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DRAUGHT ANIMAL POWER TODAY

A DEVELOPMENT TOOL NOT SO DEVELOPED

1. Why discuss about draught animal power today?

Today, all over the world, hundreds millions working animals are engaged both in the transports and in agriculture.

Although utilized for millennia, there are several areas to be investigated to improve the quality of the services rendered by them. And, due to the several and different experiences reached by the farmers, there are also a lot of good practices to be exchanged and spread in the rural sector.



As S. Abdul Rahman & K. Reed refers *There is much room for improvement in the welfare of working animals, via the provision of basic veterinary care, technical advice on health and husbandry, including foot care, improved design and maintenance of harnesses and other equipment (The management and welfare of working animals: identifying problems, seeking solutions and anticipating the future in Rev. sci. tech. Off. int. Epiz., 2014, 33 (1), 197-202, published by OIE, the World Organisation for Animal Health formerly Office International des Epizooties).*

2. Strengths of animal traction today

The draught animal power is the only source of renewable energy totally self-produced in the rural villages, then, without the supply of foreign value.

To broken and cultivate the soil, the animal work substitutes the work of the farmers with the hoe and the shovel. The animal work increases the productivity of man by 6 or 10 times. The work of animals substitute the work of women and children in lifting and transport of water, in the transport of firewood and in the seed crushing. This can really improve the quality of life in the villages.

Where the capacities and competences are present in the villages, its utilization has not the problems of other technologies. In fact other technologies are often stopped by the breaking and crushing of the equipment and by the lack of spare parts.

In the volume *La traction animale*, by Philippe Lhoste, Michel Havard and Éric Vall, Edition Quae, 2010 the Table 1.2. shows the spread in the productivity referred to the cultivation of cereals

	Per worker cultivated hectares	Tons of produced cereals per hectare	Tons of produced cereals per worker
Mechanized	100	10	1000
Animals	5	10	50
Manual	1	10	10

The same volume refers, in Figure 1.1. that according to an FAO estimate the 52% of the lands cultivated in the developing countries are cultivated with draught animal power, 26% manually and 22% with tractors.

L'Afrique des idées reçues, par Georges Courade (dir.)Ed. Belin, 2006, 400 p., 25 euros, devotes two chapters to the role of the draught animal power and reminds that in the rainy zones the defeat of the motorization has finally obtained benefits from the progressive development of the draught animal power.

3. A deep examination for better results

The improvements in the use of draught animal power should be reached through a deep analysis of the different realities presents in the remote villages of rural areas. Although here it is not possible to discuss all of them, it is necessary to emphasize that an inadequate analysis of them will conduct to an inevitable defeat.

3.1. Species and breeds

Following the volume *WATCH LIST for domestic animal diversity*, 3rd edition, edited by Beate D. Sherif and published by FAO, Rome October 2000, is possible to consider among draught animals Buffaloes, Cattle (*The term cattle is used in the broad sense to include Bos indicus, Bos taurus, Banteng, Mithan*), Yak, Donkeys, Horses, Bactrian Camels and Dromedaries, Llamas, Alpaca, Guanaco, Vicuna, Deers (*The term deer is used in the broad sense to include all domesticated and semi-domesticated deer species*).

It is obvious that there are differences in the employment of different species and families, such as Yak and camels or donkeys and buffalos, but is equally important to study the differences between the animal of the same specie and of different breeds.

The volume of *Drew Conroy, Ph.D.*, professor at the University of New Hampshire, mentioned *Oxen: A Teamster's Guide to Raising, Training, Driving & Showing* published by Storey Publishing, in 2007, offer a deep examination of the differences, in terms of speed, stamina and easy training, in the use of different races of oxen such as Chianina, Devon, Brown Swiss and so on.

Veterinary World Vol.2, No.10, October 2009:404-407 published an article on Indian Draught Animals Power written by K.L. Phaniraja and H.H. Panchasara, Department of Veterinary Microbiology, Veterinary College, Karnataka Veterinary, Animal and Fishery Science University, Hebbal, Bangalore In that number, in the table 4. *Characteristic of Cattle Breeds of India*, information on at least 15 races. To show how wide could be the differences the description of four races are here reproduced.

Breed	Distribution & habitat	Wt. Kg	Functional characteristics, size and use
Deer	Eastern Asia (including the Korean peninsula) of the western Ghats, of Hagen, India, Thailand of N.E. & Congo and Eastern of Africa	84-100	The females are excellent for all general purposes and are especially used for baby outdoor and rear transport, medium sized, fast walking draught animal
Horse	Europe (Horse Programme) India, Pakistan, Rajasthan, I.P.	371-400	Good with animal particularly for fast ploughing and road transport
Mule	Southwest and central mountain areas of Colombia, N.E.	215-260	Excellent for general purpose, fast walk, medium size
Donkey	Southwest of the Horn of Africa, extending from the Nile river of Ethiopia into the area of Chad in Africa	225-250	Excellent, known for fast work, resistance to Indian Cattle

It is important to emphasize that an element in the selection of breeds could be represented also by their capacity to produce milk, meat, fibres for clothing, hides and leather.

