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This issue is the second one of four which will be sponsored by WSPA the World Society for the Protection of Animals.

Draught Animal News accepts articles in Spanish and French, as well as in English. If you submit an article in Spanish or French we would also like a short summary in English to accompany it. For those sending in articles, notes and news we prefer you to send us your input (especially if it is a longer article), on a CD or disk (using Microsoft Word, Word Perfect or Rich Text Format) or via email. If you wish to include photographs, please ensure these are original and of good quality because of losses in the reproduction process. High-resolution photographs saved in .jpeg format are preferable (using Wipzip to compress the file if necessary). We always acknowledge the person taking the photograph so please give us the name. For those without access to a computer, contributions are especially welcome, hand-written or typed.

We are always pleased to hear of any meetings, forthcoming events, new books and useful websites that can be advertised in the newsletter. Letters from draught animal owners, users or those people wanting information on a particular topic or problem are always welcome. We are always pleased to hear of any meeting, forthcoming events, new books and useful websites that can be advertised in the newsletter.

Please send in articles and news, letters and comments to the editor, Dr R.A. Pearson, Draught Animal News, Centre for Tropical Veterinary Medicine, Division of Animal Health and Welfare, University of Edinburgh, Easter Bush Veterinary Centre, Roslin, Midlothian, EH25 9RG, Scotland, UK (fax +44 (0) 131 651 3903; email anne.pearson@ed.ac.uk).

The drawing on the front cover is by Archie Hunter of a camel herder in the Yemen.

This issue is funded by the WSPA for the benefit of working animals. The views expressed in it are not necessarily those of WSPA.
RESEARCH AND DEVELOPMENT PROJECTS

1. Asia

(a) India

Prevalence of yoke gall in draught animals in India

S.M. Manjunath and B.V. Shivaprakash
Department of Surgery and Radiology, Veterinary College, Bidar, Karnataka, India

Introduction
A yoke gall is a work induced inflammation of the skin and subcutaneous tissue due to friction of the yoke placed on top of the neck of an animal used for work. The symptoms vary from thickening of the skin to a very large swelling on the neck (Plate 1). As the neck is affected, draught animals cannot be used for agricultural operations leading to economic loss to the farmers. Though large numbers of animals are affected, the literature to describe its exact incidence and treatment is lacking. Thousands (Lakhs) of cattle suffering from yoke gall are sold for slaughter in India due to the chronic nature of the disease, failure of treatment, ineffective treatment and lack of technical facilities to control the problem. For this reason this study was conducted to determine the prevalence of yoke gall in three different study environments i.e., among clinical cases, among the animal sold and among the animals slaughtered.

Materials and methods
The prevalence of yoke gall was determined among all the medical and surgical cases of ruminants treated during the last five years (2000 to 2004) in nine different districts of Karnataka State of India. Secondly, the prevalence was determined among cattle and buffaloes sent for sale in a well-known cattle market. The animals were examined at ten different Sunday markets throughout all the seasons. Thirdly, the prevalence of yoke gall was assessed by examining the animals disposed of for slaughter in two large slaughter houses of the State.

Results and discussion
A total of 2,61,882 cases of large ruminants were treated for various medical and surgical ailments during the year 2000 to 2004 in nine different districts of Karnataka State in India. The prevalence of yoke gall was 0.8% out of all types of medical and surgical ailments. The prevalence was 3% out of the surgical cases alone (Figure 1). The majority of the animals affected were bullocks, as cows and buffaloes are not used for draught in this state. These results suggested that a 3% proportion of yoke gall out of all surgical problems exists in cattle and buffaloes. This is quite alarming and needs preventive measures.

The prevalence of yoke gall among 2,225 cattle and buffaloes disposed for sale in cattle markets was 1.7% (Table 1). The prevalence of yoke gall when only the bullocks were considered was 3.5%. The prevalence of yoke gall among 3,291 cattle and buffaloes disposed of for slaughter was 3% (Table 2). The prevalence of yoke gall among the 2,055 bullocks slaughtered was 4.8%. This suggested that yoke gall is an important work induced disorder in draught animals. Of all the animals surveyed 1 to 3% had the problem when the survey involved both cattle and buffaloes and up to 5% when only bullocks were considered.
Interesting results were obtained when the prevalence of different stages and types of yoke gall were studied under the three different situations i.e., in the hospital situation, in cattle markets and in slaughter houses (Figure 2). The prevalence of the acute type of yoke gall (Plate 1) was highest (40%) among the animals brought for treatment, whereas the subacute yoke gall (Plate 2) was highest (53%) among the animals brought for sale in cattle markets (Table 1) and the prevalence of chronic fibrosed (tumor neck) type of yoke gall was highest (53%) among the animals sent for slaughter (Table 2). This suggested that farmers prefer to provide treatment when the disease is acute and occurs due to sudden overwork during the monsoon (Plate 3). The farmers provide treatment with a hope that the condition will improve quickly and they can use their draught animals to cultivate the land before the end of the monsoon. Hence the prevalence of acute yoke gall was highest in the study involving clinical cases. The farmers prefer to sell the animals when treatment is not effective or when acute cases turn into subacute and chronic cases. Thus, the prevalence of subacute yoke gall was highest amongst the animals sold for various reasons in cattle markets. The prevalence of the acute, subacute and chronic yoke gall among the animals brought for treatment, sold and disposed for slaughter is shown in Figure 2.
chronic type of yoke gall was highest among the animals sent for slaughter as the routine anti-inflammatory drugs used are ineffective against chronic fibrosed yoke galls. These hard swellings persist for years on the neck of the animal which render them useless for draught purposes. Surgical operation is the only effective treatment for this type of yoke gall. Due to a lack of people able to treat this problem surgically in the villages of India, farmers finally resort to selling such animals or dispose of them for slaughter. Hence the prevalence of chronic yoke gall was greatest in the study of animals in slaughter houses.

Plate 1. Acute yoke gall being drained (S.M. Manjunath)

Plate 2. Bullocks with yoke gall for sale at a market
Plate 3. Bullock with acute gall is used without rest in sugar cane collection

Table 1. Prevalence of yoke gall among the animals sold in cattle markets

| Total animals exhibited for sale | 2,225 |
|-----------------------------|--|---|
| Prevalence of yoke gall in all animals (%) | 1.7 |
| Total bullocks exhibited for sale | 1,100 |
| Prevalence of yoke gall among bullocks exhibited for sale (%) | 3.5 (38) |
| Prevalence of different types of yoke gall (%) | |
| Acute | 26.3 (10) |
| Subacute | 52.6 (20) |
| Chronic | 21.1 (18) |

Figures in parenthesis indicate number of yoke gall cases.

Table 2. Prevalence of yoke gall among the animals disposed to slaughter houses

<table>
<thead>
<tr>
<th>Slaughter house</th>
<th>KAMPCO</th>
<th>Chitguppa</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of animals (cattle &amp; buffaloes slaughtered)</td>
<td>1,148</td>
<td>2,143</td>
<td>3,291</td>
</tr>
<tr>
<td>Prevalence of yoke gall in all animals (%)</td>
<td>2.9</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Total number of bullocks slaughtered</td>
<td>825</td>
<td>1,230</td>
<td>2,055</td>
</tr>
<tr>
<td>Prevalence of yoke gall among the bullocks disposed for slaughter (%)</td>
<td>4 (33)</td>
<td>5.3 (65)</td>
<td>4.8 (98)</td>
</tr>
<tr>
<td>Prevalence of different types of yoke gall (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute</td>
<td>18.2 (6)</td>
<td>15.4 (10)</td>
<td>16.3 (16)</td>
</tr>
<tr>
<td>Subacute</td>
<td>30.3 (10)</td>
<td>30.8 (20)</td>
<td>30.6 (30)</td>
</tr>
<tr>
<td>Chronic</td>
<td>51.5 (17)</td>
<td>53.9 (35)</td>
<td>53.1 (52)</td>
</tr>
</tbody>
</table>

Figures in parenthesis indicate number of yoke gall cases.
KAMPCO – Karnataka Meat & Poultry Marketing Corporation, Bangalore
Chitguppa (Bidar District) – private slaughter houses
The study showed that the prevalence of yoke gall was highest during the rainy season (46%) followed by winter (31%) and summer (22%) seasons. This suggested that extensive use of bullocks for ploughing during the early rains is the main cause of yoke gall and this requires better preventive measures. The prevalence of yoke gall varied over the five years surveyed. The occurrence of yoke gall recorded was lowest (0.7%) in the year 2003 as the State faced severe drought and agricultural activities were less and thus the use of bullocks for draught was also less. The prevalence of yoke gall was highest during the year 2004 when there was good rainfall in the state and intensive agricultural activities involving the bullocks took place.

Little work has been done on yoke gall so far in the world, most studies have been limited to reports of the problem in various places. In a study involving a single hospital in Bangladesh, a 2.7% incidence was noticed (Rahman and Ahmed, 1975). The present study involved a wider geographical area and revealed that: the yoke gall has an incidence of more than 1% among all other diseases and requires a specific treatment for each type of yoke gall. It also requires proper preventive measures such as use of better bullock carts, yokes, judicious use of animals with intermittent rest and proper pairing of animals. The study revealed that there is a need to design a strong, all steel bullock cart with a gear system for the wheels. Ample scope for marketing of such bullock carts exists if some engineering firms take up this task.

References

(b) India
Effect of draught and duration of work on physiological responses of mules

R.L. Srivastava, A.K.A. Lawrence and Shibu Mathew
AICRP on Animal Energy, College of Agricultural Engineering & Technology, FM & P Engineering Department, Allahabad Agricultural Institute-Deemed University

Abstract
Trials were conducted on two 300 kg mules working individually at three different levels of draught force, 20% ($D_1$), 25% ($D_2$) and 27% ($D_3$) draught force during a winter season (cold) for three hours continuous work. There were significant differences in physiological responses due to draught and duration of work ($P < 0.05$) when respiration rate, pulse rate and body temperature of mules were measured. The differences due to draught x duration interaction were also found to be significant for respiration rate, pulse rate and body temperature. The initial mean respiration rate was between $16 \pm 0.4$ to $17 \pm 0.8$ breaths/minute. A rise in respiration rate (breaths/minute) was observed from $16 \pm 0.4$ to $44 \pm 0.8$ on $D_1$, $16 \pm 0.8$ to $47 \pm 1.2$ on $D_2$ and $17 \pm 0.8$ to $52 \pm 1.6$ on $D_3$ draught force. Initial pulse rates of mules were between $32 \pm 0.8$ to $33 \pm 0.4$ beats/minute. An increase in pulse rate was observed from $32 \pm 0.8$ to $63 \pm 0.4$, $33 \pm 0.4$ to $67 \pm 0.4$ and $33 \pm 0.4$ to $70 \pm 0.4$ beats/minute respectively, on $D_1$, $D_2$ and $D_3$ draught load. Initial body temperature was $36.10 \pm 0.08$ to $36.20 \pm 0.08 ^{\circ} C$. A rise in body temperature was recorded between $36.1 \pm 0.08$ to $37.5 \pm 0.04$, $36.1 \pm 0.12$ to $37.7 \pm 0.04$ and $36.2 \pm 0.08$ to $38.2 \pm 0.04 ^{\circ} C$ respectively, on $D_1$, $D_2$ and $D_3$ draught force.
Introduction
Mules are well known for their strong pulling capability. In India mules are generally used for transport and carrying loads as a pack animal. The capacity of draught animals mostly depends on their physiological repose. Physiological responses of work animals are the main parameters of fatigue. Respiration rate, pulse rate and body temperature are the three major parameters to measure to study the draught animals stamina. Variations in physiological responses during work have been observed in earlier studies of bullocks also (Sastry et al., 1970a; Adkine, et.al., 1977; Rautarary, 1985). Very little work on physiological response of mules during work has been done in India. Therefore, an attempt in this study was made to observe the physiological response of mules during work.

