Hitching is the problem with harnessing donkeys

Peta Jones

Donkey Power Teaching and Consultancy
PO Box 414, Louis Trichardt 0920, South Africa

Abstract

The manufacture of harness can be easy and can even be cheap. Problems arise when the harness and what it pulls cannot easily be connected so as to direct forces to the proper places on a donkey and also to the proper places on a cart or implement. This connection is called the 'hitch', and examples of problematic hitching are considered.

Ease of harnessing

Many people (including myself) refer to the 'problem of donkey harnessing'. In actual fact the matter of harnessing is no problem at all, once one defines 'harnessing' as the equipment which goes on to an animal's body for the purpose of draught, thus excluding the equipment which connects the animal, i.e. hitches it, to the object being pulled and, perhaps, to other animals.

For donkeys, the proper harnessing is well known and relatively simple. A donkey's shoulder, i.e. the scapula-humerus joints which can exert a pushing force, are too low for ordinary yoking from the neck above (Figure 1).

An oval padded collar adapts the idea of a yoke so as to deal with this, and can work very well and comfortably for a donkey (Figure 2).

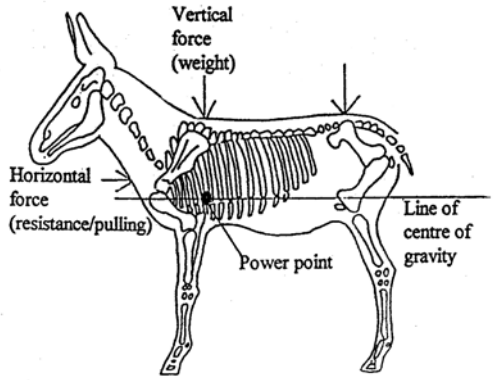

Figure 1: Skeleton of donkey

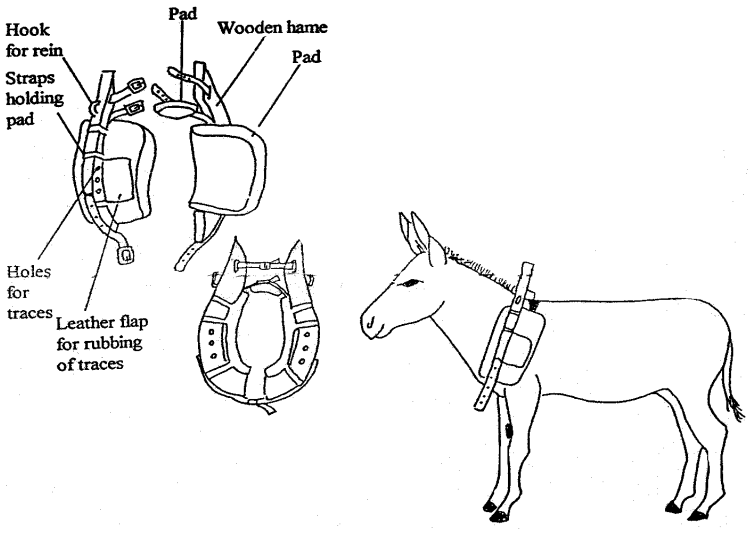

Figure 2: Collar harness

Unfortunately certain skills and materials are needed to make these which are not commonly available in rural areas, and, besides, a collar harness is not easy to adjust properly on an animal - though it only takes a little practice. However, a donkey's shoulders are fortunately on a level with its chest, the sternum of WHICH can also take the force of some pushing, so that a simpler harness can be achieved by passing a strap over both shoulders and chest. The only difficulties consist in:

- The narrowness of the area, as both windpipe and the moving tops of the legs must not be constricted.
- In keeping the strap horizontal enough so as not to stress any jointing with angular pull of the traces, which might also allow movement up or down from the narrow area where force should be applied.