3.2. Works performed

The draught animals are mainly kept for: ploughing the agriculture land, hauling carts, pulling agricultural implements, running certain other devices such as Persian wheels [mechanical pumps], running sugar cane and seed crusher etc., use as pack animal (to carry load on their backs), handling, dragging and stacking timber logs in the forests, moving mobile grocery shops (selling goods on animal driven carts).

3.3. Factors that affect the use of animal traction

The use of the draught animal power is conditioned by several factors. Among them, the main to be considered there are:

- Agronomic factors: soil texture and position of the land
- Zootechnical factors as race, size and aptitudes of the animals
- Veterinary factors: parasites and pathogens such as trypanosome
- Climate: dry, wet, monsoon, etc. and altitude
- The position of the land, its slope, and the situation of the road networks
- The type of vegetation: arid, savannah, etc
- Anthropological factors such as the presence of the culture of the use of livestock and the familiarity with the animals
- The fragmentation of the properties and the geometry of the fields
- Financial and economic factors related to the cost of buying and maintaining the working animals.



4. Vocational training and the diffusion of the best practices

Working with animals, let us say, with living matter, requires competences that can't be acquired only through books and movies. The direct experience is necessary. However there are several books, dvd and also Youtube movies that can help in the acquisition of the competences needed to obtain, from the animals, a good service with an appropriate consumption of energies.

The mentioned book of *Drew Conroy, Ph.D.*, represents a very helpful tool for vocational trainer and farmers engaged in remote areas. It contains information on the step by step training, relevant technologies, considerations on introducing oxen in those areas where oxen aren't belonging to the tradition, breed selection, yokes and implements constructions. For the purpose of the present work the chapter 19 is particularly interesting. In it the author presents his experiences and suggestion acquired working abroad in Africa and in other developing areas.

Draft Horses and Mules: Harnessing Equine Power for Farm & Show, published by Storey Publishing, October 8, 2008 written by Gail Damerow and Alina Rice is interesting, even if it is not specific for the agriculture of remote villages.

For the specificities of the camels traction it is available the document, prepared by the ONG KARKARA, Association nigérienne pour la dynamisation des initiatives locales, within the Projet de Renforcement Institutionnel et Technique de la Filière Cameline, whose title is *TRACTION CAMELINE TRACTION DE CHARRETTE, CULTURE ATTELEE, EXAURE - Guide pratique du conseiller agricole*.

Classic books published by FAO are *Draught Animal Power Manual - A training manual for use by extension agents*, Rome 1994 and *The Employment of Draught Animal Power in Agriculture* published by FAO in 1972.

Tillers International and Prommata are organizations engaged in the vocational training in the sector.

In Tillers website they write *Tillers' mission is to preserve, study, and exchange low-capital technologies that increase the productivity of rural communities. We provide international trainings and consultations on the introduction or maximization of animal power, blacksmithing, woodworking, intensive pasturing and fodder, low-capital technologies, and more. Tillers conducts ground based hands-on trainings in international rural villages, larger population centers, at our Cook's Mill Learning Center in Michigan, and at our new learning center in Chimoio, Mozambique.*

Following his inspirer and founder Jean Nolle, PROMMATA France responds to requests made by groups of farmers, who want to improve their working conditions, or by intermediary NGOs. PROMMATA is an acronym that means PROMotion d'un Machinisme Moderne Agricole à Traction Animale. In English it could be translated as Promotion of a Modern Mechanism moved by Animal Traction. In fact their original activity was the promotion of a multipurpose support for different rural tools moved by the animal traction.

Further several network are to be remembered such as ATENSA, Animal Traction Network for Eastern and Southern Africa, ROATA Réseau Ouest Africain sur la Traction Animale (West Africa Animal Traction Network) or APNEZ Animal Power Network for Zimbabwe. However there are not recent information on their activity. An important role in recent years has been played by the Centre for Tropical Veterinary Medicine directed by Anne Pearson, Senior Research Fellow of University of Edinburgh. The Center has published, from 1983 to 2009, 47 issues of the scientific Journal DAN Draught Animal News.

5. An useful and sustainable technology

The draught animal power can represent an intermediate technology from manual labor toward the introduction of the mechanization. A this regard it is useful to remember that this way has followed in Europe and in other countries. In fact the volume of Enzo Marcolini Elementi di Zootecnia, Edagricole, Bologna 1982, presents the following data. The equines in Italy in the 1979 were 499.700. In the same years the work force represented by cattle was estimated significant also if less than 15% of the energy utilized in agriculture.

The supply of food for draught animals is not concurrent with the production of food for humans. In fact the animals almost always exploit poor pastures not otherwise usable and not often they are fed in the stable.

6. The issue of animal welfare

Ethical questions have been posed for the use of working animals, all mainly connected with the question of the animal welfare. However is possible to say that – if well managed – the animal welfare is not compromised by the work. At this regard is of patent evidence that working animals have been selected in the millennia for cooperating in a proper way with the mankind. Then the selection has conducted to very patient animals that do not suffer for a monotonous and tedious work.