Plate 4. CIAE loading cart (R.L. Srivastava)

Plate 5. Observation of pulse rate (R.L. Srivastava)
Materials and methods
Two good medium size mules, 6 years of age and with live weights of 300kg were selected for study. A CIAE loading car was used to pull the desired draught load singly (Plate 4). The study was conducted with 20% (D₁), 25% (D₂) & 27% (D₃) draught load (i.e equivalent to live weight). A mule was continuously employed for work on each of the draught loads for three hours daily. Trials were conducted for three days at each draught load. Experiments were conducted on a tarmac (sealed) test track. The study was carried out during the winter season (cold). The respiration rate, pulse rate, and body temperature of each of the mules was recorded before the work and after each hour of work by stopping them for five minutes. Respiration rate was recorded by putting the hand in front of the nostril and counting the expired air, pulse rate by feeling the coccygeal artery (Plate 5) and body temperature was recorded by clinical veterinary thermometer. The average ambient temperature and relative humidity were recorded during the experiment period. The means and standard error for each observation were calculated. The statistical significance of duration, draught and draught x duration interaction effects were tested by analysis of variance (Snedecor and Cochran, 1967).

Results and discussion
Respiration rate
The mean respiration rate and the percent increase from the initial value are presented in Table 1. The results revealed that respiration rate increased with increase in draught load and duration of work. It confirms the finding made in Anonymous (2004). A significant (P < 0.05) difference in respiration rate, due to draught and duration of work, was recorded. The initial respiration rates of mules were 16.±0.4 to 17±0.8 breaths per minute. An increase in respiration rate was observed from 16±0.4 to 44±0.8 breaths per minute and it increased by 75%, 138% and 175% from the initial level respectively, after one, two and three hours of work on D₁ draught load. It increased from 16±0.8 to 47±1.2 breaths per minute on D₂ draught load. The percent increase in respiration rate on D₂ draught load from the initial level was 94%, 156% and 194% respectively, after one, two and three hour of work. The increase in respiration rate on D₃ draught load was from 17±0.8 to 52±1.6 breaths per minute and it increased by 94%, 165% and 206% respectively, after one, two and three hour of work at the same draught load. A similar finding was reported in Anonymous (2004). Differences due to draught x duration interaction were also significant.

Pulse rate
Data on changes in mean pulse rate of mules are presented in Table 1. It is clear from the study that pulse rate of mules increased with increase in draught load and duration of work as observed in Anonymous (2004). The increase in pulse rate was from 32±0.8 to 63±0.4 beats per minutes at D₁ draught load. It increased 41%, 75% and 97% from initial level respectively, after one, two and three hours of work at the same draught load. The rise in pulse rate was observed between 33±0.4 to 67±0.4 beats per minutes on D₂ draught load and percent increase in pulse rate was 42%, 76% and 103% respectively, after one, two and three hours of work at the same draught load. It was observed between 33± 0.4 to 70±0.4 beats per minute and increased 45%, 82% and 112% respectively, on D₃ draught, after one, two and three hours of work. The study
Table 1: Effect of draught and duration of work on mean ±SE (n=6) respiration rate, pulse rate and body temperature

<table>
<thead>
<tr>
<th>Duration of work</th>
<th>Mean Respiration rate (breaths/min) ± SE</th>
<th>% increase from initial value</th>
<th>Mean Pulse rate (beats/min) ± SE</th>
<th>% increase from initial value</th>
<th>Mean Body temperature (°C) ± SE</th>
<th>% increase from initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial</td>
<td>16±0.4</td>
<td>-</td>
<td>32.00±0.8</td>
<td>-</td>
<td>36.10±0.08</td>
<td>-</td>
</tr>
<tr>
<td>After 1hr</td>
<td>28±0.75</td>
<td>75</td>
<td>45±1.2</td>
<td>41</td>
<td>36.70±0.08</td>
<td>1.7</td>
</tr>
<tr>
<td>After 2hr</td>
<td>38±0.9</td>
<td>138</td>
<td>56±1.6</td>
<td>75</td>
<td>37.2±0.12</td>
<td>3.0</td>
</tr>
<tr>
<td>After 3hr</td>
<td>44±0.8</td>
<td>175</td>
<td>63±0.4</td>
<td>97</td>
<td>37.5±0.04</td>
<td>3.9</td>
</tr>
<tr>
<td><strong>D1 Draught</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>D2 Draught</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>D3 Draught</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial</td>
<td>16±0.8</td>
<td>-</td>
<td>32±0.4</td>
<td>-</td>
<td>36.1±0.12</td>
<td>-</td>
</tr>
<tr>
<td>After 1hr</td>
<td>31±0.9</td>
<td>94</td>
<td>47±0.8</td>
<td>42</td>
<td>36.7±0.09</td>
<td>1.7</td>
</tr>
<tr>
<td>After 2hr</td>
<td>41±1.0</td>
<td>156</td>
<td>58±0.4</td>
<td>76</td>
<td>37.3±0.04</td>
<td>3.3</td>
</tr>
<tr>
<td>After 3hr</td>
<td>47±1.2</td>
<td>194</td>
<td>67±0.4</td>
<td>103</td>
<td>37.7±0.04</td>
<td>4.4</td>
</tr>
<tr>
<td><strong>D1 Draught</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>D2 Draught</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>D3 Draught</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial</td>
<td>17±0.8</td>
<td>-</td>
<td>33±0.4</td>
<td>-</td>
<td>36.20±0.08</td>
<td>-</td>
</tr>
<tr>
<td>After 1hr</td>
<td>33±1.0</td>
<td>94</td>
<td>48±0.8</td>
<td>45</td>
<td>36.9±0.12</td>
<td>1.9</td>
</tr>
<tr>
<td>After 2hr</td>
<td>45±0.8</td>
<td>165</td>
<td>60±0.8</td>
<td>82</td>
<td>37.4±0.12</td>
<td>3.3</td>
</tr>
<tr>
<td>After 3hr</td>
<td>52±1.6</td>
<td>206</td>
<td>70±0.4</td>
<td>112</td>
<td>38.2±0.04</td>
<td>5.5</td>
</tr>
</tbody>
</table>
revealed a significant effect of draught and duration of work on the pulse rate of mules. Significant (P < 0.05) differences were also observed due to the interaction of draught x duration of work.

**Body temperature**
The data on changes in mean body temperature of mules are shown in Table 1. The body temperature of mules increased with increase in draught load and duration of work. A similar trend was reported in Anonymous (2004). A significant effect due draught and duration was observed (P < 0.05). The variation in mean body temperature was between 36.1±0.08 to 37.5±0.04 °C at D₁ draught load. The increase in body temperature was 1.7%, 3% and 3.9% respectively, after one, two and three hours of work. The variation in body temperature was between 36.1±0.12 to 37.7± 0.04 °C on D₂ draught load and the percent increase was 1.7%, 3.3% and 4.4% respectively, on the same draught load after one, two and three hours of work. The results on D₃ draught load revealed variations in body temperature between 36.2±0.08 to 38.2±0.04 °C. The percent increase in body temperature on same draught was found 1.9%, 3.3% and 5.5% respectively, after one, two and three hours of work. Significant differences due to duration x draught interaction were also observed during the study.

**Conclusions**
It can be concluded from the results that respiration rate, pulse rate and body temperature increased with the increase in the duration of work and increase in draught load. Draught and duration of work had a significant effect on the respiration rate, pulse rate and body temperature of mules. The interaction of draught x duration also had a significant effect on the same parameters.

**References**


(c ) Indonesia

The draught animal situation on Bali island in Indonesia

**I. Wayan Kasa**
*Department of Biology, Udayana University, Bukit Jimbaran, Bali, Indonesia*

**Introduction**
On Bali island Bali cattle, swamp buffalo and horses have been used for draught animal power (DAP) since a long time ago. There is no data to say when such animals started to be employed for work. As draught animal sources they are usually used for ploughing, carting, pulling, and entertainment. Bali island comprises of nine regencies, and each
of those have a specific way in using each animal for DAP. For examples, swamp buffalo are generally employed for ploughing and carting in Jembrana and Buleleng regencies, respectively. In addition, certain animals have been using in parts of certain regencies, but not in other areas. For example the horse is used in Denpasar, Buleleng and Jembrana for carting, but is not found in the rest of the regencies of Bali. The Bali cattle however has been used for ploughing in all the regencies over Bali island with predominant use in certain places.

In Balinese Hindu culture all animals including draught animals are dedicated as an expression of thankfulness and this could be seen in one of the Balinese holiday celebration called “Tumpek kandang” (Anon, 2001a). A survey was conducted to establish which types of DAP are used in which regencies in Bali. The Balinese Hindu culture and traditions associated with these animals were also investigated.

**Materials and methods**

Farmers, particularly those who are raising Bali cattle, swamp buffalo or horses, were surveyed using a questionnaire and a study of literature was also undertaken.

**Results**

**Bali cattle**

<table>
<thead>
<tr>
<th>Regency</th>
<th>Bull</th>
<th>Steer</th>
<th>Male</th>
<th>Calf</th>
<th>Cow</th>
<th>Heifer</th>
<th>Female calf</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denpasar</td>
<td>72</td>
<td>550</td>
<td>762</td>
<td>106</td>
<td>2,535</td>
<td>1,168</td>
<td>1,093</td>
<td>6,286</td>
</tr>
<tr>
<td>Badung</td>
<td>5,203</td>
<td>4,462</td>
<td>4,412</td>
<td>184</td>
<td>15,445</td>
<td>8,063</td>
<td>7,345</td>
<td>45,114</td>
</tr>
<tr>
<td>Gianyar</td>
<td>6,855</td>
<td>5,667</td>
<td>5,537</td>
<td>0</td>
<td>20,153</td>
<td>7,082</td>
<td>6,291</td>
<td>51,585</td>
</tr>
<tr>
<td>Klungkung</td>
<td>2,813</td>
<td>4,170</td>
<td>4,634</td>
<td>109</td>
<td>17,625</td>
<td>5,741</td>
<td>5,568</td>
<td>40,660</td>
</tr>
<tr>
<td>Karangasem</td>
<td>17,472</td>
<td>15,546</td>
<td>14,007</td>
<td>0</td>
<td>46,081</td>
<td>16,671</td>
<td>14,685</td>
<td>124,462</td>
</tr>
<tr>
<td>Bangli</td>
<td>19,970</td>
<td>13,144</td>
<td>8,549</td>
<td>0</td>
<td>18,920</td>
<td>7,061</td>
<td>5,724</td>
<td>73,368</td>
</tr>
<tr>
<td>Buleleng</td>
<td>12,431</td>
<td>12,764</td>
<td>13,053</td>
<td>1,279</td>
<td>31,594</td>
<td>13,047</td>
<td>14,594</td>
<td>98,762</td>
</tr>
<tr>
<td>Jembrana</td>
<td>629</td>
<td>1,458</td>
<td>3,094</td>
<td>489</td>
<td>11,762</td>
<td>4,257</td>
<td>3,603</td>
<td>25,292</td>
</tr>
<tr>
<td>Tabanan</td>
<td>10,236</td>
<td>8,508</td>
<td>6,862</td>
<td>0</td>
<td>21,756</td>
<td>7,133</td>
<td>5,989</td>
<td>60,484</td>
</tr>
</tbody>
</table>


Unlike swamp buffaloes and horses, the Bali cattle are found in all regencies of Bali island (Table 1). They are usually employed for ploughing, since the people of Bali island mostly live as traditional farmers. In both the dry and rainy seasons such cattle are used for ploughing in dryland and wetland for producing rice, maize and other agriculture products. Besides, the dung of the Bali cattle is also used as a natural farm manure in order to maintain soil fertility and provide good yields. The total numbers of Bali cattle
on the island are shown in Table 1. When not being used for working, usually after the ploughing season has finished in certain regencies the bull race or “sapi gerumbungan” is carried out. “Sapi Gerumbungan”, a northern Bali style bull race, is a unique event only found in Buleleng regency (Plate 6).

