitable for use in such communities and for this reason the Animal Traction Centre at Fort Hare University has recently constructed a cart and is carrying out investigations to determine its suitability and acceptability in small rural farming communities.

## The design of the Golovan one-ox cart

A plan of the Golovan one-ox cart is shown in Figure 1, and the main features of the design are outlined below.

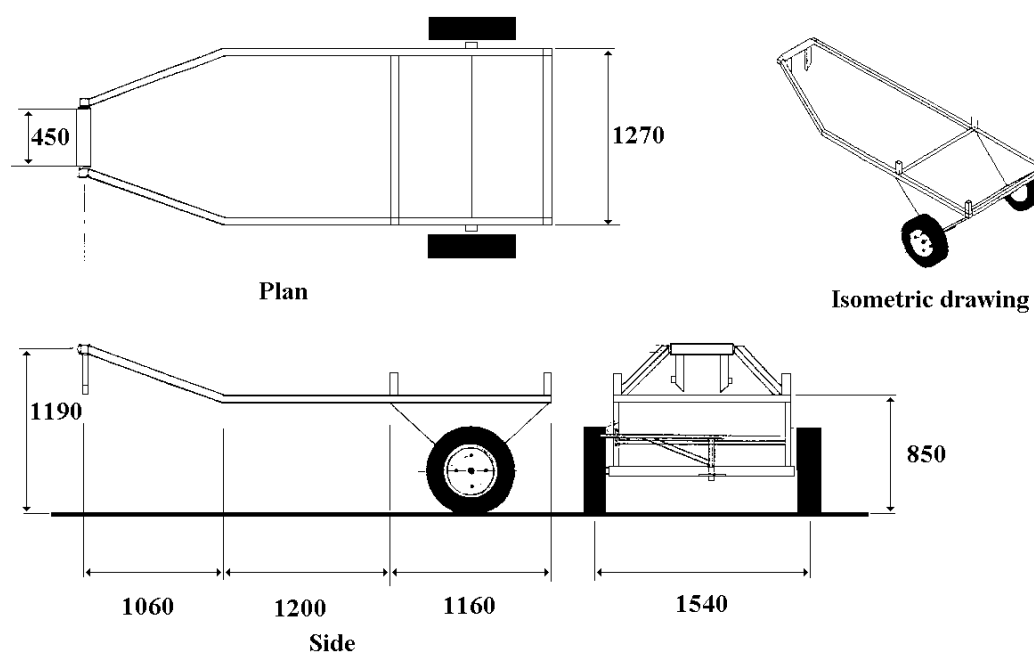


Figure 1: The Golovan ox cart. All dimensions in millimetres.

The cart is pulled by a single ox.

The cart weighs about 320 kg. When pulled by an average sized ox, it therefore has a payload of some 500 kg.

The volume of the cart-back is 0.33 m<sup>3</sup>. Its shape is such that the centre of gravity of any load placed in it is directly over the rear axle, so there is no undue down or uplift force through the shafts onto the neck of the ox.

The yoke 'skeis' are attached to a pipe, which forms the yoke and which rotates on an axle joining the two shafts. This 'swivel yoke' ensures that there is no chaffing of the animal's hump, that the action of the yoke on the neck is more gentle and that the ox is able to develop more power.

The rear door for unloading is hinged at the top and opens at the bottom of the cart-back, which means that in most cases the load is discharged through the cart-back bottom onto the ground without the need for manual unloading.

At each corner of the cart-back is a slot, which enables a seat to be fitted to

accommodate two large or three small passengers. The seat is constructed such that the centre of gravity of the seat and passengers is positioned directly over the rear axle. The cart-back is also constructed so that loads are directly over the rear axle. Stanchions can also be fitted in these slots enabling low density loads such as baled hay to be carried.

Pneumatic rubber tyres are fitted to 356 mm diameter rims, which are mounted on stub-axles with sealed, factory lubricated, tapered roller bearings.

To reduce costs and weight, no springs or braking mechanism are included on the cart.

Harnessing comprises the swivel yoke, a halter with long reins, and the breaching which enables the ox to provide the braking.

### Practical use of the Golovan cart

The Golovan cart can be used for all of the carting activities typically carried out on farms or in rural communities. The technical features, notably the shape of the load-back and the bottom unloading rear door, enable various activities to be carried out with some convenience. For example:



Photo: Bruce Joubert

*The Golovan ox cart in use showing the rear door and breaching harness*

two 210-litre drums can be loaded, empty, into the load-back and, after filling, the drums can be discharged through the bottom unloading rear door onto the ground the cart is ideal for carrying road gravel or compost, which can be unloaded through the bottom unloading rear door and placed precisely where it is required. The cart is thus suitable for road maintenance, land fertilisation and harvesting the inclusion of stanchions in the four corner slots enables up to 20 average-sized bales of hay to be carried the seat is constructed and positioned in such a way that loading can take place without removing it.