The solutions are simple ones:

- The strap should not be wider than 5 cm, which allows enough strength for a strong leather strap, and padding for any material which may be stronger than leather, but at the same time more liable to cut into easily wounded donkey skin.
- One strap over the donkey's back is usually not enough to hold the breaststrap horizontal, so it is better to have two, the second one as far back as possible, and one of them positioned over the 'power point' of the donkey's elbow, where the front leg exerts is moving force.

Depending on the height of the hitching point on cart or implement, the traces can exert an angular strain, especially on the hindmost joint between horizontal and vertical straps. Hence there it can be better to use ring-joints rather than straightforward sewn ones but it can be seen from this that there is nothing really difficult about achieving a good harness (Figure 3).

Basic problems

So where does the problem lie? Why are so many donkeys found wounded by parts of their harness, and many with deformed necks, which can only make draught painful for them and thus vastly reduce their efficiency?

Some of the problem lies in the matter of adjustment. Not all harnesses are provided with adjustable backstraps, so that force is being exerted in the wrong place and - what really damages the skin - there is movement of the straps against the donkey's body. However, the matter of adjustment is not a difficult one if appropriate materials are used (Figure 4).

The deformity of necks is even more serious, since once done it cannot be undone, and it results from the fact that, when there is only one, central, shaft to a cart, few people seem to have any idea as to its purpose and how to distribute its weight between two (or often, as it seems, more) donkeys.