It is not a mere race. It is a sport, art, competition, even ritual all combined into one event. A huge wooden bell, in Balinese called “gerumbungan”, is hung around the bull’s neck from which the name of “Sapi Gerumbungan” derived. The thumping wooden bell makes a distinctive sound as the bull runs. Many people including tourists, both locals and overseas, watch the race. This race is usually conducted on a public green field or on a rice field.

Swamp buffalo
The swamp buffalo can be found in certain regencies in Bali, with the greatest numbers found in Jemberana, Tabanan and Buleleng (Table 2). On Jembrana the buffalo is mostly employed for ploughing particularly in the rice fields. Besides this, they are also used for carting during the harvesting seasons for rice paddy, maize, coconut and other agriculture products in both the rainy and the hot seasons. After harvesting the buffalo is usually not need much for work. Farmers at that time have a lot of reserve food, therefore, they create a relaxed happy-go-lucky attraction to occupy spare time, called “makepung” which means buffalo bull race (Plate 7). “Mekepung” awards are usually given to the winner in the form of money and a trophy from the local government.

<table>
<thead>
<tr>
<th>Regency</th>
<th>Bull</th>
<th>Steer</th>
<th>Male</th>
<th>Ox Calf</th>
<th>Cow</th>
<th>Heifer</th>
<th>Female calf</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denpasar</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Badung</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Gianyar</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Klungkung</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>10</td>
<td>4</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>Karangasem</td>
<td>8</td>
<td>6</td>
<td>30</td>
<td>9</td>
<td>46</td>
<td>21</td>
<td>30</td>
<td>150</td>
</tr>
<tr>
<td>Bangli</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Buleleng</td>
<td>58</td>
<td>23</td>
<td>26</td>
<td>1</td>
<td>192</td>
<td>35</td>
<td>37</td>
<td>372</td>
</tr>
<tr>
<td>Jembrana</td>
<td>364</td>
<td>663</td>
<td>563</td>
<td>1,012</td>
<td>1,997</td>
<td>1,060</td>
<td>899</td>
<td>6,558</td>
</tr>
<tr>
<td>Tabanan</td>
<td>44</td>
<td>18</td>
<td>12</td>
<td>0</td>
<td>330</td>
<td>136</td>
<td>42</td>
<td>582</td>
</tr>
</tbody>
</table>


Selection of the champion starts from the bottom level at the village, through the sub-regency, to the top champion at regency levels. Of course, each level of competition needs time to determine its winner depending upon the number of participants.
Jembrana regency is divided into two parts, west and east, separated by the “Ijo Gading” river. Actually, competitors originate from those two areas. The final competition takes place in two famous villages of Banyubiru and Dlod Brawah in the dry season. During the last competition at regency level, the award is presented by the governor of Bali and other important government officials attend. Selection, training and pairing of swamp buffalo is started early in life in order to get a good quality of animal to use for racing. This competition helps ensure that the swamp buffalo will be maintained and sustained all year round and even forever.

Horses
The horse can be found in certain regencies of Denpasar, Jembrana and Buleleng (Table 3), and is particularly employed for carting. They pull a traditional vehicle called a “dokar”. This vehicle has been used for local transport from a long time ago. Traditionally, the “dokar” is pulled by a selected good quality male horse, but in some instances female horses are now being used for such purposes, even though the number is not too many.

Since Bali island has been recognised as both a local and overseas tourist destination, then the “dokar” is also now been using for sightseeing around the city of Denpasar, providing an old traditional transport in the centre of Denpasar. The cart is pulled by a horse with some leather harnesses and jingling bells and one coach man. Beyond that, the “dokar” carry local passengers from one place to another. On other occasions in certain tourist enterprises horse riding is organised for tourist entertainment. At certain holiday times a “dokar festival” is organised around the city for celebration (Plate 8). This festival aims to provide a tourist attraction and at the same time to preserve the local culture and the horses.

Table 3. Total numbers of horses in each regency of Bali island

<table>
<thead>
<tr>
<th>Regency</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denpasar</td>
<td>157</td>
<td>168</td>
<td>325</td>
</tr>
<tr>
<td>Badung</td>
<td>14</td>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>Gianyar</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Klungkung</td>
<td>17</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>Karangasem</td>
<td>40</td>
<td>37</td>
<td>77</td>
</tr>
<tr>
<td>Bangli</td>
<td>3</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Buleleng</td>
<td>57</td>
<td>189</td>
<td>246</td>
</tr>
<tr>
<td>Jembrana</td>
<td>254</td>
<td>25</td>
<td>279</td>
</tr>
<tr>
<td>Tabanan</td>
<td>24</td>
<td>27</td>
<td>51</td>
</tr>
</tbody>
</table>

The reproductive rate of horses in Bali is very low in comparison to that of other farm animals such as Bali cattle. Formerly, in certain remote villages where roads have not been in a good condition, the horse was also employed for carrying agriculture products for marketing purposes. This is less common now.

After working, horses are usually fed a good quality food of selective local native grass, kikuyu grass plus other supplements for nutritional value such as molasses and rice bran. When not being used for working the horse is usually just allowed to grazing in areas where local native grasses are found.

The “Tumpek kandang” holiday
The Balinese people have a special holy day called “Tumpek Kandang”. This culture was inherited from a long time ago from the Balinese Hindu ancestors. The holy day is particularly to celebrate the anniversary of animals. The “Tumpek kandang” is the day of offering and praying to God of animals including pets and draught animals, such as cattle, swamp buffalo and horses as an expression of thankfulness throughout Bali. This is where rituals are held at every farm and family compound, offered to “Sanghyang Rare Angon”, the manifestation of God in mastering all animals, cattle and other livestocks. This day they are blessed and comforted. Based on the Balinese calendar, this holy day has been celebrating every 210 days, based on 6 months of 35 days for each month. Temple ceremonies are usually conducted in some regencies of Bali, such as “Pure Puseh and Pure Desa” and “Pure Luhur Dalem Segening” temples in the centre of Gianyar and Kediri villages respectively of Tabanan regency. The philosophy and aims of the holy day are to maintain and sustain all animals including draught animals.

Discussion
The use of DAP in Bali from Bali cattle, swamp buffalo and horses started a long time ago. The animals were used for carting, pulling, ploughing, entertainment and other activities. The only animal power available other than human power for agriculture and transport in the ancient times was DAP. In some countries camels, donkeys, dogs and other animals have been employed, even up to now. Before the industrial revolution farm livestock had an important role to play in supplying power in agriculture and in transport throughout the world. On Bali island the continued use of cattle and swamp buffalo for both the wet land and dryland cultivation to this day is due to the terrain. Topographically the cultivated land is mostly terraced, as well as being small and narrow, hence, it is impossible to operate a tractor on such areas. This agrees with the observations of Simalenga and Pearson (2003), who pointed out that when farming is carried out on a smallscale on land areas of 1-4 ha it is often not economic to use motor power for land cultivation and cropping.

The spread of Bali cattle on Bali island is evenly throughout each regency with the most cattle found in Karangasem regency. This is because Karangasem is the largest area where most people work as farmers using Bali cattle as DAP for ploughing. In addition, the Karangasem regency is a very rich area for livestock feedstuffs and feed is available all year round. This has been pointed out by Kasa (2004 and 2005) who reported that factors affecting such spread of livestock could be due to the natural conditions, e.g. environmental temperature, rainfall, soil fertility. All of these factors will influence the availability of feedstuffs such as green forage, grass, legumes, straw and others. This will in turn influence stocking rate as well as carrying capacity. Moreover,
the Bali cattle has been recognised as an excellent reproductive animal. It seems able to grow and develop reproductively under many different conditions, even under the worst environment condition, eg. poor nutrition, climate etc.

The biggest population of swamp buffalo can be seen in Jembrana regency, then followed by Tabanan and Buleleng respectively. This could be due to the fact that the swamp buffalo is mostly employed in Jembrana for ploughing, carting and racing (“mekepung”), meanwhile, in Tabanan and Buleleng for ploughing and carting respectively. Since the texture and structure of the soil in some places used for paddy rice is a heavy clay soil in such regencies, the use of swamp buffalo is needed, because the animal is stronger in comparison to Bali cattle. The fact is in accordance to Petheram *et al.* (1989) who found that during work, intake declined by an average of 28% with small and large steers, but not in buffalo, hence, steers produce less energy in comparison to buffalo and of course the buffalo is stronger for work. In addition, with wallowing buffalo were able to reduce both respiration rate and rectal temperature to prework levels within one hour faster than steers. The only regency who have buffalo racing (“mekepung”) is Jembrana, carried out regularly each year from village to regency level of selective competition. Such particular event would probably be because the farmers have enough spare time and food after harvesting season. Therefore, while waiting for the next planting season, the farmer would then conduct buffalo racing particularly attractive now for tourists.

The horse can be found in each of the regencies of Bali, especially around Denpasar city, since horses have been used for carting with the traditional “dokar”. This could be because certain areas can only be reached by using “dokar”. The fact is in general agreement with Crossley (1991) who pointed out that the operating characteristics of the transport operation are determined mainly by rural road factors (gradient, curvature, road width, roughness, rolling resistance and type grip) rather than by urban factors (traffic density, pedestrians, junction priorities and traffic lights). Additionally, since Bali has become a tourist destination, then the “dokar” now is operating for sight seeing around Denpasar city particularly for overseas visitors.

In order to maintain and sustain the horse and “dokar”, a competition has always been undertaken every year with awards handed out by the local government official at the end of the celebration. Kasa (1999) stated a decorated “dokar” competition and parade is held in Denpasar city every year supported by the Ministry of Tourism and others important government officials award prize money.

Therefore, it can be concluded that the used of draught animals of cattle, swamp buffalo and horse are still going on up to now in Bali. Many efforts by local people especially farmers and related government officials maintain and sustain such animals on the Island.

The Balinese holy day called “Tumpek kandang” is basically to respect and dedicate the animals. The essence of celebrating the holiday could be due to express thankfulness to God for a gift that has been given in the form of animals for working and other purposes as well as maintain and sustain all in the animal kingdom including draught animals. Such fact is in general agreement with Anon (2001a,b,c).

