ANIMAL DRAWN CARTS

3-18 April 2005
Rustenburg
North-West Province
Republic of South Africa

Jaakii
Ibo

Dangnagui
Korean

Ass
American

Donkie
Eke

Eset
Turkish

Mager
Romanian

Roba
Japanese

Esele
Tswana

Hamor
Hebrew

Ezel
Ibo

Gadhado
Gujarati

Kahzida
Dutch/Flemish

Lü
Chinese

Donkey
Afrikaans

Idonki
Zulu

Esol
German

Âme
French

Âsna
Swedish

Burro
Spanish

Punda
KiSwahili

Ghadda
Hindi

Hemar
Iraqi

Kahzida
Malayalam/Tamil
Despite a wide spectrum of transport technologies, in rural areas much transport involves either walking or carrying. Rural people need intermediate means of transport that increase capacity & reduce human drudgery at an affordable cost.

SSATP World Bank Group
**DESIGN PROCESS**

- Research – village, gathered data and experts
- Dissemination of information
- Conceptual work
- Village feedback session
- Refinement

Kuruman carters were used to assist in the understanding of concepts, technical feedback and direct input when trying out new concepts.

Further village feedback session

Referred back to Kuruman carters and villagers

Solution production

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**Morgane James, SPCA**

Humane husbandry, handling, harnessing & use of working animals is the basis from which their power emanates and can be effectively used in a sustainable manner to the benefit of the owners, the animals & the community at large.
PROBLEM STATEMENT

- Commercially available harness and hitching systems are currently too expensive
- Yoke Braking system is hard on animal neck
- Environment is harsh on harness materials
- Harness systems are often made by owner with minimum technology (cutting, sewing by hand, weaving wire)
- Good materials for home made harnesses are not readily available or inexpensive enough
- Social resistance to new harness systems (SPCA and research experience)
- Loose and neglected harnesses cause problems
- Varying donkey sizes when attached to cart
**DESIGN BRIEF**

To offer improvements:
- hitching system (from donkey to cart)
- harnesses system (on donkey)

Reasoning:
- Improve donkey welfare through good products
- Optimise energy transfer between the donkey and cart
- To offer recommendations on best systems

**HITCHING**

Very difficult to develop hitching solutions:
- Social resistance to new harness systems
- Materials required to make decent systems are expensive
- Few craftsmen in village that can assist with such manufacture
- Good systems include a lot of components

Design solution
- Looked at a good system (Peta Jones)
- Looked at yoke braking system
- Developed our own minimum component system that requires testing
SOLUTION

Positive:
- Fewer components
- Cost is lower
- Simple hitching assembly

Negative:
- Still needs to be tested

HARNESSING

Aims:
- Economically viable
- Skills transfer possibilities
- Easy adoption

Solutions:
- “Make Your Own Harness System”
- “Pre-punched Harness System”
“MAKE YOUR OWN HARNESS SYSTEM”

• Allows for a pattern making of the harness and bridle by the cart owner
• Carters met during the Interdesign all repaired their own carts, and most made their own harness systems
• The guide would also have animal husbandry issues included and assist with animal care issue
• The system would be sensitive to regional material availability and try to work with materials from the carters local area
"PRE-PUNCHED HARNESS SYSTEM"

- Manufactured from conveyer belt material
- Reflective paint on the harnesses (visibility at night for safety)

Booklet:
- DIY pictogram assembly instructions for harnessing donkeys
- Clear descriptions of best hitching and harnessing systems
- Information on animal husbandry and harness maintenance

Fastening:
- Only equipment required for assembly: pliers and screw driver

Pre-punched package (single donkey harness)
- 1 X conveyer mat
- 1 X booklet
- 12 X gutter bolts
- 12 X lock nuts
- 24 X washers
- 1 X bit
- 4 X rings (for traces)
- 7.5 m nylon rope
- 3 m wire

Bridle and Harness Assembly
CONCLUSION

“Make Your Own Harness System”
- Sponsored and distributed by SPCA

“Pre-punched Harness and Bridle System”
- Costs offset through advertising space on mat
- Minimum cost of approximately R 35 per donkey
- First prototype to be field tested next week in Hammanskraal

LOW-CAPACITY CARTS

Donkeys and small carts have come to be very important for reducing the drudgery in rural communities – particularly for hauling water, firewood, groceries, people, and for the transportation of live giving harvests.