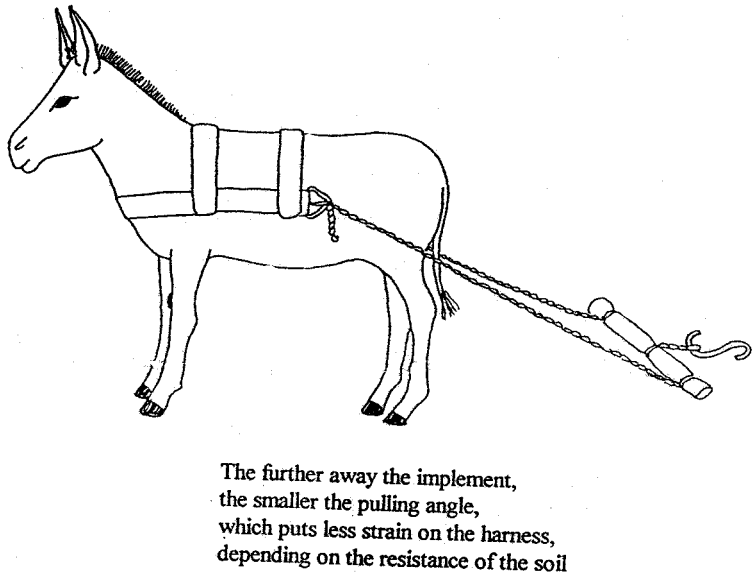

Figure 3: Breastband harness on donkey

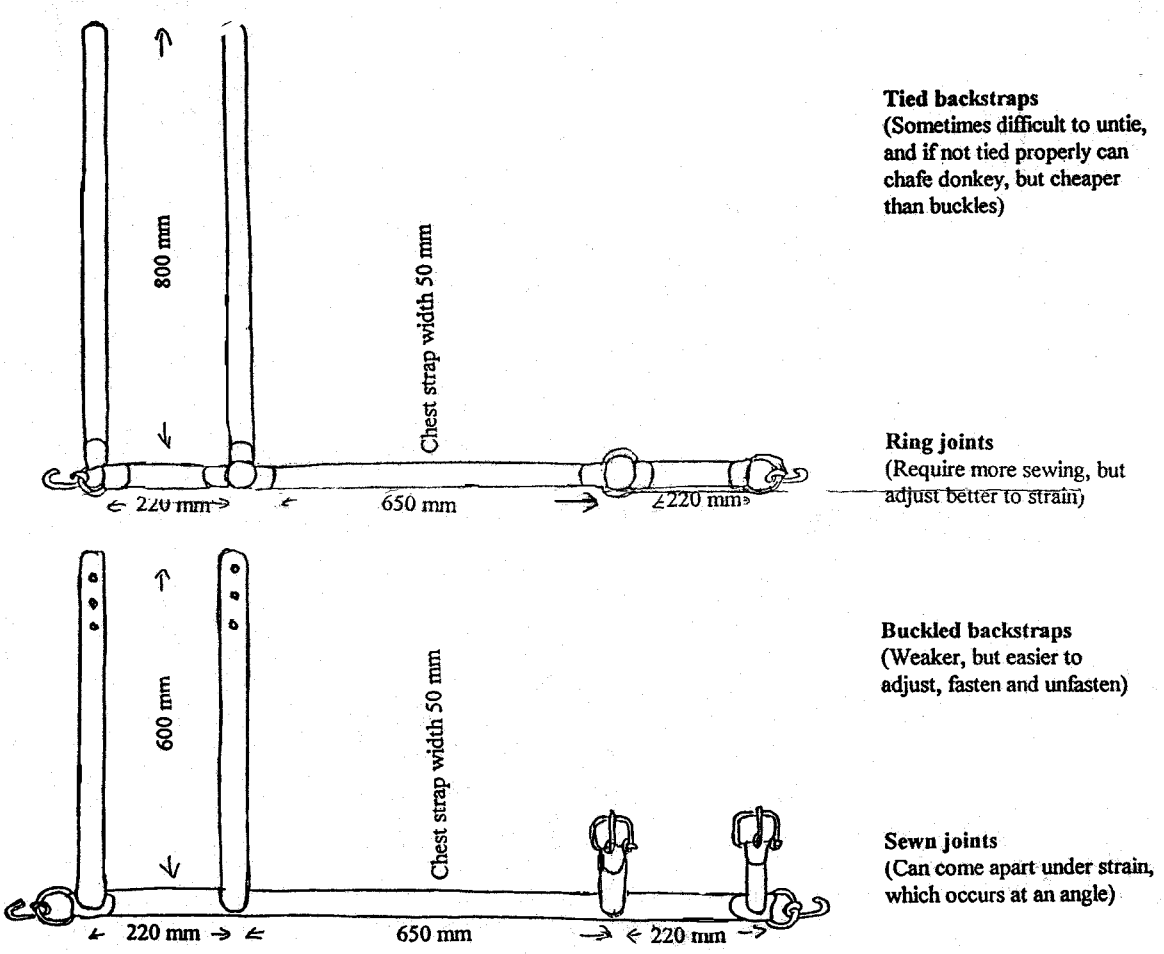

Figure 4: Variations on breastband harnesses

The purpose of shafts

Before considering how they should be handled in hitching systems, it is worth considering what functions are really served by shafts on a cart.

- They act as levers by which a cart may be turned, this being easier the further forward along the shafts such sideways pressure is exerted.
- They facilitate braking if an animal can use a *backward* pushing force against something that is attached to the *front* of the shafts.
- In the case of two-wheeled cart, they serve as a factor and also a gauge in the balancing of a load on the cart. Although not advisable, the animal's own weight can also function in this, by exerting a counterweight on shafts lifted by a cart loaded unevenly too far towards the back.

The shafts are not, therefore, necessarily the part of a cart on which pulling force needs to be exerted. Especially where the animal concerned, like the donkey, must push at a level which is below its head, a single shaft on a cart presents problems of distribution to ensure that both animals, and indeed both shoulders of each animal, are pulling on the cart itself and not merely against each other.

The direction of forces

For draught

This assumes a simple breastband harness is used, and not some kind of swivelled crossbeam, padded so that donkeys may push with their chests (the latter is difficult to adjust to different sizes of donkey). The force exerted by a donkey on a breastband becomes, through the traces, a pulling force exerted directly *behind* the donkey, in two separate places represented by the end of each trace. Since alternating movement from each shoulder, though slight, exerts this force alternately from each trace, some kind of swivel should be provided to prevent rigidity and/or movement of harness and traces causing the donkey's body to rub against the harness. It is to solve such a problem that the 'swingle' was developed.