**Acknowledgment**
I would like to express my gratitude to the faculty of Science, Udayana University, Bukit Jimbaran campus, Bali for some funds as well as some facilities in finishing this study.
References

(d) Thailand
WSPA Project – Lampang horses in Thailand
Alistair Finlay
Society programmes Europe and Middle East, World Society for the Protection of Animals, London

History
The town of Lampang is situated in the north of Thailand, approximately 600 kilometres from Bangkok. It has a population of around 400 carriage ponies, used as tourist and a local taxi service. The ponies were suffering from a mineral deficiency which was resulting in head swelling, lameness and malnutrition. This coupled with a lack of veterinary services and interbreeding was putting this unique pony breed in danger of being wiped out.

Genetic mapping of the breed, carried out by Michigan State University, proved that the Lampang ponies were a unique breed and through poor health and breeding
with larger thoroughbred horses, were in danger of becoming extinct. Unfortunately the carriage owners had the impression that breeding larger horses would be more attractive and appealing to the tourists.

A Danish equine vet and nutritionist, Nanna Luthersson was working and living in Thailand, she assisted the university with their original research work but was so concerned for the welfare of the ponies, she wanted to do something to improve their welfare and condition. After researching the problems she approached WSPA for assistance to start a project to improve the health of these ponies and to educate their owners. Teaming up with another leading equine vet in Thailand (Dr. Siraya Chunekamrai) they formed the Lampang Pony Welfare Organisation (LPWO) now a well established member society of WSPA.

**Problem**
The situation throughout northern Thailand is that the poor farmers and carriage owners cannot afford to purchase ready made feed for their ponies. They are feeding with rice bran, rice straw and rice grains, which although easily obtainable, lacks critical minerals and leads to severe diseases. The situation is heightened with the chemical compounds in tropical grasses which prevent effective uptake of various minerals. A lot of the ponies were suffering with what is known locally as “big head”, this causes the bones of the skull to become soft and the head swells to a balloon-like structure (Plate 9). The ponies usually emaciate due to loosened teeth. Ponies are sometimes unable to walk due to the bones being so damaged and young animals are often lame and face a great risk of bone fractures due to decalcified bones. More than 60% of the ponies were showing signs of malnutrition. The quality of horse shoes and farriery were very poor, leading to most animals displaying lameness. The shoes were made from round metal bars, which after hammering were still very uneven and poorly fitted. The local vets were happy to treat companion animals but not equines.

**Project**
The project started in January 2004 with the following aims:
- To improve the health and welfare of the Lampang ponies (Plate10)
- To change the feeding strategy of horse owners
- To produce a low cost mineral supplement affordable to owners
- To provide low cost veterinary services
- To use the results of this project as a model for equines in SE Asia

Plate 9. A typical case of head swelling – big head (WSPA)
Methodology

• To educate the owners in the nutritional requirements and welfare needs of their ponies, through a series of seminars and workshops
• Provision of printed educational materials
• The training of local farriers, through workshops and provision of tools
• To train local vets in the treatment of equines

Plate 10. Typical example of a Lampang pony (WSPA)

2004
At first the owners of the carriage ponies were very suspicious about the help they were being offered and it wasn’t until the LPWO decided to open a static clinic in the town square, that they finally started to respond. Several workshops took place throughout the year with owners receiving individual feeding charts for their ponies. Calcium supplement was purchased in bulk and sold to the owners at cost price. Owners became registered to the clinic and records of their ponies and treatments were kept. Registering at the clinic also qualified the owners for purchasing mineral supplement at cost price.

There were two major problems to overcome during the year, the first was that none of the local vets were willing to receive free training in the treatment of equines. This was resolved by bringing newly graduated vets and students on a rotational basis, from the university in Bangkok. Working as volunteers under the supervision of the project’s senior vets gave them valuable practical experience. The project was also used as a training aid to teach veterinary students at the university on the topic of “feeding horses and ponies in the tropics”.

The second problem was the horse shoes which were made locally and fitted by the owners. Over 20% of lameness cases presented to the clinic were due to incorrect fitting and poorly designed horse shoes. After a series of farrier workshops, nine of the owners were certificated and presented with new tools. They are now working as the official Lampang Farriers and good quality shoes and nails are being imported from Malaysia.
By the end of the year:
- 300 ponies had joined the worming and vaccination programme
- 89% of the owners were using calcium supplement
- Greatly reduces lameness cases
- Symptoms of malnutrition had almost disappeared
- Well attended workshops on nutrition, farriery, colic, heat stress, general care and husbandry
- Owners paying 50% of the medication costs
- Overall condition of ponies had improved 100%
- 1731 kg of calcium supplement sold to owners

2005
During 2005 the clinic remained busy and further workshops were held. Many of these were attended by owners from other areas that were suffering similar problems and had heard of the health improvement of the ponies in Lampang. Following concerns of unhealthy foals and birthing problems, a workshop on breeding was held at the clinic, with follow up work on the treatment of pregnant mares and the birthing of foals. The proceeds from the sale of a healthy foal can provide for a family for up to three months.

In April 2005 the LPWO ran a seminar in Bangkok inviting veterinarians from surrounding countries in the hope they would use the information to tackle the same problems in their respective countries.

By the end of the year:
- 94% of owners were using calcium supplement
- Cases of head swelling were nearly non-existent
- Malnutrition (Plate 11) was reduced to 20% (most of which were new arrivals from the border areas)

Plate 11. A Lampang pony showing symptoms of malnutrition (WSPA)
• Considerable reduction of colic cases, due to better feeding and management
• Increased number of healthy new born foals
• 2596 kg of calcium supplement sold to owners

At the end of year two the results of the project were presented at the British Equine Veterinary Association Conference in Harrogate in England. It was also awarded at the Equine Nutrition Conference in Hanover, Germany. The project is an example of how a low cost programme can effectively transform the health and welfare of working equines. In 2006 the project will continue to run, but with the addition of a mobile clinic, which will allow the project to re-start in other areas where the same problems exist. The outreach programme will be assisted by some of the Lampang owners who will hopefully convince other owners to participate in the project. Some of the Lampang farriers will train selected owners in each of the new areas. We hope that other welfare groups in SE Asia will also adopt similar projects. You can read more about this project on the WSPA website or www.lpwo.org

(e) India

Performance and evaluation of the hardened hoof shoes for bullocks used in transport

U. C. Dubey¹, V.V. Singh¹, R.C. Singh¹ and Ajay Kumar²
¹Central Institute of Agricultural Engineering, Nabi Bagh, Berasia Road, Bhopal (M.P.) and ²Indian Institute of Soil Science, Bhopal

Abstract
Improving the design of the bullock hoof shoe could lead to increased service life of the shoe and could reduce the frequency of shoeing which indirectly may reduce the cost of shoeing and may relieve the pain of the animal.

Forty-four pairs of bullocks hoof were shod with an improved ‘hardened’ hoof shoe in Bhopal, Sheore, Indore and Ujjain districts of M.P. Data revealed that the traditional hoof shoes were changed after 30-45 days and total distance travelled with conventional hoof shoes varied between 300 - 600 km depending upon the load and period of work. Cost of the traditional hoof shoes was Rs 50-80 / pair of bullocks. The weight loss of the traditional hoof shoe was 7.25 - 12.5 gm in 135 hour. The life of the hardened hoof shoes was increased to approximately 359 hours as compared to 145 hour. Improved hoof shoes resulted in reduced injury to the hoof of the bullock as it did not require frequent shoeing like the local hoof shoe.

Introduction
The ordinary hoof shoes are decreasing the life of the animal and provide pain during the fixing period. To help reduce these problems, in this study hardened hoof shoes were introduced for the Malvi breed of bullocks used to transport agricultural materials on tarred roads. Feed back of information on the use of these shoes was collected from the users. Studies conducted on the wear resistance of the hardened surfaced hoof shoes for buffaloes in the plain region and for mules in the hill region showed that the frequency of shoeing was reduced considerably with the use of the improved hoof shoes and total life of the improved shoe was 40 times more than the ordinary hoof
shoe. These shoes have better quality in comparison to ordinary shoes being used by the farmers. The comparative cost and other technical details of different hoof shoe are given in Table 1.

Table 1. Comparative cost and other technical details of different hoof shoes

<table>
<thead>
<tr>
<th>S No.</th>
<th>Particulars</th>
<th>Conventional hoof shoe</th>
<th>Improved hoof shoe</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Weld deposited</th>
<th>Powder coated</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td>Working (h)</td>
<td>125</td>
<td>253</td>
<td>490</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02.</td>
<td>Cost of basic material (mild steel) Rs</td>
<td>26</td>
<td>26</td>
<td>26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03.</td>
<td>Cost of Modi - 600 electrode or cost of coating material, Rs.</td>
<td>–</td>
<td>11</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04.</td>
<td>Cost of hoof shoeing, Rs.</td>
<td>54</td>
<td>54</td>
<td>54</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05.</td>
<td>Total net cost Rs.</td>
<td>80</td>
<td>91</td>
<td>108</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>06.</td>
<td>Frequency of shoeing (in total life) Rs.</td>
<td>160</td>
<td>79</td>
<td>41</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>07.</td>
<td>Net expenditure, Rs.</td>
<td>12,800</td>
<td>7,189</td>
<td>4,428</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08.</td>
<td>Net saving, Rs.</td>
<td>–</td>
<td>5,611</td>
<td>8,372</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Materials and methods**

A survey on the use of hoof shoes was conducted in Krishi Upaj Mandi of Bhopal, Indore, Ujjain and Sehore districts. Hoof shoes were used on the bullocks. Data such as weight and shape of hoof shoe, total time of use, distance travelled, working period, deformation in shape of hoof, frequency of shoeing, wear loss and shape of traditional/hoof shoe were observed and recorded from the users/shoers. Thirty-six pairs of bullocks were shod with the hardened hoof shoe in Bhopal and Sheore districts. Also 24 number and 12 number hardened hoof shoes were distributed in Indore and Ujjain districts for use on bullocks.

**Result and discussion**

A study of traditional hoof shoes were conducted in Bhopal, Indore, Ujjain and Sehore districts of the M.P. The status and performance of different types of the traditional hoof shoes is reported in Table 2. There were three types of the hoof shoes used by the hoof shoer in the bullock hoof: small size; medium size; large size big hoof shoes.

Data revealed that the traditional hoof shoes were changed after 30-45 days of work. The total distance travelled with the conventional hoof shoes varied between 300 - 600 km depending upon the load and period of work. The net cost of the traditional hoof shoeing was Rs 50-80 / pair of bullocks. The effect of duration of work on the wear of traditional hoof shoe was very high and these traditional hoof shoes were changed after 7 - 15 days of work. The weight loss of the traditional hoof shoe was 7.25 - 12.5 gm in 135 hour.

The improved hoof shoes for bullocks were used in the animals working in transport on the Kaccha/ Pacca road. Comparative performance and other details of traditional and improved hoof shoes are given in the Table 3.
Table 2. Status of the traditional hoof shoes in Bhopal, Indore, Ujjain and Sehore region of M.P.

