

DRAUGHT ANIMAL POWER IN INDIA



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PREFACE

Agricultural production in India can only be increased through efficient utilization of various inputs. Though the country tops the world market in production of tractors yet more than 50 per cent of area covered by small and marginal land holdings is cultivated by draught animals throughout the country. The utilization of draught animal power must be seen in the broad context of the prevailing social, economic and farming environment of our country. In contrast of many developed countries, draught animals play a major role in the economics of Indian agriculture where majority of farmers depend on them for carrying out various farm operations.

There is an urgent need to make utilization of draught animal more efficiently. The working animals can be greatly improved through better breeding, feeding, health and management. In addition, there is large scope of improvement in their harnessing systems as well as the implements or cart they pull. In recent years, many international and national centres have initiated important studies in this field. However, much more needs to be done before a comprehensive basis of systematic knowledge is available which satisfactorily integrates the necessary technical, economic and social information.

There is a lack of reliable and factual information which, in turn, has resulted in paucity of articles, journals and books on the subject. It is this shortage of good resource material that makes the present book an important collection of articles. It is expected that the book will be useful to students, teachers, extension workers and others associated with this field. It will stimulate research and extension workers to pay more attention for increasing the utilization of draught animal. If this book can provide development workers and decision makers with a constructive perspective on draught animal power, we have achieved a great deal.

February 28, 2002

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STATUS AND PROGRESS OF ANIMAL DRAUGHT POWER IN INDIA

Dr. N.S.L. Srivastava¹

Introduction

Traditionally and even today, notwithstanding the increasing mechanisation of Indian agriculture, working animals, particularly bullocks, continue to be the predominant source of energy for traction and rural transport in India. Year after year, cows replace and add to the required number of working bullocks which has been their primary function. Today, a vast herd of approx. 73 million bullocks and about 8 million male buffaloes provide approx. 32,000 MW of power and help cultivate about 90 million farm holdings which accounts to approx. 63 per cent of the total cultivated area in India, besides being the back-bone of rural transport. At an optimal replacement rate of 10 bullocks per tractor, this herd is equal to about 8 million tractors, thus saving the nation about 26 million tonnes of diesel annually, worth Rs. 22,000 crores at the prevailing market price of diesel oil. The market value of draught animals (bullocks, buffaloes, camels, horses, mules, donkeys) in the country is estimated as Rs. 34,500 crores and of animals drawn implements and carts as Rs. 24,000 crores. The replacement value of these draught animals, implements and carts by tractor system will require an investment of approx. Rs. 1,50,000 crores.

In addition to this the draught animals provide about 100 million tonnes of dry dung estimated approx. Rs. 2,000 crores annually and raw material for 1.5 million biogas plants in the country saving about 5 million tonnes of fire wood at a estimated cost of Rs. 500 crores annually. Besides contribution to food and energy, a whole lot of by-products like, skins, bone, hoof, horn, tallow and so many other uses in pharmaceutical industry, are obtained from the fallen and slaughtered animals. There is lack of data on these aspects.

In view of the above importance of draught animals in the country, any effort to increase efficiency and annual utilisation of

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draught animals will help in getting greater outputs from them and will reduce dependence on other sources of farm power. This will also save precious fossil fuels.

Present status of research on DAP

To increase the utilization of animal energy with enhanced man-animal-machine system efficiency, the Indian Council of Agricultural Research is funding number of research projects and schemes. The present status of work done by ICAR centres and other organisation on different aspects of draught animal power are summarized below.

Studies on draughtability of animals

The draught power of an animal depends on the species, breed, sex, size, body weight, nutrition and health, environment, its training for work and terrain conditions. As a thumb rule it is taken that an oxen can exert draught force 'equivalent to 10 per cent of its body weight in sustained working on the whole day basis.

Systematic studies conducted on draughtability of different breeds of bullocks, buffaloes, camels and donkeys in sustained working have shown that: -

- (a) Malvi (CIAE, Bhopal, 1990-93), Nagouri (KVK, Rewari, 1990-93), Khillari (CAE, Reichur, 1990-93) and Haryana (AAI-Allahabad, 1990-93) breeds of bullocks were able to exert draught in sustained working (7 to 8h/days in 2 sessions) equivalent to 12 per cent of their body weight during summer and 14% during winter using local yoke. With improved 3-padded collar harness they were able to exert 14 per cent and 16 per cent during summer and winter seasons, respectively.
- (b) Studies on crossbred humpless bullocks Red Dane and Sahiwal (Rautray and Srivastava, 1982), Jarsey and Sindhi and a few other crossbreds have been shown that crossbred bullocks are good for draught purposes. Rautray and Srivastava (1982) reported that the crossbred of Red Dane and Sahiwal could work in sustained working for tillage operation during summer up to draught load equivalent to 12.9 per cent of their body weight. Maurya and Devdattam (1982) and Maurya and Guruswamy (1981) also reported similar results on Jarsey and Sindhi crossbred bullocks.