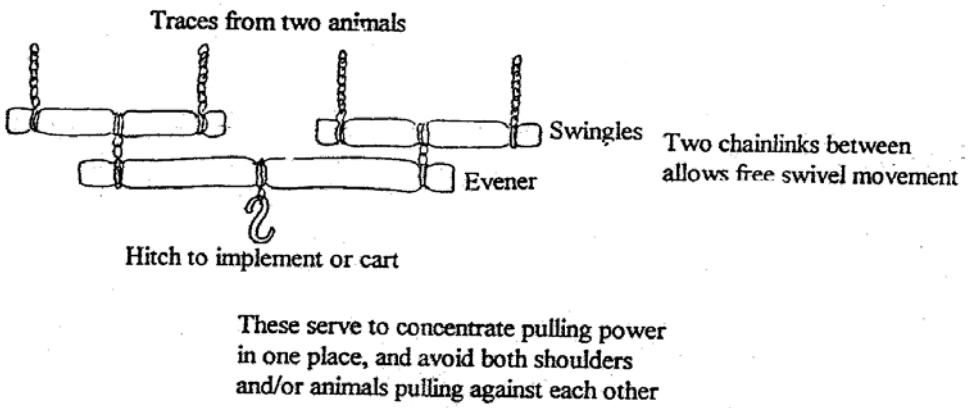

Figure 5: Traces, swingles and evener (seen from above)

Where, instead of two shoulders, two animals are involved, the result then is that, when one animal pulls and the other doesn't, the effort is exerted in swivelling against the other animal, rather than in more efficient pulling. A short pole 'evener' connecting two swingles at least provides something lighter and easier to swivel than the whole of the cart itself, leaving most of the force to be transmitted through the swivel point as pulling force (Figure 5).

Where breastband harnessing is concerned, swingles and eveners make it possible for a cart to be pulled from a central point directly in front of or between the wheels. This in itself ensures that any turning on the part of the cart will not interfere too much with the draught force (Figure 5).

In the case of a two-shaft cart, this is still possible and, in classic systems, a swingle is indeed used. However, with a light cart and only one animal it seems less necessary, and it becomes reasonable then to use the parallel shafts themselves in the place of traces, with a breastband harness attached directly to the shafts midway along the animal's body. In this instance, at least, it can be said that the pulling force actually is exerted on the shafts - but hardly necessarily.

The next question is how to handle the other various functions that the shafts normally have.

For turning

The animal on the appropriate side needs to exert some sideways force as near as possible to the front of the shafts. Since this force is not exerted continuously or for long, it does no harm to the animal simply to push with its side, preferably the side of its shoulder, directly against the shaft. If there is another animal on the other side, some way for it to exert a lateral pulling force on the front of the shaft would also be helpful.

For braking

For maximum effect, force has to be exerted on the end of the shaft in a reverse direction to stop it moving forward. For this to be done by an animal which is positioned alongside the pole, and which is harnessed so that its force is exercised below its head, the most sensible solution is for this force to be exerted by its buttocks and hind legs, as resistance to the forward force. Classically, and most practically, this involves a breechstrap, i.e. a strap around the buttocks, kept level, like the breaststrap, by one or more backstraps (or saddlestraps). This is also connected either directly to the two shafts or to the one shaft through traces, swingle and evener - this time in front rather than behind.

For load balancing

Strictly speaking, the load, particularly on a two-wheeled cart (as opposed to a four-wheeled wagon, where the problem does not occur) should be so distributed that the shafts remain level with the ground whether or not animals are hitched to them. If this is the case then no upward or downward force is necessary to balance the load. This ideal is hardly ever achieved, and the draught animal may have the task of supporting a shaft made extra heavy by a cart unevenly loaded towards its front, or of holding down a shaft lifted by a load placed too far back. These tasks obviously will be more exaggerated when the cart goes down or up a slope.