<table>
<thead>
<tr>
<th>S No.</th>
<th>Particulars</th>
<th>Traditional hoof shoe used in the bullock cart</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Small size</td>
</tr>
<tr>
<td>1.</td>
<td>Working period, days</td>
<td>20-45</td>
</tr>
<tr>
<td>2.</td>
<td>Average weight of the hoof, gm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Before use</td>
<td>52.83</td>
</tr>
<tr>
<td></td>
<td>After use</td>
<td>46.05</td>
</tr>
<tr>
<td></td>
<td>% wear loss</td>
<td>11</td>
</tr>
<tr>
<td>3.</td>
<td>Avg life of the hoof shoes, h</td>
<td>80-146</td>
</tr>
<tr>
<td>4.</td>
<td>Distance travelled, km</td>
<td>225-300</td>
</tr>
<tr>
<td>5.</td>
<td>Cost of the hoof shoes, Rs</td>
<td>50-80</td>
</tr>
</tbody>
</table>

Table 3. Comparative performance of traditional and improved hardened hoof shoe

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Particulars</th>
<th>Traditional hoof shoe</th>
<th>Improved hoof shoe</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Working period, h</td>
<td>145</td>
<td>359</td>
</tr>
<tr>
<td>2.</td>
<td>% increased with respective to traditional</td>
<td>-</td>
<td>148</td>
</tr>
<tr>
<td>3.</td>
<td>Avg weight of the hoof, gm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Before use</td>
<td>82.68</td>
<td>85.96</td>
</tr>
<tr>
<td></td>
<td>After use</td>
<td>69.06</td>
<td>74.81</td>
</tr>
<tr>
<td></td>
<td>% wear loss</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>4.</td>
<td>Avg. distance travelled, km</td>
<td>206.7</td>
<td>386.5</td>
</tr>
<tr>
<td></td>
<td>% increased with respective to traditional</td>
<td>-</td>
<td>87</td>
</tr>
<tr>
<td>5.</td>
<td>Cost of the hoof shoeing, Rs</td>
<td>80</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>% increased with respective to traditional</td>
<td>-</td>
<td>55</td>
</tr>
<tr>
<td>6.</td>
<td>Cost of the hoof shoe, Rs/h</td>
<td>0.55</td>
<td>0.35</td>
</tr>
<tr>
<td>7.</td>
<td>Avg. frequency of shoeing in total life</td>
<td>162.5</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>% reduced with respective to traditional</td>
<td>-</td>
<td>75</td>
</tr>
</tbody>
</table>

Feedback information on hardened hoof shoes

- The life of the hoof shoes increased to approximately 359 hours as compared to 145 hour.
- It resulted in saving on the cost of shoeing.
- Improved hoof shoe resulted in reduced injury to the hoof of the bullock as it did not require frequent shoeing like local hoof shoe.

Conclusion and recommendation

The powder coated improved hoof shoe resulted in an increased life of the hoof shoes. It may be appropriate to popularise them in more districts to reduce the hoof injury on the bullock.
2. Africa

(a) Namibia

Productivity Upliftment Micro-Projects Project (PUMP)

Ralf Hoffmann
PUMP Project Manager for the Namibian Agronomic Board, PO Box 5096, Ausspannplatz, Windhoek

The Project was conceived in 2003. Funds (N$ 6 400 000) were derived from the United States Wheat Donation. The purpose of the PUMP project was to increase agricultural productivity of Namibia’s small farmers at the individual farm household level by providing access to simple farm equipment. The project lasted 25 months from September 2003 until October 2005.

For cropping areas, weeding was identified as a major constraint on production and thus tools and implements for weeding were selected for productivity upliftment subsidies in cropping areas. In livestock areas, where environmental circumstances prevent farmers from regular cropping, PUMP supported an ongoing programme of the Directorate of Veterinary Services (DVS). This programme entails bringing clinical services, which are not a core part of the DVS, closer to rural communities by training and equipping Community Animal Health Workers (CAHWs). The equipment consists of a box of basic tools for animal husbandry and a voucher for veterinary drugs. Some farmer groups in the pure livestock areas requested and received portable small-stock scales.

Activities
The Ministry of Agriculture, Water and Forestry (MAWF) outsourced the implementation of PUMP to the Namibian Agronomic Board (NAB) and established a Steering Committee to guide and oversee the PUMP. The NAB in turn hired a Project Manager to implement the PUMP.

In close cooperation with the Directorate of Extension and Engineering Services (DEES) the following productivity enhancing items were subsidized to farmers:
- 4,088 Draught Animal Implements and respective harnessing and chains
- 191 Animal Health Kits
- 9 Small-stock Scales
- 193 Sets of hand tools for San in West Caprivi

The general principle governing the issuing of PUMP subsidy was that the beneficiary had to: complete relevant training; learn how to handle the subsidized implement; sacrifice time for training; contribute in cash 10% of the value of the subsidy; and collect the item(s) at the contracted traders.
The project was able to synergize with other projects for all training needs, thereby increasing the number of beneficiaries. Farmers were trained in the use of the respective technology either by DEES before 2003 or by the Draught Animal Power Acceleration Programme (DAPAP). Thus DAPAP, with the assistance of the Agricultural Extension officers of the Ministry, would train the farmers while PUMP would subsidize the implement by means of a voucher system. Consequently, DAPAP trained 191 Community Draught Animal Power Promoters who in turn trained more than 3000 farmers during one- and three-week courses (Plate 12). DAPAP also has a blacksmith component that provides backup for repairs and maintenance for the beneficiaries of the DAP implement subsidy.

Plate 12. Training venue in Kavango, Namibia (R. Hoffmann)

The Ministry through its regular DAPAP programme created various capacities at Mashare Agricultural Development Institute, from where all DAP work was conducted. Mr. Gottfried Keib who coordinated the DAP work from Mashare was assigned to the project manager as ministerial counterpart for the purpose of capacity building as well as for his knowledge of the subject matter and of the farming community.

Each region has as a Regional Draught Animal Power Coordinator (RDAPC), who is an Agricultural Extension Technician (AET) in a special function with regard to DAP. The RDAPCs were instrumental in implementing the PUMP and DAPAP at grass-roots level. They were the focal points in the regions, acted as information exchange and instructed other AETs through the Chief Agricultural Extension Officers/Technicians (CAEO/T).

Voucher system
Wherever possible, the beneficiaries received a voucher instead of direct delivery. The voucher system allowed the beneficiaries to make certain choices of items as well as limited choices of suppliers. PUMP deviated from this system only where the number of items was small, i.e. small-stock scales that were directly provided to communities on recommendation of the CAEO/AET and where San were concerned as their ability to travel to a trader was seen as very limited. In particular hand tools for the West Caprivi San community as well as draught animal implements and harnessing under SAN-DAPAP were delivered directly.
From the outset the project was designed to issue vouchers to smallholder farmers that could be redeemed at contracted traders (Plate 13). In that way the project never actually owned the subsidized items. Most other distribution methods would have involved much higher direct project costs. The voucher system also allowed for a high degree of flexibility in the choice of distributors and in items to be subsidized.

The vouchers were designed with several features to prevent fraudulent use, such as watermark paper and unique serial numbers. They were completed in triplicate, one copy being the voucher printed on watermark paper. A second copy, yellow, to be returned immediately after training/issuing to the PUMP Manager to enable him to forecast sales and direct procurement of by the traders. This was intended to reduce the risks of overstocking certain items by the traders. However forecasting for traders was not possible as the flow-back of the yellow voucher copies was much too slow.

The third copy, pink, is for record by and within the region and is kept on file by the regional DAP Coordinators.

One draw back was that transport was for farmers’ account, and in some instances limited voucher exchange i.e. it prevent some farmers from obtaining implements/harnesses?

This voucher scheme was the biggest and most successful in recent history. This success may pave the way for making use of voucher schemes in other areas in the future.

The San project

The San are severely marginalized people. Upon an initiative of PUMP a special programme was established that provided 322 draught animals to 161 San households in 6 different locations and paid the 10% farmer contribution on behalf of the San. DAPAP provided the training input and PUMP subsidized 111 implements and harnessing for these households. Some San who were previously trained had used their vouchers and community animals in Makata and Tsumkwe area. In Skoonheid implements were supplied by Komeho Namibia. San DAPAP was entirely government funded through the Directorate of Rural Development. An exception to the rule of cultivator subsidy trough voucher was granted and implements were delivered to the beneficiaries by PUMP.

Local manufacturing

Some time was spent on researching the possibility of manufacturing the required implements in Namibia. Several public domain designs were scrutinized and tested. Interested parties were then asked to submit quotations for two particular designs. Three prototypes were manufactured and tested at the Mashare Agricultural Development Institute against the performance of imported cultivators. However, it was found that the local designs were not mature enough. In addition, the prices of local manufacturers
were not competitive, i.e. where similar quality was produced the price exceeded the price of imported cultivators by more than 10% which was deemed an acceptable premium for local manufacturing. Also the tool holders were recommended to be made of cast iron, for which no foundry exists within Namibia.

However, all donkey harnesses (≈ 3600) were made in Namibia in a very short time which allowed for adaptations on the harness to be done.

**Equipment**

The following draught animal implements and harnesses were subsidized:

(a) Zimplow Standard plough V8, up until April 2004
(b) Zimplow Plough V10, 12 and 13 (only in Caprivi) up until April 2004
(c) Zimplow Maun Cultivator
(d) Zimplow BS41 Cultivator
(e) Zimplow MC 5 Cultivator (Only in Caprivi)
(f) Zimplow Ridgers (Only in Caprivi)
(g) Zimplow Harrows (Only in Caprivi)
(h) Haka C3 cultivator (from End 2005)
(i) Haka C5 cultivator (from End 2005)
(j) Donkey short breast band harness, bridle and bit and 2 donkey chains 1.4m
(k) Trek chains 2.6m
(l) Spare parts for plough, Maun and BS41 cultivator

In April 2004 the Steering Committee decided to remove the plough from the list of subsidized items as the initial aim was to enhance the weeding capacity, while the plough was intended for new entrants of DAP use only. In addition the various cultivators can also be used for primary tillage.

A total of 4724 Vouchers for DAP implement were issued in two rounds: from September 2004 to May 2005 (4124) and from Augustus 2005 to September 2005 (600).

**Animal health kits**

The Namibian Agricultural Services Support Programme (NASSP) and Directorate of Veterinary Services (DVS) funded the training of Community Animal Health Workers (CAHWs). CAHWs had to be newly trained or had to complete a refresher course before they could qualify for the subsidy, then Animal Health Kit and voucher for veterinary drugs.

As the Animal Health Kit contains relatively specialised equipment, they were procured centrally and distributed via the offices of regional State Veterinarians country wide. 191 kits were distributed. The state veterinarian usually would also go through contents of the AHK and discuss with the CAHW which drugs to purchase with the voucher. A voucher, valued at N$ 500.00, was issued with the kits to enable the CAHW to purchase such veterinary drugs and accessories as he expected to need to start his business. On collection of the AHK, CAHWs entered into an agreement with DVS specifying the use of the equipment and procedures should the CAHWs services be discontinued.

**Distribution of subsidized items**

The principle here was to involve the private sector as far as possible to create a sustainable supply of implements, rather than a one-off introduction through a project, which would sideline and discourage private sector involvement.

For draught animal implements, DEES officials were asked to assist with the selection of traders who were engaged in trade with such implements already. These
traders were then approached. The system was explained to them, the price structure was negotiated and a contract was signed.

The DAP implements were imported by three appointed wholesalers, who in turn sold to the smaller traders. From the beginning trust in the project was fortunately easily established with the biggest wholesaler. This was not the case with all traders. The slow turn-out of farmers with vouchers led to a spiral of delayed delivery.