“Empowering Farmers with Animal Traction” Kaumbutho et al.
Access to efficient and adequate transport in and around the village can contribute to increased economic opportunity, lowered domestic workloads, and the ability to access to essential services.

**CART OPTIONS**

- **Animal Drawn Carts**
  - High Capacity
  - Refurbish •Legislated standards
  - Plain Jane •Locally made
  - Tin Lizzy •Locally assembled
  - Fancy Pants •Mass manufactured

- **Low Capacity**
Refurbish

Pre-assembled kit for refitting existing carts
Designed to meet legislated standards
Improved safety
Kit contains:
- Pre-assembled chassis
- Brake system
- Fasteners
- Paint
- Chevrons and reflectors

Total cost: R2700

Plain Jane
Locally manufactured
Use of local materials
Relatively inexpensive
Easy to maintain
Durable
- Angle iron frame
- Wood plank body
- Removable tailgate
- Plank bench seat
- Flat loading bed

- **Total cost: R3396**
Tin Lizzie

Industry manufactured
Locally assembled
Designed to be maintained locally
Higher comfort standards
Family-oriented
Interim Presentation:
8 April 2005

- Square tube frame
- Corrugated metal roof
- Hinged tailgate
- Foldable back seat
- Mudguards
- Step-down chassis
- Chevrons and reflectors

- **Total cost: R 5660**

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**Fancy Pants**

- Mass manufactured
- Primarily for people transport
- Light frame
- Image oriented
- Most comfortable model
- Highest price point
• Pre-fabricated round tube frame
• Powder coated finish
• Wood side panels
• Lockable under-seat storage
• Mudguards
• Upholstered seats
• Lightweight removable canopy

• **Total cost: R6460**
Wheels, axle & draw pole :  R 2710
Frame & powder-coating :  R 1750

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TOTAL  R 4460
Wheels, axle & draw pole : R 2710
Frame & powder-coating : R 1750
Wood planks : R 200

TOTAL  R 4660

Wheels, axle & draw pole : R 2710
Frame & powder-coating : R 1750
Wood planks : R 200
Storage box & seats : R 500

TOTAL  R 5160
Wheels, axle & draw pole : R 2710
Frame & powder-coating : R 1750
Wood planks : R 200
Storage box & seats : R 500
Mudguards (safety)  : R 500

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TOTAL          R 5660
It is about women gaining control over the means to make a living. It is about women lifting themselves out of poverty & vulnerability. It is about women achieving economic & political empowerment within their homes, their villages, their countries.

**UN Dev Fund For Women**
SUSTAINABILITY MODEL: MICRO-CREDIT PROGRAMME

**Benefits**
- Accepted method of poverty alleviation
- For women who would not normally have access to credit
- Increased access to community services
- Potential changes in communities perceptions of women’s roles
- Improvement in women’s role in household

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**Socio-Economic Sustainability Model - Macro**

Implementation Partners

Govt of South Africa
Provincial Council
Local Government
Other Govt Stakeholders

Guarantee

Banks
NGOs
Public Institutions
Trusts
Etc.

Community

Beneficiary

Individual

Transfer of Ownership

Application

Monthly Contact & Payback

Scrutiny & Selection

Grant or Loan

Contract: Relationship with Funding Body
Four-wheeled vehicles (wagons) are desirable for transporting heavy loads because they eliminate the problem of large vertical forces acting on the backs – or necks of the animals.

Dr. Peta Jones, Donkey Power Consultancy
Did you know that DONKEY CARTS can provide a viable solution to high-capacity rural transportation needs?

Serious?

Seri – ass!

SERI-ASS DONKEY CARTS...