The best place for any four-footed animal to take a downward force, i.e. a weight, is across its back where the ribcage is largest and so there are more and stronger bones to support it.

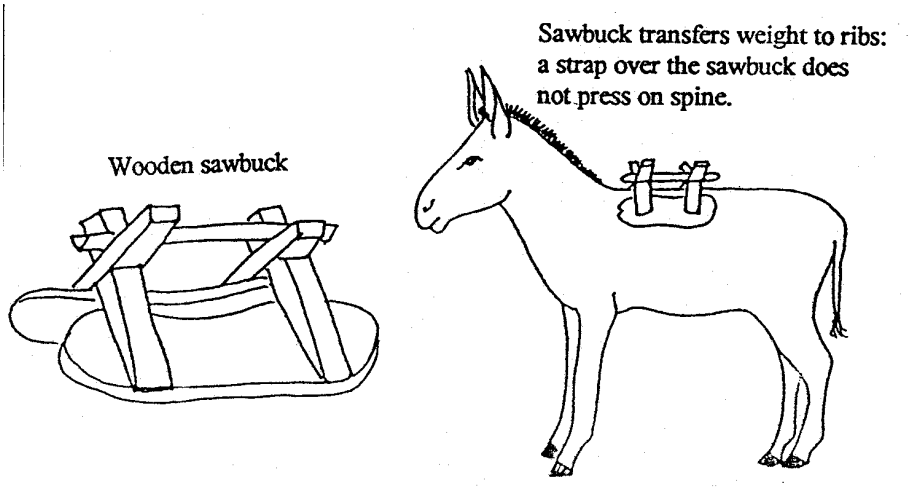

Figure 6: Sawbuck

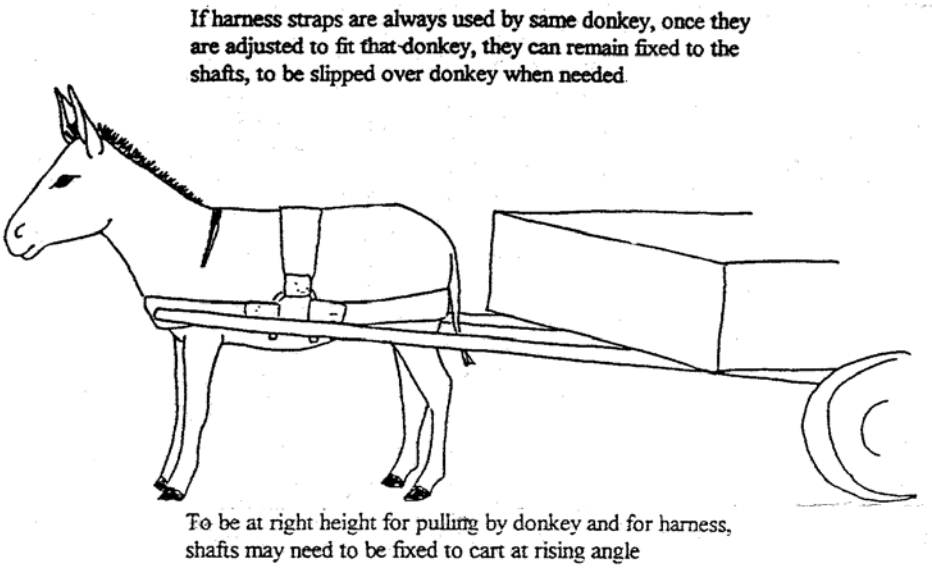

Figure 7: Harnessing for two-shaft cart

A backstrap is the obvious solution - or, even better, a backstrap lifted over a sawbuck (Figure 6) so that pressure is on the ribs rather than directly on the spine; it serves no function unless the strap can be lifted (Starkey, 1995; Dennis, 1997; Dibbits, 1997). But where is it to be attached to the cart? If the cart has two shafts, there is little problem, but it is difficult to distribute a load evenly over an animal's back when it comes from one side only, as with a single-shaft cart. The 'back-yoke' or 'dorsal yoke' solution has been suggested (Jones, 1993; Fielding and Krause, 1998), but its relative rigidity, even though swivelling, could cause abrasion problems with the differential movement of the animals. Besides, in both construction and fitting it requires a technical knowledge that, as in the case of collar harnesses, is often beyond that of the average user.