Providers of animal drugs obtainable on the animal drug voucher that came with the CAHW animal health kit were approached in a similar way as for DAP implements.

The animal health kits were procured directly and distributed to the regional state veterinarians who in turn handed them over to the CAHWs.

**Training and demonstration equipment**

On the project more than 890 items of training and demonstration equipment were donated to the MAWF – DEES.

A new make of three- and five-tine animal-drawn cultivator (HAKA) was imported and tested on PUMP initiative. Both the three and five tyne cultivators were found to be suitable for Namibian conditions.

**Outcomes -Impact assessment**

The following distinction has to be made with regard to DAP implements: beneficiaries who opted for ploughs, and beneficiaries who opted for cultivators.

The difference for the owner of a plough is timely ploughing and consequently better timed / earlier planting, because they do not have to wait to borrow a plough or to engage in tedious cultivation by hand. Better timed / earlier planting results in better yields as the various showers and heat units can be better utilized by the plants.

On the other hand, new owners of cultivators probably already had a plough. After acquiring a cultivator they can weed considerably faster than with hand hoes only. Weeding faster provides the opportunity of weed competing weeds are eliminated resulting in better and more secure yields. The biggest impact is labour saving, which is crucial when large parts of the population are affected or infected by HIV/AIDS. This presumably is true for almost all households within the nine regions of PUMP activity. Labour saving was measured by the Northern Namibian Development Project (NNRDP) and by the Ministry during 1995/96.

The following figures were used and assumptions were made for an initial financial assessment:

The area under cultivation was enumerated during the registration for training and adoption assessment and on average was found to be 4.5 ha.
65% of the farmers adopted. It is assumed that the adoption rate does not differ between farmers having chosen a plough or a cultivator. Hence the 65% adoption rate is used for both groups. From information obtained from traders it was established that 425 farmers purchased their own cultivators during round one. It is assumed that all of them used them successfully. They are thus treated like PUMP beneficiaries who adopted the technology. The Mahangu (pearl millet) price as reported by the Mahangu Marketing Intelligence Unit of the Ministry is used to assess the value of the additional production. While it can be argued that not all surpluses will be absorbed by the market, such surpluses will replace more expensive cereals in the producing households or will be given away or bartered in the community. Thus the open market price seems to be a usable approximation in this rough calculation.

The NNRDP measured the differences in time required to weed one ha manually as opposed to DAP weeding. This resulting information is used by the Ministry on posters and during DAP training. Accordingly DAP cultivator weeding saves 40 hours per ha as compared to pure hand hoe weeding. Failing other reliable information on wages paid in the northern communal areas, the negotiated and gazetted Agricultural Minimum Wage is used to value the labour input. In reality wage cost may be higher.

Table 1 presents assumptions made to calculate the financial impact of the DAP implement subsidy. Table 2 presents the aggregate financial gain by beneficiaries of the two groups in an average year of production. The results show that almost the entire project costs will be recovered in production gain during three average years.

These figures illustrate that the biggest impact is due to reduced competition between crops and weeds and to better moisture penetration as a result of loosened soil as well as a reduction in evaporation due to the cutting off of capillaries. The second biggest impact is due to labour saving, which is extremely important in Namibia where
very few households are unaffected by HIV AIDS. The national average Mahangu (pearl millet) yield of 257 kg per ha underestimates the yields expected by DAP users, which usually have achieved an advanced stage of production above farmers with sole hand hoe cultivation. If that figure were used instead, the repayment period would be 4.1 years.

Table 1. Assumptions for impact assessment.

<table>
<thead>
<tr>
<th>Assumption</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vouchers exchanged for implements</td>
<td>4,088</td>
</tr>
<tr>
<td>Average area of beneficiaries</td>
<td>4.5 ha</td>
</tr>
<tr>
<td>% adoption rate, farmers using the technology</td>
<td>65</td>
</tr>
<tr>
<td>Users of subsidized implements</td>
<td>2,657</td>
</tr>
<tr>
<td>Farmers chose a plough Group 1</td>
<td>917</td>
</tr>
<tr>
<td>Farmers chose a cultivator Group 2</td>
<td>1,740</td>
</tr>
<tr>
<td>Spin off – Direct cultivator sales Haka &amp; Zimplow</td>
<td>425</td>
</tr>
<tr>
<td>Kg / Ha Estimated Average Mahangu (pearl millet) yield DAP users</td>
<td>400</td>
</tr>
<tr>
<td>N$/ t value of Mahangu (pearl millet) at open Market Oshakati; Source: MMIU</td>
<td>1,750</td>
</tr>
<tr>
<td>hours weeding for 2 persons with hoe per ha*</td>
<td>60</td>
</tr>
<tr>
<td>hours weeding for 2 persons with cultivator per ha, incl. inter-row hoe*</td>
<td>20</td>
</tr>
<tr>
<td>Agricultural Minimum wage per hour</td>
<td>2.2</td>
</tr>
</tbody>
</table>

* NNRDP and MAWRD 1995

Table 2. Financial return for the DAP Implement subsidy

<table>
<thead>
<tr>
<th>Putting values to the impact</th>
<th>N$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beneficiaries who opted for ploughs:</td>
<td></td>
</tr>
<tr>
<td>Plough on time plant on time Yield increase %</td>
<td>25</td>
</tr>
<tr>
<td>Area increase, still have weeding limitations %</td>
<td>20</td>
</tr>
<tr>
<td>Beneficiaries who opted for cultivators:</td>
<td></td>
</tr>
<tr>
<td>Labour saving per ha cultivator weeding hours</td>
<td>40</td>
</tr>
<tr>
<td>Yield increase due to timely weeding %</td>
<td>35</td>
</tr>
<tr>
<td>Area increase - decreased weeding limitation %</td>
<td>30</td>
</tr>
<tr>
<td>Total</td>
<td>4,105,564</td>
</tr>
<tr>
<td>Combined Direct Project Costs (PUMP-DAPAP)</td>
<td>12,869,705</td>
</tr>
<tr>
<td>Repayment of combined project costs</td>
<td>3.1 Years</td>
</tr>
</tbody>
</table>

Also the entire direct costs of DAPAP and PUMP were used in the calculation; while DAPAP has not been completed yet and will also subsidize roughly 650 DAP implements, the benefit of which is not included in this calculation. PUMP covered some non-DAP activities of which the cost have been included. The total cost incurred by DEES to implement DAPAP and that are not covered from the DAPAP budget is not known and thus by including al non-DAP cost of PUMP in the calculation, this is partially captured.

Hence it is expected that increased production and savings on labour will repay the project costs in 3.1 years.

Impact of animal health kits
The animal health kit beneficiaries were selected by the DVS. The impact of an
improvement in animal health is more difficult to assess than that of an increase in crop production. However, the following general observations can be made:

- The CAHW has a start capital of drugs to generate income.
- The CAHW has knowledge and tools which he can rent out to the surrounding community.
- Farmers have quicker and easier access to minor clinical services, which otherwise would bind time of state veterinarians, whose task is control more than actual clinical work.
- CAHWs assist with annual vaccination campaign of the DVS.
- The DVS’s epidemiological surveillance network is substantially increased.

**Recommendations from the project**

**More of the same.** Although the PUMP has made considerable gains in terms of introducing DAP weeding it is believed that there is scope for more cultivator subsidies for resource-poor farmers with draught animals. The system that was created by PUMP could easily be used to channel more subsidies.

**Planters.** After overcoming the weeding problem, the next limitation is sowing speed and sowing seed in parallel rows for easier weeding with cultivators. This limitation could be overcome by the introduction or development of simple lightweight 2-, 3- or 4-row planters for mahangu. During January 2006 a single-row ripper–planter made by HÄSST was introduced for testing and evaluation. More work needs to be done in this field.

**Extension experiment** of paid farmer to farmer training with result orientated second payment. The Ministry, and more specifically DEES, should evaluate the impact of the Extension Experiment PUMP / DAPAP implementation and the impact it during the next three years. DEES should continue to act as quality control for and keep proper records of direct farmer-to-farmer training as it was already doing during the final month of PUMP. This should also include an in-depth assessment of the level of advantage for the individual beneficiary.

**Voucher system.** The successful use of a voucher system on a fairly large scale demonstrated the efficiency in using existing private sector channels for development, instead of establishing a parallel distribution channel. The Ministry and development agents should carefully evaluate their general farmer support to see whether vouchers can be part of it, as it supports existing channels, allows limited choice for beneficiaries and in the case of PUMP also assured sustainability of the DAP implement supply.

### 3. Latin America

(a) Argentina

**Working towards improved equine welfare in Argentina**

*Ivana Pagés*

*President, Fundación Argentina para el Bienestar Animal (FABA)*

*Email: presidencia@fabaonline.com, www.fabaonline.com*

**FABA** is a NGO dedicated to promote animal welfare in Argentina, with a long record on campaigning (furs, circuses, farm animals and generic cruelty), successful public awareness efforts, as well as providing basic veterinary assistance to a statistically
significant numbers of working horses and companion animals in the poverty rings around Buenos Aires.

**Introduction**

Last year we built a static horse care centre at the local army cavalry grounds (Campo de Mayo) and we are in the process of purchasing a second hand truck and a horse trailer to offer an equine vet.service. This effort is aimed at helping a large population of working horses in the poor areas of Greater Buenos Aires.

**Problems**

Working equines in the city of Buenos Aires are used by their owners or by those who rent them to carry all kinds of goods, construction materials, furniture, etc. These animals work approx. 10 hours a day, carrying loads up to 500+ kg and up to 5 km. They pull 2-wheel carts, with the load and the driver on them. Fees per trip charged are small (a max. of 5US$), which means no money is left to be used to support the animal’s health.

Each animal is worth 300-500US$ when purchased. No veterinary care is ever offered or provided during the natural life of these animals; most of the scarce emergency care is done by the owners themselves, and based on custom and empirical wisdom.

These animals are routinely subjected to chronic mistreatment and abuse in the poverty rings of Buenos Aires, due to their owners’ ignorance and lack of regular access to veterinary services.

**Most common health problems found**

- Acute and chronic cuts and bruises due to bad harnessing
- Skin problems
- Poor shoe balancing, shoeing and lack of general hoof maintenance
- Respiratory problems
- Eye problems (Conjunctivitis and tumors)
- Lack of teeth maintenance
- Worm infestation
- Poor nutrition

In any given month, FABA may tend 80 equines in these circumstances depending on the villages where we work.

**Other important and more complex health problems**

- Intoxication
- Traffic accidents (Trauma)
- Severe respiratory problems
- Colic

Horse owners depend entirely on their equines for their income, as there are no subsidies for poor working families of any kind by local governments.
The problems seen are a part of the current environment that working horses live in around Buenos Aires. Owners simply cannot afford or cannot conceive of ways to afford any treatment or interventions. This is where FABA gets involved, in order to help these noble animals out of living in misery or dying excruciating and unnecessary deaths.

Our experience in working horse campaigns has showed us that the complete lack of veterinary care leads to many preventable injuries in horses including harness injuries and lameness. Poor feeding habits cause malnutrition and fatal colics. Accidents result in crippled animals and fatalities.

**Aim**
Our aim is that horses should be treated with consideration and given adequate shelter, care, food and water. If necessary they must not be worked again until they are fit for the job. They must not be overworked or overloaded, nor must they be forced to work through ill-treatment.