### **Case study appraisal of the Golovan cart**

The Eastern Cape Department of Agriculture has inspected the cart and is interested in its potential to carry gravel for the repair and maintenance of rural roads.

The Animal Traction Centre at Fort Hare University is presently evaluating the Golovan to assess the feasibility of using it for this purpose. The project will take about two years, and will involve a number of case studies, undertaken at different times of the year, which will aim to:

establish the gravel haulage capacity of the cart

determine the type and amount of supplementary feeding required for the ox

determine the cost of operating the cart and one ox under rural conditions

establish the acceptability of the cart to the inhabitants of rural communities in the neighbourhood of Fort Hare University.

Results from the first case study, carried out in September 1994, showed that over a six-hour average work day, the Golovan has a gravel haulage capacity of about 1 t-km per hour or 6 t-km per day (Ntili and Higa, 1995). In the case study, this was made up of 13 loads weighing an average of 630 kg each carried for journeys averaging 0.75 km (one-way).

Realistic maintenance rations and minimum supplementary feed requirements of the oxen during road gravelling work will be established during 1996, in collaboration with the Department of Animal Science at Fort Hare University.

The Eastern Cape Department of Agriculture has recently had two Golovan ox carts constructed. These will be stationed in two communities in the vicinity of Alice, where they will be used for

various communal activities. In this phase of the project the performance of the carts will be monitored by the project supervisor, and their acceptability to the rural people will be assessed.

### Evaluation on the research farm

The Golovan ox cart has now been doing work on the research farm for 16 months; during this time it has been used for collecting wood for farm staff, delivering water, putting down compost on lands, hauling soiled bedding to the compost heap, transporting lucerne hay for animals in the veld as well as in pens, and gravelling roads.

The road gravelling process is carried out by first putting down some 50 m of gravel dumps, spaced about 2 m (centre to centre) apart, with the golovan. Two oxen are then inspanned in a wide weeding yoke and hitched to a road smoother, which enables the oxen to walk either side of the dumps pulling the smoother which flattens the dumps. It would appear from the data collected to date that it will be possible to completely gravel and smooth 100m of road in approximately 10 working days using one golovan and a pair of oxen.

A few problems were encountered in the 16 months of work with the cart:

It took one whole month to train two oxen, both already trained to work as a pair, to accept the Golovan completely. Early in the investigation, the Golovan was extensively damaged when one of the oxen inadvertently broke away and crashed the cart into a tree. This was because the oxen had been trained to work as a pair and had to be retrained to work alone without a leader.

The rear door opening mechanism has had to be modified to facilitate opening when the load back is full of gravel. This was due to the weight of the gravel on the door and latch making it difficult to open the door.

Attempting to hitch the Golovan through a connection on the swivel yoke to a pick-up truck caused the side shafts to bend. This practice is not recommended with the existing design.

Oxen do not perform well in extreme heat, so during hot weather it was often necessary to

start work early in the morning and to finish late in the evening, allowing the oxen to rest during the middle of the day. An outspan area and an adequate supply of feed and water are essential in the vicinity of any road gravelling operation.

It is necessary to use good quality harnesses as the breaching, back straps and halters come under considerable strain during normal working, particularly when turning in confined spaces.

### Discussion

Comparisons between tractor/trailer combinations operating at low gross utilisation rates and donkey-drawn cart systems in Botswana have indicated that using donkey-drawn carts is financially competitive for distances of up to about 2.5 km (McCutcheon, 1985). For practical reasons, haulage distances in the Alice area are generally less than 1 km (on average 0.747 km during the case study appraisal), so using the Golovan to cart gravel will probably also be financially competitive.

The introduction of the Golovan one-ox cart system could offer additional benefits, including the employment (job creation), the manufacture of carts and harnesses locally (small business) and the creation of entrepreneurial opportunities in rural communities (contract haulage). These would provide independence to the communities, keep local finances circulating within the communities and reduce the need to import fossil fuels into such areas.

It is important to note that animal-drawn cartage systems are compatible with local culture: the skills to manage them already exist and if something does go wrong it can be rectified by the people without the need to call in a suitably qualified expert.

### Conclusion

Investigations carried out to date have led to the conclusion that the Golovan one-ox cart is suitable for consideration as a means of transport in rural small farming communities in the Eastern Cape. In certain respects it has advantages over other designs of ox cart.

It is necessary to fully establish the perceived needs of such communities in so far as animal

drawn carts are concerned and to gain acceptance by the people for the Golovan.

If this can be successfully achieved, plans and specifications can be made available. This will enable the cart to be constructed locally, by small businesses, for supply throughout the region.

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For details of ATNESA and how to obtain this publication see <http://www.atnesa.org>

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*Photo (opposite): Calf suckling a yoked working cow in South Africa*