In any case, if the animal's harnessing already involves backstraps, it makes better sense to utilise these, provided there is no lateral force to pull them out of position. However, if the weight of and on the shaft has to be borne, there is little use in backstraps connected only to the front of the cart for the exertion of force: they must connect further along the shaft. As already pointed out, for two shaft carts, again the attachment is simple (Figure 7).

For single-shaft carts, it is only those backstraps that position the breechstrap that are suitable - and they are particularly suitable not only because the force connects to the end of the shaft, where it is at its maximum, but because the weight is distributed evenly to both sides by means of swingle and traces (Jones, 1994).

Where it is a question of weighing down a shaft, a girth under the animal's belly is really the only way to

handle it. However in practice this is hardly ever necessary - and when it is, so much adjustment may need to be made that having the harness simply lifted off the animal results in the handler responding more immediately to the need to re-arrange the load on the cart.

Observable problems

The connection between the various injuries to donkeys and problematic hitching can now be made.

Harnessing sores

Also called 'galling', these are the result of harnesses not only wrongly fitted and made of inappropriate materials, but very often result from movement of the harness against the animal's skin for reasons other than bad fitting. This happens rather easily if the forces on the harness are not horizontal, level with the point where force is exerted, and directly parallel with the animal's body. Any lateral force on the harness loosens and weakens it. Not only does this cause angular and damaging pressure on the animal's skin, but more possibilities of movement as well. In addition, of course, the harness itself breaks more easily, and most users in an emergency mend broken harnesses with wire, causing more skin damage.

Sometimes this lateral force is exerted when handlers decide to connect one animal with another by means of their harnesses (and if by means of their bridles or halters, similar problems occur around the mouth and nose). This is often because they do not realise that the animals will routinely move in the same direction, parallel abreast, without encouragement as long as they are not too crowded and are pulling (or pushing) on something behind them.

It needs to be remembered that animals are mobile in most parts of their body, which will move at different rates at different times, and what must be avoided is the tendency of such movement to cause movement in the harness relative to the body.

Harnessing sores can also be caused when the animal is not using the harness at all for pulling and pushing, as can happen when, as described below, the shaft is suspended from its neck by means of a transverse pole beneath its chin. If the traces are not well adjusted, the animal can be exerting its forward pushing force on this pole, thus pulling the cart, and the harness serves no function but, apparently, decoration. All the pressure is being exerted between the animal's body and a pole which is not only not shaped to the body, but is rigid and not even firmly attached.

Neck deformities

These are inevitably caused by the habit of hanging the shafts of carts onto donkeys' necks by means of straps attached to a transverse pole beneath their chins. Little regard is paid to the balance of the cart in such circumstances, so the load thus borne by the donkeys' necks can often be heavy. It can get even heavier on a downward slope when, in addition, because breeching is usually absent, the animals' only way of stopping the cart rolling over them is to exert force on this neckstrap. This is to prevent the forward motion of the shaft and, through it, the cart and its load as a whole. The bones of a donkey's neck are not large and strong, and the muscles are not angled for exerting force upwards.

Discomfort and inefficiency

Another thing, which causes discomfort for donkeys, though not necessarily injury, is the habit of crowding them together, four or sometimes five abreast. Various reasons are given for this:

- If two oxen are needed for a cart, then surely at least four donkeys.
- The cart (usually with its wheels projecting from the sides) is wider than two donkeys, so when two donkeys are used they can easily cause the cart to wedge fast in narrow places.
- Unless all the donkeys are used, who is going to look after those that are left behind?