**Solutions**
FABA’s veterinary team is among the best in equine veterinary medicine in the country. During our work we advise communities of the imminent visit by our teams well in advance, thus gathering interested audiences and equine owners who listen to our educating and humane messages, while their animals are treated by our vets.

We are currently providing basic veterinary treatments and preventive medicines on minor yet common health problems (cuts, minor infections) and supplying basic training and education to hundreds of horse owners, so as to improve the lives and welfare of their working equines. During each intervention (weekly field trips) we offer advice on shoeing, molar rasping, harnessing, nutrition and cruelty.

**Logistics**
The World Society for the Protection of Animals (WSPA) has, as part of a lengthy re-organisational and developing process, graciously approved partial funding of the operational expenses on a sliding scheme to deal with the common problems mentioned above.
SHORT NOTES AND NEWS

Rural Heritage update
Gail Damerow writes: “A couple of nifty new books have been added to the Rural Bookstore. Farming with Horses comprehensively explains harnessing and hitching work horses, with loads of photos to illustrate each aspect. 96 Horse Breeds of North America is a beautiful tribute to the breeds of light horse, pony, heavy horse, and longears that are popular in North America. Our online Bookstore also has the new video and DVD called Brabant Horses, Built for Work by the American Brabant Association.”

Rural Heritage, 281 Dean Ridge Lane, Gainesboro, TN 38562-5039 (Tel: 931-268-0655; editor@ruralheritage.com; http://ruralheritage.com/)

The Swedish Cooperative Centre Regional Office for Southern Africa launched its new website www.sccrosa.org on April 20, in an effort aimed at strengthening the presence of SCC as a major player in development initiatives in the region. The website will provide visitors with information on the development work that is being undertaken by SCC ROSA in cooperation with its partners in Zambia, Zimbabwe, Malawi, South Africa, Mozambique and Madagascar.

Visitors to the website will be able to access in-depth information about the SCC mission and strategy, objectives, collaborating partners, projects and news, but also to download materials published by SCC and partners.

The website will eventually be integrated into a new global SCC website, where both SCC and partners from other regions in the world will come together, presenting their work and developments on the ground.

For views and comments info@sccrosa.org (Tel: +263 4 707494; Fax: 700136 www.sccrosa.org, www.sccrosa.se)

KENDAT have improved their website and Fred Ochieng writes “Please check out our website at www.kendat.org. We are still improving on it and should get better.”

Book on Production and Management of Camels (DAN43)
DR ARSHAD IQBAL would like us to point out that the price we quoted for his book on camels in DAN 43 is the average price. He says, “The price varies within different countries, so it may be more or less than the mentioned one (30 US$)”. Please contact him at his email: drarshad_iqbal@hotmail.com if you are interested in buying the book and he will be able to give you an exact price.
LETTERS TO THE EDITOR

Information on harnessing and hitching donkeys – request for feedback
From Peta Jones “I wish I had done these long ago, but now that I have done them, I must circulate them actively! And please could I have some feedback and comments on these designs”.

Peta Jones, Donkey Power Facilitation and Consultancy,
P.O. Box 414 Tshitandani/Makhado 0902, South Africa, Email: astute@lantic.net

What a neckstrap does to a donkey

Short traces push the cart’s weight further forward on a donkey’s neck.

Long traces mean that the donkey pushes with the transverse pole and not with the breastband of its harness. Depending on the length of the neckstrap, this can be with its throat or the top of its legs, not only its chest.

Request for information from Honduras
From: Jose Angulo
“I am a Civil Engineer, from Honduras (Central America), working for many years as a Consultant in Jamaica, and I am thinking about going back to Honduras in September this year, settle in an Agricultural community, and try to help small Campesinos that own small lots of land to do Agricultural works in such a way that their Production could be competitive with big Mechanized Producers. I have been studying the Treadle Pump as an alternative for extracting water with human power for irrigation, and I am wondering if there is a similar pump operated by Animal Traction? Also I am interested in knowing if there are efficiently designed Agricultural Instruments, of Public Domain that I could reproduce without violating the rights of the designers, or companys that sell this type of instruments. In Honduras we have Oxen and Donkeys, and even though the original technology has been almost lost, with the use of the Agricultural tractors, I think it is time to do a comeback and try to develop technicalities the development of tools and rearing of traction animals. I wish to find people that are ready and willing to help with advice and knowledge, a Project that even though I have not started yet, I am very enthusiastic about doing, and I will be informing now and then about my progress. Regards.”

Jose Angulo, Email: consultant@cwjamaica.com
How an evener helps to handle torque

Each animal will pull at slightly different strengths at slightly different times, thus requiring rotation (torque) where they are joined.

much easier for a short pole to rotate than a whole loaded vehicle

torque exerted here
Research on draught animals in the tropics

From Jan Koster

“I am preparing myself for a 3 months visit to South Sudan. Since I will be involved in the possibilities of the use of draught animals for the local people (pastoralists) I would like to know whether you can assist me in obtaining some literature on “draught animal technology”. I heard e.g. about the journal “Draught Animal News”. I am looking for practical instructions on this subject.

As an (former) agriculturist I will be involved most probably in coaching and training the local staff how to train and handle oxen in non-commercial farming systems. Therefore I am interested in:

• The (technical drawings of) the various hitching methods,
• The maximum of traction one full grown ox may develop (cart pulling, ploughing etc.)
• Literature on advantages/disadvantages of use of ox-drawn equipment in order to derive hands-outs for training purposes.
• URL-links for me to browse and select useful information”.

Jan Koster, Daalderslag 43, NL 3991 RE HOUTEN, The Netherlands
(Tel: +31306350545, mobile +31654700963. email: jankoster@euronet.nl)

FORTHCOMING EVENTS

Commonwealth Veterinary Association

4th Pan Commonwealth Veterinary Conference
4 – 8 November 2007
St Michael, Barbados, West Indies

Animal Health and Welfare: Constant Challenges for Veterinarians

First Announcement

http://commonwealthvetassoc.org/Home/BarBados.htm
MEETING REPORT
Interdesign 2005
70 designers from South Africa and around the world got together for two weeks in April 3-16 April 2006 at an ICSID Interdesign held in Rustenburg. This coming-together of creative talent was to address design problems surrounding sustainable rural transport for developing communities.

The workshop was divided into four focus areas – animal-drawn carts, bicycles and tricycles, alternative modes of transport and communication. The two-week period saw the development of several concepts, 19 of which were eventually considered to have real potential and to possibly alleviate transport problems in the communities. Of these, several have been developed into prototypes and tested amongst the original communities.


Discussion topics included the perceptions formed and suggestions made during and after the Interdesign workshop, the way forward in implementing the Interdesign concepts and outcomes. Interested members of the public are welcome to download presentations from the event, or the overall Report of the workshop findings. A glossy, printed publication of the event is available from the SABS Design Institute.


HARNESSES AND IMPLEMENTS

‘Hands-On’ Harness
A sustainable, affordable harness system designed to reduce injuries and improve the efficiency of working equines in the developing world

Terry Davis, Harness Development Agency,
Bridle Cottage, 5 Leamoor Common, Wistanstow, Craven Arms, Shropshire, SY7 8DN, UK

For centuries, equines have played an important role in the progress of mankind. In developing countries they are still used extensively where they represent a means of low-cost, efficient, sustainable energy, vital in areas of poor economic resources. Viewed as “old technology” in the developed world, this easily transferable and adaptable knowledge needs to be supported and indeed further encouraged given the looming global energy crisis.

In disadvantaged areas worldwide, working equines and their owners endure harsh conditions. Many of the problems encountered are caused by widespread unremitting poverty and a lack of knowledge that makes it difficult for owners to give animals the care and attention they deserve.

Important concerns like health/nutrition, foot care, harness development, cart design, draught implements and an understanding in the dynamics of animal draught
are lacking. The result is that the capabilities of this "power tool" are not fully realised.

Harness development has long been identified and acknowledged as a problem area and one of significance in which little progress has been made. Owners, through necessity and without the skills and expertise required for successful harness manufacture, are left to their own devices in creating what they believe to be suitable harness using inappropriate materials. As a consequence of this “do-it-yourself” approach the poorly manufactured equipment is directly responsible for wounds to the neck, shoulders, abdomens and backs of animals. These are commonplace and generally go untreated, sometimes with fatal consequences.

Most harness related injuries are avoidable. The productivity of working equines can be vastly improved by the use of harness that’s strong, comfortable and allows freedom of movement without the risk of serious injury. With this in mind the Harness Development Agency (H.D.A.) have developed and manufacture the “Hands-On” single harness system for use with donkeys or small horses (Plate 16). Using our skills as fully trained, long serving professional harness/horse collar makers and drawing on reliable historical and traditional designs, the harness fulfils all the criteria required for successful animal draught.

Some of the main characteristics are:

• An innovative, adjustable collar and hames allowing for maximum dispersal of the forces of draught
• A lightweight, strong cart saddle with detachable, stuffed panels for easy adjustment. Complete with girth strap, bellyband, crupper and dock
• Can be manufactured using locally available materials and is easily adaptable to local conditions
• Cost effective to produce and easy to maintain
• Can be used with two or four wheeled vehicles
• Suitable for use in both urban and rural locations
• Does not require specialist tools or equipment to assemble.

Although designed with easy assembly and maintenance in mind the Hands-On harness is not proposed as a “do-it-yourself” solution to harness production (Plate 17). For reasons already stated there’s little to be gained by the D.I.Y. approach to harness development. It is seen as detrimental to working equines and represents a major part of the problem that offers no solution to the difficulties presented. There is more to be gained by a standardised production approach to harness development. To this end our “Hands-On” harness is ideally suited.
Standardisation is a means by which harness and its component parts can be produced cost effectively and sustainably. The manufacture of “Hands-On” harness requires professional training. Using the standardised method, this can be achieved in a short period of time by holding local workshops to advise, demonstrate and teach the simple manufacture of such equipment to indigenous people using locally available materials. For people with a dependency on animals for their livelihoods this could be of significant value, leading to a better understanding of draught animal harness and its usage.

It is estimated that 70% of veterinary intervention in developing countries is involved in dealing with the symptoms of harness related injuries. While animals may receive expert, professional veterinary treatment of a high standard, the cause of the commonest debilitating injuries is not being addressed. The problem is essentially a harness related one for which vets are not accountable. Addressing it effectively requires practical, preventative intervention employing people with relevant expertise in harness manufacture and usage. The use of improved harnessing methods will lead to reduced incidence of injury, and greatly reduce the need for expensive veterinary treatment and enable draught animals to work more effectively.

It is hoped that H.D.A.s development of the “Hands-On” harness will go a long way to resolving many of the difficulties experienced by working equines and their owners and provide a better state of well-being for all concerned.

The Hands-On harness has the flexibility to meet many of the harnessing difficulties faced by draught animals and is cost-effective to produce. Production costs can be determined by taking into account locality, the availability of suitable materials and local labour rates.

In the initial development stages of Hands-On harness, recycled materials were used. This had the desired effect of zero costs for materials. Purchasing new materials, using a U.K. model, would cost in the region of £70. However, in adopting a standardised production method, costs could be reduced considerably.

The Hands-On harness can be manufactured using a variety of materials. To ensure sustainability, two essential ingredients are required in moderate quantities, wood and metal (Plate 18). These are used in the construction of the cart pads and hames. A level of proficiency is required to manufacture the Hands-On harness. This can be achieved by a short period of training (6 weeks) after which, a manufacturing time scale of 20-24 hours is feasible.