EXISTING HIGH-CAPACITY PROTOTYPES
## PROBLEM ANALYSIS

### PROBLEMS

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>PRINCIPLES</th>
<th>INITIAL DESIGN</th>
<th>FEEDBACK</th>
<th>SOLUTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptability</td>
<td>• Cultural sensitivity</td>
<td>practicality</td>
<td>&quot;Cool&quot; factor</td>
<td>Upgrade the existing products/prototypes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower deck height/steps</td>
</tr>
<tr>
<td>Accessibility</td>
<td>• Design-for-all</td>
<td>ingress/egress</td>
<td>Elderly/Disabled</td>
<td>Provide spaces for promotional graphics</td>
</tr>
<tr>
<td>Aesthetics</td>
<td>• Attractiveness</td>
<td>branding</td>
<td>Popular brands</td>
<td>Government subsidies needed</td>
</tr>
<tr>
<td>Affordability</td>
<td>• Low-cost</td>
<td>appropriateness</td>
<td>Simplicity</td>
<td>Provide canopies</td>
</tr>
<tr>
<td>Comfort</td>
<td>• User-friendliness</td>
<td>shelter/seats</td>
<td>Canopies/Cushions?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ergonomics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Durability</td>
<td>• Ruggedness</td>
<td>structural integrity</td>
<td>Metal &amp; some wood</td>
<td>Durable finishes &amp; robust fittings</td>
</tr>
<tr>
<td>Flexibility</td>
<td>• Modularity</td>
<td>multi-functional</td>
<td>Cargo &amp; People</td>
<td>Removable &amp; adjustable features</td>
</tr>
<tr>
<td>Maneuverability</td>
<td>• Stability</td>
<td>weight</td>
<td>Low centre-of-gravity</td>
<td>Optimized chassis</td>
</tr>
<tr>
<td>Safety</td>
<td>• Accident prevention</td>
<td>visibility</td>
<td>Passenger safety</td>
<td>Omit sharp edges</td>
</tr>
<tr>
<td>Sustainability</td>
<td>• Technology transfer</td>
<td>use of local resources/skills</td>
<td>Export potential</td>
<td>Appropriate production methods</td>
</tr>
<tr>
<td>Welfare of Draft Animal</td>
<td>• Humane treatment</td>
<td>Weight limitation/distribution</td>
<td>Avoid overloading</td>
<td>Provide food storage &amp; weight indicator</td>
</tr>
<tr>
<td></td>
<td>• Good husbandry</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CART OPTIONS

High Capacity

Animal Drawn Carts

Low Capacity

Flat Bed

Cargo

Special Use

Passengers

• School Bus
• Taxi

• Building Materials
• Firewood / Water
• Agricultural Produce

• Ambulance
• Hearse

• School Bus
• Taxi

• Building Materials
• Firewood / Water
• Agricultural Produce

• Ambulance
• Hearse

High Capacity

Stepped Deck

Cargo

Special Use

Passengers

ERGONOMICS

• Overall Dimensions
• Accessibility
• Comfort
• Safe Edges
• Functional Accessories
• Textures

SAFETY FEATURES

• Reflectors
• Handbrake
• Indicators
• Mirrors
• Safety Strapping
PAYLOADS
• People
• Bricks, Wood, Sand & Stone
• Food
• Water
• Furniture
• Scrap metal

FUNCTIONALITY
• Loading Methods & Means
• Ingress & Egress
• Fastening Methods
• Stability
• Utility Holders

AESTHETICS
• Branding “The COOL Factor”
• Graphic Surfaces
• Colour choice & Surface finishes

CONTROLS/DISPLAYS
• Radio
• Hooter
• Indicators
• Lighting
SHELTER
• Canopy (ease of use & flexibility)
• Side Walls
• Drainage
• Windscreen

MATERIALS & PROCESSES
• Rubber Weaved floor mats
• Polyester Web Hammock Seating
• Woods, Metals & Plastics
• Welding & Standard Fasteners

STORAGE
• Multi-Purpose Utility Spaces
• Toolbox & First-Aid Kit
• Water Containers
• Fold Away Features (e.g. seats, canopy, etc)
• Animal Feed
## ECONOMIC COMPARISONS