The first reason has long since been disproved by research (Prasad, *et al.,* 1991): two donkeys can easily exert the draught of two oxen. The second reason has more validity, perhaps, but only in the absence of a watchful driver. The third reason is the most powerful argument, and needs to be considered further.

If all the donkeys are hitched directly to a cart without swingles and eveners, then they are pulling against each other in differential movements as well as jostling each other, and this is definitely counter-productive and inefficient (e.g. Figure 8).

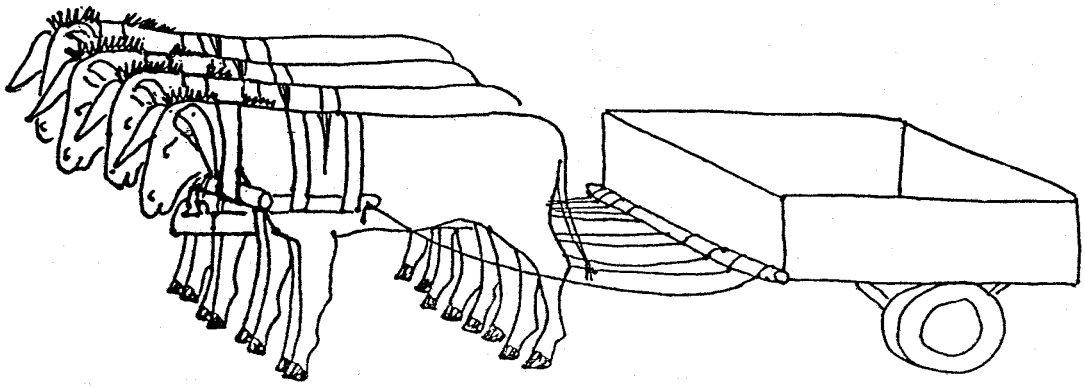

Figure 8: Four donkeys hitched to a cart

The forward swingles-and-evener arrangement that can handle the braking of a cart is only practicable when applied to the animals on each side of the shaft; the animals on the outer sides can only be employed in pulling.

This is also true in cases of tandem pairs, two animals in front of the two directly in front of the cart (Figure 9). Only the latter pair is in a position to exercise braking force. We do not, unfortunately, seem to know which pair exercises most force in pulling. It could be that the front two exercise their pull on the pair behind as well as on the cart, and obviously the rear pair need to be the stronger animals in order to effect braking. So this arrangement clearly also has its inefficiencies, its main advantage where donkeys are concerned is that it more nearly matches the way donkeys move when free: in a file rather than in a row, so it may be assumed that they feel easier hitched into this system.

Having all available donkeys along when pulling a cart can have this advantage in efficiency. It means another team is available when the first one gets tired (and as all donkey handlers know, tired donkeys are never so tired that they cannot give trouble). In other words, it enables the donkeys to be used in relays. This efficiency, however, is undermined if all the donkeys are actually working at the same time. It would be better in the circumstances to have the spare donkeys tied behind the cart and trotting there. The only time I have ever seen this done is when I've done it myself, but I can testify as to its workability.

Conclusions: the economics of efficiency

All the information given here is to enable us to consider this matter of efficiency. Donkeys may be cheap to buy, but unless they are used efficiently, the cost of keeping them becomes too high. Having eight donkeys when, used properly, four would be enough, represents the wrong attitude towards a working animal. Donkeys are not (generally) a meat animal, so an accumulation of numbers has little advantage - even less when the selling price is so low. In the right conditions, a donkey may live as long as 50 years (Sewell, 1990; Kelly, 1991; Jones, 1997), so there is not much reason to keep a couple exclusively for breeding. One or two as spares in case of emergency may be a good idea, but it is more cost effective simply to take better care of the donkeys that one does use. In addition one should use them regularly in a way that good practice results in good care, and then have borrowing arrangements with neighbours in the case of real emergencies.