Regardless of the materials used in harness production, the aim is to ensure that the finished article and its component parts interrelate and comply and with the criteria required for efficient, comfortable draught. The Hands-On harness was designed to meet these needs and represents a suitable, practical, sustainable low-cost option for use in developing countries (Plate 19).
Our thanks go to TAWS (Transport Animal Welfare Studies) for allowing us to display the “Hands-On” harness at their recent seminar held at the Royal Veterinary Collage, 22\textsuperscript{nd} February 2006. Young veterinary students, keen to expand their knowledge by working on projects overseas were in attendance. Harness development/manufacture is not included in the core curriculum of veterinary training, the students showed great interest in this preventive approach to harness related injuries.

It's hoped that in having a better understanding of draught animal harness and its function, many of the injuries endured by working animals can be alleviated.

If you feel that you’re in a position to help us, to help you, then we’d be happy to hear from you. All enquiries to:

Harness Development Agency, 5 Leamore Common, Wistanstow, Craven Arms, Shropshire. SY7 8DN, UK (Tel/Fax: +44-0- 01694781206; harness@yahoo.co.uk)

Animal powered traditional irrigation systems of the Mewar region of Rajasthan

C.P. Doshi, G.S. Tiwari and Rajeev Garg

Department of Farm Machinery and Power Engineering, College of Technology and Engineering, MPUA&T, Udaipur-Rajasthan, India-313001

The Mewar region of the state is spread over the Udaipur, Chittorgarh and Rajsamand districts of Rajasthan. Agro-climatically this region is categorised as sub-humid southern plains and Aravali hills. This zone lies in $23^\circ 32'\ S$ and $26^\circ 20'\ N$ latitude and $72^\circ 16'\ E$ and $75^\circ 49'\ E$ longitude. The terrain is irregular with an average annual rainfall range of 500-900 mm received during June to September by the south-west monsoon. Frequent spells of drought are observed in most of the parts. The daily temperature range is $-3.4^\circ C$ (January) to $43.8^\circ C$ in (June). The main crops are maize and wheat and other crops are sorghum, pulses, groundnut, chickpea, rapeseed and mustard. About 68% of landholdings are less than 2 ha.
Underground water is the main source of irrigation commanding about 80 % of the irrigated land (Anon. 2004). Canals and tanks are the other sources of irrigation. Riverbed and tank bed farming is practiced in some places for gram and mustard cultivation when water recedes in these water bodies.

Animals are still the reliable and dependent source of power on small and marginal farms. Water lifting is one of the main uses of animals besides farm operations and carting. The animals can be employed for about 150 days per year for water lifting operations. Animals can easily work in shifts of 3 hrs work and rest period totalling 8-10 hrs per day (Michael and Khepar, 1989). The two most common water lifting devices are the Persian wheel (local name 'Rahant') and the rope and bucket lift (local name ‘Charas’) which are used in Mewar region of Rajasthan for water lifting. There is considerable scope to improve the efficiencies of the traditional water lifting devices like the Persian wheel and harness, used in these systems. In this article an attempt has been made to describe the animal powered traditional irrigation systems of the region in the sections below.

**The Persian wheel**

The Persian wheel is the most popular amongst the traditional water lifts. It consists of two major components one of which is mounted on the top of the water well, and the other is installed on a circular platform at certain distance from the well. These two components are connected through an under ground mild-steel (MS) shaft. The Persian wheel consists of an endless chain, buckets, a MS spoked drum (sprocket), water trough, one set of peg-toothed bevel gear and a wooden beam to hitch the animals (Plate 20).
A pair of bullock is hitched to a long horizontal (wooden) beam and is allowed to walk on the circular track (radius about 3 m.). The centre of the track is 3.2-3.5 m away from the side of the well on which the MS spoked drum (sprocket) is mounted. The beam drives a large horizontal gear (about 1.1 m) installed at the centre of the track. This horizontal gear (48-peg tooth) drives a vertical gear (32-peg tooth). This set of gears changes the horizontal movement of the bullocks in a vertical plane. The vertical gear drives a long underground MS shaft (laid under the track) extending to the central axis of a large open spoked MS wheel (drum).

A chain and a series of buckets mounted on an open MS spoked drum are installed on the top of the well through a beam for supporting a shaft, projecting vertically above the water. The wood log bears all the load of the chain, the buckets and also it houses the other end of the underground MS. shaft, which transmits the bullock power to the chain and bucket system. Two parallel loops of chain joined by spacing bars have pots attached to them at regular interval and pass over the drum and loop into the water in the well (Plate 21). The traditional type of Persian wheels used earthen pots (Plate 22) and jute or coir rope for the endless chain on which small pieces of bamboo (or wood) are inserted at regular interval. The modern Persian wheels use sheet metal buckets and hooks chain made of mild steel bars. The length of the endless chain depends
on the height to which water is to be lifted. Earthenware pots of 3-4 litre capacity are manufactured by local artisans solely for the Persian wheel with a typical shape (Plate 23). The open mouth is tied to the horizontal bars at uniform spacing (60 cm) depending on the lift of water needed and the pulling capacity of the animals. The endless chain is rotated through an open spoked MS drum (dia.1.5-1.8m. and width 30 cm), mounted at the top of the water well. Buckets of the chain are free to rotate in the vertical plane and remain fully immersed in water. Upward moving buckets are always full of water and carry water to the top where the water is discharged in a trough made of stone slabs (1.2-1.5 m x 0.3m). Water from the buckets is poured into the trough. A ratchet arrangement is provided to prevent backward turning of the open spoked drum due to the weight of water filled buckets. The volume of the bucket ranges from 3- 5 litres. Rotation of the sprocket causes the buckets to move and fill with water when the buckets are submerged in water and lifted up. The full buckets reach the top with their open mouth upward.

The draught requirement of the Persian wheel ranges between 25 to 45 kgf, which depends on the water lift as well as the capacity of the buckets. The system is suitable for water lifting from a depth of about 10 m with a discharge of 200 to 250 litres per minute. An area of 0.18 to 0.22 ha can be irrigated by this system in one day (7 -8 hours).

**Rope and bucket lift (self emptying type)**
The self-emptying type rope and bucket water lift (locally known as “charas”) consists of a bucket, rope and wooden pulley (Plate 24). The bucket is tied to a thick rope (15 mm thick) moving over a wooden pulley. The wooden pulley in turn is mounted on a
wooden beam, which projects vertically over the water in the well. The bottom end of the spout is fastened with another rope (8-10 mm thick), which passes over a roller fixed in front side of the water-receiving trough. Both ropes are tied together and attached to the bullock yoke. The two common types of bucket are in use; in the first type a leather or canvass spout is attached to the open bottom of the bucket (Plate 25), whereas in the second type a square hole at the bottom of the bucket is provided with a flap to close it. The bullocks walk down on a ramp until when they each the extreme end, the bucket reaches the top of the well and water is discharged into the trough. After water is discharged, the bullocks walk back up on the ramp to the starting place. This cycle is completed in 50-70 seconds depending on the depth of the water lift.

A pair of bullocks normally operates this system, but in the Mewar region two pairs of bullocks are also used to operate two sets of the system simultaneously (Plates 26 and 27). About 0.08 to 0.1 hectare of land can be irrigated in one day by using one pair of bullocks. The discharge may be almost doubled by using two pairs of bullocks. This system is used in open wells (7.5-10.5 m deep).
Conclusions
It is clear from the above data that animals are still used for water lifting in the Mewar region of Rajasthan. The Persian wheel and rope and bucket system are commonly used. The efficiency of these devices is low. It needs proper attention to improve the efficiency of these old tested systems powered by animals, which will increase the annual use of the animals at no extra cost and make them more viable economically. These factors have special importance in rural area because of increasing cost of commercial sources of energy like electricity and diesel and lack of sufficient supply especially during the peak season. Therefore paying attention to draught animal use will be beneficial to both the poor farmers and the nation as a whole to reduce dependence on commercial sources of energy.

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RECENT PUBLICATIONS


CONTRIBUTORS TO DAN 44

Terry Davis  
Harness Development Agency  
Bridle Cottage, 5 Leamoor Common  
Wistanstow, Craven Arms, Shropshire SY7 8DN, UK  
Email: harness@yahoo.co.uk

C.P. Doshi, G.S. Tiwari and Rajeev Garg  
Department of Farm Machinery and Power Engineering  
College of Technology and Engineering  
MPUAT, Udaipur-Rajasthan, India-313001  
Email: tiwarigsin@yahoo.com

U. C. Dubey et al  
Central Institute of Agricultural Engineering, Nabi Bagh, Berasia Road, Bhopal (M.P.)  
Email: ucdubey@ciae.res.in

Alistair Findlay  
Society Programmes Europe and Middle East  
World Society for the Protection of Animals  
14th floor, 89 Albert Embankment, London, SE1 7TP, UK  
Email: alistairfindlay@wspa.org.uk

Ralf Hoffmann,  
PUMP Project Manager  
Namibian Agronomic Board  
PO Box 5096, Ausspannplatz  
Windhoek, Namibia  
Email: oros@iway.na

S.M. Manjunath and B.V. Shivaprakash  
Department of Surgery and Radiology Veterinary College  
Bidar, Karnataka, India – 585 401.  
Email: shivaprakash bv@yahoo.co.in

Ivana Pagés  
President, Fundación Argentina para el Bienestar Animal (FABA)  
Email: presidencia@fabaonline.com  
www.fabaonline.com

R.L. Srivastava et al  
AICRP on Animal Energy  
College of Agricultural Engineering & Technology  
FM & P Engineering Department  
Allahabad Agricultural Institute-Deemed University  
Allahabad-211007, India  
Email: risrivastava_64@yahoo.co.in

I. Wayan Kasa  
Department of Biology  
Udayana University, Bukit Jimbaran, Bali, Indonesia  
Email: iwkasa@yahoo.com
The world may be getting smaller, but the big issues about animal welfare are still going largely unnoticed.

We understand the importance of taking action locally but to achieve fundamental reforms we have to act globally.

WSPA has been active on a worldwide basis for 25 years and our greatest achievements have come from collaborating with other animal welfare societies.

Today WSPA is the largest animal welfare federation in the world, with +600 Member Societies operating in +130 countries.

Recently, WSPA has co-ordinated aid to animals afflicted by the Tsunami, funded a campaign to help end foie gras production in Israel and helped maintain the moratorium on commercial whaling.

Throughout all of this, we have continued to work with our Member Societies to foster and promote general animal welfare.

If we are to continue this animal welfare progress, we need to think bigger.

WSPA is calling for all animal protection societies to join this global movement.

Only by working closely together, sharing our knowledge and skills, can we make faster and long-lasting progress for animals.

Member Societies work in co-ordination with each another, and independently, to find effective ways of addressing all aspects of animal suffering.

WSPA and its global network also provide advice, support, training and materials for organisations working in communities where there remains great indifference to animal cruelty.

Animal protection groups in any country may apply to become a WSPA Member Society.

If your organisation is interested in joining our Global Member Society Network, please email: membersocieties@wspa.org.uk

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WSPA
World Society for the Protection of Animals

WSPA, World Society for the Protection of Animals, 14th Floor, 89 Albert Embankment, London SE1 7TP
PHONE: +44 (0) 207 587 5000. FAX: +44 (0) 207 793 0208. WEB: www.wspa-international.org