<table>
<thead>
<tr>
<th>Modes of Transport</th>
<th>Purchase Price</th>
<th>Maintenance Cost/Year</th>
<th>School Fee Income</th>
<th>Additional Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Bicycle</td>
<td>R2400 (6 bicycles)</td>
<td>R600 (6 bicycles)</td>
<td>R0</td>
<td>R0 R4000-8000 R5000-10000 R20000-40000</td>
</tr>
<tr>
<td>• Donkey Cart (upgraded)</td>
<td>R2880</td>
<td>R1000</td>
<td>R0</td>
<td></td>
</tr>
<tr>
<td>• Cheap Bakkie</td>
<td>R10000</td>
<td>R2000</td>
<td>R2400</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R12000</td>
<td>R6000</td>
<td>R2400</td>
<td></td>
</tr>
</tbody>
</table>

## SOCIAL COMPARISONS

<table>
<thead>
<tr>
<th>Modes of Transport</th>
<th>Maintenance Skill Level</th>
<th>Travel Conditions</th>
<th>User Energy Consumption</th>
<th>Cool Factor Perception</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Bicycle</td>
<td>Low</td>
<td>Poor</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>• Donkey Cart (upgraded)</td>
<td>Low Medium</td>
<td>Poor Good</td>
<td>Low High</td>
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<td>Good</td>
<td>Low</td>
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## HIGH-CAPACITY CHASSIS OPTIONS

- Stepped Deck
- Flat Bed
## Stepped Deck Costing

<table>
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<tr>
<th>Item</th>
<th>Cost</th>
</tr>
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<tbody>
<tr>
<td>Chassis Structure</td>
<td>R 4 000</td>
</tr>
<tr>
<td>Moving Gear</td>
<td>R 2 800</td>
</tr>
<tr>
<td>Seating</td>
<td>R 400</td>
</tr>
<tr>
<td><strong>Sub-Total</strong></td>
<td><strong>R 5 800</strong></td>
</tr>
<tr>
<td>Side and Canopy Support</td>
<td>R 2 250</td>
</tr>
<tr>
<td>Seating</td>
<td>R 400</td>
</tr>
<tr>
<td>Roof Canvas</td>
<td>R 200</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>R 9 650</strong></td>
</tr>
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</table>
**Flat Bed Costing**

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</table>
Question posed to Chief of Pitsedisulejang:
If you could do one thing to improve transport in your village, what would it be?
Answer:
To get the children to school in all weather — and a donkey cart will do just fine.
INTERIM PRESENTATION:
8 April 2005
6am - 8am
Transport of learners to school
(50c/child)

8am - 3pm
Transport of goods for operator
income

3pm - 5pm
Transport of children back home
(50c/child)

SUSTAINABILITY MODEL
Cart and donkeys would be school-owned and supported by
outside funding

Operator responsible for:
- Care and maintenance of donkeys and carts
- Transport of learners to and from school

In exchange for:
- Learner transport fees (R 1.00 / child / day)
- Income derived from off-hour economic activity
MOOD BOARD

Musicians
• Mzekezeke
• Mandoza
• Zola 7

Soccer Stars
• Benedict Vilokazi
• Steve Lekoela
• Sibusiso Nzuma

Brands
• Loxion Kulca
• Network Jeans
• OBR

Music
• Hip Hop
• Kwalto

CONCLUSION
WAY FORWARD

This is the start...

- Department of Transport to sponsor manufacture of a cart
- Development work still to be done by Industrial Design students
- CPUT and UJ students to manufacture prototypes
- Harnessing and bridle system has been made into a working prototype with a guide and will be field tested by the SPCA in Hammanskraal from next week
- Extension of this system for horse and mule use to follow

THANKS

Thank you to the community leaders and villages for giving us the opportunity to visit your villages and to share your knowledge

The experts, most especially: Morgane James, David Serepelo, Whitey Maphakela, Peta Jones, and Linda Jele