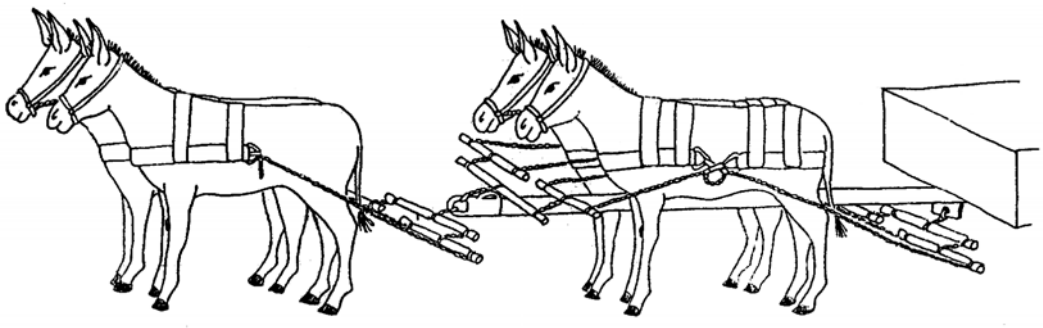

Figure 9: Tandem pairs harnessed to cart

In most countries of Eastern and Southern Africa, there is a demand for donkeys. They are not difficult to sell (although they may be difficult to buy), and if it is a question of finding a good home for animals one cares for, there is usually some choice in the matter. Even where it is merely a question of price, a seller may find that the traditional low price of donkeys may easily be negotiated upwards. Castration is recommended for its effect on donkey behaviour if nothing else, and all-in-all there is no reason for there to be anywhere a 'surplus' of donkeys. Donkeys are less damaging to the environment than other working animals (Jones, 1998), so this may constitute another element in the economic equation which gives a high value to donkeys, provided only that they are properly used.

References

Dennis, R.A., 1997. *Guidelines for design, production and testing of animal-drawn carts.* London: Intermediate Technology Publications.

Dibbitts, H., 1997. Harnessing guidelines for single donkey carts, In: *Improving donkey utilisation and management.* ATNESA Workshop, 5-9 May, 1997. Debre Zeit. Ethiopia. Workshop Reader *Donkey power benefits* Volume 2, 60-72

Fielding, D. and P. Krause, 1998. *Donkeys*. London: Macmillan

Jones, P.A., 1993. Donkey harnessing: equalizers and swingletrees (a.k.a. eveners and swingles). *Draught Animal News* 20, 29-30.

Jones, P.A. 1994. A note on a donkey harnessing problem and innovation in Zimbabwe In: *Improving animal traction technology* (eds: P. Starkey, E. Mwenya and J. Stares) pp.426-427. Proceedings of the 1st workshop of ATNESA, January 18-23 1992, Lusaka, Zambia, Technical Centre for Agricultural and Rural Co-operation (CTA), Wageningen, The Netherlands.

Jones, P.A. 1997. *Donkeys for development*. ATNESA and South African Agricultural Research Council, Institute of Agricultural Engineering (ILI).

Jones, P.A. 1998. Understanding donkeys better. *Land* 2 (7), 4-5.

Kelly, R. 1991. Rocky Mountain canaries. *The Brayer*, Winter 1991, 119.

Prasad, V.L., Marovanidze, K. and Nyathi, P. 1991. The use of donkeys as draught animals relative to bovines in the communal farming sector of Zimbabwe. In: *Donkeys, mules and horses in tropical agricultural development.* (eds. Fielding, D. and Pearson, R.A.), pp. 231-239. University of Edinburgh.

Sewell, S.E. 1990. *The donkey: care and feeding* (Agdex 467/20-1). Edmonton: Alberta Agriculture.

Starkey, P. H. 1995. The donkey in South Africa: myths and misconceptions,. In: *Animal traction in South Africa; empowering rural communities* (ed. P.H. Starkey), pp. 139-151, Halfway House, South Africa, Development Bank of Southern Africa.