In recent years the training of animals has acquired a deep consciousness from the ethology and from the psychology of domesticated mammals. This has led to what can be considered a relationship between the herd leader, the farmer, and the members of the herd. The mentioned Drew Conroy remember us that *Cattle weighing in excess of 3.000 pounds may be haltered, led, and handled only because they believe humans are dominant; if this ox just once learns he can break the halter, no normal halter or rope will hold him in the future.*



In the applied behavior analysis, borrowed by human science, it has been studied the role – also in the relation with animals – of the Positive/Negative Reinforcement and Positive/Negative Punishment. For instance positive reinforcement works by presenting a motivating/reinforcing stimulus to the animal after the desired behavior is performed.

Several books are a good source of information on the matter, among them there are: *Improving Animal Welfare: A Practical Approach*, edited by Dr. Temple Grandin, Colorado State University, USA; *How to Think Like a Horse: The Essential Handbook for Understanding Why Horses Do What They Do*, 2006, by Chery Hill and *I cavalli di Federico - Guida pratica di Etologia applicata al cavallo di Paolo Baragli*, 2012 edited by Pisa University Press.

In particular *Improving Animal Welfare* examines the different areas of animal welfare such as housing, behavioral needs, transport, handling, euthanasia, draught animals, slaughter, welfare audits, numerical scoring systems, stockmanship, pain relief, and implementing improvements. The book is particularly interesting because the authors have worked extensively in developed and developing worlds and also because they underlines issues such as the implementation of effective standards and scoring systems for assessing animal welfare on farms and how to improve livestock handling and reduce stress. Particularly significant is Chapter 13: *Practical methods for improving the welfare of horses, donkeys, and other working draught animals in developing areas.*

Although dedicated to the sport horse the sources of information from the International Society for Equitation Science (ISES) are very useful. ISES is a not-for-profit organization that chiefly aims to facilitate research into the training of horses to enhance horse welfare and improve the horse-rider relationship. According to their opinion *Equitation science promotes an objective, evidence-based understanding of the welfare of horses during training and competition by applying valid, quantitative scientific methods that can identify what training techniques are ineffective or may result in equine suffering*. They suggest the article on *The Veterinary Journal* 174 (2007) 492-500 on *The advent of equitation science* by Paul D. McGreevy, Faculty of Veterinary Science, University of Sydney, Australia

In addition to the above mentioned OIE, there are several institutions engaged specifically in the promotion of the welfare of working animals in developing countries. Among them it should be remembered The Brooke and ACE. The Brooke is an international animal welfare organization dedicated to improving the lives of working horses, donkeys and mules in some of the world's poorest communities. ACE, Animal Care in Egypt is a charity dedicated to helping stop the suffering of thousands of animals in the poorest communities of Luxor by providing free veterinary care and education.

7. The improvement of harnessing and implements and new perspectives

The focus on animal welfare moves also through the improvement of equipments, harnessing and implements. Deep information on this arguments can be found in the books mentioned above and in particular in *Oxen: A Teamster's Guide*, in *TRACTION CAMELINE*, in *Draught Animal Power Manual* and in *The Employment of Draught Animal Power in Agriculture*.

Several articles refer on the use of animal traction for the generation of electric current. Among them there is the article, at page 60 of the n. 40 of the mentioned Draught Animal News, that discusses very deeply the subject. The article is *HARNESSING AND IMPLEMENTS Power transmission unit for efficient utilization of draught animal power in rotary mode of operation* and the authors are C.P.Doshi, G. Tiwari, R. N. Verma, Rajiv Garg and Hemant Shrivastava of the Department of Farm Machinery and Power Engineering of the College of Technology and Engineering, Maharana Pratap University of Agriculture and Technology. Although not the most recent, it seems to be one of the most complete in the analysis of the perspectives of the use of draught animal power for the said purpose.

Further, dozens of patents have been issued, in several countries, for equipments capable to produce electricity. The more ancient patent has been issued in 1925.

Some more information on this issue is made available by WEDAP at www.wedap.eu. WEDAP, an acronym for Water and Electricity from Draught Animal Power, is an initiative promoted by Masseria Coppola, a farm based in southern Italy. Recent results of the studies in the matter have been presented by Antonio Perrone, on June 18th, 2014, at the workshop on the perspectives of the use of animal traction organized by CeTamb LAB, a center of Brescia University directed by prof. Carlo Collivignarelli.

8. Quantitative data

Although the data on the number of working animals, presented above in paragraph 1., is evident and consolidated it seems useful to give here some references on books and article where those data can be verified and examined for different regions of the world.

What is really significant is that one of the most detailed document on the matter is not a specific document on the use of draught animal power but is a document, published by FAO, on rural mechanization. The reference is to the Vol. 20-2013 of *Integrated Crop Management* whose title is *Mechanization for Rural Development: A review of patterns and progress from around the world*. It gives information on the diffusion of draught animal power disaggregated for regions and provinces of different countries in the world.

From this literature is possible to understand how draught animal power is certainly decreasing in certain areas because won by the mechanization. But in other areas it is increasing and in other there are significant new establishment.

Other source of information on the matter are represented by the mentioned articles and books of Lhoste, Phaniraja and Conroy