- (c) He-buffaloes (GBPUAT, Pantnagar, 1990-93) were able to exert draught in sustained working of 6 h in 2 sessions equivalent to 12 per cent of their body weight using local yoke in both summer and winter seasons.
- (d) Camels (CTAE, Udaipur, 1990-93) were able to exert draught load in sustained working of 7 h (in 2 sessions) equivalent to 18 per cent of their body weight. However, following 2 h work and 2 h rest schedule they could work for 6 h at draught load equivalent to 26 per cent of their body weight.
- (e) Donkeys (CTAE, Udaipur, 1990-93, and CAE Raichur 1990-93) were able to exert draught load in sustained working for 6 hour (in 2 sessions) equivalent to 32 per cent of their body weight. However they could work up to 36 per cent draught load for 4 h for 1 to 2h.

Improved yokes and harnesses

The draught force from the animal to the implements is transmitted through yokes and harnesses. How much draught the animal will exert depends on the yoke or the harness used.

Improved wooden yokes and single and double animal harnesses with padded collars have been developed for bullocks and he-buffaloes. Swamy Rao (1964) reported that Allahabad single and double animal collar harnesses gave about 59 per cent higher power output as compared to local yokes and 38 per cent as compared to Nagpuri yoke. In the co-ordinated trials (CAE, Bhopal, 1993, Singh 1985, Srivastava, 1994) conducted on the Nagpuri wooden yoke, 7-15 per cent higher power output was obtained while Allahabad type single and double animal harness with 3-padded collar gave 15-25 percent more power output in comparison to local yoke under sustained working.

Nagpuri yoke and modified Allahabad type 3-padded (CIAE, Bhopal, 1990-93) collar harness were extensively evaluated in farmers fields. The advantage of collar harness in terms of output of work was more pronounced when the animals worked in higher draught range and when draught load was more than 12 per cent of the body weight, i.e. when the animal had to work in the discomfort zone with local yoke.

At GBPUAT, Pantnagar adjustable collar yoke and collar harness for buffaloes have been developed which could be used for different crop row spacing.

Improved animal-drawn implements and carts

A large number of designs of ploughs, harrows, puddlers, cultivators, seed-cum-fertilizer drills, weeders, diggers, patela harrow, bund formers, multi-purpose tool carriers, etc. were developed at CIAE, ICAR, coordinated Research Scheme on Form Implements and Machinery and Agricultural Universities and are commercially available and used by the farmers. These implements have higher field capacity as compared to traditional implements.

A large number of animal drawn processing equipments like chaff cutter, cane crusher and oil-extracting machines are also commercially available. Animal drawn 'Rahat' and duplex pumps for water lifting are also used. The CIAE, Bhopal (Shanmugham, 1992) and CAPART have brought out a number of monographs and bulletines giving details of different designs of animal drawn equipment.

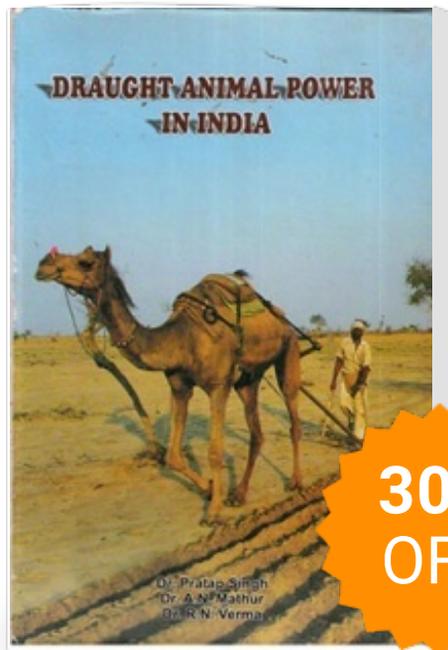
Lot of work has been done on the design of the bullock carts. Improvements have been made mainly to replace wooden axle by iron axle, providing ball or taper roller bearing instead of bushes, replacing wooden wheels by pneumatic wheels or providing iron or rubber rims on wooden wheels, providing punctureless tyres, FRP body and better designing of chasis on scientific basis for higher pay loads and human comforts. These improved carts can carry loads from 1.5 to 3.5 t as compared to 0.8 to 1t load carried by local bullocks carts.

CIAE, Bhopal (Deshpande and Ojha, 1984) and IIM, Bangalore (Ramaswamy and Narsimhan, 1984) and many other organisations have brought out publications giving specifications and capacities of various designs of animal carts.

Matching of implements to draught animals

At CIAE, Bhopal (1990-93), use of draught animals with matching implements for tillage, sowing and weeding gave greater area coverage, higher power output, lower specific energy consumed for a particular operation and lower cost of operation in comparison to

Draught Animal Power in India



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